WestConnex

Australian Government
BUILDING OUR FUTURE

NSW
MAKING IT HAPPEN

M4 East

Submissions Report

Main Volume Chapters 5 to 9

Volume 1B

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Glossary of terms and abbreviations

Term	Meaning
A	
Aboriginal cultural heritage	The tangible (objects) and intangible (dreaming stories, song lines and places) cultural practices and traditions associated with past and present day Aboriginal communities.
Aboriginal object	Any deposit, object or material evidence (not being a handicraft made for sale), including Aboriginal remains, relating to the Aboriginal habitation of NSW.
Aboriginal place	Any place declared to be an Aboriginal place under section 94 of the *National Parks and Wildlife Act 1974*.
ABS	Australian Bureau of Statistics
ADT	Average daily traffic
AHD	Australian height datum A common national surface level datum approximately corresponding to mean sea level
AHIMS	Aboriginal Heritage Information Management System. A register of NSW Aboriginal heritage information maintained by the NSW Office of Environment and Heritage.
Alignment	The geometric layout (eg of a road) in plan (horizontal) and elevation (vertical).
AMO	Allied Meteorological Office
AM peak period	Broadly defined as the period between 6.00 am to 10.00 am weekdays
Ancillary	A subordinate part of an element.
ANZECC	Australian and New Zealand Environment Conservation Council
Aquifer	A groundwater bearing formation sufficiently permeable to transmit and yield groundwater
ARI	Average recurrence interval The average period in years between the occurrence of a flood of a particular magnitude or greater. In a long period of say 1,000 years, a flood equivalent to or greater than a 100 year ARI event would occur 10 times. The 100 year ARI flood has a 1 per cent chance (i.e. a one-in-100 chance) of occurrence in any one year The frequency of floods is generally referred to in terms of their AEP or ARI. In this report the frequency of floods generated by runoff from the study catchments is referred to in terms of their ARI, for example the 100 year ARI flood.
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
Arterial roads	The main or trunk roads of the state road network.
AS	Australian Standard
ASC NEPM	*National Environment Protection (Assessment of Site Contamination) Measure 1999* (Commonwealth)

Term	Meaning
ASS	Acid sulfate soils Naturally occurring soils, sediments or organic substrates (eg peat) that are formed under waterlogged conditions. These soils contain iron sulfide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulfate soils are benign. However if the soils are drained, excavated or exposed to air by a lowering of the water table, the sulfides react with oxygen to form sulfuric acid.
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
At-grade	A road at ground level, not on an embankment or in a cutting.
AWS	Automatic weather station
AWT	Average weekday traffic
B	
Background concentration	Describes all contributing sources of a pollutant concentration other than road traffic. It includes, for example, contributions from natural sources, industry and domestic activity.
Background noise level	The ambient sound-pressure noise level in the absence of the sound under investigation exceeded for 90 per cent of the measurement period. Normally equated to the average minimum A-weighted sound pressure level.
Bank cubic metres	A measure of volume representing a cubic metre of unexcavated material. Once material is excavated, it expands to varying degrees depending on its constituents.
bgl	Below ground level
BH	Borehole
BITRE	Bureau of Infrastructure, Transport and Regional Economics
BoM	Bureau of Meteorology
Bore	Constructed connection between the surface and a groundwater source that enables groundwater to be transferred to the surface either naturally or through artificial means.
BTS	Bureau of Transport Statistics
Bus lane	A traffic lane dedicated to buses, but which can also be used by taxis, bicycles and motorcycles.
C	
Carriageway	The portion of a roadway used by vehicles including shoulders and ancillary lanes.
Catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
CBD	Central business district
CCTV	Closed circuit television
CEMP	Construction Environmental Management Plan A site specific plan developed for the construction phase of the project to ensure that all contractors and sub-contractors comply with the environmental conditions of approval for the project and that the environmental risks are properly managed.
CLM Act	*Contaminated Land Management Act 1997* (NSW)
CNVMP	Construction noise and vibration management plan
CO	Carbon monoxide

Term	Meaning
CO_2	Carbon dioxide
Concept design	Initial functional layout of a road/road system or other infrastructure. Used to facilitate understanding of a project, establish feasibility and provide basis for estimating and to determine further investigations needed for detailed design.
CAQMP	Construction air quality management plan
Construction ancillary facility	Facilities used to support the operation of a construction site including (but not limited to) site offices, workshops, delivery areas, storage areas, crib sheds, staff vehicle parking, material and plant equipment.
Construction footprint	Area required for the construction of the project. This includes the operational footprint and temporary construction ancillary facilities.
Contributory item	Place within a Heritage Conservation Area that contributes to its heritage significance.
CPTED	Crime Prevention Through Environmental Design
Cul-de-sac	A street or road that is open for vehicular traffic at one end only.
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts than a single impact considered alone.
Cut-and-cover	A method of tunnel construction whereby the structure is built in an open excavation and subsequently covered.
Cutting	Formation resulting from the construction of the road below existing ground level, the material is cut out or excavated.
D	
dBA	A-weighted decibels A-weighting is applied to instrument-measured sound levels in effort to account for the relative loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies.
DCP	Development Control Plan
DECC	Former Department of Environment and Climate Change (now OEH).
DECCW	Department of Environment, Climate Change and Water (formerly DECC, but now OEH).
Design speed	A nominal speed which determines the geometric design features of a road.
Detailed design	The stage of design where project elements are designed in detail, suitable for construction.
DFO	Direct Factory Outlet
Discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m^3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving (eg metres per second [m/s]).
Divided road	A road with a separate carriageway for each direction of travel created by placing a physical separation (eg median) between the opposing traffic directions.
DGRs	Director-General's requirements. Now Secretary's Environmental Assessment Requirements (SEARs).
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries

Term	Meaning
DPI – Water	NSW Department of Primary Industries – Water (formerly NSW Office of Water)
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water.
Drawdown	Reduction in the height of the water table caused by changes in the local environment.
E	
Enabling works	Works that are required to enable the commencement of the main construction works.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
EEC	Endangered ecological community
Egress	Exit
EIS	Environmental impact statement
Embankment	An earthen structure where the road (or other infrastructure) subgrade level is above the natural surface.
Emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
EMF	Electromagnetic field
ENMM	*Environmental Noise Management Manual* (Roads and Traffic Authority 2001)
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Act 1999* (Commonwealth)
EPL	Environment protection licence
Erosion	A natural process where wind or water detaches a soil particle and provides energy to move the particle.
ESD	Ecologically sustainable development.
EU	European Union
F	
FBA	*Framework for Biodiversity Assessment* (Office of Environment and Heritage 2014a)
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. **Feasible** relates to engineering considerations and what is practical to build. **Reasonable** relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community expectations and nature and extent of potential improvements.
Flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. It is often defined as flooding which peaks within six hours of the rain event.
Flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.

Term	Meaning
Flood prone land	Land susceptible to flooding by the probable maximum flood. Note that the flood prone land is also known as flood liable land.
Flood storage area	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. It is necessary to investigate a range of flood sizes before defining flood storage areas.
Floodplain	Area of land which is inundated by floods up to and including the probable maximum flood event (ie flood prone land).
Floodplain Risk Management Plan	A management plan developed in accordance with the principles and guidelines in the NSW *Floodplain development manual* (DIPNR 2005). Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.
FMS	Flood management strategy
Footprint	The extent of impact that a development makes on the land.
Fracture	Cracks within the strata that develop naturally or as a result of underground works
Freeboard	A factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. It is usually expressed as the difference in height between the adopted flood planning level and the peak height of the flood used to determine the flood planning level. Freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels across the floodplain, such as wave action, localised hydraulic behaviour and impacts that are specific event related, such as levee and embankment settlement, and other effects such as “greenhouse” and climate change. Freeboard is included in the Flood Planning Level.
FTE	Full-time equivalent
G	
GHG	Greenhouse gas
GIS	Geographic information systems
Global Sydney	As defined in *A Plan for Growing Sydney* (NSW Government 2014). Global Sydney includes the Sydney CBD, North Sydney CBD, Barangaroo, Darling Harbour, the Bays Precinct, Pyrmont-Ultimo, Broadway and Camperdown Education and Health Precinct, Central to Eveleigh, Surry Hills and City East.
Grade	The rate of longitudinal rise (or fall) with respect to the horizontal expressed as a percentage or ratio.
Grade separation	The separation of road, rail or other traffic so that crossing movements at intersections are at different levels.
Groundwater	Water that is held in rocks and soil beneath the earth’s surface.
GRAL	Graz Lagangrian dispersion model Air quality modelling package.
GRAMM	Graz Mesoscale Model

Term	Meaning
H	
HAMU	Historical archaeological management unit
HARD	Historical archaeological research design
Hazard	A source of potential harm or a situation with a potential to cause loss. In relation to the *NSW Floodplain development manual* (DIPNR 2005) the hazard is flooding which has the potential to cause damage to the community.
HCA	Heritage conservation area
Heavy vehicles	A heavy vehicle is classified as a Class 3 vehicle (a two axle truck) or larger, in accordance with the Ausroads Vehicle Classification System.
Heritage Act	*Heritage Act 1977* (NSW)
Heritage item	Place listed on a statutory heritage register
Hydraulic conductivity	A characteristic of soil that describes how easily water moves through it.
Hydrology	The term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
I	
IAQM	Institute of Air Quality Management
ICNG	*Interim Construction Noise Guideline* (Department of Environment and Climate Change 2009a)
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
INP	*Industrial Noise Policy* (Environment Protection Authority 2000)
Intrusive item	Place within a heritage conservation area that detracts from its heritage significance.
Inside shoulder	The area of pavement outside the traffic lanes that is closest to the 'fast' lane
Interchange	A grade separation of two or more roads with one or more interconnecting carriageways.
ISCA	Infrastructure Sustainability Council of Australia
ITS	Intelligent Transport Systems Systems in which information and communication technologies are applied in the field of road transport, including infrastructure, vehicles and users, and in traffic management and mobility management, as well as for interfaces with other modes of transport.
K	
KGRIU	King Georges Road Interchange Upgrade
kL	Kilolitres
kL/day	Kilolitres per day
km/h	Kilometres per hour
L	
L_{A90}	The noise level exceeded for 90 per cent of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
LAC	Local area command (when referring to police stations)

Term	Meaning
L_{Aeq}	The 'energy average noise level'. It is often expressed with a time period eg 1 hour, 9 hour (to represent the night-time period from 10.00 pm to 7.00 am) or 15 hour (to represent the daytime and evening periods from 7.00 am to 10.00 pm). The L_{Aeq} can be likened to a noise dose representing the cumulative effects of all the noise events occurring in the relevant time period.
LALC	Local Aboriginal Land Council
Lane	A portion of the carriageway allotted for the use of a single line of vehicles.
LCZ	Landscape character zone
LEP	Local environmental plan
LGA	Local government area
Licensed discharge point	A location where a licensed operation discharges water to the environment in accordance with conditions stipulated within the site environment protection licence (EPL).
LoS	Level of service
LSJH JV	Leighton, Samsung C&T and John Holland Joint Venture
L/s/km	Litres per second per kilometre
M	
M4 and Parramatta Road corridor	The M4 and Parramatta Road Corridor is the area from Parramatta CBD to Sydney CBD, generally between the Main Western Rail Line in the south and the Parramatta River to the north.
m^2	Square metres
m^3	Cubic metres
M	Metres
m/day	Metres per day
Mainline tunnels	The main two tunnels to be constructed as part of the project. This does not include tunnels for on- and off-ramps.
Mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
Managed motorway	A managed motorway uses active traffic management to reduce congestion, improve reliability of travel times and inform travellers of real-time incidents and expected travel times to set destination along the motorway.
Mathematical/computer models	The mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.
Median	The central reservation which separates carriageways from traffic travelling in the opposite direction.
Methodology	The method for analysis and evaluation of the relevant subject matter.
mg/L	Milligrams per litre
ML	Megalitres
ML/day	Megalitres per day
MLALC	Metropolitan local aboriginal land council
Motorway	Fast, high volume controlled access roads. May be tolled or untolled.

Term	Meaning
N	
NCA	Noise catchment area
NCG	*Noise Criteria Guideline* (Roads and Maritime Services 2014a)
NEPM	National Environmental Protection Measure
Neutral item	Place within a heritage conservation area that does not contribute to or detract from its heritage significance
NGA	National Greenhouse Accounts
NGER	National Greenhouse and Energy Reporting
NGER Act	*National Greenhouse and Energy Reporting Act 2007* (Commonwealth)
NMG	*Noise Mitigation Guideline* (Roads and Maritime Services 2014b)
NML	Noise management level
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NSW	New South Wales
NWQMS	National Water Quality Management Strategy
O	
OEH	NSW Office of Environment and Heritage (formerly DECCW)
Off-ramp	A ramp by which one exits a limited-access highway/tunnel.
On-ramp	A ramp by which one enters a limited-access highway/tunnel.
Operational footprint	Areas to be directly impacted by the operational components of the project such as roadways and associated facilities (eg motorway operations complex and ventilation facilities. The operational footprint also includes sections of the M4 East that are located below ground in tunnel.
Overbridge	Bridge which conveys another road, rail or pedestrians over the described road.
Overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
P	
PACHCI	*Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (Roads and Maritime 2011b)
Parramatta Road corridor	The Parramatta Road Corridor is the area from Parramatta CBD to Sydney CBD, generally between the Main Western Rail Line in the south and the Parramatta River to the north.
Pavement	The portion of a carriageway placed above the subgrade for the support of, and to form a running surface for, vehicular traffic.
PEA Act	*Protection of the Environment Administration Act 1999* (NSW)
Peak discharge	The maximum discharge occurring during a flood event.
Peak flood level	The maximum water level occurring during a flood event.
pH	Numeric scale ranging from zero to 14 used to specify the acidity or alkalinity of an aqueous solution. Solutions with a pH less than seven are acidic and solutions with a pH greater than seven are alkaline. Pure water has a pH of seven and is neutral.
PM	Particulate matter
PM_{10}	Particulate matter of up to 10 micrometres
$PM_{2.5}$	Particulate matter of up to 2.5 micrometres

Term	Meaning
PMF	Probable maximum flood The flood that occurs as a result of the probable maximum precipitation on a study catchment. The PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land (i.e. the floodplain).
PM peak period	Broadly defined as the period between 3.00 pm to 7.00 pm weekdays
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
POEO Regulation 2005	*Protection of the Environment Operations (Waste) Regulation 2005* (NSW)
Pollutant	Any measured concentration of solid or liquid matter that is not naturally present in the environment.
Potential heritage item	Place identified in this report as potentially having heritage significance, which is not recognised on a heritage register.
PPFL	Preliminary peak flood level
Preferred design	The design that is the subject of this environmental impact statement.
Probability	A statistical measure of the expected chance of flooding (see annual exceedance probability).
Proponent	The person or organisation that proposes to carry out the project or activity. For the purpose of the project, the proponent is the NSW Roads and Maritime Service.
Project	M4 East project
R	
Rat run	A minor street used by drivers during peak periods to avoid congestion on main roads.
RBL	Rating background noise level
REP	Regional Environmental Plan
Residual land	Land acquired for construction that is not required during operation of the project.
Risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the manual it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
RNP	*Road Noise Policy,* Department of Environment, Climate Change and Water (DECCW) 2011.
Roadheader	A commonly used machine for excavation in sandstone using pics mounted on a rotary cutter head attached to a hydraulically operated boom.
Road reserve	A legally defined area of land within which facilities such as roads, footpaths and associated features may be constructed for public travel.
Roads and Maritime (RMS)	NSW Roads and Maritime Services
Roadside furniture	A general term covering all signs, street lights, protective devices for the control, guidance and safety of traffic and convenience of road users.
RTA	(Former) NSW Roads and Traffic Authority (now Roads and Maritime Services)

Term	Meaning
Runoff	The amount of rainfall that ends up as streamflow, also known as rainfall excess.
RWR receptors	Residential, workplace and recreational receptors.
S	
SCATS	Sydney Co-ordinated Adaptive Traffic System
SEARs	Secretary's Environmental Assessment Requirements Requirements and specifications for an environmental assessment prepared by the Secretary of the Department of Planning and Environment under section 115Y of the *Environmental Planning and Assessment Act 1979* (NSW).
Section 170 register	State Government agency section 170 Heritage and Conservation Register
SIP	Social infrastructure provider
Shoulder	The portion of the carriageway beyond the traffic lanes adjacent to and flush with the surface of the pavement.
SO_2	Sulfur dioxide
Socio-economic	Involving combination of social and economic matters.
SOPA	Sydney Olympic Park Authority
Spoil	Surplus excavated material
Stockpile	Temporarily stored materials such as soil, sand, gravel, spoil/waste.
Stub tunnel	Driven tunnels constructed to connect to the possible future M4–M5 Link.
Surface road concentration	Describes the contribution of pollutants from the surface road network. It includes not only the contribution of the nearest road at the receptor, but also the net contribution of the modelled road network at the receptor.
Surface water	Water flowing or held in streams, rivers and other wetlands in the landscape.
SMC	Sydney Motorway Corporation
T	
TBM	Tunnel boring machine. An excavation machine that 'bores' through soil or rock to create a tunnel with a circular cross section (as opposed to drilling and blasting methods).
TEC	Threatened ecological community
TfNSW	Transport for NSW
The Blue Book	*Managing Urban Stormwater – Soils and Construction* Volumes 1 and 2, NSW Government 2004 and 2006
TMSP	Traffic Management and Safety Plan
Total concentration	The sum of the background, surface road and ventilation outlet concentrations. It may relate to conditions with or without the project under assessment.
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
Transport Master Plan (TMC)	*NSW Long Term Transport Master Plan* (Transport for NSW 2012a)
U	
µg	microgram
UFP	Ultrafine Particle
Urban design	The process and product of designing human settlements, and their supporting infrastructure, in urban and rural environments.

Term	Meaning
V	
Ventilation facility	Facility for the mechanical removal of air from the mainline tunnels, or mechanical introduction of air into the tunnels.
Ventilation outlet concentration	Describes the contribution of pollutants from tunnel ventilation outlets.
VKT	Vehicle kilometres travelled
VMS	Variable message signs
VOC	Volatile organic compounds
VTTS	Value of Travel Time Surveys
W	
WARR Act	*Waste Avoidance and Resource Recovery Act 2001* (NSW)
Waterway	Any flowing stream of water, whether natural or artificially regulated (not necessarily permanent).
WDA	WestConnex Delivery Authority
WHO	World Health Organisation
WHS	Work Health and Safety Plan
WM Act	*Water Management Act 2000* (NSW)
WRTM	WestConnex Road Traffic Model
WSUD	Water Sensitive Urban Design
WUDF	WestConnex Urban Design Framework

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5 Responses to community submissions

5.1 Planning and statutory requirements

5.1.1 Approval process

2,107 submissions raised issues regarding the approval process for the project.

Issue description – lack of due process

Concerns were raised regarding a perceived lack of due process that undermined the independence, transparency and credibility of project planning. Particular matters that were raised include:

- Absence of a strong or detailed business case
- Lack of consideration of the Auditor General's Report
- Non-adherence to the Major Projects Assurance Framework
- Transfer of project delivery functions to a private entity
- Lack of transparency in NSW Government tendering process
- Award of construction contracts prior to project approval
- Acquisition of properties prior to project approval.

Furthermore, a number of submissions focussed on issues around the apparent lack of due process around the timing of the EIS in particular. These submissions are addressed in **section 5.1.2** of this report. Other submissions focussed on a perceived lack of due process in regard to public consultation. These submissions are addressed in **section 5.6** of this report.

Response

As outlined in section 2.1.1 of the EIS, on 5 December 2014, the project was declared, by Ministerial Order, to be State significant infrastructure and critical State significant infrastructure under sections 115U(4) and 115V of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). The order also amended Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* to include the M4 East as critical State significant infrastructure. In accordance with section 115Z of the EP&A Act, an environmental impact statement (EIS) is required. The EIS has been prepared in accordance with Secretary's Environmental Assessment Requirements, or SEARs, prepared by the Secretary of DP&E and the relevant provisions of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (NSW).

NSW Roads and Maritime Services (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 of the project for Roads and Maritime.

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 on Parramatta Road. There is a recognised need to provide freight links between Sydney Airport, Port Botany and Western Sydney. The project would assist in achieving this, but in combination with other WestConnex projects.

The *WestConnex Business Case Executive Summary* (Sydney Motorways Project Office, 2013a) (Business Case) outlines the need for WestConnex and identifies the process for delivering this major infrastructure initiative. Further details on the Business Case are detailed in section 3.1.8 of the EIS. As explained in this section, the Business Case was being updated at the time of the EIS publication. An updated document, *WestConnex Updated Strategic Business Case* (NSW Government, 2015), was released in November and is available on the WestConnex website at the following address:

www.westconnex.com.au/documents/updated_strategic_business_case.pdf

The Updated Business Case has been subject to an externally managed Business Case Gateway Review, under the NSW *Infrastructure Investor Assurance Framework*, which was developed by Infrastructure NSW for the *State Infrastructure Strategy 2012-2032* (Infrastructure NSW, 2012), and reaffirmed in the *State Infrastructure Strategy Update 2014* (Infrastructure NSW, 2014).

As stated in the Auditor General's report to Parliament, WestConnex adopted different assurance arrangements designed to suit its size, duration and complexity. It is noted that the Auditor General's report to Parliament did not examine the merit of the project.

The Updated Business Case explicitly addresses a number of the recommendations made by the Auditor General, including reflection of stages 2 and 3 of WestConnex and adoption of the Infrastructure Investor Assurance Framework.

The broad NSW Government tendering process was explained in Chapter 4 of the EIS. As outlined in section 4.1.4 of the EIS, following a competitive tender process to design and construct the M4 East that commenced in May 2014 when expressions of interest were called, a shortlist of three consortia to build the M4 East was announced by the NSW Government in August 2014. Tenders from shortlisted contractors to build the M4 East were received in December 2014, and tender evaluation and design refinement to cater for changes to WestConnex took place over the first half of 2015. The preferred tenderer, a consortium comprising Leighton, Samsung C&T and John Holland, was announced on 4 June 2015.

The contractor was engaged 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. The preferred design 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 as part of the EIS process. This provides more certainty as to the proposed design and construction of the project for assessment of the EIS. The project will continue to be refined during detailed design and construction planning phases. The appointment of a contractor does not undermine the EIS process and it is a matter for the NSW Minister for Planning to determine whether the project should be approved and the conditions of any such approval.

All property acquisition for the project would be undertaken in accordance with Roads and Maritime Services land acquisition information guide and the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW). Approval from the NSW Minister for Planning under the EP&A Act is not a prerequisite for the commencement of the land acquisition process and the project will not commence on any acquired land unless planning approval is obtained. Acquisition of property pre-planning approval will reduce timeframes for delivery of the project (if approved).

Issue description – staged approval

Concerns were raised regarding the decision to progress WestConnex 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.

WestConnex has also been considered in its entirety in the 2003-2004 *Strategic Environment Review* and again in the 2013 *Strategic Environmental Review*. The review included a strategic traffic and air quality assessment based on preliminary modelling of regional traffic movements and associated estimation of emissions. Other priority issues considered in the review included energy efficiency, noise and vibration and socio-economic issues. The review found that the WestConnex scheme would deliver significant long term benefits to economic growth and reduce the negative effects of traffic congestion along key corridors.

Response

As described in Chapter 1 of the EIS, the M4 East 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 will be lodged for each individual component project of WestConnex. Each project will be assessed separately, but the impacts of each project will also be considered in the context of the wider WestConnex. The consideration of WestConnex within the EIS is discussed further in **section 5.1.2** of this report.

Chapter 26 of the EIS assesses potential cumulative impacts associated with the construction and operation of all WestConnex component projects, based on information about the component projects that was publicly available at the time the EIS was prepared.

Issue description – authority of Minister

Concerns were raised about the authority of the NSW Minister for Roads, Maritime and Freight to assess and approve the project.

Response

The project is subject to assessment and approval by the NSW Minister for Planning under Part 5.1 of the EP&A Act. The reference to the NSW Minister for Roads, Maritime and Freight in the submission is incorrect. As described in section 2.1.1 of the EIS, the project was declared by Ministerial Order to be State significant infrastructure and critical State significant infrastructure under section 115U(4) of the EP&A Act, section 115V of the EP&A Act and clause 16 of the *State Environmental Planning Policy (State and Regional Development) 2011*. The associated approval process under Part 5.1 of the EP&A Act is illustrated in Figure 2.1 in section 2.1 of the EIS.

In determining whether to grant approval to the project, the NSW Minister for Planning is required to exercise the Minister's discretion in accordance with the EP&A Act.

Issue description – need for approval

Concerns were raised that the project would commence construction prior to the publication of an EIS and the award of relevant approvals.

Response

Construction of the project components described in the EIS will not commence unless and until the project is approved by the NSW Minister for Planning in accordance with Part 5.1 EP&A Act. Once approved, construction would only be allowed to proceed in accordance with any conditions of the approval.

Separate assessments have been undertaken or may be proposed for works which would be required before construction of the project can commence, including, for example, the relocation of the hockey field at Cintra Park determined under Part 5 of the EP&A Act.

Issue description – no referral

Concerns were raised that the project would not be referred under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act).

Response

As stated in section 20.1.5 of the EIS, the project is not considered likely to have a significant impact on a matter of national environmental significance. As such, a referral under the EPBC Act is not required.

5.1.2 Adequacy and independence of EIS

4,054 submissions raised issues regarding the adequacy and independence of the environmental impact statement.

Issue description – timing of assessment

Concerns were raised about a perceived lack of due process in the timing of the EIS in relation to other project milestones. The submissions particularly questioned the appropriateness of awarding tenders and acquiring properties prior to publication of the EIS. The submissions argued this was evidence of a lack of authenticity in the EIS, suggesting findings were predetermined.

Response

A range of activities have been undertaken in tandem to align with major project milestones, including the display of the preliminary concept design, selection and award of the design and construction contract, display of the preferred design, and acquisition of properties.

The contractor was engaged to develop the detailed design and, if 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. The preferred design enables a more detailed and accurate representation of the project that would be constructed.

The advancement of the preferred design and appointment of a contractor have 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 presented in the EIS.

These activities do not undermine the EIS process and associated public consultation. These processes are set out under Part 5.1 of the EP&A Act. The project cannot be determined until the EIS and associated public consultation are complete.

The EIS associated with this project was on public exhibition for 55 days, from 9 September to 2 November 2015, and a range of consultation activities were undertaken during this period as described in **Chapter 2** (Community involvement) of this report.

If the project is approved, the contractor could commence construction in accordance with the detailed design and any relevant conditions of approval under the EP&A Act. Multiple aspects of the design have already been refined, clarified or changed to address community feedback on the preliminary concept design, the preferred design and the EIS. These design changes are outlined in section 7.5 of the EIS and **Chapter 6** (Clarifications) and **Chapter 7** (Preferred Infrastructure Report) of this report, as relevant.

The project will continue to be refined during detailed design and construction planning, as outlined in Chapter 5 of the EIS. Issues raised during public consultation and in submissions would be an ongoing consideration during this detailed design process.

A separate approval, in the form of a modification to the project approval, would need to be obtained for any works which are not consistent with the EIS and the project approval.

Issue description – adequacy of assessment

Concerns were raised 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:

- Inadequate explanation of methodologies
- Inadequate assessment of alternatives
- Inadequate consideration of alternative policy scenarios
- Inadequate traffic impact assessment
- Inadequate flooding assessment
- Inadequate social impact assessment
- Inadequate economic impact assessment

- Inadequate geotechnical testing for tunnelling
- Inadequate consideration of other WestConnex projects
- Inadequate consideration of other connecting infrastructure
- Inadequate consideration of cumulative impacts
- Inadequate maps to indicate exact location of infrastructure
- Inadequate information regarding the project design including levels
- Inadequate consideration of 2003-2004 Strategic Environment Review
- Inadequate consideration of use of private motor vehicles during construction
- Failure to clearly identify all residents, businesses and social infrastructure potentially impacted
- Deferral of assessments and commitments to future project phases.

Submissions also claimed study areas presented in the EIS were constrained and did not account for the full extent of potential impacts.

Response

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).

The EIS included the preparation of a range of detailed technical studies (contained in Appendices A to W in Volumes 2A to 2H of the EIS). These technical studies were prepared in accordance with the SEARsand associated material received from key referral agencies as well as industry standards and guidelines. For example, the traffic and transport assessment was undertaken using the industry standard strategic transport model administered by Roads and Maritime.

The study areas and identification of affected receivers such as residences or business were determined by the relevant technical specialists in accordance with relevant guidelines for the technical assessments and the likely extent of potentially significant impacts. In many cases, the study areas extended beyond the footprint of the project, including the air quality and noise and vibration assessments presented in Appendix H and Appendix I of the EIS respectively.

The EIS represents a detailed and project specific assessment supported by community consultation and addressing all environmental issues as identified in the 2003-2004 Strategic Environment Review of WestConnex. The design, construction and operation of the project would be undertaken in line with the *WestConnex Sustainability Strategy*, including various commitments, guiding principles, objectives and overarching targets across a range of sustainability themes. The sustainability strategy was identified in the strategic review and is discussed in Chapter 27 of the EIS,

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.

Responses to public submissions on the EIS relating to specific aspects of the assessment are included in other sections of this report throughout **Chapter 5** (Response to community submissions). Clarifications and corrections of errors or ambiguities in the EIS are provided in **Chapter 6** (Clarifications).

Issue description – assessment of WestConnex

Concerns were raised that the EIS selectively considers the benefits of the full WestConnex project without a corresponding consideration of potential impacts WestConnex. For example, it was argued the EIS considered the expected mitigating effect of other WestConnex projects on traffic congestion, without corresponding consideration of impacts in relation to noise, air quality and biodiversity. This approach was also criticised given the lack of certainty surrounding other WestConnex projects.

Response

As described in Chapter 1 of the EIS, the M4 East 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 will be lodged for each individual component project of WestConnex. Each project will be assessed separately, but the impacts of each project will 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 Roads and Maritime. Accordingly, the traffic and transport assessment presented in the EIS considered the M4 East project alongside other WestConnex projects 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'. The assessments included a range of scenarios under which some or all of the other WestConnex projects are completed.

Other assessments such as the air quality assessment and the noise and vibration assessment similarly considered the impacts of other WestConnex projects in modelling of future scenarios, in accordance with industry standards and guidelines.

Section 26.4 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 were the Haberfield Heritage Conservation Area due to the construction of the M4–M5 Link and areas of Homebush north of the M4, which may be subject to construction fatigue in combination with the Parramatta Road Urban Transformation Strategy. Some potential for cumulative biodiversity impacts with the M4–M5 Link was also identified but would be limited in extent due to the highly modified and fragmented nature of potentially affected ecosystems.

Issue description – suitability of consultant

Concerns were raised regarding the suitability of the EIS consultant with reference to prior legal disputes and perceived conflicts of interest in the planning and construction of WestConnex. Submissions also noted that AECOM failed to consider input from other independent consultants.

Response

It is noted that disputes over traffic modelling involving AECOM are an ongoing legal matter, involving traffic modelling undertaken to inform a business case for a project unrelated to WestConnex and using a different methodology from that described in the EIS.

The traffic and transport assessment for the M4 East utilised an industry standard strategic transport model administered by Roads and Maritime. An integral part of the traffic modelling process was the involvement of independent expert peer reviewers to examine model development, traffic forecasts and associated methodologies. The reviewers included 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.

The engagement of AECOM and GHD as lead consultants to undertake the environmental assessment of the M4 East project occurred via a competitive Request for Tender process. The preparation of the EIS also involved a range of separate consultants outside of AECOM and GHD including GML Heritage, EnRiskS, Stacey Agnew and Rygate Surveyors. Both SMC and AECOM have engaged probity auditors to promote probity with regard to all contracts related to WestConnex.

5.1.3 Statutory requirements and other approvals

346 submissions raised issues regarding statutory requirements and other approvals.

Issue description – need for Council approval

How can the contract be awarded without council approval?

Response

As the project is subject to assessment and determination under Part 5.1 of the EP&A Act, it does not require approval from local councils.

As described in section 4.1.4 of the EIS, a competitive tender process to design and construct the M4 East commenced in May 2014, when expressions of interest were called. A shortlist of three consortia to build the M4 East was announced by the NSW Government in August 2014. Tenders from shortlisted contractors to build the M4 East were received in December 2014, and tender evaluation and design refinement to cater for changes to WestConnex took place over the first half of 2015. The preferred tenderer, a consortium comprising Leighton, Samsung C&T and John Holland, was announced on 4 June 2015.

The EIS was prepared based on the contractor's preferred design and preliminary construction methodology. This means that the project described and assessed by the EIS more closely reflects the project that will be constructed if planning approval is granted. This provides more certainty for the community as to the design of the project and how it is likely to be constructed. The project will 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.

The contractor would be required to construct the project in accordance with the project approval, if granted, and any conditions of approval issued by the Minister for Planning. A separate approval, in the form of a modification to the project approval, would need to be obtained for any works which are not consistent with the EIS and the project approval.

Local councils were consulted in detail through this process. Further explanation of the specific consultation with councils is found in **Chapter 2** (Community involvement) of this report. However, as the project has been declared to be State significant infrastructure, planning approval is required from the NSW Minister for Planning rather than from the local councils.

Issue description – local planning instruments

Submissions argued that the project was in conflict with the relevant local environmental plans administered by the local councils.

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 five local government areas (LGAs): Auburn, Strathfield, Canada Bay, Burwood and Ashfield. Above ground works are proposed to be located within each of these LGAs, except for the Burwood LGA.

Land use zones under each of the following LEPs, corresponding to LGAs where above ground works are proposed to be located, were discussed in Chapter 12 of the EIS:

- *Auburn Local Environmental Plan 2010*
- *Strathfield Local Environmental Plan 2012*
- *Canada Bay Local Environmental Plan 2013*
- *Ashfield Local Environmental Plan 2013.*

Issue description – freedom of information

Concerns were raised regarding the transfer of functions from the WestConnex Delivery Authority to the private Sydney Motorway Corporation. Submissions argued that these arrangements were designed to shield the project from statutory freedom of information requests. Submissions also objected to the perceived use of public money to establish the private corporation.

Response

As outlined in **Chapter 1** (Introduction) of this report, SMC was originally established in 2014 by the Government to act as the financing entity for WestConnex. It was established as an entity under the *Corporations Act 2001* (Commonwealth), and is not guaranteed by the State. SMC is owned by the NSW Government, with the NSW Treasurer and NSW Minister for Roads, Maritime and Freight as shareholders.

In October 2015, additional procurement and delivery functions were assigned to SMC and some functions of the WestConnex Delivery Authority (WDA) were retained by Roads and Maritime. SMC is now responsible for project management of the delivery of WestConnex, contract engagement and management, and funding and financing of WestConnex. Roads and Maritime remains the NSW Government commissioning agency for the project and is responsible for management of the concession arrangement from the Government side of contract. It acts on behalf of the Government as the agency commissioning WestConnex.

Although SMC is formed under the *Corporations Act 2001* (Commonwealth), there are external governance and oversight arrangements in place for the project generally. Further information on the 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 is the proponent of the planning application for this project.

The *Government Information (Public Access) Act 2009* (NSW) provides a legally enforceable right to government information for members of the public. As a private corporation, SMC does not hold government information accessible under the Act.

Roads and Maritime will continue to hold information relating to the project and will remain subject to the *Government Information (Public Access) Act 2009* (NSW).

5.2 Strategic justification and project need

5.2.1 Need for the project

3,846 submissions raised issues relating to the need of the project and also the wider WestConnex.

Issue description – project would not resolve congestion issues

Submissions raised concerns regarding the need for the project on the basis that it would not resolve congestion issues. Submissions raised the following issues:

- The project would not solve traffic problems
- The project is not an effective solution
- The project would not alleviate congestion
- The project would create more problems
- The project would not meet most of its objectives
- WestConnex is the wrong solution
- The WestConnex motorway is the wrong transport project for Sydney's future
- The community would not benefit.

Response

Once completed, the project would provide immediate operational benefits in relieving congestion along the M4 and Parramatta Road, between Homebush Bay Drive at Homebush and Wattle Street (City West Link) and Parramatta Road at Haberfield/Ashfield, including reduction in travel times and improvements in the level of road safety. Further benefits would be realised when the M4–M5 Link (which is subject to separate planning approval) is operating.

As outlined in the executive summary of the recently released *WestConnex Updated Strategic Business Case* (NSW Government 2015) (Updated Business Case), traffic volumes on Parramatta

Road between Wentworth Road at Strathfield and Wattle Street at Haberfield/Ashfield show significant reductions due to the relief provided by the project. East of Wattle Street the 2031 traffic volumes with WestConnex are similar to the current 2012 volumes, in essence, containing 20-years of forecast growth that would occur if no action was taken.

Section 10.3 of the Updated Business Case provides details of travel time savings achieved with the construction of all of the WestConnex component projects. The analysis demonstrates that WestConnex would deliver improvements in travel times to and from the Sydney Airport and Port Botany precinct from the west and south west. A comparison of morning peak network performance in 2031 with and without WestConnex shows that travel times improve by as much as 20 minutes from the west with WestConnex.

WestConnex is intended to be delivered as an integrated package of transport improvements across Sydney, with complementary enhancements to the existing road network including associated surface street changes, bus priority measures, heavy vehicle access improvements, redesign of bus services and facilities, improved access to rail stations and upgrades to cyclist and pedestrian facilities.

Integrated land use and transport planning initiatives are key factors in developing a future where 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 *NSW Long Term Transport Master Plan* (Transport for NSW, 2012a) (Transport Master Plan). Ultimately, it is the combination of these initiatives that will best address Sydney's future needs.

WestConnex would cater for the diverse travel demands along the M4 and Parramatta Road corridors that are best met by road infrastructure such as the distribution of business goods and services across the Sydney region.

Parramatta Road is Sydney's main east−west route, and the only continuous route between Parramatta and the Sydney CBD. The section of Parramatta Road between Burwood and the Sydney CBD is identified in the Transport Master Plan as the most important Sydney transport corridor, due largely to it having the highest public transport movements of any corridor in Sydney. Sections of Parramatta Road currently carry more than 90,000 vehicles each day, with up to 6,000 of these being heavy vehicles.

The project would:

- Provide a motorway standard link between Concord and Haberfield which would improve safety and provide reliability and savings in travel time for through traffic
- Provide improved access and travel along and across Parramatta Road for local vehicle trips and for active transport
- Enable improvements to public transport on Parramatta Road, including provision of kerbside bus lanes between Burwood Road at Burwood/Concord and Chandos Street at Ashfield/Haberfield at project opening, and the possible future provision of rapid public transport services along Parramatta Road
- Facilitate urban renewal in precincts adjoining the Parramatta Road corridor by improving local amenity with less traffic noise and vehicle emissions from congested traffic.

Section 5.7 of this report responds to issues raised in relation to traffic impacts including congestion.

Issue description – induced demand

Submissions object to the project, stating that constructing new roads would attract additional vehicles to the road network (induced demand).

Response

Secondary vehicle travel is usually generated from new transport infrastructure such as road projects. This is called induced demand, which is predicted to increase 2031 future year traffic volumes using WestConnex by between two per cent and seven per cent. The predicted induced travel demand was considered in the WestConnex Road Traffic Model (see section 8.1.1 of the EIS). 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 project would also remove traffic along the Parramatta Road corridor, particularly east of Burwood, which would allow for improvements in bus services along Parramatta Road. Traffic modelling undertaken for the 2021 'do something' scenario includes a revised layout along Parramatta Road including the provision of kerbside bus lanes between Burwood Road at Burwood and Chandos Street (east of Bland Street) at Haberfield/Ashfield, and the retention of two through traffic lanes in each direction. Improvements to the bus system would be the responsibility of Transport for NSW.

Further, as outlined in section 5.9.3 of the EIS, the project includes the provision a seven metre wide, central running mass transit corridor along Parramatta Road in the vicinity of the Parramatta Road interchange. This corridor would not be used at opening of the project, however in the future it would potentially be used for mass transit such as buses or light rail.

Potential future changes to the Parramatta Road pedestrian and cycling environment would also be considered and developed as part of the complementary Parramatta Road Urban Transformation Program (subject to separate approval).

Issue description – temporary solution only

Submissions raised concerns that the project would only provide a temporary solution and would not provide a long term solution to Sydney's congestion.

Response

While WestConnex plays a role in easing congestion, the WestConnex program of works is not designed to solve all of Sydney's transport problems. WestConnex is part of an extensive plan to meet Sydney's growing transport and infrastructure needs and is fully integrated into the State's Infrastructure transport and planning strategies, including the *State Infrastructure Strategy* and the Transport Master Plan.

As detailed in the EIS, once completed and as modelled in 2021 (nominal year of opening), the project would provide immediate operational benefits in relieving congestion along the M4 and Parramatta Road, between Homebush Bay Drive at Homebush and Wattle Street (City West Link) and Parramatta Road at Haberfield/Ashfield, including reduction in travel times and improvements in the level of road safety. Further benefits would be realised when the M4–M5 Link (which is subject to separate planning approval) is operating, as modelled in 2031 (10 years after the nominal year of opening).

As outlined in the executive summary of the Updated Business Case, traffic volumes on Parramatta Road between Wentworth Road at Strathfield and Wattle Street at Haberfield/Ashfield show significant reductions due to the relief provided by the M4 East project. East of Wattle Street the 2031 traffic volumes with WestConnex are similar to the current 2012 volumes, in essence, containing 20-years of forecast growth that would occur if no action was taken.

Section 10.3 of the Updated Business Case provides details of travel time savings achieved with the construction of all of the WestConnex component projects. The analysis demonstrates that WestConnex would deliver improvements in travel times to and from the Sydney Airport and Port Botany precinct from the west and south west. A comparison of morning peak network performance in 2031 with and without WestConnex shows that travel times improve by as much as 20 minutes from the west with WestConnex.

Issue description – general objection to the project

Submissions raised general objections to the project including:

- Cancel the project altogether
- We don't need more roads
- The project does not support a sustainable future
- The project is not needed
- The department has embraced the wrong set of priorities.

Response

The need for the WestConnex project has been identified in a number of strategic planning documents including, *NSW 2021: A Plan to Make NSW Number One* (NSW Department of Premier and Cabinet 2011), *State Infrastructure Strategy 2012–2032* (Infrastructure NSW 2012a) and the Transport Master Plan. The need for the project in particular has been identified in the Transport Master Plan (refer section 3.1.3 of the EIS) as a critical link in Sydney's motorway network and the immediate priority for the NSW Government.

A detailed explanation of the need for the project is presented in Chapter 3 of the EIS, and summarised in section 3.4. Once completed, the project would provide immediate operational benefits in relieving congestion along the M4 and Parramatta Road, between Homebush Bay Drive at Homebush and Wattle Street (City West Link) and Parramatta Road at Haberfield/Ashfield, including reduction in travel times and improvements in the level of road safety.

The project is being developed as part of the first stage of WestConnex which also includes the M4 Widening project. On completion of both projects, WestConnex would provide a full motorway connection between the Blue Mountains in the west and Haberfield in the east. Future stages of WestConnex would link the project with Sydney's south-west, Sydney Airport and the Port Botany precinct.

Once approved and constructed, the project would play a key role in supporting the financial delivery of proposed future stages of WestConnex by using toll revenue to raise private sector debt. Investment in the project and subsequent stages of WestConnex would facilitate a step change in network performance, enabling delivery of major city shaping improvements and delivering economic growth.

As part of WestConnex, the project would support NSW's key economic generators and provide a strategic response to the currently inadequate, and highly congested, transport routes. Critically, this includes providing the missing link in the motorway network which supports Sydney's global economic corridor. Improvements to the transport network, including this project, support the global economic corridor by enabling domestic and international trade and therefore underpin a sustainable NSW economy and Sydney's role as a global city.

Integrated land use and transport planning initiatives are key factors in developing a future where 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. Ultimately, it is the combination of these initiatives that will best address global Sydney's needs.

Sydney's freight, service and business task requires distribution of goods and services across the Sydney region, which relies on more diverse and dispersed point-to-point transport connections. The project supports this task by improving access to, and reliability of, the motorway network. The project would also provide a high quality road connection between the key centres in the global economic corridor, such as the Parramatta and Sydney CBDs.

WestConnex is intended to be delivered as an integrated package of transport improvements across Sydney, with complementary enhancements to the existing road network including associated surface street changes, bus priority measures, heavy vehicle access improvements, redesign of bus services and facilities, improved access to rail stations and upgrades to cyclist and pedestrian facilities.

A Plan For Growing Sydney (NSW Government 2014a) identifies the project as essential to support major planning renewal and growth areas, including precincts in the Parramatta Road corridor, where it would allow for significant improvements to local amenity by reducing through traffic on surface roads, and allowing for enhanced north−south local connectivity.

Issue description – benefits would be limited

Submissions raised concerns that the benefits of the project would be limited:

- The project would be used by less than one per cent of the NSW population, while the costs would be borne by the whole population
- The project would not be utilised by and would not benefit a large proportion of Sydney commuters, including residents of Western Sydney (who are identified as key target users)
- The project would only benefit a small number of motorists
- The benefits of the project do not outweigh the negatives.

Response

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

The project would provide a number of benefits to the local area including:

- Provide a motorway standard link between Concord and Haberfield which would improve safety and provide reliability and savings in travel time for through traffic
- Provide improved access and travel along and across Parramatta Road for local vehicle trips and for active transport
- Enable improvements to public transport on Parramatta Road, including provision of kerbside bus lanes between Burwood Road at Burwood/Concord and Chandos Street at Ashfield/Haberfield at project opening, and the possible future provision of rapid public transport services along Parramatta Road
- Facilitate urban renewal in precincts adjoining the Parramatta Road corridor by improving local amenity with less traffic noise and vehicle emissions from congested traffic
- Provide additional capacity to address existing traffic congestion on the M4 and Parramatta Road by separating longer-distance through traffic from local traffic. Current traffic congestion is causing poor amenity along Parramatta Road and constraining the operation of existing businesses and efficient movement of people and freight.

Together with the M4 Widening, the project would provide additional indirect benefits to the broader community including:

- Support the economic development of Sydney by providing a high quality and efficient road connection for motorists and freight vehicles between Parramatta and Global Sydney (as defined in *A Plan for Growing Sydney* (NSW Government 2014))
- Enable possible opportunities to transform Parramatta Road as well as local centres that exist alongside Parramatta Road
- Provide better connectivity between local centres adjacent to Parramatta Road
- Accommodate rising travel demand created by increasing population and employment in high growth localities in the Parramatta to Strathfield corridor, including Sydney Olympic Park and Burwood.

Section 3.2.3 of the EIS acknowledges that there is 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 flow of goods and freight which can only occur by road transport, as rail transport does not provide access to individual warehouse and commercial premises. It is important to note that this flow of workers, goods and freight is a two-way flow, and is not simply about providing opportunities for Western Sydney residents to travel to the east. Connection between the international gateways and Western Sydney is necessary for centres such as Parramatta to develop further, as employment grows in Western 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.

As part of the greater WestConnex scheme the project would provide benefits to the NSW economy. The assessment of the economic viability of WestConnex, undertaken by KPMG, demonstrates that WestConnex is economically viable and would return $1.71 (2015 dollars) for every dollar invested. The project has a Benefit Cost Ratio of 1.71 without wider economic benefits and 1.88 with wider economic benefits.

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 – inadequate explanation of strategic justification

Submissions raised concern that the strategic justification for the project has not been adequately explained.

Response

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

Parramatta Road is Sydney's main east-west route and the only continuous route between Parramatta and the Sydney CBD. Sections of Parramatta Road carry more than 90,000 vehicles each day which results in Parramatta Road (an urban arterial road) rating on par with the M4 and M5, which are Sydney's busiest motorways. Congestion caused by these high traffic volumes has led to long travel times along the corridor and also impacts on public transport services which run along the corridor.

The project is intended to relieve congestion so as to improve the speed, reliability and safety in the M4 and Parramatta Road corridor, including parallel arterial roads. This would also create opportunities for urban revitalisation, improved liveability, and public and active transport improvements along and around Parramatta Road. The project would support economic growth and productivity by improving freight efficiently through reduced congestion and better access to international gateways at Sydney Airport and Port Botany and Sydney's Global Economic Corridor.

A reduction in traffic would improve road safety along Parramatta Road. The reduction in traffic and congestion along sections of Parramatta Road would also make the corridor more attractive for pedestrians and cyclists due largely to improved safety.

The project forms part of WestConnex which, when complete, would have significant benefits for Sydney and NSW. When considered as part of WestConnex, the project would support NSW's key economic generators and provide a strategic response to the currently inadequate, and highly congested, transport routes. Critically, this includes providing the missing link in the motorway network. Improvements to the transport network, including this project, support the global economic corridor by enabling domestic and international trade and therefore underpin a sustainable NSW economy and Sydney's role as a global city.

The justification for the project is presented in a number of strategic documents including the Updated Business Case and the Transport Master Plan.

Issue description – Parliamentary inquiry

Submissions call for a Parliamentary inquiry into WestConnex.

Response

A Parliamentary inquiry does not form part of the assessment and approval process under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

Issue description – motivation for the project

Submissions questioned the motivation and need for the project. In summary, submissions raised the following issues:

- The project was conceived by blind political ideology
- The project was conceived by developers and Liberal party donors
- The project is about appeasing corporate greed
- The only aim of the project is job creation
- Concern that the government is financing developer's projects
- The project only benefits developers
- The project does not meet the rationale of the Transport Master Plan
- The Transport Master Plan was amended to include the project after it was published as a draft for community comment
- The project is driven by doubtful ethics.

Response

The need for the WestConnex project has been identified in a number of strategic planning documents including, *NSW 2021: A Plan to Make NSW Number One* (NSW Department of Premier and Cabinet 2011), *State Infrastructure Strategy 2012–2032* (Infrastructure NSW 2012a) and the Transport Master Plan. The role of the project in meeting the objectives of these plans is discussed in section 3.1 of the EIS and in the Updated Business Case.

As described in section 4.1 of the EIS, variations on the component projects of WestConnex have been under consideration since the early 2000s. WestConnex evolved from earlier schemes for the M4, M5 East and the connection between the two and is aimed at enhancing the capacity and connectivity of the M4 and M5 East motorways. WestConnex was first set out in the *State Infrastructure Strategy 2012-2032* (Infrastructure NSW 2012a) as a strategic concept, developed as a response to a series of strategic challenges faced by Sydney and NSW.

WestConnex was a recommendation of Infrastructure NSW. Infrastructure NSW was established to assist the NSW Government in identifying and prioritising the delivery of critical public infrastructure for NSW. It is an independent statutory agency, established under the *Infrastructure NSW Act 2011* (NSW).

The Board of Infrastructure NSW comprises the Chief Executive Officer, an independent Chairman and eight additional Board members. The Board provides strategic policy direction and oversight for planning, management and performance. The Board comprises a mix of business people with expertise in infrastructure, alongside the secretaries of the NSW Department of Premier and Cabinet, NSW Department of Environment and Planning, and NSW Treasury.

In September 2012, Infrastructure NSW completed one of its principal tasks under the *Infrastructure NSW Act 2011* (NSW), delivering to the NSW Premier the 20-year State Infrastructure Strategy. It was the first time a prioritised and costed long-term strategy had been developed for the Government's consideration. The Strategy was released publicly on 3 October 2012.

A consultation program on the draft Transport Master Plan was launched in November 2011, and the draft Transport Master Plan was released for public comment in September 2012, prior to the release of the State Infrastructure Strategy.

As described in the Updated Business Case, WestConnex will be financed through user tolling in the long term, supported by short to medium term investment by both government and the private sector. Sydney Motorway Corporation Pty Ltd (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 will 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.

As described in Chapter 3 of the EIS, Parramatta Road is Sydney's main east−west route, and the only continuous route between Parramatta and the Sydney CBD. The section of Parramatta Road between Burwood and the Sydney CBD is identified in the Transport Master Plan as the most important Sydney transport corridor, due largely to it having the highest public transport movements of any corridor in Sydney.

Parramatta Road east of Concord Road carries more than 90,000 vehicles each day, with up to 6,000 of these being heavy vehicles. This is similar to the traffic volume on both the M4 and the M5 motorways, and means that Parramatta Road, an urban arterial road, currently carries a similar traffic volume to two of Sydney's busiest motorways.

Parramatta Road is now one of the six most congested transport corridors in Sydney, with high travel demand and average travel speeds of private vehicles during the morning peak of about 30 kilometres an hour. The Parramatta Road corridor is also one of Sydney's busiest corridors for public transport. It has one of the highest numbers of bus passengers during the morning peak of any major bus route in Metropolitan Sydney. Congestion on Parramatta Road has led to bus services using the road being delayed and unreliable.

The pressure on the road corridor is predicted to continue to increase, with greater Sydney's population set to increase by another million people in the next 10 years and Western Sydney alone expecting an increase in population of up to 900,000 people by 2031. An increase in transport demand from and to Western Sydney will continue to rise in parallel.

While rail and public transport do 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 area and not easily accessed by public transport. In addition, public transport alone cannot provide sufficient point-to-point access to the diverse range of employment and educational hubs, shopping centres or recreational centres, nor can it provide for the safe and efficient delivery of goods and services to Sydney's growing population.

There is also a need to provide a link between Western Sydney and other work and freight centres such as the Sydney Airport and Port Botany, which generate about $10.5 billion of economic activity for Sydney each year and both locations are heavily dependent on road vehicles for the movement of people and freight. Investment in additional road infrastructure such as the M4 East and other WestConnex projects would increase connections to Sydney's west, where the majority of airport and port freight traffic originates or ends.

This two-way flow between the international gateways and Western Sydney is necessary for centres such as Parramatta and Sydney Olympic Park to continue to experience development, urban renewal and economic benefit.

Issue description – freight improvements in Western Sydney

One of the biggest arguments being used for this project is freight however a new freight terminal being built in Western Sydney is part of a strategy to move freight from Port Botany by rail instead of more trucks on overcrowded roads.

Response

As detailed in section 3.2.4 of the EIS, a large proportion of Australia's goods are imported and exported via Port Botany, NSW's primary container port. Port Botany is located in the same precinct as Sydney Airport, Australia's primary international airport.

By 2031, the freight task in NSW is projected to nearly double to 794 million tonnes compared to 2011. Even with new intermodal terminals boosting freight rail capacity substantially, truck movements from Port Botany are still forecast to almost triple.

Road freight is also increasingly subject to capacity constraints and peak hour congestion throughout Sydney. The M4 and M5 motorways in particular have limited available capacity in peak periods.

The 2013 *NSW Freight and Ports Strategy* examined whether the shift from road to rail freight would address this issue for the motorway network. Given the predicted population growth and increase in total freight volumes, even if a significant percentage mode shift from road to rail was achieved, there would still be increases in road freight volumes. Specifically, it found that: 'even with the targeted increase in rail mode share, early modelling results indicate the M4 and M5 will not be able to accommodate the additional container traffic when combined with background growth from employment and population by 2031'.

Issue description – what has changed since 2004 M4 East project

The project does not satisfy the objections raised against the M4 East project when it was previously proposed in 2003/2004. What has changed since 2004 that now makes the M4 East economically viable with positive environmental impacts?

Response

The 2003/2004 M4 East project was a stand-alone project with the objective to enhance the main road network between Western Sydney and the central business district (CBD).

As described in section 3.3 of the EIS, one of the core objectives of the project is to support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways (Sydney Airport and Port Botany), Western Sydney and places of business across the city.

As part of the Updated Business Case, an assessment of the economic viability of WestConnex has been undertaken using Cost Benefit Analysis and wider economic impacts analysis. The economic analysis undertaken demonstrates that WestConnex is economically viable and will return $1.71 (2015 dollars) for every dollar invested. The project has a Benefit Cost Ratio of 1.71 without wider economic benefits and 1.88 with wider economic benefits.

Potential impacts on the environment resulting from the project have been assessed in the EIS and a range of safeguards and management measures are proposed to minimise and mitigate these impacts.

Issue description – project does not deliver a coherent freight strategy

The project, as designed, does not deliver a coherent strategy for the movement of freight away from Kingsford Smith Airport and Port Botany, something desperately needed for Sydney's growth.

Response

The *NSW Freight and Ports Strategy* (Transport for NSW 2013d) sits alongside the Transport Master Plan. The strategy acknowledges the upcoming challenges associated with the expected doubling of the State's freight task over the next 20 years particularly from key areas such as Kingsford Smith Airport and Port Botany. The strategy recognises WestConnex as one of the key strategic freight projects for Sydney, as it: 'will reduce freight costs through increased travel speeds and reliability and reduce the distances travelled by freight vehicles... WestConnex has the potential to deliver time savings on the M4/M5 corridors in the order of 15 to 35 minutes by 2021'.

WestConnex would improve the productivity of the freight fleet by reducing travel times, and consequently enabling more deliveries to be conducted per day.

Issue description – incorrect assessment of job growth in Western Sydney

Submissions relating to project need raised concerns that the EIS has incorrectly assessed job growth in Western Sydney and consequently overestimated the number of future east-west trips. Issues raised include:

- Disagree with the assertion that job growth in eastern Sydney would be stronger than in Western Sydney
- Question why a tunnel to Sydney CBD would be built, when Western Sydney is to be developed, negating the need to bring people into the city of Sydney
- Question the numbers in the EIS, citing the SGS Economics and Planning report which states that the proportion of workers in Sydney's west travelling to jobs in the east is low, and of these, most are made by public transport.

Response

The population of the Sydney metropolitan area is expected to grow by around 1.6 million people by 2031. The majority of this growth is expected to be in Western Sydney, which will experience a population increase of around 900,000 people. While growth in jobs in Western Sydney is expected to be strong, it is not expected to match the numbers of new jobs forecast in the eastern half of Sydney. Workforce and employment forecasts between 2011 and 2031 indicate that employment will remain higher in eastern Sydney than in the west. This increase in population in Sydney's west (without a similar rate of jobs growth) will significantly increase travel demand towards the east (where the majority of jobs will exist) on an already constrained transport network, particularly along the M4 and Parramatta Road corridor.

Population growth and employment forecasts used in Chapter 3 of the EIS were taken from the NSW Governments report *A plan for Growing Sydney* (NSW Government 2014a).

Employment forecasts in the plan are based on the employment forecasts of the 'Bureau of Transport Statistics Small Area Employment Forecasting Model'. The forecasts are prepared by applying the following processes:

- Estimation of total Greater Metropolitan Region employment for each historical and forecast year
- Trend analysis of employment by industry, geographic subregion and specific job node
- Distribution of Greater Metropolitan Region total employment forecasts using forecast shares derived from trend analysis
- Adjustment for major new developments.

Population growth figures in the plan are taken from the NSW Department of Planning and Environment, State and Local Government Area Population Projections: 2014 Final (www.planning.nsw.gov.au/projections).

Issue description – project is not supported by the majority of people

The project is not supported by the majority of local and non-local community, planners and politicians.

Response

As described in section 16.6 of the Updated Business Case, over the three-year period since the announcement of WestConnex, stakeholder perceptions have improved and acceptance of the project by key stakeholders and the community has increased. For example, a number of Opposition Members of Parliament have made public statements of support for the project.

Research into community perceptions with regard to WestConnex (Newgate Research 2015), compiled in January 2015, found that overall most respondents had a positive opinion of WestConnex or felt neutral towards it.

Most respondents believed WestConnex would have a positive effect on Sydney as a whole (68 per cent). WestConnex is seen to have a net positive effect on travel times, businesses, congestion, the NSW economy, quality of life and the amenity of local areas.

However, the research found knowledge levels about the project were low and there was only moderate community awareness (50 per cent across Greater Sydney and 61 per cent in the local area) and interest (52 per cent across Greater Sydney and 62 per cent in the local area) in the project.

Further spatial analysis reveals respondents toward the start and end of the route were most positive.

Issue description – why is Parramatta Road being improved instead of other corridors

The EIS states that Parramatta Road is in the top six most congested roads in Sydney but does not justify why this road corridor is being improved over others.

Response

The Transport Master Plan presents a whole‑of-NSW, multi-modal transport 20-year plan. It outlines the Government's strategic priorities for rail, road, freight, bus, light rail, ferry, cycling and walking – covering both infrastructure development, and service delivery improvement.

The Master Plan identified Sydney's 46 strategic transport corridors, including six constrained corridors. It identified strategic solutions to address the problems faced by Sydney along these corridors, including a set of major rail, light rail, bus, and road projects. The Transport Master Plan aligns with the Government's 2012 State Infrastructure Strategy.

The Transport Master Plan identifies WestConnex as Sydney's next motorway priority, particularly given that: 'together, the combined Western Motorway (M4) and South Western Motorway (M5) corridors contain around 30 per cent of Sydney's population and employment and service the diverse transport demands generated in the corridor. Sydney's international gateways - Sydney Airport and Port Botany and major freight activity areas are concentrated around the M4 and M5 corridors'.

WestConnex also includes the New M5 project, which would provide additional capacity on the M5 corridor.

The Master Plan identifies WestConnex as just one of a number of major transport projects for Sydney. Other major projects included are:

- CBD and South East Light Rail
- The North West Rail Link (now Sydney Metro Northwest)
- A second Harbour rail crossing (Sydney Metro CBD & Southwest)
- Long-term work to develop the M1 (F3) – M2 Link (now the NorthConnex project) and the F6.

It is therefore important to note that WestConnex is part of an overall transport strategy for Sydney that includes significant public transport investment and operational road improvements.

Issue description – the project would not work

Submissions raised concerns that the project would not work for a number of reasons:

- There is no need for the project because motor vehicles will be used less in the future
- We have reached peak car usage
- It is not appropriate to be investing in large urban motorways when car use in large metropolitan areas like Sydney has shown a sustained decrease over many years.

Response

As described in the Updated 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.

This information is garnered from Household Travel Survey Results, which confirm that convenience, the indirectness and speed of services, and the inability to get to a destination by public transport are the top reasons for car travel.

Given Sydney's urban structure, and despite significant planning effort and continuing government investment in expanding public transport, the road network will need to continue to support a significant and growing number of cars.

In addition to servicing private vehicle trips there is also a need to provide a link between Western Sydney and other work and freight centres such as the Sydney Airport and Port Botany, which generate about $10.5 billion of economic activity for Sydney each year and both locations are heavily dependent on road vehicles for the movement of people and freight. Investment in additional road infrastructure such as the M4 East and other WestConnex projects would increase connections to Sydney's west, where the majority of airport and port freight traffic originates or ends.

Issue description – proposed redevelopment of Parramatta Road would increase traffic

Submissions raised concerns that the proposed development along Parramatta Road would make WestConnex redundant. Submissions suggest that the planned increase in housing in the area would result in an increase in commuters in turn cancelling out the benefits of the WestConnex project.

Response

The *New Parramatta Road: Draft Parramatta Road Urban Renewal Strategy* (UrbanGrowth NSW 2015) (Parramatta Road Strategy) identifies areas along the corridor where there will be a focus on encouraging growth and changes in the long term (about 20 years).

The project (as part of WestConnex) is identified within the Parramatta Road Strategy as a catalyst for the restoration of the Parramatta Road corridor, because it would remove through traffic from the Parramatta Road corridor. 'Through traffic' in this context refers to traffic that travels more than five kilometres along Parramatta Road to destinations away from Parramatta Road. The reduction in traffic, particularly trucks, would assist in improving public transport and urban amenity, both of which would support future growth along the corridor, in particular residential development.

The Parramatta Road Urban Transformation Program is being undertaken in parallel with the project to implement the Parramatta Road Strategy. A key element of this program is improved public transport services along Parramatta Road. The M4 East and the greater WestConnex would enable traffic reductions on Parramatta Road from Burwood to the CBD, which would in turn free up road space and create greater public transport options for existing and new residents along the Parramatta Road corridor.

Additionally, predicted population growth generated by the Parramatta Road Urban Transformation Program has been incorporated into the traffic modelling for the project. As such predicted travel time savings and benefits of the project in 2021 and 2031 have accounted for the proposed development.

Issue description – benefits are not based on evidence

Submissions object to the project stating that the purported benefits are subjective and not based on evidence. Submissions were concerned that the proponent does not provide any evidence to support the perceived benefits of the project.

Response

The EIS includes a number of specialist technical assessments that consider the benefits or potential negative impacts of the project.

A number of the project benefits are related to improvements in traffic congestion, improved safety, and improved travel times for through traffic. Quantitative specialist assessments and modelling were undertaken for the EIS, including:

- A traffic impact assessment, which involved an integrated traffic modelling and forecasting approach
- An air quality impact assessment, which modelled in-tunnel and external air flows and pollutant concentrations
- A noise and vibration impact assessment, which predicted noise levels resulting from construction and operation of the project

- A flooding and drainage impact assessment, which used hydrologic and hydraulic models to estimate peak flood levels, depths of inundation and flow velocities
- A groundwater impact assessment, which involved numeric modelling to estimate the range of potential groundwater inflows and groundwater drawdown and changes in groundwater interaction with the nearby Parramatta River and tributaries.

Issue description – EIS does not demonstrate how the project would meet its objectives

Submissions raise concerns that the EIS does not demonstrate how it would meet the proposed objectives.

As discussed in Chapter 3 of the EIS, 10 key 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 strategic objectives of national and NSW planning and policy documents. **Table 5.1** provides a summary of how the project would meet these objectives.

Table 5.1 Assessment of the project against the project objectives

Project objectives	Assessment of project against objectives
Support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways (Sydney Airport and Port Botany), Western Sydney and places of business across the city	*A Plan For Growing Sydney* (NSW Government 2014a) identifies the project as essential to support major planning renewal and growth areas, including precincts in the Parramatta Road corridor. Here it would allow for significant improvements to local amenity by reducing through traffic on surface roads, and allowing for enhanced north−south local connectivity. The project would result in a reduction in travel times along the M4 and Parramatta Road corridor, reduced congestion, improved access to the major international gateways of Sydney Airport and Port Botany (and future Western Sydney Airport), and improved industrial and business efficiency. The project would also provide opportunities for urban renewal along Parramatta Road, where a reduction in travel times and improved local connectivity would reduce costs and help to increase the competitiveness of doing business, in NSW.

Project objectives	Assessment of project against objectives
Relieve road congestion so as to improve the speed, reliability and safety of travel in the M4 corridor, including parallel arterial roads	The project would result in a reduction in traffic along sections of Parramatta Road particularly between the end of the M4 and Wattle Street, due to vehicles using the M4 East tunnels in this section. There are however some areas where traffic numbers would increase such as Parramatta Road east of the project. This increase in traffic in these areas is considered to only be an issue until further stages of WestConnex are built. Once operational WestConnex would remove around 45 per cent of the existing traffic from Parramatta Road by 2031. The project would be a key link in the transport network to support Sydney's growth. The project is designed to reduce travel times along the Parramatta Road corridor by removing through traffic from the surface network into tunnels. The reduction in congestion along parts of Parramatta Road would result in improved road safety because lower vehicle numbers would result in fewer potential conflicts between vehicles. A reduction in the number of vehicles would also potentially result in increased safety for pedestrians and cyclists, making these modes more desirable along the Parramatta Road corridor.
Cater for the diverse travel demands along these corridors that are best met by road infrastructure	WestConnex is intended to be delivered as an integrated package of transport improvements across Sydney, with complementary enhancements to the existing road network (including associated surface street changes, bus priority measures, heavy vehicle access improvements), redesign of bus services and facilities, improved access to rail stations and upgrades to cyclist and pedestrian facilities. The project (as part of WestConnex) is considered to be a key driver for the introduction of a rapid transport solution (i.e. buses or light rail). The introduction of a rapid transit solution would result in more frequent and reliable public transport which would encourage higher patronage of public transport along the Parramatta Road corridor.
Create opportunities for urban revitalisation, improved liveability, and public and active transport improvements along and around Parramatta Road	The project would enable the use of some road space for other purposes such as bus lanes. This provision of space for public transport will enable the growth in local trips from urban renewal and general development in the corridor to be met. The project would therefore serve as a catalyst for urban renewal and transport improvement in the Parramatta Road corridor. The planned reduction in trucks and cars travelling longer distances on Parramatta Road (refer to Chapter 8 of the EIS) would facilitate urban renewal along the corridor through improved urban amenity and liveability characteristics, supported by improved public transport, active transport such as walking and cycling, and local vehicle travel. The project would enhance the connections between key housing and employment areas.

Project objectives	Assessment of project against objectives
Enhance the productivity of commercial and freight generating land uses strategically located near transport infrastructure	Sydney's freight, service and businesses require distribution of goods and services across the Sydney region, which relies on more diverse and dispersed point-to-point transport connections. The project supports this task by improving access to, and reliability of, the motorway network.
Enhance movements across the Parramatta Road corridor which are currently restricted	The project would provide a high quality road connection between the key centres in the global economic corridor, such as the Parramatta and Sydney CBDs, where it would allow for significant improvements to local amenity by reducing through traffic on surface roads, and allowing for enhanced north−south local connectivity.
Fit within the financial capacity of the State and Federal Governments, in partnership with the private sector	The project would play a key role in supporting the financial delivery of proposed future stages by using toll revenue to raise private sector investment. Investment in the project and subsequent stages of WestConnex would facilitate a step change in network performance, enabling delivery of major city shaping improvements and delivering economic growth.
Optimise user pays contributions to support funding in a way that is affordable and equitable	Funding of WestConnex as proposed, assumes a distance based toll would be implemented on operation of the M4 Widening and the project. This would optimise private contributions in an equitable and affordable way.
Integrate with the preceding and proposed future stages of WestConnex, without creating significant impacts on the surrounding environment or duplicating any potential issues across the construction periods	The project is a component of WestConnex, which is a proposal to provide a 33 kilometre motorway linking Sydney's west and south-west with Sydney Airport and the Port Botany precinct. Separate planning applications will be lodged for each individual component project. Each project will be assessed separately, but the impacts of each project will also be considered in the context of the wider WestConnex.
Protect natural and cultural resources and enhance the environment	Potential impacts on the environment have been assessed and a range of safeguards and management measures are proposed.

Issue description – the project focuses on monetary benefits only

Submissions raised concerns that the project has not considered people, and instead focuses on monetary benefits. Submissions were concerned that the Government is not acting in the interest of the people of NSW.

Response

The EIS has considered the environmental, social and economic impacts of the project in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued by the Secretary of the Department of Planning and environment. Technical assessments were prepared in accordance with the requirements of the SEARs, and are included as Appendix G to W of the EIS.

A number of benefits of the project, whilst having a positive impact on the broader NSW economy, would also directly benefit the local area and road users. The project would allow traffic to use the tunnel thus reducing traffic numbers on Parramatta Road. A reduction of traffic along Parramatta Road would allow for improvements on the network to allow for greater north-south movements across the corridor and also improved movements for local traffic. The reduction in traffic along the Parramatta Road corridor would also be the driver for redevelopment of the corridor as part of the Parramatta Road Urban Transformation Program.

A reduction in traffic would improve road safety along Parramatta Road. The reduction in traffic and congestion along sections of Parramatta Road would also make the corridor more attractive for pedestrians and cyclists due largely to improved safety.

As with any other project of this nature and scale in an existing urban environment, there would also be impacts associated with the construction phase of the project, including property acquisition, and during operation, due to new infrastructure being present and changed traffic conditions and access.

These impacts have been considered during the project development phase and minimised where possible, and a suite of management measures provided to minimise any negative impacts of the project on the local community and the environment. Revised management measures for the project are as amended in **Chapter 8** (Revised environmental management measures) of this report.

Issue description – objectives were designed to justify the project

Submissions raised concerns that the project objectives were contrived to fit the project after it had been announced.

Response

The objectives of WestConnex were first outlined in *WestConnex – Sydney's next motorway priority* (Infrastructure NSW, 2012b). These objectives were developed following consideration of problems that are routinely experienced by road users, businesses and the community who live and work in Sydney, and future anticipated problems.

The project objectives were refined in the 2013 Business Case. The EIS considers the objectives specific to the M4 East project which have evolved following refinement of the project and the wider WestConnex.

Issue description – objectives have no associated targets

Submissions raised concerns that the project objectives have no associated targets by which their achievement can be measured.

Response

A number of the project objectives relate to matters that can be measured, including:

- Economic growth
- Speed, reliability and safety of travel
- Productivity of commercial and freight generating land uses
- Financial capacity of the State and Federal Governments.

5.2.2 Release of the strategic business case

2,535 submissions raised issues relating the availability of and failure to release the WestConnex business case.

Issue description – failure to release the business case

Submissions raised concerns about the business case for the project including:

- No business case has been released
- Concerns about the project award of tender and construction prior to the release of the business case
- Object to compulsory acquisition and loss of homes, businesses and communities before the release of the business case
- Value for money is not evident as business case has not been released
- Request for a fully transparent long-term cost-benefit analysis.

Response

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.

Issue description – criticism by the Auditor-General

Submissions raised concern that the NSW Auditor-General criticised an earlier version of the WestConnex business case and identified it did not meet best practice standards, and did not conduct the required gateway reviews.

Response

In December 2014, the NSW Auditor-General reviewed and released a report on various aspects of WestConnex including the 2013 Business Case Executive Summary.

The Updated Business Case recognises and responds to recommendations from the NSW Auditor-General. In particular, the NSW Auditor-General recommended that '…the business case … be formally and thoroughly revisited for stages 2 and 3 of the project [WestConnex] as well as any other major changes to the scope' (Hehir, 2014).

In relation to this recommendation, formal reports have already been submitted to government addressing the business case for stages 2 and 3 of WestConnex. The recently released Updated Business Case consolidates that work and includes the revised Cost Benefit Analysis for the entire WestConnex project.

Details of WestConnex's updated assurance processes, which were also subject to Auditor General recommendations, are also covered in the Updated Business Case.

The *Infrastructure Investor Assurance Framework* was developed by Infrastructure NSW for the *State Infrastructure Strategy* in 2012, and was reaffirmed in 2014. The framework is an evolution of the previous gateway review process, which applied to major infrastructure projects in NSW. The NSW Government has adopted the *Infrastructure Investor Assurance Framework*.

Under the *Infrastructure NSW Act 2011* (NSW), one of the functions of Infrastructure NSW is: 'to review and evaluate proposed major infrastructure projects by government agencies … [and to] assess the risks involved in planning, funding, delivering and maintaining infrastructure, and the management of those risks'.

As such, and in the context of recent Auditor-General reports, the Government has centralised the independent gateway assurance review process for projects over $10 million, including WestConnex, to Infrastructure NSW.

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.

5.2.3 Project cost and funding

2,021 submissions raised issues regarding the cost of the project and the source of funding.

Issue description – cost of the project

Submissions raised general concerns regarding the cost of the project including:

- The project is a waste of money and public funds
- The project is a waste of money and won't work
- The project does not represent value for money
- The project is too expensive
- A travel time saving of only six minutes does not justify spending $15.4 billion
- Opposed to spending $15.4 billion without significant return on investment
- The cost of the project is not justified as it would not address traffic issues or meet the project objectives.

Response

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).

An assessment of the economic viability of WestConnex 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 WestConnex is economically viable and will return $1.71 (2015 dollars) for every dollar invested this would extend to $1.88 with the inclusion of wider economic benefits.

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 1 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 $15.4 billion figure quoted in submissions is the capital cost estimated for the whole of WestConnex in the 2015 budget. The capital cost estimated for the whole of WestConnex in the Updated Business Case is $16.8 billion, due to the inclusion of additional project components. The cost of the M4 East component is $3.8 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.

Section 8.4.1 of the EIS outlined the travel time savings predicted to be experienced as a result of the M4 East project. An approximate six minute travel time saving is predicted on a number of key routes along the Parramatta Road and M4 corridor.

Section 10.3 of the Updated Business Case provides details of travel time savings achieved with the construction of all of the WestConnex component projects. The analysis demonstrates that WestConnex would deliver improvements in travel times to and from the Sydney Airport and Port Botany precinct from the west and south west. A comparison of morning peak network performance in 2031 with and without WestConnex shows that travel times improve by as much as 10 to 20 minutes from the west with WestConnex.

In addition to travel time savings, the project would result in a number of other key benefits. Benefits from the project are outlined in **section 5.2.1** of this report.

Issue description – funds could be better spent on other projects

Submissions objected to the construction of WestConnex for $15.4 billion, as it is a very poor use of tax payer's money which could be better spent elsewhere, such as on public transport, health, schools or regional NSW.

Response

The need for the project has been identified in Chapter 3 of the EIS and **section 5.2.1** of this report.

The Updated Business Case clearly defines the importance of road infrastructure in the broader Sydney transport strategy. 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 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 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 future.

The vast majority of the growth in travel demand is expected to be accommodated by road. The same is true for freight movements. The Government has set a target to double the share of port container freight that is moved by rail by 2021. However, meeting this target will still leave two-thirds of the growth in container demand to be moved by road over the next 20 years.

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 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.

Issue description – financial viability of the project

Submission relating to project cost and funding raised concerns around the financial viability of the project. Submission raised the following issue:

- Concern that the only reason the project stops at Wattle Street is due to a lack of funding for the M4–M5 Link
- Funding for the next stage is from M4 East tolls, what happens if tolls do not raise enough funding?

- The lack of clarity about financial viability (and especially traffic counts) could also lead to reluctance by private proponents to participate in the project
- It is difficult to understand financial viability in the absence of a detailed discussion on road pricing strategies including toll rates
- Funding sources for the ongoing operation and the construction of Stage 3 are insufficient
- How will $15.4 billion of debt be repaid
- The project has a high financial risk.

Response

As described in the Updated Business Case, WestConnex will be financed through user tolling in the long term, supported by short to medium term investment by both government and the private sector. 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 will 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.

The overall cashflow 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 will be sufficient to cover the costs for Stage 3 (the M4–M5 Link).

Issue description – cost benefit analysis

Submissions relating to project cost and funding requested that a cost benefit analysis is undertaken.

Response

A Cost Benefit Analysis for the project is presented in the Updated Business Case with inputs from the WestConnex Road Traffic Model. The analysis demonstrates that continuing demand for the project and the resultant benefits including network reliability benefits, vehicle operating cost savings, travel time savings, crash cost savings would result in a return of $1.71 (2015 dollars) for every dollar invested this would extend to $1.88 with the inclusion of wider economic benefits.

Issue description – traffic modelling needed to demonstrate value for money

Submissions request information on traffic modelling to demonstrate the efficacy and value for public money of the project.

Response

Chapter 8 of 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 M4 Stage 1 project. 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 interpeak 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 Stage 1 project has relied on population and employment data from the Bureau of Transport Statistics (BTS), which is the best information currently available but which does not currently include some urban renewal/activation initiatives. The current WRTM version 2.1 is based on 2014 Landuse Projections and includes induced traffic demands as well as the proposed airport at Badgerys Creek.

Modelling of the 'do minimum' scenarios (i.e. without the project) was undertaken to understand the effects and to provide a comparison against the project.

Traffic volumes on Parramatta Road between Wentworth Road and Wattle Street show significant reductions due to the relief provided by the project. East of Wattle Street the 2031 traffic volumes with WestConnex are similar to the current 2012 volumes, in essence, containing 20-years of forecast growth that would occur if no action was taken.

Responses to issues relating to traffic modelling are addressed in **section 5.7.7** of this report.

Issue description – privatisation of roads

Submissions raised concerns about the privatisation of public roads, and requested that the project be retained in public ownership. Concerns were also raised that the project would be funded by the majority of the NSW population who won't use the motorway.

Response

The NSW Government is using a limited-recourse financing model for the project. Private sector debt finance and a loan from the Federal Government will be raised against future toll revenue to fund a significant portion of the construction costs.

Under this model, it is also possible to implement private sector financing during or after construction. The State will then sell down the equity it has invested into the project and recycle the proceeds into the proposed future M4–M5 Link. This approach helps to maintain flexibility and helps to protect the State's AAA-credit rating.

Issue description – operating costs of ventilation and lighting

Submissions raised concerns that the EIS fails to consider the operating costs (financial and environmental) of the ventilation and lighting systems associated with the tunnel.

Response

The financial appraisal in Chapter 13 of the Updated Business Case considers all of the operating costs associated with the project.

The environmental impacts of the ventilation and lighting systems were considered in the noise and vibration impact assessment (Chapter 10 of the EIS) and the greenhouse gas assessment (Chapter 21 of the EIS).

5.2.4 Tolling

89 submissions raised issues relating to the tolling of the project.

Issue description – objection to tolling

Submissions raised general objections to tolling. Submissions raised the following issues:

- Object to new tolls
- Tolls only provide profits for big companies
- The EIS does not consider the capacity of drivers to pay the tolls

- The toll will impact the less well-off
- Roads should not be tolled unless there is an affordable public transport alternative or free alternative, viable routes
- Object to paying a toll to use a road that would be congested and difficult to navigate
- Object to tolling as it is set up to profit the toll operator but it is a bad deal for the tax payer.

Response

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.

In addition, the use-pays principle allows the government to invest in public transport. As outlined in Chapter 3 of the EIS, the project would enable improvements to public transport on Parramatta Road, including provision of kerbside bus lanes between Burwood Road at Burwood/Concord and Chandos Street at Ashfield/Haberfield at project opening, and the possible future provision of rapid public transport services along Parramatta Road. The NSW Government is also investing in other public transport projects, including Sydney Metro, Sydney Light Rail and other enhancements to the suburban rail network.

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

Traffic modelling as part of the EIS (refer to section 8.4.1 of the EIS) indicates that the M4 East tunnels would operate below capacity in 2021 (i.e. before the completion of WestConnex). In 2031, once the remaining WestConnex components are operational, traffic within the tunnels is expected to increase to a point where capacity is reached but not exceeded.

Issue description – details of tolls

Submissions requested details of the proposed tolls, and raised concerns that the toll would be too expensive and would cost $20 per day.

Response

Funding of WestConnex as proposed in the 2013 Business Case Executive Summary assumes a distance based toll would be implemented on operation of the M4 Widening and M4 East. It is likely the maximum toll for cars and light commercial vehicles travelling on the M4 East section of WestConnex would be about $3.60 (2013 dollars). Cars and light commercial vehicles would pay one third of the toll for heavy commercial vehicles. This was reaffirmed as the reference tolling regime for the Updated Business Case. As described in the Updated Business Case, the anticipated tolling regime for the entire WestConnex is shown in **Table 5.2**.

Table 5.2 Anticipated tolling regime

Component	Cost (Jan 2015)
Flagfall	$1.12
Toll per kilometre	$0.42
Toll cap	$7.95
Truck multiplier	3 times
Escalation	Max of 4% or CPI

There would be a maximum cap of $7.95 (January 2015 $) per trip.

Issue description – other similar toll road projects have failed

Submissions raised concerns that the project lists other 'similar projects' (Appendix A of the Social Impact Assessment in Appendix M of the EIS) all of which have failed. Why this project would work when others have failed has not been justified.

Response

In December 2014, the NSW Auditor-General reviewed and released a report on various aspects of WestConnex including the *WestConnex Business Case Executive Summary* (Sydney Motorways Project Office, 2013a) (2013 Business Case Executive Summary). A recommendation was made that the business case be formally and thoroughly revisited for stages 2 and 3 of WestConnex as well as any other major changes to the scope.

An assessment of the economic viability of WestConnex 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 recently released Updated Business Case consolidates the revised work completed for stages 2 and 3 of Westconnex and other project changes as well as the revised Cost Benefit Analysis for the entire WestConnex project.

Details of WestConnex's updated assurance processes, which were also subject to Auditor-General recommendations, are also covered in the Updated Business Case.

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

Issue description – tolls on the existing M4

Adding tolls to the existing M4 is going to cost the residents of Western Sydney a lot of money. If tolls must be included in the project they should not be added to the existing M4.

Response

As described above, 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.

The project would also deliver important operational improvements along the M4 between Homebush Bay Drive and Concord Road, including reductions in travel times and improvements to road safety

Issue description – terms of public private partnership agreement

Submissions request that the terms of the public private partnership agreement be released and that the agreement should not include a clause that allows for the compensation of the motorway operator where the revenue they expect to receive from tolls is less than the revenue they actually generate if a public transport system competes effectively with the motorway. Submissions raised concerns regarding the 'Golden Parachute'. Where projected toll revenue does not hit its targets so the Toll operator receives huge kickbacks as "consolation".

Response

The WestConnex M4 Project Deed between Roads and Maritime and WCX M4 Pty Limited has been published on the Roads and Maritime website at the below address:

http://www.rms.nsw.gov.au/business-industry/partners-suppliers/tenders-contracts/contracts-awarded/class-3-contract-documents.html.

Issue description – effects of tolling on the road network

Submissions raised concerns about the effects of tolling on the road network including:

- Adding a toll on the M4 will push cars and trucks onto alternative routes
- Request a feasibility study into the likelihood of road users paying a toll to access the road
- Differential tolling should be applied on Parramatta Road to reduce through traffic

- A toll introduced to surface roads could encourage more cars to use the tunnel.

Response

Chapter 8 of 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 M4 Stage 1 project. The WRTM uses the Sydney 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 interpeak 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 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.

Details regarding time of day tolling have not yet been determined. Neither was assumed for the purposes of assessment.

It is not proposed to introduce tolls to surface roads, other than the M4 between Homebush and Parramatta.

5.2.5 Timing and need for other WestConnex components

45 submissions raised issues regarding timing of the other components of WestConnex and the issues associated with this.

Issue description – congestion impacts without the M4–M5 Link

Submissions raised concerns that the construction of the M4 East before the M4–M5 Link would mean that there would be significant congestion and local roads would continue to be used as rat-runs.

Response

Once completed, the project would provide immediate operational benefits in relieving congestion along the M4 and Parramatta Road, between Homebush Bay Drive at Homebush and Wattle Street (City West Link) and Parramatta Road at Haberfield/Ashfield, including reduction in travel times and improvements in the level of road safety. Further benefits would be realised when the M4–M5 Link (which is subject to separate planning approval) is operating.

Current traffic levels on roads surrounding the project have been considered in the Traffic and Transport Assessment. A detailed description of the assessment is included in Appendix G of the EIS. The assessment has been summarised in Chapter 8 of the EIS.

The assessment concluded that the project would result in large reductions in vehicle delay along the corridor between Homebush Bay Drive in the west, and City West Link and Haberfield/Leichhardt in the east. However, the project would also result in some higher traffic densities downstream of the project on- and off-ramps on Parramatta Road and Wattle Street.

The assessment has also identified benefits on the parallel route along Queens Road and Gipps Street. The project would also provide additional route options along the corridor and therefore increase network resilience in the event of incidents.

Traffic impacts and benefits are further discussed in section 8 of the EIS and **section 5.7** of this report.

Issue description – cost-effective to build the M4–M5 Link at the same time as the M4 East

Submissions suggested that the M4–M5 Link should be completed at the same time as the M4 East as it would be more cost effective.

Response

The size and scale of WestConnex requires the program of works to be delivered in stages. The project is naturally aligned to fit into three construction stages. This is primarily due to natural 'break points' where the project can be cost effectively integrated into the surrounding road network.

The three stages comprise:

- Stage 1 – consisting of Stage 1A M4 Widening and Stage 1B M4 East
- Stage 2 – consisting of the New M5, King Georges Road Interchange Upgrade and the Sydney Gateway
- Stage 3 – M4 – M5 Link.

The widening and extension to the M4 ranked highest against staging factors when assessed in the 2013 business case. Key differentiating factors include a further developed design, constructability, traffic volumes and the ability of the project to be packaged into contract sizes that can be readily met by the construction industry. The M4 Widening and M4 East (Parramatta to Haberfield) was therefore selected to be the first stage of WestConnex to be delivered.

Funding of WestConnex as proposed in the Business Case assumes a distance based toll would be implemented on operation of the M4 Widening and M4 East. The proceeds of this toll would be applied to fund the construction of the project and, in the longer term, remaining WestConnex projects.

Issue description – staging of WestConnex

Submissions raise concerns about the staging of WestConnex and consideration of issues including:

- The ultimate success of WestConnex depends on the future construction of the M4–M5 Link, however it is uncertain whether it will actually proceed
- There is no funding or approval for the M4–M5 Link
- The project should not go ahead until the M4–M5 Link is confirmed, funded and approved
- The M4–M5 Link should be built first.

Response

WestConnex is the largest integrated transport and urban renewal project in Australia. When completed, WestConnex will link Parramatta to the Sydney CBD, Sydney Airport and the Port Botany precinct and the M5 in southwest Sydney.

The NSW Government is committed to fully implementing WestConnex, subject to environmental planning assessment and approval, and is contributing $1.8 billion from its Restart NSW fund to the initial stages of WestConnex. The Australian Government is contributing $1.5 billion with a further $2 billion through a concessional loan to the NSW Government. Private sector capital can then be raised against tolling revenue to fund subsequent stages.

Issue description – construction of M4–M5 Link infrastructure as part of the M4 East

Submissions objected to the construction of stub tunnels and ventilation facilities for the M4–M5 Link when it has not been approved and is yet to be funded.

Response

The provision of the stub tunnels and ventilation infrastructure for the future M4–M5 Link as part of the M4 East project would minimise the cumulative impacts to the community as well as minimising disruption to the M4 East, once operational.

The NSW Government is committed to fully implementing WestConnex, subject to environmental planning assessment and approval for each project.

Issue description

Submissions raise concerns that information has not been released around potential connections to the future M4–M5 Link in Haberfield.

Response

The proposed Wattle Street interchange provides for tunnel stubs and surface road connections for the future M4–M5 Link, which are depicted in Figure 5.7 and described in section 5.5.4 of the EIS. An indicative concept including the location of interchanges, which is subject to further concept development, is provided in the Updated Business Case.

5.2.6 Support for the project

Seven submissions express support for the project.

Issue description – support for the project

Submissions express support for the project.

Response

The support for the project is noted.

5.3 Project development and alternatives

5.3.1 Strategic alternatives

3,478 submissions raised issues relating to the strategic options to developing WestConnex (and the project).

Issue description – public transport alternatives

Submissions relating to project development and alternatives raised the following issues with respect to public transport alternatives:

- Alternatives to road transport, such as public transport (buses, light rail and ferries), freight and active transport (such as bike paths) should be prioritised. This includes:
  - Focused light rail networks, complimented by support for active modes of transport such as cycling and walking
  - Ecotransit Sydney's Pippita City Express proposal
  - Park and ride stations at key locations along the M4 alignment to facilitate rapid movement to the city and the airport
  - A combined rail and road tunnel
  - A fast-west metro rail line (southern alignment option presented in Sydney Metro consultation)
  - Upgrading of existing roads coupled with mass transit alternatives
  - Purchasing the airport line, and reducing train fares to the airport
  - Stage 1 of the Sydney to Newcastle rail line upgrade
  - Cycling storage at selected stations
  - Greater rail capacity, and frequent services servicing western Sydney
- Investment should be redirected to alternatives to road transport such as integrated, multi-modal transport initiatives
- Public transport alternatives would be less expensive
- Urban motorways are an inefficient means of moving people around

- New or improved public transport alternatives would ease traffic congestion
- The proposal does not appropriately consider future demand and changes to travel modes and patterns
- A better solution is one that directs traffic away from the city with an efficient public transport solution
- Concern that the project would not leave any funds for public transport initiatives
- Investment in public transport would assist in managing population growth and in-turn improve liveability
- Sydney has underinvested in public transport, as demonstrated by the proportion of road projects which have been completed in the past 30 years, when compared to the number of public transport projects that have been completed in the same period
- Public transport alternatives would be more effective at moving people into and out of employment and activity centres
- Demand management was not considered as a feasible alternative
- The assessment of alternatives assumed an auto-dependent study area, which contrasts with at least one study, which shows that 90 per cent of trips from Western Sydney to the Sydney Central Business District are via public transport modes
- Few cities around the world are building as many roads as Sydney. Investment should be diverted to integrated transport alternatives
- Investment should be diverted to maintaining and improving existing roads, as well as providing more public transport alternatives
- That the 'Do nothing' as a baseline was assumed, and that a more viable comparison might have been an incremental improvement of multiple modes of transport infrastructure (including for cars, buses, trains, light rail, walking and cycling) using the funding amounts for the M4 East and wider WestConnex project
- The project would encourage car dependence in Sydney and fails to provide a long term solution to traffic and congestion
- Improving ring roads in Western Sydney
- Investment should be diverted to road projects that encourage business and population growth in regional areas
- The project has disregarded Infrastructure Australia's processes, has not given regard to other expert analysis of congestion problems in Sydney and has not been developed in consideration of strategic transport planning, improvements to economic productivity or sustainability
- Congestion pricing should be considered as it would be a more effective means of reducing congestion.

Response

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

The Transport Master Plan 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.

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 construction of new roads and the upgrade of existing roads in Sydney is required due to the continued demand for the movement of people, goods and services across Sydney. As mentioned in section 4.2.3 of the EIS, investment in public transport and freight facilities are only a number of options available in order to improve congestion on Sydney's Roads. The NSW Government is already directing funding towards a number of public transport (eg buses, trains and ferries) and freight projects (eg Northern Sydney Freight Corridor projects), which, coupled with investment in roads would improve congestion on Sydney's roads. Investment in public transport is the responsibility of Transport for NSW who is currently implementing a number of public transport projects in Sydney.

As noted in the EIS, Parramatta Road is Sydney's main east−west route, and the only continuous route between Parramatta and the Sydney CBD. The section of Parramatta Road between Burwood and the Sydney CBD is identified in the Transport Master Plan as the most important Sydney transport corridor, due largely to it having the highest public transport movements of any corridor in Sydney. Parramatta Road is now one of the six most congested transport corridors in Sydney, and congestion will continue to worsen as both population and the freight task increases. One of the key objectives of the project is to assist in reducing traffic congestion on Parramatta Road and provide shorter travel times for road users (both public and private transport).

The base case or 'do nothing/do minimum' option ('do minimum'), as described in section 4.2.1 of the EIS, found that the current network retained in essentially its current configuration would not support a growing population that needs to efficiently and reliably access dispersed employment areas and services. Without improvements to the Parramatta Road corridor, road congestion costs are expected to increase to $8.8 billion by 2020 (Transport for NSW 2012a) and modelling has shown that travel times between Strathfield and the Sydney CBD would continue to increase, even under a scenario where various public transport improvements currently planned or under construction are implemented. Without the project, congestion on Parramatta Road would continue to have significant impacts on the NSW and economy as a result of longer delivery and transport times in Sydney, and in particular for businesses in Western Sydney.

The *WestConnex Updated Strategic Business Case* (NSW Government 2015) (Updated Business Case) clearly defines the importance of road infrastructure in the broader Sydney transport strategy. 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 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 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 future.

The vast majority of the growth in travel demand is expected to be accommodated by road. The same is true for freight movements. The Government has set a target to double the share of port container freight that is moved by rail by 2021. However, meeting this target will still leave two-thirds of the growth in container demand to be moved by road over the next 20 years.

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 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.

As outlined in section 4.2.3 of the EIS, public transport (including light rail) is not considered to be the sole solution to traffic issues within Sydney and along the Parramatta Road corridor. The project and other WestConnex projects would remove around 45 per cent of the existing traffic from Parramatta Road by 2031. This project is therefore considered to play an important role in the implementation of the Parramatta Road Transformation Program and would be the first stage in the improvement of public transport along the Parramatta Road corridor by reducing the number of vehicles which use Parramatta Road and enabling the future provision of permanent bus lanes (as part of a separate project). Planning has already commenced on a series of projects that would support public transport, active transport and local vehicle travel improvements in the corridor. The project also would allow for a future mass transit corridor generally along the Parramatta Road alignment to be used for buses or potentially light rail. Without the project, the provision of such infrastructure would not be feasible as existing traffic along the road prevents use of any lanes for this purpose.

Section 4.2.4 of the EIS considered demand management as an alternative to the project. 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. This includes 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. While demand management would help to spread the demand for peak travel to less congested time periods, its effectiveness would be limited by other constraints, such as availability of other travel modes at the user's origin and destination, and flexibility of working arrangements to take advantage of 'time of day' tolling or transport pricing benefits. To have a major impact on road traffic, demand management would also require major changes in social attitudes, travel behaviour and government policy.

The revised State Infrastructure Strategy details a number of infrastructure projects within regional NSW which are aimed at regional economies and communities. This includes road and rail freight projects, which would complement investment within urban areas of NSW.

Issue description – lack of consideration of alternatives which would have less impact

The project appears to have been planned without due consideration of other ideas/proposals which would have less impacts (such as noise, heritage and traffic), and would result in lower levels of greenhouse gas emissions.

Response

Chapter 4 of the EIS describes the alternatives that were considered during development of the project, and explains how and why the project was selected as the preferred option. Alternatives considered included both strategic alternatives to the project as a whole, and alternatives for specific components of the project. The criteria used to evaluate the alternatives included the potential for environmental and community impacts.

An assessment of greenhouse gas emissions that would be generated as a result of the construction and operation of the project is included in Chapter 21 and Appendix U of the EIS. Submissions relating to greenhouse gas emissions as a result of the project have been addressed in **section 5.20** of this report. The results of the assessment illuminate the benefits of road tunnel usage in urban areas, where a reduction in congestion and stop-start driving via the provision of more direct routes which can be traversed at a higher speed results in fewer greenhouse gas emissions being generated by road users. Management measures to further reduce the greenhouse gas emissions from the project are detailed in Table 21.5 of the EIS.

Issue description – consideration of alternatives for road freight

Submissions noted that there are various policy and project alternatives for dealing with the task of road freight that have not been considered in the EIS, including:

- Freight should be transported by rail and not by trucks
- Increasing the capacity and reliability of rail freight
- Increasing rail freight subsidies to match/surpass those of road freight
- Divert container operations to other ports outside the city centre.

Response

Section 4.2 of the EIS considers the merits of the project in the context of a range of alternatives, including alternative 3 which considers investment in public transport and rail freight improvements.

Sydney's freight, service and business task is large and significant, with 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 will 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 – desire for consideration of alternatives

A number of submissions:

- Requested a comparative study of the project against the benefits of an integrated transport system, including improvements to public transport, and making a decision based on this outcome
- 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.

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.

Chapter 4 of the EIS describes the alternatives that were considered during development of the project, and explains how and why the project was selected as the preferred option. Investment in public transport and freight rail improvements was one of five strategic alternatives to the project considered.

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 will 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 4.2.3 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 3.2.1, 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 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, together with other major projects forming part of WestConnex, would improve accessibility to jobs in Sydney's west, but more significantly, would encourage business and industry investment in centres such as Parramatta and Penrith through improved connections to other centres, allowing the flow of people and goods.

The project would also play a role in the implementation of the Parramatta Road Transformation Program. By removing traffic from Parramatta Road and improving amenity (eg. noise and air quality), the project, together with WestConnex overall, would assist in facilitating new development along the corridor, including housing and jobs in key locations along the corridor.

Issue description – consideration of light rail

Light rail is the only solution to gridlock along Parramatta Road.

Response

As outlined in section 5.2.1 of this document and section 4.2.3 of the EIS, public transport options such as rail, light rail or bus would be feasible potential alternatives if the project, as part of WestConnex, was primarily concerned with transporting people to and from centres. However, not all road users along this corridor are suited to using public transport for their entire journey.

The project is considered to be the first stage in a process of public transport improvements along the Parramatta Road corridor. It would assist in reducing the number of private vehicles travelling along Parramatta Road. This reduction in traffic would allow for the provision of bus lanes initially, with the longer term option to provide a rapid transit system which could consist of either buses or light rail. Without the project, the provision of such infrastructure would not be feasible, as existing traffic along the road prevents the use of lanes for any purpose other than the movement of private cars. The project also includes the provision of land at the Parramatta Road interchange to allow for the future installation of a rapid transit network.

Issue description – modelling of emissions for a public transport alternative

Submission asserting that parallel modelling of emission levels for a public transport alternative should be included in the EIS.

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.

The alternatives that were considered were selected based on their capacity to meet the objectives of the project and their performance with reference to other transport, environmental, engineering, social and economic factors. This included a qualitative assessment of a public transport and freight rail improvements alternative (Alternative 3).

No further studies are proposed as the Transport Master Plan identifies WestConnex as a project that will support Sydney's economic and population growth into the future.

5.3.2 Options development

48 submissions raised issues in relation to the development of options for the project.

Issue description – superficial treatment of alternatives

Concerns were raised with the seemingly superficial treatment of options. Discussion about extending tunnels to Anzac Bridge appears to be purely about cost. .

Submissions also indicated preference for:

- The long tunnel option presented in the M4 East options study (RTA 2003)
- Extending the tunnel to locate the eastern tunnel portals at Anzac Bridge and Taverners Hill.

Response

There has been ongoing development of the project since 2003, including the development and display of an options study for an eastern extension of the M4 to Sydney central business district (CBD). The options study concluded that the preferred option would involve the extension of the M4 to the City West Link and Parramatta Road at Ashfield as well as widening the existing motorway between Homebush Bay Drive and Concord Road. The 2003 preferred option formed the basis of the concept design for the M4 Widening and M4 East projects.

As outlined in section 4.3.1 of the EIS, the long tunnel option was, along with two other options (the short tunnel and the Parramatta Road slot option) considered during the M4 East options study (RTA 2003). The options study outlined the major advantageous and disadvantages of the three options.

Key benefits of the long tunnel option included the reduced disruption to local traffic, property and businesses along Parramatta Road, and the relief to the City West Link between Haberfield and Rozelle, when compared to the short tunnel or slot option. However, key disadvantages of the long tunnel option were:

- Higher construction and operational costs
- Traffic congestion at the Anzac Bridge which would result in significant queuing back into the tunnel during the morning peak
- The need for additional ventilation facilities.

Further information on the 2003 options analysis can be found in the M4 East options study (RTA 2003).

The 2012 original WestConnex slot scheme consisted of a connection between the existing M4 at North Strathfield and Taverners Hill at Petersham. Following further analysis including an industry partner development process, the slot option was not preferred due to:

- The extent of property acquisition required
- Complex traffic management and substantial traffic impacts on Parramatta Road during construction
- Difficulties in managing surface water around and over the open slot.

Issue description – location and alignment of the interchanges

Submissions raised concerns with the location and alignment of the interchanges within Haberfield and Ashfield, and proposed alternative options for the location of the eastern tunnel portals, including:

- Extending the tunnel to Rozelle Yards
- Modify or use other options to avoid impacts on the Haberfield Heritage Conservation Area.

Response

The M4 East options study (RTA 2003) considered three options, including a long tunnel option which would connect with City West Link at Lilyfield and to Parramatta Road at Haberfield via a spur tunnel. The assessment found that the long tunnel option would have the potential to increase congestion on the approaches to the Anzac Bridge, including queuing back into the eastbound tunnels. In addition, the long tunnel option would be more expensive to construct and would require additional ventilation stacks.

Section 4.4.4 of the EIS discusses the various options considered for the Wattle Street (City West Link) interchange including its location and configuration. In selecting the location for the interchange the following were important considerations:

- Optimising accessibility to the tunnel from the surrounding area and providing good connectivity with the existing arterial road network (City West Link)
- The functional performance of the interchange
- Integration with the future M4-M5 Link, with the alignment of this future project located further north to connect with Anzac Bridge and the proposed Western Harbour Tunnel and Beaches Link.

The existing level of congestion at the Wattle Street / Parramatta Road intersection meant that the most logical location for any interchange was downstream, or to the north and east, of that intersection. Other considerations included:

- The existing topography and flood level constraints mean that the eastern tunnel portals cannot be moved further north along Dobroyd Parade
- The existing location of the Wattle / Ramsay and Wattle / Parramatta Road intersections meant that the tunnel portals cannot be moved further south without interfering with these intersections.

The Wattle Street interchange provides for movements heading north east via City West Link and Anzac Bridge to the following destinations:

- To the central and northern parts of the CBD
- Via the Harbour Bridge to the north shore
- Via the Cross City Tunnel to the eastern suburbs.

In terms of regional accessibility it was also important to provide north/south ramp connections to the future M4-M5 Link. Without the interchange at Wattle Street the closest interchanges would be at Concord Rd (to the west) and Rozelle Rail Yards (to the north east) which is a considerable distance apart. This would compromise access to the M4 East tunnel, limit its ability to reduce traffic using surface roads and potentially create bottlenecks at these two interchanges. This becomes even more important with the prospect that the future M4-M5 Link would connect with the Western Harbour Tunnel and Beaches Link in the future.

Without the Wattle Street interchange all traffic from the tunnel would be funnelled east onto Parramatta Road with significant consequences for congestion and travel time on that road travelling toward the CBD. In turn this would compromise the provision of future public transport improvements and urban renewal opportunities along this part of the corridor as foreshadowed in the Parramatta Road Urban Transformation Program.

The preferred option for the Wattle Street interchange was selected following design refinements which considered two options. The preferred option assessed in the EIS was selected as it would reduce the impacts of construction in this area via the inclusion of all infrastructure associated with the WestConnex scheme (both M4 East and the M4-M5 Link) being constructed at the same time.

In response to submissions and as a consequence of ongoing design refinement, the configuration of the Wattle Street interchange has been amended. This change is described in detail in **section 7.5** and shown in **Figure 7.8** of this report. The reconfiguration of the Wattle Street interchange would reduce its operational footprint and would not therefore result in significant additional impacts to the environment. An environmental overview of this change is provided in **section 7.5.2** of this report.

The Parramatta Road interchange underwent a similar options appraisal and analysis process as described in section 4.4.5 of the EIS. The option assessed in the EIS was selected as the preferred option as it would avoid impacts on Ashfield Park and Yasmar, and would not create unacceptable impacts on the Wattle Street/Parramatta Road/Frederick Street intersection.

Extending the tunnel to mitigate impacts on the Haberfield Heritage Conservation Area or to the Rozelle Yards would have similar constraints. In addition, in the context of the WestConnex scheme, Wattle Street and Parramatta Road are logical points in the network to provide interchanges as they provide for connection to a number of strategically important roads and centres in Sydney's inner-west, including Strathfield, Ashfield, Haberfield, the City West Link and the Sydney CBD.

Issue description – lack of consideration of surface and tunnel options

Concerns were raised regarding the lack of consideration of surface and tunnel options, and omission of the construction of an overhead motorway from the options analysis, which would be cheaper. This has been applied in other transport projects such sections of the M4 and the North West Rail Link at Rouse Hill.

Response

The M4 East options study (RTA 2003) and section 4.3 of the EIS provides a robust consideration and assessment of alternatives and options for the project. In the 2003 M4 East options study, surface motorway options were considered, including an elevated roadway, a surface roadway and a lowered motorway (the slot option). The slot option was considered the most viable surface road option for a range of environmental and engineering reasons.

However, as detailed in the 2003 options study as well as following the further options analysis (including the industry partner development process), the advantages of the slot road solution did not outweigh the benefits of a tunnel option, and presented engineering challenges.

The option of an overhead motorway has not been considered as a viable option to the preferred option as an overhead motorway in a same or similar alignment would be expected to result in significant impacts, which can be avoided or ameliorated by the preferred option, which is predominately underground.

Issue description – connection of M4 East tunnel

Submissions suggested that the M4 East tunnel should connect directly to Port Botany and the airport and not bring traffic closer to the city.

Response

WestConnex forms part of the Government's long-term integrated transport and planning solution and will enable significant improvements in travel times, productivity, reliability and accessibility, providing a significant contribution to both the State and National economies.

In 2014, a Strategic Project Definition and Delivery Plan for the future M4-M5 Link proposed a change to the alignment of this stage of the WestConnex program of works. The plan confirmed the economic viability of the northern extension and recommended that the future M4-M5 Link be diverted from the previous Parramatta Road alignment, to instead follow a City West Link alignment to Rozelle, before turning south to Camperdown. The revised future M4-M5 Link alignment is shown in **Figure 5.1**.

Figure 5.1 WestConnex incorporating revised Stage 3 alignment including Northern Extension

Detailed analysis of a number of options and sub-options for the change to the alignment of the future M4-M5 Link identified that duplication of the City West Link to Rozelle would deliver the functionality of the northern extension option, but within the main WestConnex project. Specifically, the recommended option was identified as being more cost effective, would accommodate the Western Harbour Tunnel and Beaches Link without the need for additional infrastructure investment and would deliver equivalent reductions in surface traffic flows to those expected for a WestConnex alignment which followed the Parramatta Road corridor. The revised alignment for future M4-M5 Link of the WestConnex scheme was endorsed by the Government in October 2014.

Improving connections between the Sydney airport and ports precinct and the wider Sydney motorway network has also been identified as an imperative by the Government and Infrastructure NSW. The future Sydney Gateway project would provide a high-capacity, high-quality connection between the airport and port precinct and the St Peters interchange (which is being delivered as part of the New M5 project). The NSW Government has been working to optimise and finalise the design of Sydney Gateway in consultation with stakeholders.

Issue description – M4 westbound on-ramp in Homebush

Concerns were raised regarding the consideration of options for the M4 westbound on-ramp in Homebush. The option needs to be developed in greater detail including a recommendation that the on-ramp consider an alignment that reduces impacts on amenity (including Arnotts Reserve).

Response

Four options were considered for providing access to the M4 westbound including an option involving no change to the current access arrangements for westbound traffic. Discussion of the advantages and disadvantages of these options is detailed in section 4.4.2 of the EIS.

Closure of the existing on-ramp from Concord Road northbound to the M4 westbound is proposed in order to simplify vehicle movements and improve the functionality of the Parramatta Road/Concord Road/Leicester Avenue intersection. This intersection is currently experiencing significant delays, and reducing the number of vehicles using this intersection would assist with improving its performance and the performance of nearby intersections on Parramatta Road.

As discussed in section 4.4.2, it was considered that providing an on-ramp adjacent to Powells Creek was the preferred option from a network performance, traffic functionality, land acquisition and cost perspective.

While the on-ramp would impact part of the Arnotts Reserve, much of the land area would remain available for development as public open space after completion of the project. This includes areas under the on-ramp structure which could be creatively designed/used as part of the open space.

Landscaping plans for the area adjacent to the new on-ramp 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 Strathfield Council to ensure they integrate appropriately with the design of Council's proposed open space area.

Issue description – justification and impact of Concord Road interchange

Submission queried the justification for the Concord Road interchange having regard to the goals of the project and the impact of the intersection post-construction on nearby receivers.

Response

Section 4.4.3 of the EIS presents an assessment of the options that have been considered for the Concord interchange. Four options were considered for an interchange at or near Concord, including an option that did not provide an interchange (Option C1), an interchange on Parramatta Road near Wentworth Park (C2), an interchange on Parramatta Road near Shaftsbury Road (C3), and the preferred option at Concord Road (C4).

Option C1, which provided no interchange in addition to the western portals, would have cost savings given the reduction in construction costs. However, in the absence of an interchange, traffic wishing to access the M4 East tunnels would need to travel to Homebush Drive interchange or Wattle Street interchange via Parramatta Road or other parallel routes. As such, providing an interchange in addition to the western portals supports the project objectives, specifically:

- Relieving congestion so as to improve the speed, reliability and safety of travel in the M4 corridor, including parallel arterial routes
- Creating the opportunities for urban revitalisation, improved liveability and public and active transport improvements along and around Parramatta Road.

The Concord Road interchange (C4) also performs better and best meets the project objectives than Option C2 and Option C3 as it:

- Provides better north-south connectivity to Strathfield and Rhodes, as well as the existing major road network compared to Option C2 and Option C3
- Reduces the amount of acquisition required when compared to Option C2, with Option C2 requiring very long on- and off- ramps due to topography
- Provides a safer integration to the main alignment tunnels when compared to Option C3 given the proximity of that option to the Wattle Street interchange.

Following the selection of the preferred location for this interchange, an assessment of two main designs, and further design refinements, for the interchange and the locations of the on- and off-ramp portals was undertaken.

The Concord Road interchange is complex due to the number of required movements and the integration into an already complex interchange for the M4. The design also needed to ensure that the design:

- Could maintain or improve upon the function and capacity of each turning movement
- Could be constructed in a manner that enabled normal road operations during construction
- Minimised interaction with existing road infrastructure, specifically the Concord Road bridge
- Could be made as compact as possible to minimised land acquisition.

The preferred option was selected as, on balance, it:

- Reduces the number of residential properties that would need to be acquired
- Avoids the severance of residential areas at Ada Street and Franklyn Street from the remainder of the residential areas
- Maintains or improves on the performance of nearby intersections by reducing the volume of traffic that would use the Concord Road/Leicester Avenue and Parramatta Road intersection, and the existing M4 and Parramatta Road intersection.

Issue description – consideration of northern options

Submissions queried if alignments that generally followed Queens Road and to the north of Iron Cove Creek were considered.

Response

As described in Table 4.2 of the EIS, an option for a northern tunnel alignment was considered and assessed against the project objectives.

This option would provide a shorter tunnel option and would not require a crossing of Parramatta Road. However, ground conditions were expected to be unsuitable for tunnelling due to less stable rock, higher groundwater inflows and historic landfilling activities that occurred in a number of areas including near Concord Oval.

Issue description – consideration of the original 2012 slot scheme

A submission expressed a preference for the 2012 original WestConnex slot scheme.

Response

The 2012 original WestConnex slot scheme consisted of a connection between the existing M4 at North Strathfield and Taverners Hill at Petersham. A key feature of the conceptual scheme was a slotted motorway running parallel to Parramatta Road. Following further analysis including an industry partner development process, the slot option was not preferred due to:

- The extent of property acquisition required
- Complex traffic management and substantial traffic impacts on Parramatta Road during construction
- Difficulties in managing surface water around and over the open slot.

5.3.3 Tender process and alternative tender designs

No issues were raised regarding the tender process and alternative tender designs.

5.3.4 Preferred tender design refinements

14 submissions raised issues regarding the preferred tender design refinements.

Issue description – suggested design refinements to the Concord Road interchange

Submission recommending design refinements to the Concord Road interchange in the vicinity of the apartment building at 167-173 Parramatta Road at Concord, including:

- That consideration be given to putting the westbound M4 on-ramp underground
- That the existing M4 westbound entrance be repurposed to provide an additional entry/exit to the apartment building from Concord Road
- A footpath be provided on the southern side of the revised M4 alignment to improve pedestrian connections between Concord Road, Queen Street and George Street, including improved crossing of the Main North Rail Line.

Response

The new M4 westbound on-ramp at the Concord interchange as shown in Figure 5.16 of the EIS is raised above the surface ground level at this location as it needs to pass over Concord Road. This solution would also utilise the majority of the existing M4 westbound on ramp alignment.

Access to the apartment building at 167-173 Parramatta Road at Concord is via Young Street, which is accessed from the eastbound lanes of Parramatta Road. The project would not alter access currently provided to Young Street or the residential building.

Adequate pedestrian connection to Queen Street at Concord, crossing of the Main North Rail Line and George Street at Concord is provided for on the northern and southern sides of Parramatta Road via existing footpaths.

5.3.5 Selection of surface infrastructure locations

390 submissions raised alternate locations for surface infrastructure or questioned changes in the location of facilities when compared to the previous display of the design.

Issue description – concerns with the Concord Road interchange

Submissions raised concerns with the Concord Road interchange, specifically with the westbound M4 on-ramp accessed from Concord Road southbound. This option was not included in the preliminary concept design and would impacts receivers in the vicinity of the interchange.

Response

Section 4.4.3 of the EIS presents an assessment of the options that have been considered for the Concord interchange. Following the selection of the preferred location for this interchange (C4), two main designs for the interchange and the on- and off-ramp portals were considered (Location C4a and C4b). Location C4a, which was identified as the preferred option, was located mostly on the western side of Concord Road. Location C4b, which was mostly located on the eastern side of Concord Road, was the arrangement included in the concept design that was publicly displayed in 2013.

A design refinement of the preferred option resulted in the inclusion of a new westbound on-ramp from Concord Road southbound to the M4 westbound and a new M4 westbound on-ramp about 500 metres to the west, near Powells Creek. The new ramps were incorporated into the preferred option as the ramps reduce the volume of traffic that would need to use the Concord Road/Leicester Avenue and Parramatta Road intersection, and the existing M4 and Parramatta Road intersection.

Issue description – positioning of operational infrastructure at Cintra Park tunnel site

Submissions raised concerns with the positioning of the operational infrastructure at Cintra Park tunnel site (C6) along the eastern boundary of the site. The location is adjacent to residential properties on Taylor Street and would result in a range of impacts.

The operational infrastructure should be relocated elsewhere, such as areas adjacent to St Lukes Park Canal, adjacent to Queens Road / Gipps Street or within the car park area to the north of Concord Oval.

Response

The location of the water treatment plant and sediment pond is shown indicatively in the Figure 5.21 of the EIS.

Opportunities to increase the distance of operational infrastructure at the Cintra Park fresh air supply and water treatment facility from adjoining residential properties would be explored during detailed design and in consultation with Canada Bay Council. This could include the relocation of certain infrastructure to other areas within the footprint of the Cintra Park tunnel site (C6), such as areas adjacent to St Lukes Park Canal.

The relocation of this infrastructure to the car park located to the north of Concord Oval is not viable as this car park would be fully available to users of the oval following construction.

Issue description – changed location of ventilation facility

Submissions questioned the location of the ventilation facility at the corner of Wattle Street and Parramatta Road when the previous design placed on display in November 2013 did not include a facility at that location.

Response

As stated in the community update (M4 East Preliminary Concept Design, November 2013), the preliminary concept design placed on display in November 2013 did not include any details of the location of supporting infrastructure, including ventilation facilities, as the design was in its early stages of development. The preliminary concept design was placed on display to highlight a proposed route and to seek community input to help inform design development and environmental impact assessment of the preferred design.

The preferred design which was made public in June 2015 showed that the ventilation outlet was proposed to be located at the corner of Wattle Street and Parramatta Road in Haberfield.

Section 4.5.2 of the EIS includes an assessment of the alternate locations considered for the eastern ventilation facility at the corner of Wattle Street and Parramatta Road. The location was considered to be the preferred location due to its proximity to the tunnels (including the future M4-M5 Link tunnels) and therefore maximising the operational efficiency of the ventilation system. The location also minimised impacts to residential areas and other sensitive receivers, as well as maximised the use of areas impacted by construction.

Issue description – concerns regarding location of ventilation facilities

Submissions raised concerns with the location of ventilation facilities. In particular, that the ventilation facilities should be relocated away from residential areas, schools and childcare centres.

Response

As discussed in section 4.5.2 of the EIS, minimising local air quality impacts on nearby receivers and maximising the operational efficiency of the tunnel ventilation system were the main considerations for determining the location of the ventilation facilities for the project. The location of the road tunnel ventilation outlets is very important for the efficiency of the tunnel ventilation system, whereas minimising local air quality impacts is largely achieved through the design and operation of the ventilation facility.

The longitudinal ventilation system, which has been selected for the project, results in the need for a ventilation facility at each end of the project, with at least one outlet for each tunnel.

Section 4.5.2 of the EIS details the assessment of the potential locations for both the western and eastern ventilation facilities.

Western ventilation facility

The positioning of the western ventilation facility was largely dependent on the operational requirements, which requires the ventilation facility to be located as close as practicable to the western portals. It has been positioned as far away from sensitive receivers as feasible while still meeting operational requirements. The key disadvantageous of the alternatives considered included sub-optimal outcomes for the ventilation system, conflicts with existing road infrastructure or additional land acquisition and proximity to a greater number of residential dwellings.

Eastern ventilation facility

It is not possible to achieve both operational requirements and locate the eastern ventilation facility away from residential areas, schools and childcare centres. No alternate locations away from residential properties were identified that could also meet the operational requirements for the ventilation facility to be located close to both the Wattle Street and Parramatta Road interchanges.

Positioning of the eastern facility sought to maximise the distance from the key non-residential residential receivers such as Haberfield Public School and The Infants Home. A number of options south of Parramatta Road would have increased the distance from Haberfield Public School, however would result in the ventilation facility being located directly adjacent to The Infants Home.

Issue description – relocation of eastern ventilation facility

A submission requested that the ventilation facility at Walker Avenue (eastern ventilation facility) be relocated out of the Heritage Conservation Area.

Response

The justification for the location of the eastern ventilation facility is discussed in section 4.5.2 of the EIS. It is not possible to achieve both operational requirements and locate the eastern ventilation facility away from Heritage Conservation Areas. No alternate locations away from Heritage Conservation Areas were identified that could also meet the operational requirements for the ventilation facility to be located close to both the Wattle Street and Parramatta Road interchanges.

Positioning of the eastern facility sought to maximise the distance from the key non-residential residential receivers such as Haberfield Public School and The Infants Home. The preferred option was considered to best meet the main considerations of minimising local air quality impacts on nearby receivers and maximising the operational efficiency of the tunnel ventilation system.

The layout of eastern ventilation facility at the corner of Wattle Street and Parramatta Road seeks to minimise impacts on the Heritage Conservation Area by positioning the facility closer to Parramatta Road where commercial and light industrial land uses (eg. Bunnings) that do not contribute to the conservation area currently exist. The design of the ventilation facility would continue during detailed design in order to minimise impacts on the conservation area while meeting the operational requirements for the facility. Such measures may include a change to the alignment of the facility to match the grid pattern of the surrounding area which is one of the key attributes of the Heritage Conservation Area.

5.3.6 Tunnel alignment

104 submissions raised issues regarding the alignment of the tunnel.

Issue description – changed tunnel alignment

Submissions questioned why the tunnel alignment changed from the previous design shown to the public. The previous alignment travelled predominately below Parramatta Road and commercial properties, the new alignment travels beneath more residential properties. This change shows a lack of transparency regarding the project and suggests that the design and assessment process has been rushed.

Response

The preliminary concept design alignment was placed on public display in November 2013 had the main alignment tunnels running along Parramatta Road. Since this display, further design development, achieved through a competitive design and construct tender process before preparation of the environmental impact statement, has allowed for consideration of further design solutions and a more detailed, definitive assessment of potential environmental impacts than would typically be provided for other major infrastructure projects.

Section 4.3.2 of the EIS outlined the advantages and disadvantages of three tunnel alignments, being an option that follows Parramatta Road, or options located north or south of Parramatta Road.

The southern alignment was selected as:

- It would provide a shorter tunnel and therefore reduced costs
- Ground conditions are expected to be favourable for tunnelling, which would allow for quicker construction and lower risks associated with tunnelling activities

- It would not limit future development along the Parramatta Road corridor as highlighted in the Parramatta Road Transformation Program due to the positioning of a tunnel below ground which would limit the size and depth of any development.

Issue description – concerns with tunnel alignment

Concerns were raised with the tunnel alignment. It should follow the alignment of Parramatta Road to ameliorate impacts on private residences, including potential impacts on the value of homes. Setbacks for new buildings along Parramatta Road would limit interaction between the tunnels and development.

Response

The concept design alignment placed on public display in November 2013 had the tunnels running along Parramatta Road. Since this display period the alignment of the tunnels was relocated south of Parramatta Road (with the exception of a section north of the road at the Concord Road interchange). Section 4.3.2 of the EIS outlined the advantages and disadvantages of these tunnel alignments, as well as another alignment to the north.

The southern alignment was selected as it would:

- Result in a shorter tunnel and therefore reduced costs
- Not limit future development along the Parramatta Road corridor as highlighted in the Parramatta Road Transformation Program due to the positioning of a tunnel below ground which would limit the size of any development.

Potential impacts on receivers and properties as a result of the mainline tunnel alignment have been assessed in the EIS, including construction impacts arising from tunnelling activities and property acquisition. Impacts relating to the value of homes have been responded to in **section 5.12.5** of this report.

In addition, the underlying geology to the south of Parramatta Road is more suitable for tunnelling.

Issue description – selection of revised alignment

Submissions suggested the revised alignment of the tunnel had been selected to benefit developers at the expense of local residents.

Response

Tunnel corridor options were assessed in section 4.3.2 of the EIS. The assessment determined that the positioning of the tunnel generally to the south of Parramatta Road was the preferred alignment as the ground conditions are generally considered to better facilitate the construction of the project, allowing for a shorter construction duration and lower risks associated with tunnelling activities. The cost of the project would also be reduced as the preferred alignment is shorter than the alternatives.

Aligning the corridor south of Parramatta Road also preserves the Parramatta Road corridor for future urban development as part of the Parramatta Road urban renewal strategy.

Issue description – alternative location for on- and off-ramp tunnels

A submission suggested that the tunnel alignment should be revised so that the alignment re-joins the Parramatta Road alignment further west of the Parramatta Road/Frederick Street intersection.

Submissions suggested that the Wattle Street and Parramatta Road westbound on-ramps be realigned further to the north and west, to reduce impacts on The Infants' Home.

Response

As described in section 4.4.5 of the EIS, five options were considered for the Parramatta Road interchange, including Option P4 on the western side of Wattle Street.

Option P4 was not considered feasible as this option would have resulted in significant and unacceptable traffic impacts at the Wattle Street/Parramatta Road/Frederick Street intersection, particularly during the morning and afternoon peaks. The assessment also found that there would be issues with vehicles queuing back into the tunnel during the morning peak.

5.4 Project description

5.4.1 General

517 submissions raised issues regarding the design of the project.

Issue description – insufficient detail regarding aesthetic appearance

Submission stated that the level of detail provided in the EIS for the aesthetic appearance of temporary and permanent project elements was insufficient to allow for a proper assessment of the design outcome. The submission requested careful consideration of the design of these elements to ensure they were in keeping with the built environment.

Response

A detailed urban design, landscape character and visual impact assessment has been undertaken for the project in accordance with the SEARs and is included at Appendix L of the EIS and summarised in Chapter 13 of the EIS. Artists' impressions of the project interchanges and portal entries, which also showed the ventilation facilities, the tunnel interiors and the Cintra Park fresh air supply facility, were included in the assessment.

In addition, and as a consequence of ongoing design development, the configuration of the Homebush Bay Drive interchange and the Wattle Street interchange are proposed to be modified from the configuration described in the EIS. A description of the proposed changes is included in **section 7.2** (Homebush Bay Drive interchange) and **section 7.6** (Wattle Street (City West Link) interchange) of this report, including updated indicative views of these interchanges.

Chapter 6 of the EIS also anticipated that further refinement of the construction methodology and layout and access arrangements for the construction ancillary facilities would be undertaken during detailed design. Accordingly, **section 6.1** to **section 6.4** of this report describe refinements to the construction work set out in the EIS following further construction planning and design development undertaken.

The construction ancillary facilities and construction methodology in the EIS and this submissions report are subject to further refinement as the detailed design phase continues.

The EIS has assessed key elements of the project based on the preferred design, which defines a constructible concept that provides for:

- A definition of property acquisition requirements sufficient to allow acquisition to proceed
- A general project footprint, including for construction and operation
- A clear description of the design principles, extent of impacts and impact management requirements
- A sound and clear basis for later development of the detailed design to a standard required to support project delivery.

The key urban design elements of the project would be consistent with the objectives and design principles set by the *Draft WestConnex Urban Design Framework* (WDUF) Roads and Maritime 2013a) and Roads and Maritime Design Guidelines.

The WUDF's vision statement states that 'a "whole of corridor" design approach shall be adopted, to ensure the realisation of a memorable motorway experience that is legible, identifiable and integrated into the existing urban fabric'. The successful project 'integration within the existing urban fabric' is critical to a well-managed response to potential visual impact and is of direct relevance to the assessment. Section 4.3.1 of the assessment at Appendix L of the EIS includes additional information regarding the objectives of the WUDF and the design direction for the key urban design elements of the project.

Chapter 8 (Revised environmental management measures) of this report includes the revised environmental management measures for the project, including measures relating to the urban design and landscaping outcomes for the project. These measures include:

- Optimise the integration of noise barriers and other features to improve amenity
- Consider a standard design for retaining walls and major structures across the project, to present a coordinated 'suite of elements'
- During pre-construction, refinements to the ventilation facilities' designs should be considered to further moderate their visual impact
- Refine substation designs during pre-construction to be integrated as far as possible within each landscape and urban context
- During pre-construction (if feasible), consider how the eastern ventilation facility addresses Walker Avenue. Explore whether the exterior of the ventilation facility can be oriented to mirror the Bunnings 'street-wall', with street trees providing scale mitigation and shade amenity
- Further develop the interface between the project pedestrian bridges and the existing shared paths and retaining walls
- Design the highly visible bridge parts, such as piers, girders and parapets, to ensure a controlled, integrated and high quality finish taking into account the Roads and Maritime Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW.

In addition, and in response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the project. The panel would review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist would also be included on the panel.

The nature of the design process is iterative and would continue to evolve as various elements become realised in detail and better coordinated as part of the whole project.

Issue description – location of the project within the M4 and Parramatta Road corridor

Concerns were raised that the EIS contains the incorrect statement that the project is generally located within the M4 and Parramatta Road corridor.

Response

The location and alignment of the project is described in section 5.1 and shown in Figure 5.1 of the EIS. The M4 and Parramatta Road corridor as defined in the glossary of the EIS is the area from Parramatta CBD to Sydney CBD, generally between the Main Western Rail Line in the south and the Parramatta River to the north. The project is located within this corridor.

Issue description – height of central barriers

Submissions requested that the height of central barriers should be raised so drivers are unable to see the other side of the road.

Response

Eastbound and westbound traffic would be in separate tunnels, where it would not be possible to see the other side of the road. The barriers on surface roads have been designed in line with Roads and Maritime specifications.

5.4.2 Project footprint

Issue description – alter project to minimise impacts to properties

Submissions stated that the design should be altered to minimise property impacts.

Response

The preferred design was selected based on a number of criteria, one of which was impacts to properties. As discussed in section 12.3.1 of the EIS, the preferred design described in the EIS reduced the number of private properties to be acquired compared with the preliminary concept design. Chapter 4 of the EIS outlines all the options considered and provides justification for the preferred project.

5.4.3 Tunnels

Issue description – height of tunnels

Concerns were raised regarding the height of the M4 East tunnels, and stated that they should be built to accommodate tall vehicles such as buses and trucks.

Response

As outlined in section 5.4 of the EIS, the tunnels would have an internal clearance of 5.3 metres. This is higher than other tunnels in Sydney where the clearance is typically 4.6 metres or less. This would reduce the likelihood of tunnels being damaged due to over-height vehicles.

Issue description – tunnel safety features

Concerns were raised regarding the tunnel safety features provided in the event of a major incident, as they do not seem adequate for a long tunnel.

Response

As outlined in section 25.2.3 of the EIS, the potential for incidents and accidents to occur is a function of:

- The design of the project
- The type and volumes of traffic using the project
- Driving conditions, including light conditions and meteorology
- Human factors, including compliance with road rules, attention to driving conditions and fatigue
- Vehicle failure and breakdown.

The project has been designed to provide for efficient, free flowing traffic with physical capacity to accommodate predicted traffic volume. The design has incorporated all feasible and reasonable design measures including in relation to geometry, pavement, lighting and signage, consistent with current Australian Standards, road design guidelines and industry best practice. In doing so, the design of the project has been developed to inherently minimise the likelihood of incidents and accidents.

Specific tunnel features designed to minimise the occurrence of incidents and accidents include:

- Height detection system prior to the tunnel portals
- Tunnel barrier gates to prevent access in the event of tunnel closure
- Closed-circuit television (CCTV) throughout the tunnel and approaches.

The project has also been designed to meet appropriate fire and life safety requirements in the event of an incident or accident in the tunnel. Each project tunnel would be one directional, reducing the risk of vehicle accidents through head-on collisions and simplifying smoke management and egress requirements. The transport of dangerous goods and hazardous substances would be prohibited through the mainline tunnels and on- and off-ramps, reducing the risk of very large fires or the release of toxic materials in the tunnel. Other fire and life safety aspects that would be incorporated into the project include:

- Tunnel operation; the tunnel will be actively operated at the Motorway Control Centre continuously (24 hours, seven days)
- State of the art CCTV and audible systems to detect incidents and manage evacuation processes
- Multiple pedestrian cross passages between the main alignment tunnels and longitudinal egress passages along the on- and off-ramps, to allow pedestrians to exit the tunnel and on- and off-ramps in the event of a major incident
- Automatic fire and smoke detection within the tunnels
- Longitudinal ventilation to 'push' smoke in the direction of traffic flow away from the fire source towards a ventilation facility or tunnel portal
- A water deluge system that can be activated manually by the tunnel operator or automatically based on the automatic fire detection system
- Structures, linings and services that would be fire resistant to protect them from fire damage before the activation of the deluge system, or if the deluge system fails.

In the event of an incident, approaching traffic would be prevented from entering the tunnels. Vehicle occupants at the location of the fire and upstream of the fire source would be instructed to leave their vehicles, and exit in the upstream direction through the section of carriageway that would be protected by the smoke management system, or through an exit door to a cross-passage leading to the other ('non-incident') tunnel.

Occupants downstream of the fire source would be encouraged to continue driving out of the tunnel. If this is not possible and they are forced to evacuate on foot, egress would be provided via an exit door to a cross-passage leading to a non-incident tunnel. Emergency services would be able to reach the fire source via the non-incident tunnel (by vehicle or on foot), or from the upstream direction in the affected tunnel by vehicle (depending on traffic) or on foot.

Issues description – height of on- and off-ramps at the Concord Road interchange

Submissions question the difference in depths below the surface of the on-ramp and off-ramp at the Concord Road interchange, and suggest that the gradient of the tunnel on- and off-ramps at the Concord Road interchange could be steeper to increase the distance between the top of the ramp tunnels and the buildings above.

Response

As per section 5.2.1 of the EIS, new works would be designed generally in accordance with Australian Standards, Austroads Design Standards, Guides and Codes and the Roads and Maritime supplements to these documents.

The on-ramp is allowed to be steeper because this has a positive effect on vehicle emission and speed. The off-ramp cannot be as steep to ensure vehicles do not slow down and do not create excessive emissions whilst climbing. The off-ramp also needs to go over the mainline tunnel whereas the on-ramp does not, which again would create differences in depth between the two ramps.

Ground-borne noise and vibration impacts as a result of tunnelling works have been assessed in Chapter 10 and Appendix I of the EIS.

Issues description – depth of tunnels

A submission requested clarification of the depth of the proposed tunnels below properties, including the property at 35 Lang Street at Croydon.

Response

As described in section 5.4 of the EIS, the depth to the top (or crown) of the mainline tunnels would vary between about 20 metres and about 50 metres below ground level. As shown on the interactive map on the WestConnex website (https://gis.aecomonline.net/westconnex/m4east/), the depth of the proposed tunnels below the property at 35 Lang Street at Croydon would be around 35 metres.

Issues description – location of tunnels

A submission requested details of where the tunnels were in relation to their property at 7 Miller Street at Haberfield, including the proposed and potential future M4–M5 Link tunnels.

Response

The property at 7 Miller Street at Haberfield is not located over the proposed M4 East mainline tunnels or on- and off-ramps. The design for the M4–M5 Link has not been finalised and therefore it is not possible at this stage to indicate where this property is in relation to the M4–M5 Link mainline tunnels and on- and off-ramps. The M4–M5 Link would be subject to a separate planning approval process which would include consultation with the community and other stakeholders.

5.4.4 Road treatments at intersections and interchanges

Issue description – confirmation of elements of the Concord Road interchange

A submission requested confirmation regarding elements of the Concord Road interchange, including:

- The configuration, including the height above the ground, of the M4 westbound on-ramp, specifically where the on-ramp is closest to Edward Street at Concord
- The height of the noise barrier on the eastern side of the Concord interchange, between the interchange and Edward Street.

Response

As described in section 5.8.1 of the EIS, the bridge carrying the M4 westbound on-ramp would have a maximum height of about eight metres above Concord Road.

In relation to noise barriers, the EIS includes an assessment of the need for, location and height of noise barriers for the project. Consistent with the requirements of the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014), noise barriers have been considered where receivers exceed noise goals identified in these guidance documents. Noise barriers have been proposed for the project, as part of a broader suite of noise mitigation measures, with the aim of achieving the noise criteria.

As shown in Figure 10 of the noise and vibration impact assessment at Appendix I of the EIS the noise barrier on the eastern side of the Concord interchange has been assessed as being most effective at a height of up to three metres. The noise barrier at this location would be located on the edge of the westbound on-ramp.

The assessment of noise barriers would be revised during detailed design to ensure that noise barriers are designed and installed where required. This would include confirmation of the location and height of new permanent noise barriers.

Issue description – potential loss of laneway

Concerns were raised that the design of Concord Road interchange would result in the loss of the laneway between Edward Street and Alexandra Street, which is currently used by motor vehicles.

Response

The six metre wide laneway to which this submission refers is the extension of Alexander Street, providing connection to Edward Street. The Concord Road interchange would require the existing cul-de-sac at the western end of Edward Street to be moved approximately 60 metres to the east, resulting in the loss of the Alexander Street laneway extension. Vehicular connection between Edward Street and Alexander Street would be provided via Inverary Street around 200 metres to the east of the existing laneway.

A pedestrian and cyclist connection would also be provided in this location, connecting Sydney Street, Edward Street and Alexandra Street to Concord Road and beyond.

Issue description – existing and proposed access to M4

A submission questioned whether the existing ramp onto the M4 westbound at Concord Road would remain following construction of the project. The submission also questioned whether Leicester Avenue traffic and traffic from Parramatta Road west of George Street would be required to access the M4 via the existing M4 and Parramatta Road intersection at Concord.

Response

As outlined in section 5.5.3 of the EIS, the existing on-ramp from Concord Road northbound to the M4 westbound is proposed to be removed as part of the project. The closure of this ramp at the Concord Road interchange would reduce the number of vehicles travelling through the Parramatta Road/Concord Road/Leicester Avenue intersection. This intersection is currently experiencing significant delays and reducing the number of vehicles using this intersection would assist with improving its performance.

The project includes the construction of a new westbound on-ramp from Parramatta Road to the M4 near Powells Creek, to the west of George Street (refer to section 5.5.2 of the EIS). Vehicles that previously used the Concord Road on-ramp could use this new on-ramp. A right turn bay would be provided to allow access to this ramp from Parramatta Road (westbound) at a signalised intersection.

The existing left turn from Parramatta Road (eastbound) to the M4 would also be removed as part of the project (refer to section 5.5.3 of the EIS). Therefore the movement described in the submission would no longer be possible. Instead, vehicles wishing to access the M4 (westbound) from Leicester Avenue would turn left onto Parramatta Road (westbound) and then access the M4 via the new on-ramp at Powells Creek.

Issue description – relocation of Wattle Street interchange

A submission questioned if the on- and off-ramps at the Wattle Street interchange could be relocated further south towards Parramatta Road, to reduce the number of residential properties they are located adjacent to.

Response

The on- and off-ramps need to be located north of Parramatta Road intersection to allow enough distance to integrate with the surface traffic prior to the intersection. For example, vehicles emerging from the M4-M5 Link need enough distance once they have exited the tunnel to safely move to the right or left depending on which direction they wish to travel (west on Parramatta Road or Frederick Street).

Issue description – relocation of Wattle and Ramsay Street intersection

A submission expressed concern that relocating the Wattle Street and Ramsay Street intersection at Haberfield to the east (along Ramsay Street) would make it difficult for residents at 154 Ramsay Street to access their driveways.

Response

Access to properties along Ramsay Street would not be affected by the project. During construction, temporary access may need to be provided for short periods.

Section 8.2.3 of the EIS presents the existing road network performance including an assessment of the level of service at intersections along the Parramatta Road corridor for the AM and PM peak. The assessment found that under existing conditions, the intersection at Wattle Street is subject to highly congested levels of F (AM peak) and E (PM peak).

Section 8.4.1 of the EIS summarises the intersection performance modelling results and identified that the project would result in substantial reductions in delay at the intersection of Wattle Street with Ramsay Street, with this intersection going from a highly congested level of service F/E conditions to level of service B to D conditions.

This expected improvement in intersection performance would assist in ameliorating the impact of this intersection being located closer to the property at 154 Ramsay Street.

Issue description – removal of proposed right hand turn

A submission suggested that the proposed right hand turn from the eastbound lanes of Wattle Street into Ramsay Street at Haberfield should be removed.

Response

Currently, vehicles travelling east on Wattle Street are able to turn right at Waratah Street to access the eastern part of Haberfield. As described in section 5.5.4 of the EIS, a dedicated right turn bay would be provided at the Waratah Street signalised intersection for traffic exiting the eastbound mainline tunnel only. Eastbound Wattle Street surface traffic (not originating from the eastbound mainline tunnel) would not be able to turn right at this intersection.

To cater for Wattle Street surface traffic that may wish to access the eastern part of Haberfield, a right turn from Wattle Street eastbound into Ramsay Street would be provided. If this was to be deleted, the next available right turn on the City West Link would be at James Street at Leichhardt.

Issue description – retaining location of right turn from Wattle Street

A submission suggested that the right turn from Wattle Street westbound into Ramsay Street at Haberfield should remain in its current location. If moved, the right turn would be closer to the submitter's property.

Response

The ability to make a right turn from Wattle Street westbound into Ramsay Street would remain; however, the surface traffic lanes, including the right turn bay, would be moved to the east, closer to the submitter's property. The relocation is required to accommodate the on- and off-ramps for the M4 East and M4–M5 Link. **Section 7.5** of this report describes changes to the Wattle Street interchange; however the Wattle Street surface lanes would remain in the general location as described in the EIS.

Issue description – removal of right turn lane from the tunnel to Waratah Street

Submissions questioned why there is a dedicated right turn lane from the tunnel to Waratah Street. It has been requested that this turn be removed.

Response

The right turn lane from the eastbound Wattle Street off-ramp into Waratah Street is required as it would be the last point at which vehicles could make a right hand turn into Haberfield from Dobroyd Parade/City West Link.

Traffic forecasting indicates very limited demand for this right hand turn. Vehicles travelling on Wattle Street would not be able to use the right turn as it would not be accessible. Vehicles traveling on the surface road network would need to take the right hand turn at Ramsay Street. The volume of trips emerging from the tunnel (coming from Concord or west of Concord) who would use Waratah Avenue to access their destination is low and the Parramatta Road off-ramp provides an attractive alternative for many Haberfield destinations.

Furthermore, Roads and Maritime could implement traffic management measures to control the volume of traffic travelling along this route.

Issue description – design of on- and off-ramps from Parramatta Road

Concerns were raised about the short-sighted nature of the on- and off-ramps to and from Parramatta Road. The single lane off-ramp onto Parramatta Road (even if it is two lanes for a short distance) would cause queuing, potentially back into the tunnel, which could result in dangerous traffic conditions and increased congestion.

Response

The on- and off-ramps at Parramatta Road would comprise two lanes in the initial configuration, until the M4–M5 Link is operating. The proposed lane arrangement at this interchange is shown on Figure 5.19 of the EIS.

The proposed arrangement at the off-ramp is not expected to result in queuing back into the tunnels as one lane would continue onto Parramatta Road with no merge, while one would merge with one of the two surface lanes along Parramatta Road.

When the M4–M5 Link is operating, there would be fewer vehicles exiting at the Parramatta Road interchange. The off-ramp would comprise two lanes for the majority of the ramp, merging to one lane just prior to joining Parramatta Road.

Issue description – removal of proposed right hand turn

A submission expressed concern that removal of the right hand turn from Wattle Street into Waratah Street would result in eastbound Wattle Street road users having to travel to James Street at Leichhardt before being able to make a right hand turn,

Response

Currently, vehicles travelling east on Wattle Street are able to turn right at Waratah Street to access the eastern part of Haberfield. As described in section 5.5.4 of the EIS, a dedicated right turn bay would be provided at the Waratah Street signalised intersection for traffic exiting the eastbound mainline tunnel only. Eastbound Wattle Street surface traffic (not originating from the eastbound mainline tunnel) would not be able to turn right at this intersection.

To cater for Wattle Street surface traffic that may wish to access the eastern part of Haberfield, a right turn from Wattle Street eastbound into Ramsay Street would be provided.

Issue description – on- and off-ramps at Homebush Bay Drive interchange

Submissions suggested the Homebush Bay Drive Interchange should be considered so that there are no at-grade traffic lights with all movements made via ramps to remove impacts on north-south travel along the road.

Response

To safely and efficiently manage the array of turning movements associated with the on- and off-ramps at the Homebush Bay Drive interchange lights are required.

The arrangement at the Homebush Bay Drive Interchange is not to be significantly altered by the project with the existing eastbound on-ramps and westbound off-ramps to largely remain as they currently are, however some extra capacity is to be provided.

The M4 Widening project is construction a G-loop which will allow vehicles travelling southbound on Homebush Bay Drive to enter the westbound carriageway without the need wait at lights. This will improve the current right turn movement from the Homebush Bay Drive southbound lanes to the M4 westbound which causes considerable delays at this intersection.

5.4.5 Ventilation system

Issue description – location of Cintra Park ventilation facility

Submissions suggested that the location of the Cintra Park emergency smoke exhaust and fresh air supply facility be located further from nearby dwellings.

Response

The location of the Cintra Park emergency smoke exhaust and fresh air supply facility has been determined having regard to existing conditions, the design principles for the project, the extent of impacts and impact management requirements.

The exact location of operational infrastructure at Cintra Park would be confirmed during detailed design to minimise the potential for impacts on adjacent properties. This would include consideration of potential alternative locations in consultation with council.

The design of all operational facilities would be considered during detailed design to ensure that they blend with the surrounding landscape and minimise the potential for impacts.

Issue description – operational power requirements

Submission requested clarification of the operational power requirements of the ventilation stacks. The EIS indicates that the western ventilation facility would require 10,700 MW/year, whereas the eastern ventilation would require only 4,525 MW/year. As the eastern ventilation facility is much larger, this must be incorrect.

Response

Due to a transcribing error, the anticipated operational power requirements for the western ventilation facility and the eastern ventilation facility were incorrectly assigned. The correct anticipated operational power requirements for these two facilities are shown in **Table 5.3** and in **section 6.5** of this report.

Table 5.3 Corrected anticipated operational power requirements

Location	Power requirement (megawatt hours a year)
Western ventilation facility	4,325
Eastern ventilation Facility	10,700

5.4.6 Other ancillary facilities

Issue description – sediment basins at the Homebush Bay Drive interchange

A submission expressed concern about the need for large sediment basins at the Homebush Bay Drive interchange, including concern regarding potential contaminants.

Response

Section 5.8.3 of the EIS addresses the drainage and operational water quality for the project including a description of surface drainage associated with surface works at the interchanges. The project would increase the amount of impervious surfaces within the catchment area, which would require alterations and augmentations to the existing drainage infrastructure, including the following basin infrastructure near to the Homebush Bay Drive interchange:

- Provision of a water quality basin on the western side of Saleyards Creek on the northern side of the existing M4
- Provision of a spill containment basin on the eastern side of Saleyards Creek on the northern side of the existing M4.

The operational water quality impacts from the above ground permanent infrastructure associated with the project are assessed in section 15.4.2 of the EIS. These impacts would be predominantly due to an increase in runoff from a small increase of impervious area and the related mobilisation of pollutants from the carriageway. Although the project would result in a minor increase in impervious area, the project would also change traffic volumes on surface roads and would result in a reduction in the number of heavy vehicles on some of the surface roadways. As such, the additional operational impacts of the project on stormwater runoff pollutants would be marginal.

Section 15.5 of the EIS (as amended by **Chapter 8** (Revised environmental management measures) of this report) outlines the measures to mitigate potential water quality risks to the waterways during operation.

The interchanges and connections to existing roads including Homebush Bay Drive, Concord Road, Wattle Street and Parramatta Road east of Wattle Street would require the management of additional runoff from the widened carriageways in these areas. The following mitigation measures are proposed:

- The water quality basin at Saleyards Creek would be designed to minimise impacts on the creek corridor and the setback area along this boundary should be appropriately landscaped
- A surface water quality monitoring program for the pre-construction, construction and operation of the project would be undertaken in accordance with the ANZECC Guidelines and RTA Guideline. The program would be periodically reviewed so that it provides appropriate information relevant to the project implementation phase
- The criteria for discharge from the mainline carriageways during operation would be based on Part N of the Strathfield Consolidated Development Control Plan 2005, which provides clear targets for water quality.

5.4.7 Changes to the existing road network

Issue description – implementation of traffic management measures

Submissions requested that, where traffic levels on local streets increase to unacceptable levels, traffic management measures be implemented including consideration of road closures, speed bumps and/or supervised crossings.

Response

Chapter 5 of the EIS describes in detail the proposed changes to the existing road network. At this stage, the project does not propose any modifications to the existing road network beyond what is described in Chapter 5 of the EIS.

Section 8.6.3 of the EIS describes management measures to mitigate traffic impacts associated with the operational phase of the project. An operational traffic review would be undertaken 12 months after the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections.

Further modifications to the local road network would be subject to separate consideration, assessment and approval by the relevant roads authority.

Issue description – access arrangements for residents of Martin Street at Haberfield

Concerns were raised that access arrangements for residents of Martin Street at Haberfield (on the western side of Wattle Street) were overlooked. To travel westbound on Wattle Street, residents would be required to turn left out of Martin Street in the eastbound direction and undertake a considerably longer journey. One solution would be to reopen Martin Street at its western end where it joins Ramsay Street, to provide an alternate route to travel westbound on Wattle Street, or to access Ramsay Street east of Wattle Street where schools and local shops are located.

Response

As described in **section 7.6.1** of this report, in response to submissions and ongoing refinements during detailed design, it is proposed to undertake works at the currently closed intersection of Ramsay Street and Martin Street. This intersection would be reopened to traffic, and all turning movements into and out of the western end of Martin Street would be permitted. Signal control is not proposed at this location due to the low turning volumes anticipated. The proximity of the upstream and downstream signals is anticipated to provide sufficient gaps for turning vehicles. Parking restrictions on Ramsay Street may require further investigation to ensure right turning vehicles do not impact through traffic on Ramsay Street.

In addition, to prevent rat-running to avoid the Ramsay Street and Wattle Street intersection, the eastern end of Martin Street (west) would be altered to be left in only, with the left turn out movement prohibited. Geometric changes to the intersection would be required to physically restrict egress to Wattle Street. This would retain the low volume, residential nature of the existing street.

Issue description – potential rat running

Concerns regarding rat running and congestion as a result of the project are also discussed in **section 5.7.8** of this report.

Concerns were raised that the proposal would result in 'rat running' and increased congestion of local roads. Specifically, submissions related to:

- Closure of Mortley Avenue at Dobroyd Parade
- Closure of Wolseley Street at Parramatta Road
- Closure of Northcote Street at Parramatta Road
- Closure of Walker Avenue at Parramatta Road
- Closure of Alt Street at Parramatta Road
- Prohibiting the left hand turn movement from Parramatta Road into Walker Avenue and Alt Street.
- Closure of Chandos Street at Parramatta Road
- Closure of Rogers Avenue at Parramatta Road
- Closure of St Davids Road at Parramatta Road.

Response

As described in section 5.9.1 of the EIS, a number of streets would be closed permanently. At this stage, the project does not propose any modifications to the existing road network beyond what is described in section 5.9.1 of the EIS.

Section 8.6.3 of the EIS describes management measures to mitigate traffic impacts associated with the operational phase of the project. An operational traffic review would be undertaken 12 months after the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections.

Further modifications to the local road network would be subject to separate consideration, assessment and approval by the relevant roads authority.

Issue description – concerns regarding Dalhousie Street at Ashfield

A number of submissions raised issues regarding Dalhousie Street at Ashfield, including:

- Investigate the requirement for an additional right turn lane into Dalhousie Street from Parramatta Road westbound
- Maintain access into Dalhousie Street from Parramatta Road
- Maintain access into Orpington Street from Dalhousie Street.

Response

Increases and decreases on local roads can be seen in section 8.2 of the traffic and transport assessment in Appendix G of the EIS. A number of the routes listed would not see an increase in traffic as a result of the project. Overall traffic volumes on the Hume Highway are expected to decrease with the implementation of the M4 East project. This is a consistent pattern on most east-west routes in the region of the scheme with volumes also decreasing on Queens Road, Ramsay Road and Marion Street.

Modest increases in traffic are expected on some north-south routes throughout the study area including Frederick Street however due to reductions in traffic on east-west routes it is anticipated that additional priority could be provided to these corridors maintain or improving on performance without the M4 East project. Monitoring of traffic conditions post opening of the M4 East would occur at regular intervals.

At this stage, the project does not propose any modifications to the existing road network beyond what is described in section 5.9.1 of the EIS. Further modifications to the local road network would be subject to separate consideration, assessment and approval by the relevant roads authority.

Traffic in Dalhousie Street would continue to be able to turn right into Parramatta Road and then left into Orpington Street.

Issue description – alterations to Bland Street at Ashfield

Submissions requested the following alterations to Bland Street at Ashfield:

- Widen the street between around 120 Bland Street and Parramatta Road
- Improve the ability to turn left from Parramatta Road into Bland Street
- Make Bland Street a one-way street between Charlotte Street and Parramatta Road
- Make one side of Bland Street a clearway.

Response

Chapter 5 of the EIS describes in detail the proposed changes to the existing road network. No changes are proposed to Bland Street. At this stage, the project does not propose any modifications to the existing road network beyond what is described in Chapter 5 of the EIS.

Section 8.6.3 of the EIS describes management measures to mitigate traffic impacts associated with the operational phase of the project. An operational traffic review would be undertaken 12 months after the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections.

Further modifications to the local road network would be subject to separate consideration, assessment and approval by the relevant roads authority.

Issue description – confirmation of installation of traffic signals

A submission sought confirmation as to whether traffic signals would be installed at the intersection of Parramatta Road and Rogers Avenue at Haberfield.

Response

Chapter 5 of the EIS describes in detail the proposed permanent changes to the existing road network. No permanent traffic signals are proposed at the intersection of Parramatta Road and Rogers Avenue.

As described in section 6.5.11 of the EIS, during construction only, a new signalised intersection would be provided on Parramatta Road, near (but to the west of) Rogers Avenue. This intersection would include a dedicated right turn bay to allow construction vehicles travelling eastbound on Parramatta Road to turn into the site. This signalised intersection would only be used by construction vehicles, and would be removed following completion of construction.

Issue description – alterations to Walker Avenue at Haberfield

Submissions requested the following alterations to Walker Avenue at Haberfield:

- Access to the section of Walker Avenue between Parramatta Road and Ramsay Street be retained at the completion of the project
- The southern end of Walker Avenue at Parramatta Road be made a cul-de-sac.

Response

Access to Walker Avenue from Parramatta Road and Ramsay Street would be retained. As described in section 5.9.1 of the EIS, a section of Allum Street north of Walker Avenue would be affected by the realignment of Wattle Street and this section of Allum Street would be converted into a cul-de-sac.

Section 6.1.8 and **section 6.1.9** of this report describes the temporary changes to access to Walker Avenue during the construction period. These changes are shown in **Figure 6.7** and **Figure 6.8** of this report.

Further modifications to the local road network would be subject to separate consideration, assessment and approval by the relevant roads authority.

Issue description – alterations to City West Link

Submissions queried if there will be lanes added to the City West Link as part of the project and if some of the traffic lights or turning lanes would be removed.

Response

The proposed Wattle Street interchange would connect the M4 East mainline tunnels and the M4−M5 Link tunnels to Wattle Street and the City West Link in the vicinity of Ramsay Street and is described in section 5.5.4 of the EIS. In the EIS, the Wattle Street (City West Link) interchange included separate cut and cover tunnel structures.

As a result of ongoing design development, the configuration of the Wattle Street interchange is proposed to be modified. The purpose of these changes is to combine the dive and cut and cover structures for both the M4 East ramps and the M4–M5 Link ramps.

The surface Wattle Street eastbound lanes would not change as part of the modification of the interchange.

The surface Wattle Street westbound lanes would be realigned to the east of its existing alignment; however, it would continue in the centre lanes (instead of the kerbside lanes as described in the EIS). To do this, the surface lanes would travel over the cut and cover sections of the M4–M5 Link on- and off-ramps.

South of Ramsay Street, the westbound surface Wattle Street lanes would still split as described in the EIS, two separate sets of lanes providing access to Parramatta Road westbound, and Parramatta Road eastbound or Frederick Street southbound.

North of Waratah Street, the surface works would remain on the same general alignment. A cul-de-sac would be established at Martin Street abutting the eastern side of the project.

Consideration of changes to the configuration of the City West Link beyond the project footprint is outside the scope of the M4 East project.

Issue description – closure of Mosely Street at Strathfield

Submissions recommended that Mosely Street at Strathfield be closed at Parramatta Road, as the intersection is not heavily utilised however the lights cause congestion along Parramatta Road. Submissions recommended that a pedestrian bridge be provided at this intersection instead of the pedestrian crossings.

Response

The project does not include a proposal to close Mosely Street at Strathfield at the intersection with Parramatta Road.

The traffic and transport assessment presented in Chapter 8 of the EIS includes a summary of midblock operational performance under do minimum and do something scenarios for 2021 and 2031. A summary of the midblock operational performance for the section of Parramatta Road between Mosely Street and Burwood Road Strathfield is shown in Table 8.9, Table 8.10, Table 8.11 and Table 8.12 of the EIS. Under the Do something scenario for 2021 and 2031 during the AM and PM peak the Level of Service for this midblock would improve generally from highly congested D/E to C/D.

Given that the project would result in an improvement to the level of service along this section of Parramatta Road the traffic and transport assessment did not identify any requirement to replace the existing at-grade signalised pedestrian crossing at this location with a pedestrian bridge.

Further modifications to the local road network would be subject to separate consideration, assessment and approval by the relevant roads authority.

Issue description – provision of additional lanes at Frederick Street at Ashfield

Submissions recommended that additional lanes be provided at Frederick Street at Ashfield.

Response

Chapter 5 of the EIS describes in detail the proposed permanent changes to the existing road network. The proposal does not include provision for changes to the road configuration along Frederick Street.

Further modifications to the local road network would be subject to separate consideration, assessment and approval by the relevant roads authority.

5.4.8 Pedestrian and cyclist facilities

Issue description – construction of a footbridge/cycle bridge

Submissions suggested that the project should include a footbridge/cycle bridge for people to move between the Concord Road/Queens Road area, the Parramatta Road area and further south to the Strathfield station and high street, to benefit the amenities available in all areas.

Response

As described in section 5.9.2 of the EIS, the project involves closing a 200 metre section of the footpath on the western side of Concord Road because of potential conflicts with cars exiting via the off-ramp onto Concord Road northbound. A network of new pedestrian footpaths and footbridges would be provided on the eastern side of Concord Road. These are shown in Figure 5.16 of the EIS.

The project would not result in any change to the Concord Road/Leicester Avenue and Parramatta Road or Mosely Street and Parramatta Road intersections, and there would be no change to the pedestrian crossing arrangements at these intersections.

A footbridge extending from north of the Concord Road interchange to Parramatta Road would need to be a substantial structure that would have significant visual and overshadowing impacts and constructability issues.

Issue description – provision of a pedestrian and cyclist path

Submissions requested that a shared footpath and cycleway be provided extending from the western end of Edward Street to the intersection of Alexandra and Franklyn Streets.

Response

Section 5.9.2 of the EIS describes the network of new pedestrian footpaths that would be provided as part of the new Concord Road interchange. A new footpath would be provided between Edward Street and Alexandra Street. This footpath would connect to Patterson Street in the north, and to Concord Road.

Issue description – provision of a pedestrian and cyclist bridge over Wattle Street

A number of submissions requested that pedestrian and/or cyclist footbridges be provided over Wattle Street (City West Link), including:

- At the Ramsay Street intersection
- Linking Waratah Street and Timbrell Park.

Response

The project would not permanently change the number or configuration of crossings of Wattle Street in the vicinity of the Wattle Street interchange.

Connectivity is currently provided by:

- Signalised, at-grade crossing with pedestrian phase at the intersection of Wattle Street and Parramatta Road
- Signalised, at-grade crossing with pedestrian phase at the intersection of Wattle Street and Ramsay Street

- Signalised, at-grade crossing with pedestrian phase at the intersection of Wattle Street and Waratah Street
- Signalised, at-grade crossing with pedestrian phase at the intersection of Dobroyd Parade and Timbrell Drive/Mortley Avenue.

The project would not result in any change to the Wattle Street and Parramatta Road intersection, and there would be no change to the pedestrian crossing arrangements at this intersection.

The pedestrian crossings of Wattle Street at Ramsay Street would be retained, but modified to accommodate additional traffic lanes. Pedestrian and cyclist crossing would be provided via signalised at-grade crossings on either side of Ramsay Street. The crossing time at this location would increase as the intersection would be widened to accommodate the cut-and-cover tunnels for the Wattle Street eastbound off-ramp, the on-ramp to the future M4–M5 Link and the Wattle Street westbound on-ramp, as well as the Wattle Street eastbound right turn lane into Ramsay Street.

Pedestrians crossing Wattle Street at Waratah Street currently cross four lanes. The only change to the crossing of this intersection as a result of the project would be that pedestrians would be required to cross one additional lane (the eastbound off-ramp, which merges with Dobroyd Parade further east). Access to Timbrell Park and Five Dock would be retained via the existing footbridge over Dobroyd Canal (Iron Cove Creek) at this location.

The project would not result in any change to the Dobroyd Parade and Timbrell Drive/Mortley Avenue intersection, and there would be no change to the pedestrian crossing arrangements at this intersection.

Issue description – provision of pedestrian and cyclist bridge over Parramatta Road

A number of submissions suggested that a pedestrian and cyclist bridge be provided over Parramatta Road which would link the suburbs of Haberfield and Ashfield, including:

- Over Parramatta Road between Chandos Street north and south
- Near Ashfield Park to linking Haberfield with the park.

Response

The project would not permanently change the number or configuration of crossings of Parramatta Road in the vicinity of the Parramatta Road interchange.

Connectivity is currently provided via:

- Signalised, at-grade crossing with pedestrian phase at the intersection of Parramatta Road and Frederick Street/Wattle Street
- Signalised, at-grade crossing with pedestrian phase and pedestrian footbridge over Parramatta Road at the intersection of Parramatta Road and Bland Street
- Signalised at-grade crossing with pedestrian phase at the intersection of Parramatta Road and Dalhousie Street. This crossing provides pedestrian and cyclist connectivity between Haberfield and Ashfield Park.

Although widening of Parramatta Road would be undertaken to facilitate the new road and tunnel portal arrangement as shown in Figure 5.19 of the EIS, this would not impact on the existing crossings described above.

The provision of a footbridge at Chandos Street is not considered necessary as there is no existing pedestrian crossing at this location and a pedestrian footbridge is currently provided 200 metres to the west at Bland Street.

Issue description – provision of a footpath between Chandos Street and Bland Street

A submission suggested a footpath should be provided between Chandos Street and Bland Street on Parramatta Road (405).

Response

Section 5.9.2 of the EIS describes the realignment and alteration of pedestrian and cyclist facilities as a consequence of the project. New and/or modified footpaths would be provided on both sides of Parramatta Road between Bland Street and Rogers Avenue/Orpington Street. This includes the section of Parramatta Road between Bland Street and Chandos Street.

Issue description – consideration of an elevated cycleway

Submissions noted *Sydney's Cycling Future* (Transport for NSW, 2013b) states that 'the needs of people on bikes will be included in the planning, design and construction of new transport and urban development projects'. Based on this, the provision of a completely separate cycle path should be incorporated into the project. Use of motorway shoulders is not high, with the shoulders of the existing M4 rarely being used by cyclists. Any off-road cycleway should be connected to the cycleways on City West Link and the M7. Although it is acknowledged that cyclists should not enter the tunnels, consideration should be given to alternatives such as an elevated cycleway.

Response

As described in section 5.9.2 of the EIS and as modified by the proposed design change described in **section 7.2** of this report, the project includes the construction of an off-road cycleway in the vicinity of the Homebush Bay Drive interchange to ensure safe movement of cyclists through the new arrangement at this location. The cycleway would connect to the shoulders of the M4.

For westbound cyclists, a new cycleway ramp would connect to the existing M4 from Queen Street at North Strathfield, between the Main North Rail Line and Concord Road. This ramp would connect to the existing westbound shoulder of the M4. The shoulder would connect with a proposed westbound cycleway to divert cyclists permanently off the M4 and onto a new bypass of the Homebush Bay Drive interchange (which will be delivered as part of the M4 Widening project).

The construction of a full off road cycle way along the length of the surface section at the western end of the project is not proposed because:

- The constrained nature of the existing M4 corridor means that additional property acquisition would be required to provide a full off-road cycleway. The M4 corridor is more constrained than a greenfield corridor, such as when the M7 was constructed
- The presence of alternate cycle routes are available in the surrounding area and therefore cyclists are not forced to use the M4 shoulders.

The connection of the proposed cycleway to other cycleways in the region would be the responsibility of other agencies such as Roads and Maritime Services and local councils.

Issue description – re-routed eastbound cycleway

Submissions expressed concern with the proposed re-routed eastbound cycleway as shown in Figure 5.28 of the EIS, specifically:

- The path through SOPA land conflicts with traffic and parking during major events
- The deviated route contains a number of tight turns
- The existing Homebush Bay Drive underpass, known as the Mouse Hole, will be unsafe if it is to accommodate bi-directional bus flow and a three metre wide cycleway.

Response

There are limited opportunities for cyclist to traverse from the M4 Motorway west of the Olympic Park precinct to re-join to the M4 Motorway east of Homebush Bay Drive. As the Australia Avenue / Underwood Road roundabout is unsuited to safe use by cyclists, the only current viable option is to utilise the Mouse Hole underpass.

It is acknowledged that operational measures will need to be put in place during major events at Sydney Olympic Park to manage the shared use of the Mouse Hole by cyclists and motorists. These measures could include bollards and signage on the cycleway to advise cyclists during relevant event times.

During other periods when the Mouse Hole underpass or Rod laver Drive are closed to vehicles (buses), additional gates could be provided to enable use by cyclists.

Continuation of the cycleway east to the Mouse Hole is subject to further design development which will address cyclist safety and security matters, including lighting. SMC will consult with SOPA during the coming months to identify mutually acceptable solutions to the above matters. These improvements would complement and connect to future regional cycleway facilities developed by other government agencies and stakeholders through relevant projects such as the Parramatta Road Urban Transformation study.

Issue description – Bland Street pedestrian bridge

A submission expressed concern that the Bland Street footbridge would be closed and that no equivalent or alternative pedestrian link would be provided.

Response

Where possible, pedestrian access across the Bland Street pedestrian bridge would be retained at all times. As described in Section 6.4.4 of the EIS, short shutdowns may be required for safety reasons. During these periods, alternative access would be available via the existing traffic signals.

5.4.9 Public transport

Issue description – lack of planning for public transport

Submissions raised concerns with the lack of planning for public transport.

Response

As outlined in section 5.9.3 of the EIS, the project includes the provision a seven metre wide, central running mass transit corridor along Parramatta Road in the vicinity of the Parramatta Road interchange that is not being developed as part of this project. This corridor would not be used at opening of the project, however in the future it would potentially be used for mass transit such as buses or light rail.

The project would also remove traffic along the Parramatta Road corridor, particularly east of Burwood, which would allow for improvements in bus services along Parramatta Road. Improvements to the bus system would be the responsibility of Transport for NSW and do not form part of this project.

5.5 Construction

5.5.1 Construction program

51 submissions raised issues regarding the construction program.

Issue description – duration of construction program

Concerns were raised about the overall duration of the construction program and the potential impacts this would have on residents.

Response

In developing construction methodologies and a construction program for the project, the aim has been to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers. This has required a balance between the speed of construction activities and the ability to reasonably and feasibly maintain impacts within acceptable limits. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during the detailed design process.

As stated in section 6.2 of the EIS, the construction program is expected to last around three years. Given the length and linear nature of the project, the presence and intensity of construction activities at any given point within the construction period would vary over this period. On the other hand, activities at certain construction ancillary facilities would be reasonably constant through construction.

A range of measures are proposed in the EIS (as amended 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 ancillary facilities specifically. The proposed environmental management measures would be reflected a construction noise and vibration management plan and would include:

- The provision of acoustic sheds at tunnel sites and early implementation of operational noise treatments at properties, if possible
- Particularly noisy activities will be scheduled during the less sensitive times of 9.00 am to 12.00 pm or 2.00 pm to 5.00 pm where appropriate, or in accordance with the environment protection licence
- When working adjacent to schools, particularly noisy activities will be scheduled outside normal school hours, where practicable
- Works will be scheduled to avoid the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers
- Ongoing noise monitoring will be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events
- Respite periods (eg one hour respite for every three hours of continuous construction activity) will be scheduled for high noise impact works where appropriate
- Building condition surveys will be undertaken on certain properties and structures.

Consultation with property owners likely to be impacted by construction activities would be undertaken as necessary prior to and during construction.

5.5.2 Construction methods

11 submissions raised issues regarding construction methods.

Issue description – impacts of blasting on residences

Concerns were raised with the use of blasting during tunnelling and potential impacts on residences.

Response

As discussed in section 6.4.2 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. The drill and blast method offers the shortest potential exposure to vibration for residents and businesses above the tunnels, when compared to the more continuous noise and vibration from mechanical excavation equipment such as roadheaders and rockbreakers.

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. It is not expected to be utilised in the shallower sections of tunnel construction, where variable ground conditions exist.

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.

Underground blasting would also be limited to one single detonation in any one day per receiver group, unless otherwise agreed by the EPA.

The potential impacts of blasting with regard to human comfort and building damage were assessed in the noise and vibration assessment in Chapter 10 and Appendix I of the EIS. The assessment found that the human comfort and structural vibration criteria could be achieved through blast design.

Further investigations into predicted noise and vibration level would be undertaken following confirmation of the scope of blasting. Where levels are to exceed the criteria, alternative methods (eg 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.

Potential impacts relating to noise and vibration as a result of blasting are discussed in **sections 5.9.3, 5.9.5** and **5.9.6** of this report. Potential impacts to properties as a result of ground settlement during tunnel construction are discussed in **section 5.17.2** of this report.

5.5.3 Location and layout of construction ancillary facilities

25 submissions raised issues regarding the location and layout of construction ancillary facilities.

Issue description – Location and layout of facilities

General concerns were raised regarding the location and layout of construction ancillary facilities.

Response

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.

As stated in section 6.5.1 of the EIS, the layout and access arrangements for construction ancillary facilities are based on the concept design. The layout and access arrangements for construction ancillary facilities would be refined during detailed design, with the following design objectives:

- Where practicable, temporary structures would be used to provide a noise barrier between the construction site and adjacent sensitive receivers
- The location of temporary structures would have regard to overlooking and overshadowing impacts on adjacent sensitive receivers
- Where feasible and reasonable, acoustic sheds would enclose noise-generating spoil and haul preparation activities that would be undertaken outside standard construction hours
- Lighting would be designed to minimise light spill onto adjoining properties
- Spoil stockpiles would be located away from adjacent sensitive receivers where possible
- Appropriate erosion and sediment controls would be incorporated
- Vehicle access points and internal circulation roads would be located away from adjacent sensitive receivers where possible
- Vehicle access points would have ready access to the arterial road network, where possible, and would minimise the need for heavy vehicles to travel on local roads through residential areas
- Construction sites would provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours.

Since the exhibition of the EIS and as anticipated by Chapter 6 of the EIS, further construction planning has been undertaken by the contractor, which has resulted in refinements to the internal layout and access arrangements of the construction ancillary facilities. **Section 6.1** of this report describes proposed refinements to the layout and access arrangements of the construction ancillary facilities, and the environmental impacts of these refinements.

Issue description – Pomeroy Street civil site (C2)

Submissions raised concern with the location and layout of the Pomeroy Street civil site (C2) particularly having regard to impacts to Bill Boyce Reserve, and suggested alternatives including:

- To retain fringing vegetation and provide access from Short Street East
- Provide alternative parking on Park Road, near the pedestrian bridge

- Alternate use of unused bowling greens at Homebush bowling club.

Response

As described in **section 6.1.2** of this report, the location of car parking at the Pomeroy Street civil site (C2) would be relocated to retain existing vegetation adjacent to Pomeroy Street.

As shown in **Figure 6.2** in **Chapter 6** (Clarifications) of this report, it is proposed to provide an internal construction haul road within the road reserve between Short Street East and the Pomeroy Street civil site (C2). This would mean that the Pomeroy Street entrance to the Pomeroy Street civil site would only need to be used by light vehicles.

Park Road is on the southern side of the existing M4, and contains on-street car parking only. This on-street car parking is likely to be used by residents and visitors to residential development along Park Street and surrounding streets. As described in section 6.6.5 of the EIS, a car parking strategy would be developed as part of the TMSP to limit impacts of construction worker car parking on surrounding communities, in consultation with local councils and relevant stakeholders.

The former Homebush bowling club is located on Pomeroy Street, adjacent to Powells Creek, and is over 350 metres from the existing M4 road reserve and the area of construction work. As described above in the general response, the location of construction ancillary facilities 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. Locating the construction ancillary facility at the former Homebush bowling club would require the use of Pomeroy Street and the local road network by construction heavy vehicles.

Issue description – Concord Road civil and tunnel site (C5)

Submissions questioned the location and need for the Concord Road civil and tunnel site (C5) as a main tunnelling site.

Response

The Concord Road civil and tunnel site (C5) includes land required for permanent operational infrastructure, namely the on- and off-ramps at the Concord Road interchange. The Concord Road tunnel site is also located directly above the mainline tunnels, which provides for the efficient removal of spoil material. Locating the construction ancillary facility at any site other than its proposed location would require additional property acquisition. Not using the Concord Road civil and tunnel site (C5) as a main tunnel site would have significant implications for the construction timeframe.

Issue description – Cintra Park tunnel site (C6)

Submissions questioned the location and layout of the Cintra Park tunnel site layout (C6), particularly having regard to noise, dust and light impacts.

Response

The Cintra Park tunnel site (C6) is located at about the mid-point of the mainline tunnels. Locating a tunnel site at or near the mid-point provides for efficiencies in construction of the tunnel, by reducing the distance that spoil material needs to be hauled. Not using the Cintra Park tunnel site (C6) as a main tunnel site would have significant implications for the construction timeframe.

As described in **section 6.1.6** of this report, a number of changes to the layout of the Cintra Park tunnel site are proposed. In particular, the workshop on the eastern boundary would be relocated to the centre of the site, away from adjacent residential dwellings on Taylor Street at Five Dock. The storage building on the eastern boundary would also be moved to south, closer to Parramatta Road and adjacent to existing commercial development. Appropriate management measures would be implemented during the construction period to minimise noise, dust and lighting impacts as described in the EIS and amended in **Chapter 8** (Revised environmental management measures) of this report.

Issue description – Northcote Street tunnel site (C7)

Concerns were raised in relation to the layout of the Northcote Street tunnel site (C7), including:

- Structures within 20 metres of property boundaries

- Overshadowing issues resulting from the acoustic enclosure
- Storages of fuels, chemicals or explosives near properties
- Obstruction of driveway access for neighbouring properties
- Potential parking issues, suggesting enforcement of maximum parking provisions or shuttle buses servicing satellite parking areas or Ashfield and Croydon train stations
- Potential security issues on pedestrian footpath to Wattle Street, suggesting implementation of security fencing, cameras and lighting.

Response

As described in **section 6.1.7** of this report, a number of changes to the layout of the Northcote Street tunnel site are proposed. In particular, the facilities and buildings on this site would extend to the construction footprint boundary. Structures proposed to be located adjacent to residential properties include a covered dive to the tunnels, an acoustic shed, storage and a workshop.

A preliminary assessment of overshadowing issues associated with the acoustic shed at the Northcote Street tunnel site is provided in **section 6.1.11** of this report. This assessment notes that the acoustic shed would be on the south-western side of the adjacent residential properties, and shadows would likely be largely contained within the site or would fall onto adjacent roadways, perimeter fencing or hoardings. At 3.00 pm in mid-winter, some shadow would likely fall onto the adjacent dwellings on both sides of Northcote Street; however, the extent of shadow would be similar to that of a two storey dwelling.

The siting of acoustic sheds and temporary acoustic hoardings has required a balance between the minimisation of noise impacts and other impacts such as overshadowing associated with noise management measures. A new management measure has been included in **Chapter 8** (Revised summary of environmental management measures) this report that a Solar Access and Overshadowing report would be developed during construction planning to assess the impacts of overshadowing as a result of buildings at construction ancillary facilities that are two storeys (or equivalent) or greater in height, where they are immediately adjacent to residential properties.

In relation to fuels, chemicals and explosives, the final location of storage of these materials would be confirmed during detailed construction planning. However, appropriate mitigation would be implemented to minimise risk to adjoining land uses, as described in section 25.3 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report). In particular, dangerous goods and hazardous materials would be stored in accordance with:

- *Work Health and Safety Act 2011* (NSW)
- *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW 2005)
- Supplier's instructions
- Relevant Australian Standards
- *The Environment Protection Manual for Authorised Officers: Bunding and Spill Management*, technical bulletin (EPA, 1997).

In relation to driveway access, as described in section 6.6 of the EIS, the construction traffic and safety management plan would include provision of temporary access arrangements with private landowners whose property is adjacent to construction activities, should there be any disruption to existing access. In addition, as described in **section 6.2.1** of this report, at Northcote Street at Haberfield, about eight parking spaces on both sides of the street adjacent to the construction ancillary facility would be removed during the construction period. This would enable cars and garbage trucks to turn around at the end of Northcote Street, which is to be closed at Parramatta Road, as described in Table 6.16 of the EIS. This would also enable vehicles to manoeuvre into and out of adjacent driveways.

Section 5.7.2 of this report provides a response to issues associated with car parking provision for construction ancillary facilities.

As shown in **Figure 6.6** in **Chapter 6** (Clarifications) of this report, the proposed pedestrian footpath has been deleted. As described in section 6.3 of this report, the footpath on the northern side of Parramatta Road would be closed. A detour would be provided via the southern side of Parramatta Road (cross at Great North Road and Wattle Street), or via Wolseley Street and Ash Lane.

Issue description – impacts resulting from a temporary access tunnel

A submission raised concern that the potential impacts from the temporary access tunnel to be constructed at Parramatta Road and along Page Avenue at Ashfield have not been assessed in the EIS.

Response

A construction access tunnel would be constructed from the Northcote Street tunnel site (C7) to provide access to the Parramatta Road and Wattle Street eastbound on- and off-ramps and the mainline tunnels. The location of this tunnel is shown in Figure 12.15 of the EIS. The potential impacts resulting from the construction and operation of this tunnel for the duration of the construction period have been assessed in the relevant sections of the EIS, in particular Chapter 8 in relation to traffic, Chapter 10 in relation to noise and vibration, and Chapter 11 in relation to human health.

Issue description – Construction ancillary facilities in Haberfield Heritage Conservation Area (C7, C8 and C9)

Concerns were raised regarding construction ancillary facilities (Northcote Street tunnel site (C7), eastern ventilation facility (C8), Wattle Street and Walker Avenue civil site (C9)) being located within the Haberfield Heritage Conservation Area, and Timbrell Park was suggested as an alternative location for construction ancillary facilities.

Response

Construction ancillary facilities in the Haberfield Heritage Conservation Area include the Northcote Street tunnel site (C7), eastern ventilation facility site (C8), and Wattle Street and Walker Avenue civil site (C9). The eastern ventilation facility site (C8) and Wattle Street and Walker Avenue civil site (C9) are co-located with operational infrastructure. The location of these construction ancillary facilities within the Haberfield Heritage Conservation Area therefore reduces the extent of the construction footprint, in addition to providing efficiencies during construction. The Northcote Street tunnel site has been chosen because of its proximity to mainline tunnels and the Wattle Street and Parramatta Road interchange on- and off-ramps, and because it comprised predominantly commercial properties and minimise acquisition of residential property. Alternative locations for the tunnel site would require additional subsurface property acquisition associated with a longer construction access tunnel.

Timbrell Park is located on the western side of Dobroyd Canal (Iron Cove Creek), and is over 350 metres from the main area of work associated with the Wattle Street interchange. As stated in numerous submissions, Timbrell Park is also heavily used by residents and school children for passive and active recreation purposes. Timbrell Park was therefore not considered to be a suitable location for a construction ancillary facility.

Issue description – Parramatta Road civil site (C10)

Concerns were raised regarding the location of Parramatta Road civil site (C10) and providing heavy vehicle access via Bland Street.

Response

The Parramatta Road civil site (C10) includes land required for permanent operational infrastructure, namely the tunnel dive and cut-and-cover sections of the on- and off-ramps at the Parramatta Road interchange, as well as the realigned westbound lanes of Parramatta Road. Locating the construction ancillary facility at any site other than its proposed location would require additional property acquisition.

As described in **section 6.1.10** of this report, heavy vehicles would exit the Parramatta Road civil site via either a left turn at the new signalised intersection near Rogers Avenue or via Bland Street. An exit via Bland Street is required as the cut-and-cover sections of the on- and off-ramps (involving deep excavations) restrict the ability to turn heavy vehicles around within the site or to cross the site and

exit directly onto Parramatta Road. The signalised intersection at Bland Street and Parramatta Road also provides for safe access to Parramatta Road.

Issue description – installation of traffic signals

A submission requested that traffic signals be installed at the corner of Alt Street and Parramatta Road prior to the commencement of construction, to provide an alternative crossing of Parramatta Road due to the use by project vehicles of Bland Street for access to the Parramatta Road civil site (C10).

Response

A small section of Bland Street near to the intersection of Parramatta Road would be used by heavy vehicles during construction. Heavy vehicles exiting the Parramatta Road civil site (C10) would make a right turn into Bland Street from the civil site and a left turn into Parramatta Road via the existing signalised intersection. A second heavy vehicle exit (and entry) point would be located on Parramatta Road just west of Orpington Street.

A maximum of 90 one-way movements of heavy vehicles would be generally shared equally across these two exit points during the daytime (7.00 am to 6.00 pm). However, using a worst-case assessment methodology where all heavy vehicles use the Bland Street exit, the expected number of heavy vehicles exiting onto Bland Street would be around eight trucks per hour (90 trucks divided by 11 hours).

This worst-case contribution to the existing traffic at this intersection would result in only minor delays. Additionally, as the volume of traffic generated by construction is expected to be relatively low compared to existing traffic volumes, the impacts of this short-term increase in traffic is not expected to significantly impact network performance or road safety in this location. An alternative signalised crossing of Parramatta Road is also provided at Frederick Street.

Any foreseen impacts to performance or road safety at this location during construction would be mitigated through the provision of tailored traffic management plans and other measures.

Issue description – mitigation measures for construction ancillary facilities

Concerns were raised regarding a perceived lack of measures to mitigate the potential impacts of construction ancillary facilities on surrounding residences and businesses.

Response

Chapter 29 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.

The layout and access arrangements for construction ancillary facilities would be refined during detailed design and construction planning, with the objective of further mitigating potential impacts. A construction ancillary facilities management plan would be prepared to outline the environmental management measures to be followed during establishment and utilisation of the facilities.

5.5.4 Hours of work

449 submissions raised issues regarding hours of work.

Issue description – 24 hour construction activities

Concerns were raised in relation to proposed 24 hour construction activities and associated disturbance during night works, particularly tunnelling and truck movements. Submissions requested restrictions on hours of work including:

- Work only between 8.00 am and 5.00 pm, being ‘standard working hours’ or ‘business hours’

- Work only between 7.00 am and 6.00 pm Monday to Friday, 8.00 am and 1.00 pm Saturday, and no work Sunday, being 'standard construction hours'
- Work only between 7.00 am and 5.00 pm Monday to Friday; 8.00 am to 2.00 pm Saturday, and no work Sunday
- Rock breaking only between 8.00 am and 4.30 pm Monday to Friday, 8.00 am and 2.00 pm Saturday
- Provision of respite periods between 9.00 pm and 6.00 am.

Response

The majority of aboveground construction works would be undertaken in accordance with the Interim Construction Noise Guideline (DECCW 2009a) during the standard working hours of between:

- 7.00 am and 6.00 pm Monday to Friday
- 8.00 am and 1.00 pm on Saturdays.

There would generally be no aboveground construction works on Sundays or public holidays, with the exception of those activities required to be undertaken outside of standard construction hours.

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 tunnelling works would operate continuously, the associated tunnel support activities would also be undertaken up to 24 hours a day, seven days a week. This would include heavy vehicle movements to and from the five tunnel construction sites, and on these sites outside the acoustic sheds.

The exception to this would be blasting activities which would only occur 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.

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 feasibly and reasonably maintain impacts within acceptable limits. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during the detailed design process.

Continuous tunnelling would minimise the overall length of construction and the duration of any associated amenity impacts at a given location. Continuous tunnelling requires a number of activities that support the tunnelling to be undertaken continuously.

A number of measures would be implemented to minimise the impacts of tunnelling, including:

- Acoustic sheds would be erected at the Underwood Road tunnel site (C3), Concord Road tunnel site (C5), Cintra Park tunnel site (C6) and Northcote Street tunnel site (C7), and would be reviewed during construction planning to determine the attenuation level required
- Vehicle access points would have ready access to the arterial road network, where possible, minimising the need for heavy vehicles to travel on local roads through residential areas
- Spoil removal would be minimised between 10.00 pm and 7.00 am.

Construction noise generated by the project, if approved, would likely be controlled by conditions attached to an environment protection licence for the project under the *Protection of the Environment Operations Act 1997* (NSW).

Issue description – notification of tunnelling activities

Submissions requested residents above the tunnel be notified when tunnel boring is about to commence below their property including time/date start and end.

Response

The contractor would provide notification to residents of upcoming construction activities, including tunnelling, in accordance with the community involvement plan. These notifications would be provided to groups of residences and would advise approximate start and end dates for tunnelling under that group and an approximate timeframe for tunnelling under an individual property.

5.6 Consultation

5.6.1 Level and quality of consultation

1,169 submissions raised issues regarding the level and quality of consultation undertaken.

Issue description – Level and quality

Concerns were raised around the level and quality of consultation.

Criticisms of the level of consultation included a general lack of consultation effort, with some describing it as ad hoc, as well as insufficient with regard to particular sectors of the community including local residents and businesses. Some submissions stated that consultation with local councils was based on the concept design only. Other submissions argued that there was no direct consultation with individuals or organisations specifically for the social impact assessment, or with businesses specifically for the economic impact assessment.

Criticisms of the quality of consultation included the genuineness of the engagement, the responsiveness of the proponent and the quality and comprehensiveness of communication materials. The genuineness of the engagement was seen to be undermined by a lack of transparency surrounding project and design decisions, including the signing of contracts and acquisition of properties prior to the completion of consultation.

Response

Consultation for the project has been 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) for the EIS. Consultation activities were designed to target affected communities and were planned and advertised well in advance.

Consultation for WestConnex commenced in late 2011 and informed the preparation of the strategic environmental review and business case. Feedback received during this period was an input into the preliminary concept design for WestConnex and the M4 East project.

Consultation for the preliminary concept design for the project occurred in late 2013 and early 2014. Feedback received during this round of consultation was published in a community feedback report. Following release of the preferred design in June 2015, there was another round of community consultation, while further consultation activities were undertaken to inform tendering processes, the EIS and supporting technical investigations. Consultation undertaken during the preparation of the EIS is described further in Chapter 7 of EIS.

These consultation activities were ongoing throughout preparation of the EIS, including numerous community information sessions and more than 80 meetings with property owners and neighbours potentially affected by property acquisition. Meetings with councils, agencies and key stakeholders have been ongoing and included both issue-specific meetings and general project updates, including details of project developments subsequent to the preliminary concept design.

The EIS was placed on public display for a period of 55 days. As described in **Chapter 2** (Community involvement) of this report, further consultation activities were undertaken during this time including community information sessions and stakeholder meetings. If the EIS is approved, future consultation would be undertaken with regard to construction activities and subsurface acquisition and the mitigation of impacts.

The materials presented throughout all consultation activities from preliminary concept design through to the development of the preferred design and the public exhibition of the EIS represented the most up-to-date information about WestConnex and the M4 East project at the time.

As outlined in section 4.1.4 of the EIS, following a competitive tender process to design and construct the M4 East that commenced in May 2014 when expressions of interest were called, a shortlist of three consortia to build the M4 East was announced by the NSW Government in August 2014. Tenders from shortlisted contractors to build the M4 East were received in December 2014, and tender evaluation and design refinement to cater for changes to WestConnex took place over the first half of 2015. The preferred tenderer, a consortium comprising Leighton, Samsung C&T and John Holland, was announced on 4 June 2015.

The contractor was engaged to develop the detailed design and to construct the project. The contractor's design and preliminary construction methodology formed the basis of the preferred design assessed in the EIS. The preferred design is therefore a more accurate representation of the project that would be constructed.

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 will 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.

Separately, consultation with property owners potentially affected by acquisition has commenced in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) and will continue throughout detailed design. This act provides for a statutory minimum 90 days when providing a notice of intent to acquire land. The commencement of these negotiations with property owners does not undermine the public consultation process for the purposes of the EIS. Approval of the project by the Minister for Planning under the EP&A Act is not a prerequisite for this land acquisition process.

Consultation with Aboriginal parties was discussed in section 22.1.1 and Appendix V of the EIS.

Issue description – Quality of communication material

Communication materials provided during consultation were criticised as conflicting, unclear, or of generally poor quality. The communication materials were also criticised for their lack of availability in languages other than English.

Response

Communications material prepared for the EIS was consistent with material prepared for other major infrastructure projects throughout NSW and was developed in line with the project consultation objectives, which are detailed in section 7.2 of the EIS.

The project team endeavoured to provide factual, up-to-date, transparent and comprehensive information on the project to assist community members and other stakeholders to form their independent views about the project and make an informed submission during the exhibition period.

A range of channels were used to consult with the community through the EIS period which were supported by communications material. This communication material included a community update brochure, project overview document, community factsheets, information posters, email notifications and responses, online website information, interactive tunnel tool and newspaper advertising.

While the communications material to support the EIS exhibition period was never developed to replace the comprehensive EIS main volumes and appendices, the information contained in the supporting communications material summarised key information and was consistent with the contents of the EIS.

Information presented in the overview document, brochures, fact sheets and online was selected based on issues raised by stakeholders and the community during earlier consultation. The project team considered that information included in the communication material was the most relevant and important to highlight for the community, based on the issues previously raised through this earlier consultation.

Over 105,000 residents and businesses were invited to the EIS information sessions through a community update, in addition to newspaper advertising, email invites and details on the WestConnex website. Details of these EIS information sessions are in **Chapter 2** (Community involvement) of this report. Attendance numbers at these sessions were lower than expected given the level of interest and attendance numbers at the information sessions held in July 2015 to discuss the M4 East preferred design. Subject matter experts were available at all eight sessions to answer detailed questions on the project. About 200 people attended the sessions over a total of 29.5 hours of consultation.

The project team considers that low attendance numbers were indicative of the fact that relevant, appropriate and informative communications material had been distributed directly to residents, at stakeholder meetings and online and hence community members did not need to attend the information sessions in person.

The project team responded to 170 emails and had 261 phone conversations during the EIS exhibition period and provided additional information as required.

The project team also met with about 20 residents one-on-one in their homes to resolve any issues surrounding unclear information or misunderstanding.

A comprehensive summary of communications material produced during the project development, including the preliminary concept design display, midway tunnelling point announcement and preferred design display, are detailed in section 7.3.2 of the EIS.

SMC provides a Translating and Interpreting Service. Details of this service were promoted on most communication materials, where appropriate as well as on the WestConnex website (http://www/westconnex.com.au/yourlanguage). This included details in the following languages represented in the project area:

- Arabic
- Chinese
- Greek
- Italian
- Korean
- Hindi
- Vietnamese.

The project team received phone calls to the project information line via the Translating and Interpreting Service and, upon request, also met with residents to discuss their concerns with the support of a translator. In addition, noting the high percentage of Mandarin speakers, the project team also arranged for Mandarin speaking project team members to attend the community information sessions at Burwood and Ashfield.

Issue description – Ability to effect change in the project design

Submissions raised concerns with the perceived lack of responsiveness to input from the community during consultation and subsequent design. Specific aspects of the design where concerns were raised include the tunnel alignment and the use of parks and open space during construction.

Response

Multiple aspects of the design of the project between the preliminary concept design and preferred design presented in the EIS were changed to address feedback from the community. These design changes are outlined in Chapter 4 and section 7.5 of the EIS. Further changes to the design, including those made in response to ongoing submissions received on the EIS, are described in **Chapter 7** (Preferred infrastructure report) of this report.

As stated in section 4.3.2 of the EIS, three tunnel corridor options were considered. The preferred design option was selected for a number of reasons. One of the key reasons was to protect Parramatta Road for future urban renewal in line with the Parramatta Road Urban Transformation Program. The preferred design also avoids direct impacts to the heritage listed suburb villa 'Yasmar' in Haberfield, and Ashfield Park.

A tunnel corridor following Parramatta Road was presented during consultation surrounding the preliminary concept design in late 2013 and early 2014. The preferred tunnel corridor was subsequently selected as part of the preferred design in June 2015. The preferred design was subject to another round of community consultation in June and July 2015, including distribution of a community update to more than 105,000 residences and businesses and holding four community information sessions. Targeted consultation activities including phone-arranged meetings, door knocks, phone calls and letter drops were directed at properties potentially affected by acquisition around this time.

Open space utilised by the project during both construction and operation would include:

- Bill Boyce Reserve for the establishment of Pomeroy Street civil site (C2)
- Part of Arnotts Reserve near the corner of Station Street and Parramatta Road for the establishment of Powells Creek civil site (C4) and permanent operational infrastructure associated with Powells Creek on-ramp
- Cintra Park hockey field for the establishment of Cintra Park tunnel site (C6) and permanent operational infrastructure including a water treatment facility and electrical substation
- Part of Reg Coady Reserve for the establishment of Wattle Street and Walker Avenue Civil Site (C9) and the widening of Wattle Street.

Bill Boyce Reserve, majority of Arnotts Reserve, the majority of Cintra Park and part of Red Coady Reserve would be returned to the relevant councils for use as open space following construction. The acquisition or lease of public land is discussed further in **section 5.12.1** of this report.

5.6.2 Consultation during exhibition

2,427 submissions raised issues regarding the consultation undertaken during exhibition.

Issue description – Timing and duration

Concerns were raised that the 55 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 undermined the ability of the public to make meaningful submissions. These timing and duration issues were seen as an attempt to avoid community submissions. The lack of translate material was also seen to undermine consultation during exhibition.

Response

There is a legislated requirement under Section 115Z of the EP&A Act for an EIS for State significant infrastructure to be placed on public exhibition for a minimum period of no less than 30 calendar days. Legislation also states that this period be extended for 45 days should the exhibition period occur over a school holiday period. As the exhibition period for the project fell over the school holidays, the exhibition period was extended accordingly. The M4 East EIS was publicly exhibited for 55 days. Community and stakeholder consultation activities that were undertaken during the EIS public exhibition period are detailed in Chapter 2 of this report.

SMC provides a Translating and Interpreting Service. Details of this service were promoted on most communication materials, where appropriate as well as on the WestConnex website (http://www/westconnex.com.au/yourlanguage). Noting the high percentage of Mandarin speakers, the project team also arranged for Mandarin speaking project team members to attend the community information sessions at Burwood and Ashfield as outlined in Chapter 2 of this report.

Prior to the EIS being finalised and publicly exhibited, SMC hosted four community information sessions throughout July 2015 following the announcement of the preferred design. These events provided an opportunity for community members to obtain detailed information of the project design and speak to relevant subject matter experts during the development of the EIS.

Project team members also met with a variety of local stakeholder groups and community members during this period to provide detailed project information and provided community members with information via the project info line and email responses.

These additional activities ensured that community members had relevant and specific information on the M4 East design prior to the EIS exhibition period.

Submissions regarding public consultation more generally, including activities undertaken prior to public exhibition of the EIS, are discussed in **section 5.6.1** of this report.

Issue description – Ability to effect change

Concerns were raised around the process for evaluating submissions received during exhibition and the potential for these submissions to effect change. Confirmation was requested that submissions are recorded and for the project to provide comment on and response to those submissions. The award of tenders prior to exhibition was perceived as evidence of a lack of genuine interest in public submissions.

Response

The public exhibition process for State significant infrastructure is defined in the EP&A Act. Under Section 115Z of the EP&A Act, the Secretary of the DP&E must make the EIS publicly available for a minimum period of no less than 30 days. During that period, anyone may make a public submission.

The Secretary of DP&E may require the proponent to submit a response to the issues raised in public submissions. The Secretary may also require the proponent to submit a preferred infrastructure report that outlines any changes to the infrastructure made in response to the submissions or design development.

The EIS was publicly available for 55 days as outlined above and in **Chapter 2** (Community involvement) of this report. Submissions received during this period were provided to the proponent by the Secretary. **Chapter 4** (Response to key stakeholder submissions) and **Chapter 5** (Response to community submissions) in this report constitute the response to the issues raised in the submissions. **Chapter 6** (Clarifications) and **Chapter 7** (Preferred infrastructure report) in this report describe clarifications and changes to the project, including those made in response to the submissions.

All submissions received during public exhibition were reviewed by the project team. The issues raised in each submission were recorded in a submissions database. This report provides a response to the issues raised by submissions. **Appendix A** identifies where issues raised in each submission are addressed in this report. All individual submissions are also provided on DP&E's Major Projects website to ensure transparency at the following address:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6307

Some additional refinements to the project design have been made in response to submissions or feedback received during consultation during exhibition. These changes are discussed in **Chapter 7** (Preferred infrastructure report) of this report and include:

- Expansion of Homebush Bay Drive civil site (C1), providing additional dedicated parking for the construction workforce
- Reconfiguration of the Homebush Bay Drive interchange, addressing potential visual amenity and noise impacts
- Sydney Street substation re-orientation, improving urban design and visual outcomes
- Construction of an access tunnel at the Concord Road interchange, which would provide efficiencies for tunnelling activities

- Provision of emergency smoke exhaust capability at the fresh air supply facility at Cintra Park, to improve operational safety within the proposed tunnel
- Closure of Martin Street (east) at Wattle Street, as part of changes to the Wattle Street interchange, to mitigate traffic impacts (rat running)
- Reopening of Martin Street (west) at Ramsay Street to facilitate access for residents.

To minimise impacts on the environment and the surrounding community, issues raised in submissions would continue to be considered throughout the detailed design process.

5.6.3 Future consultation

25 submissions raised issues regarding the proposed future consultation activities.

Issue description – Requests for future consultation

Submissions requested ongoing consultation and transparent provision of information with local councils, groups and residents, as well as active involvement in planning and design decisions. Further consultation on particular topics was also requested including health risk, urban design, civil site layouts and the broader WestConnex project.

Response

As outlined in **section 2.3** of this report, SMC, on behalf of Roads and Maritime, will continue to provide opportunities for the community to participate during the ongoing refinement of the design with a view to further minimising project impacts.

During construction, the project team 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. Key involvement activities and tools would include:

- Development and implementation of a detailed construction communications plan
- Notification of works (including targeted letterbox drops)
- 24-hour project information phone line. Transport Management Centre (TMC) communication channels; radio crosses and interviews, Variable Message Signs throughout the metropolitan network
- Live Traffic and Transport NSW Info websites and TMC 24-hour Traffic Information Line (132 701)
- 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 councils, emergency services and bus operators).

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 F of the EIS.

In addition, a number of management measures as identified throughout the EIS require further consultation, including:

- Consultation with relevant road authorities, local councils, emergency services, schools and road user groups regarding the preparation of a TMSP
- Consultation with relevant road authorities regarding road network upgrades or closures
- Consultation with NSW Health and the NSW Environment Protection Authority regarding appropriate air quality criteria and preparation of an air quality management plan

- Consultation to support the preparation of the urban design and landscaping plan including consultation with relevant local councils regarding screen planting and residual land and consultation with potentially affected landowners regarding construction ancillary infrastructure sites and operational signage
- Consultation with relevant State authorities regarding preparation of various other environmental management plans including a soil and water quality management plan and a groundwater monitoring plan
- Consultation with property owners likely to be impacted by construction activities regarding matters such as alternate property access arrangements
- Consultation with property owners regarding acquisition in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW)
- 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 the Translation and Interpreting Service and a commitment to promoting this service on communication material
- Consultation with local councils and communities regarding landscaping and planting options or options for the reuse/reinstatement of residual land as open space.

Furthermore, in response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel will be established for the detailed design phase of the M4 East project. The panel will review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist will also be included on the panel.

Issue description – Request for role on community consultative committee

Submissions requested that the Haberfield P&C and/or Haberfield Public School Principal would hold a seat on the community consultative committee that would be established as part of this project.

Response

An air quality community consultative committee would be established to provide input prior to and during the operation of the project. The committee would include representatives from the local community. An expression of interest process would be held to identify and appoint community representatives. The committee would review and provide advice on the location of community-based air quality monitoring stations, operation environmental management plans and other operation stage documents, compliance tracking reporting, audit reports, or complaints, and provide advice on the dissemination of monitoring results and other information on air quality issues.

5.6.4 Endorsement of other submissions

35 submissions endorsed other submissions.

Issue description – Endorsement of other submissions

A number of submissions included endorsements or similar references to other submissions. These included the following:

- Submissions endorsing Jo Haylen's objections to the project
- A submission with a supporting petition signed by 1427 individuals
- Submissions endorsing the submissions from Ashfield Council, Kerry Barlow, Victor Storm, The National Trust of Australia, The People's EIS and Ecotransit
- Submissions endorsing the submission from Leichhardt Council, making specific reference to the accompanying traffic and transport assessment

- Submissions endorsing the submission from Ashfield Council, making specific reference to the mitigation measures proposed in that submission
- A submission from the Haberfield Association in support of the submission from Ashfield Council
- Submissions endorsing the submission from Haberfield Public School
- Submissions endorsing the submission from Dobroyd Point Public School.

Response

The submissions endorsing other submissions have been noted. The issues raised in all submissions have been addressed in the relevant sections of this report.

5.7 Traffic and transport

5.7.1 Construction traffic numbers and routes

20 submissions raised issues regarding construction traffic numbers and/or routes.

Issue description – concerns regarding construction traffic

Submissions relating to construction traffic raised issues regarding heavy vehicle haulage routes and the use of local roads by construction vehicles.

Local roads mentioned in submissions include: Coleman Avenue and Cartwright Avenue at Homebush; Carrington Street at North Strathfield; Northcote Street and Wolseley Street at Haberfield; Bland Street, Gower Street and Ormond Street at Ashfield.

Response

Table 6.19 in Chapter 6 of the EIS describes indicative access routes to and from construction ancillary facilities and Figures 6.9 to 6.18 of the EIS show the location of access points. **Section 6.1** (Clarifications) of this report provides further clarification on the construction ancillary facilities, and describes some minor refinements to the layout and access points at these facilities.

With the exception of Underwood Road, Short Street East and Powell Street at Homebush, part of Walker Avenue at Haberfield, and part of Bland Street at Ashfield, heavy vehicles would only use main, arterial roads such as the existing M4, Parramatta Road and Wattle Street. It is not intended that heavy vehicles would use the streets identified in the submissions during operation of the construction ancillary facility sites. Notwithstanding this, during initial demolition and site establishment for all 10 construction ancillary facilities, construction vehicles (both light and heavy vehicles) may potentially use all existing and proposed site entries and exits, and may use local roads to access these entries and exits. This would be temporary only, and once the construction ancillary facilities are operating, vehicle access points would be as shown on **Figure 6.1** to **Figure 6.9** in **Chapter 6** (Clarifications) of this report.

Issue description – increase in traffic due to more parents driving children to school

Submissions raised concerns with the increased vehicle traffic along Bland Street at Ashfield and Haberfield during construction, because parents would drive their children to school rather than have them walk to school.

Response

As clarified in **section 6.5.1** (Clarifications) of this report, the pedestrian footbridge over Parramatta Road at Bland Street would remain open for the majority of the construction period. There would be a period of about two months when there would be short-term, intermittent closures of the footbridge for safety reasons when high risk work activities are occurring. Alternate pedestrian access across Parramatta Road would be available at the existing signalised intersection.

Pedestrian movements around construction ancillary facilities, including at the Parramatta Road civil site (C10) where construction vehicles would exit onto Bland Street, would be managed in accordance with a TMSP, to be prepared in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups.

Issue description – request for traffic monitoring during construction

A submission requested that traffic be monitored during construction and if traffic levels exceed what is acceptable, mitigation should be provided.

Response

A summary of the construction traffic impact assessment including the impacts on local roads is provided in section 8.3 of the EIS. A detailed description of construction traffic impacts can be found in section 7 of the Traffic and Transport Assessment in Appendix G of the EIS.

Potential traffic impacts during construction would be managed a TMSP, prepared as part of the construction environmental management plan (CEMP), in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups.

Issue description – spoil haulage

Submissions request the Proponent prohibit spoil truck movements in the AM and PM weekday, and weekend road traffic peaks.

Response

A TMSP would be prepared in addition to the CEMP. The TMSP would include the guidelines, general requirements and principles of traffic management to be implemented during construction. It is mandatory for the construction contractor to take all reasonable planning monitoring, communication and implementation measures to ensure the safe distribution of all materials from site.

In addition to development of a TMSP, mitigation strategies would be implemented to manage and control traffic during construction. This would include a spoil management plan which outlines subsequent monitoring of heavy vehicle and haul routes to ensure compliance and minimise the impact on the road network.

5.7.2 Impact on network performance due to construction

332 submissions raised issues regarding the performance of the road network as a result of construction traffic.

Issue description – increase in traffic congestion

Submissions raised concerns regarding an increase in traffic and congestion as a result of construction.

A number of specific locations were mentioned including: Chandos Street, Parramatta Road, Northcote Street, Wattle Street, Rogers Street and Dalhousie Street.

Response

A summary of the construction traffic impact assessment including the impacts on local roads is provided in section 8.3 of the EIS. A detailed description of construction traffic impacts can be found in section 7 of the Traffic and Transport Assessment in Appendix G of the EIS.

An integrated traffic modelling and forecasting approach was adopted for the traffic assessment for the project. The results of this modelling show that construction of the project would result in changes and disruptions to the existing road and transport network. Changes are as a result of the movement of construction vehicles and 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.

Construction would result in the generation of additional movements of both heavy and light vehicles on the road network and the need for additional vehicle parking spaces. Highest volumes of heavy vehicles are forecast to originate from the Concord Road civil and tunnel site (C5) and Northcote Street tunnel site (C7), with the highest volumes of light vehicles generated by the Cintra Park tunnel site (C6). In addition, 24 hour spoil haulage would be required during tunnelling activity. Vehicles would generally use the arterial road network to access the various construction ancillary facilities.

The project would require temporary road closures and diversions on the existing road network required to facilitate construction. The majority of closures are anticipated to result in limited impacts to road users, as they would mainly affect local roads with low traffic volumes and/or streets where land acquisition is taking place. Alternative routes could therefore be used with minimal impacts. Some impacts would occur at various local roads due to the provision/modification of traffic signals and additional heavy and light vehicle movements. The capacity of several sections of Parramatta Road, with increased background traffic and construction traffic, would be exceeded.

As the volume of traffic generated by construction is expected to be relatively low compared to existing traffic volumes, the impacts of this short-term increase in traffic is not expected to significantly impact road safety in the vicinity of the project. In addition, any foreseen impacts to road safety during construction would be mitigated through the provision of tailored traffic management plans and other measures.

The increase in heavy vehicles on the existing road network would be likely to result in increased bus service travel times. At least four bus stops would be relocated to protect community safety during construction and reduced amenity for bus users waiting at stops may arise.

Issue description – management of traffic during construction

Submissions raised concerns regarding the management of traffic during construction. Construction management measures should ensure that:

- Flow of local traffic is not adversely impacted
- Access to construction sites is monitored
- The community is advised of any proposed changes to traffic conditions.

Response

Measures to manage traffic during construction are detailed in section 8.6.3 of the EIS. In particular, traffic would be managed in accordance with a TMSP, to be prepared in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups. The TMSP 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), 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. It would seek to minimise delays and disruptions, and identify and respond to any changes in road safety as a result of highway construction works.

Issue description – impact of construction traffic on parking availability

Submissions relating to construction traffic raised issues regarding parking impacts as a result of construction personnel parking on local streets, affecting parking availability and access to properties.

Submissions also requested a number of management measures to be implemented to minimise impacts of construction personnel parking, including:

- Request a two hour maximum parking (24 hour) parking restriction along Taylor Street for non-residents throughout the construction period
- Request that the project monitor parking issues near construction areas
- Request that parking on Wolseley Street is signposted and enforced for residents only
- Request for parking restrictions for non-residents on Edward Street, Sydney Street, Inverary Street and Alexandra Street.

Response

As described in section 6.6.5 of the EIS, the majority of the construction ancillary facilities would have parking for some of the construction personnel based at those sites. Further, as outlined in **section 6.1** of this report, the location and layout of car parking at a number of the facilities is proposed to be amended, generally to maximise the number of car parking spaces provided.

In addition, as outlined in **section 6.4** of this report, the upgraded car park on the northern side of Concord Oval would provide about 210 car parking spaces. This would serve as the parking area for the main project office during the week. This site would also be available for use by the public on weekends and on weeknights, with the following spaces allocated to both groups:

- 145 public parking spaces on Saturdays (leaving 65 for the construction workforce)
- 195 public parking spaces on Sundays (leaving 15 for the construction workforce)
- 145 public parking spaces on weeknights after 6.30 pm (leaving 65 for the construction workforce).

This allocation is indicative only and would be further refined following consultation with Canada Bay Council and Concord Oval user groups.

An additional car park site has also been identified at Railway Lane containing about 50 car parking spaces. The site is owned by Roads and Maritime and is currently occupied by the North Strathfield Rail Underpass (NSRU) Alliance. Major NSRU works were completed in June 2015, leaving this site available for use as an overflow car park. This car park is within walking distance of the Underwood Road civil and tunnel site (C3), Powells Creek civil site (C4) and the Concord Road civil and tunnel sites (C5).

In addition, a car parking strategy would be developed as part of the TMSP to limit impacts on the surrounding communities, in consultation with local councils and stakeholders associated with the sporting facilities adjacent to the project site. This may include provision of parking restrictions on local roads.

The construction workforce would be encouraged to utilise public transport. Parramatta Road is a major transport corridor that has multiple bus routes. The study area is also well serviced by the rail network with seven stations within walking distance of the construction ancillary facilities.

Issue description – request for specific details on traffic numbers

Submissions requested details of traffic numbers on specific streets during construction.

Specific streets mentioned include Wolseley Street and Cove Street.

Response

The construction traffic modelling assessment included analysis of all local roads that are expected to see an increase in volumes due to construction vehicle access or through diversions and road closures. An assessment of impacts on local roads during construction in presented in section 8.3 and Appendix G of the EIS.

5.7.3 Impact on public transport and emergency services during construction

Eight submissions raised issues regarding the impacts of the construction of the project on public transport and emergency services.

Issue description – impacts to bus stops and bus services

Submissions raised concerns regarding impacts to bus stops and bus services during construction.

Response

As described in section 6.6.3 of the EIS, construction of the project would generally not impact bus stops and bus services. Initial assessment has identified that a number of bus stops would be relocated during construction to protect community safety, as detailed in Table 6.18 of the EIS. As the detailed design develops, additional bus stops requiring relocation may be identified. Any bus stop relocations would be agreed with Transport for NSW and all 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 any bus stops or access arrangements.

Section 8.3.6 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 be likely to result in increased delays at intersections along the project corridor and in surrounding areas. It is likely that the volumes of heavy vehicles on Parramatta Road and surrounding major roads would increase. Construction would have the potential to result in the following impacts to public transport services:

- An increase in bus service travel times due to slower travel speeds and increased intersection delays
- Longer travel times to and from bus stops by supplementary travel modes (eg car passenger, walking to/from bus stop) due to an increase in traffic volumes, slower travel speeds and increased intersection delays
- Reduced amenity for bus users waiting at stops
- At least four bus-stops would need to be relocated to protect community safety during construction
- Connections between bus services and trains services may be affected.

Issue description – request to maintain access to health services

Submissions relating to construction traffic requested that access be maintained to health services, hospitals and aged care facilities (including the aged care facility at 169-171 Parramatta Road) during construction.

Response

Access to property (including hospitals, health care facilities and aged care facilities) not acquired or leased for the project would be maintained during construction. Where impacts on property access are unavoidable as a result of construction activities (eg footpath and pavement works), consultation would be undertaken with the property owner and/or tenant to develop appropriate alternative access arrangements. This may involve provision of a temporary alternate access.

5.7.4 Impacts on pedestrians and cyclists during construction

82 submissions raised issues regarding impacts on pedestrians and cyclists during construction.

Issue description – impacts to pedestrian and cyclists during construction

Submissions relating to construction traffic raised issues regarding potential impacts to pedestrians and cyclists from the project.

In summary, the submissions raised the following issues:

- Concern that pedestrian access would be restricted during construction
- Concern that more attention has not been given to pedestrian access through the road work
- Concerns around pedestrian safety from closure of footpaths, increase in traffic congestion along main roads and ‘rat-runs’ and construction vehicles entering and exiting construction ancillary facilities
- Concerns around impacts to cycling routes during construction
- Request that bike paths are provided during construction.

Response

As described in section 6.6.2 of the EIS and further clarified in **section 6.3** of this report, 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. In most cases, this would involve maintaining pedestrian access on one side of the road, with suitable crossing points and signage provided.

As outlined in section 8.3.7 of the EIS, a staging plan would be implemented to ensure connectivity is maintained for cyclists during construction. This would involve the provision of detour routes as the section of existing cycle route on the M4, around Homebush Bay Drive, would be unavailable during construction. A diversion route, to remove cyclists off the M4 has been implemented for the M4 Widening project, and this detour may be used during construction of the M4 East project. To avoid Concord Road, a further diversion would be provided, as described in section 6.6.2 and Figure 6.19 of the EIS. The route would be confirmed following appropriate consultation with Roads and Maritime, local councils and cycling groups.

Pedestrian and cyclist access would be maintained where possible throughout construction. Where not feasible utilising 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 TSMP, to be prepared in consultation with the relevant road authority, local councils, emergency services, road user groups, and pedestrian and bicycle groups. The TSMP would include measures to ensure pedestrian safety is maintained during construction.

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 – impacts relating to pedestrian safety

Concerns were raised regarding impacts to pedestrian safety resulting from the closure of the Bland Street pedestrian footbridge during construction.

Response

As clarified in **section 6.5.1** of this report, the pedestrian footbridge over Parramatta Road at Bland Street would remain open for the majority of the construction period. There would be a period of about two months when there would be short-term, intermittent closures of the footbridge for safety reasons when high risk work activities are occurring. Alternate pedestrian access across Parramatta Road would be available at the existing signalised intersection.

Pedestrian movements around construction works, including at the Bland Street footbridge, would be managed in accordance with a TMSP, to be prepared in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups.

Issue description – use of Dobroyd Parade will exacerbate safety issues

Submissions raised concerns that safety issues would be exacerbated by the use of the local road part of Dobroyd Parade as a parking area for construction workers 24 hours a day seven days a week for the duration of the project.

Response

As described in section 6.6.5 of the EIS, the majority of the construction ancillary facilities would provide for some of the construction personnel based at those sites. Further, as outlined in **section 6.1** of this report, the location and layout of car parking at a number of the facilities is proposed to be amended in the manner shown in section 6, generally to maximise the number of car parking spaces provided.

A car parking strategy would be developed as part of the TMSP in consultation with local councils and stakeholders associated with the sporting facilities adjacent to the project site to ensure pedestrian safety is maintained.

5.7.5 Traffic safety during construction

24 submissions raised issues regarding traffic safety during the construction period.

Issue description – introduction of safety measures during construction

Submissions relating to construction traffic requested that traffic safety measures be introduced around construction ancillary facilities during construction (eg imposing and policing speed restrictions).

Submissions also raised concerns around traffic safety on particular roads and at particular intersections, including:

- Walker Avenue at Haberfield
- Alt Street and Parramatta Road at Haberfield
- Church Street and Alt Street at Ashfield
- Wolseley Street and Ramsay Street at Haberfield
- Northcote Street and Ramsay Street at Haberfield.

Submissions request that modifications are made to the northern end of Northcote Street to assist with traffic movements on to Ramsay Street (eg keep clear zone).

Response

As described in section 8.6.3 of the EIS, a TMSP would be prepared as part of the CEMP, in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups. The TMSP 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), 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. 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 – heavy vehicle safety features

Submissions request the proponent apply additional safety features to improve road safety associated with the operation of trucks on the project. Examples of appropriate safety features could include front/ side/ rear under-run protection and speed control.

Response

The contractor will implement systems that require all trucks engaged on the project to comply with existing requirements and laws (including the National Heavy Vehicle Law) and to be fitted with audible reversing alarms where required. All drivers will be required to follow Australian Road Rules.

5.7.6 Impacts on local roads (eg closures) during construction

29 submissions raised issues regarding impacts on local roads during construction.

Issue description – increased vehicle numbers on the road during construction

Submissions relating to construction traffic raised issues regarding increased vehicles numbers on local roads during construction.

Response

Table 6.19 of the EIS describes indicative access routes to and from construction ancillary facilities and Figures 6.9 to 6.18 of the EIS show the location of access points.

It is not anticipated that heavy vehicles would be required to use local roads (with the exception of Underwood Road and Short Street East at Homebush, Walker Avenue at Haberfield, and Bland Street at Ashfield). Note that during site establishment works heavy vehicles would also utilise existing site accesses from local roads to facilitate construction of the access points to major roads. Heavy vehicle routes would be defined in the TMSP which would be produced in consultation with all relevant stakeholders. Access would be managed to ensure that vehicles adhere to this plan. This plan would also address issues such as removal of parking.

Table 8.7 in section 8.3.2 of the EIS outlines the potential impacts of construction on the local road network in the vicinity of each of the construction ancillary facilities. Chapter 6 (Clarifications) and Chapter 7 (Preferred infrastructure report) describe refinements to the size, layout and construction traffic access points for the construction ancillary facilities, and assess the impacts of these refinements.

Issue description – access to properties during construction

Submissions raised concerns regarding access to driveways and properties during construction.

Response

During construction, there is potential for direct impacts on access to property, or road network changes that would alter access to a property.

Access to property not acquired or leased for the project would be maintained during construction. Where impacts on property access are unavoidable as a result of construction activities (eg footpath and pavement works), consultation would be undertaken with the property owner and/or tenant to develop appropriate alternative access arrangements. This may involve provision of a temporary alternate access.

Issue description – closure, diversions and modifications of local roads

Submissions relating to construction traffic raised issues relating to closure of local roads as well as diversions and modifications.

In summary the submissions raised the following issues:

- Request for clear maps showing what roads will be closed and used during construction
- Request further information on the closure of Parramatta Road and Walker Avenue at Haberfield during and after construction
- Objection to closure of Northcote Street at Haberfield at Parramatta Road for three years
- Concern that roads would be closed and schools would not be able to be accessed
- Request that adequate plans are provided for re-routed traffic during construction.

Response

The project would require temporary road closures and diversions to facilitate construction. At all locations where road closures are required, access would be maintained to affected properties (including schools) throughout the construction period and appropriate signage for road closures or detours would be installed.

A detailed description of local road closures during construction is included in section 6.6.1 of the EIS. Table 6.16 of the EIS identifies the location of road closures, the estimated duration of closure and how traffic would be managed during closure. As noted in the table, Walker Avenue would be reopened once construction work is complete.

Northcote Street would be closed at Parramatta Road, as part of the road reserve would be used for the Northcote Street tunnel site (C7). Alternate access would be available via Wolseley Street, Wattle Street and Ramsay Street. Northcote Street would be reopened once construction work is complete.

As described in section 8.6.3 of the EIS, local road closures would be managed and adequate property access would be maintained. Where road closures are required, reasonable and practical alternate traffic routes would be provided and communicated to the community. This would be undertaken in consultation with Roads and Maritime, local councils and property owners likely to be affected.

Construction traffic routes are detailed in section 6.6.4 of the EIS.

Issue description – damage to local roads during construction

Submissions relating to construction traffic raised concerns regarding heavy vehicles damaging local roads during construction.

Response

As described in section 8.6.3 of the EIS, a Road Dilapidation Report would be prepared and would include identification of the existing conditions of local roads and mechanisms to repair any damage caused by the project.

5.7.7 Operational traffic forecasts and modelling

852 submissions raised issues about the traffic assessment including traffic forecast and modelling.

Issue description – quality and methodology of the traffic model

Submissions relating to the traffic assessment 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 M4 East project. 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 interpeak 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 but which does not currently include some urban renewal/activation initiatives. The current WRTM version 2.1 is based on 2014 Landuse Projections and includes induced traffic demands as well as the proposed airport at Badgerys Creek.

Modelling of the ‘do minimum’ scenarios (i.e. without the project) was undertaken to understand the effects and to provide a comparison against the project.

With the exception of the potential design refinements, no major changes to the M4 East route following public exhibition of the EIS have been made. Modelling has been based on the concept design described in the EIS. Currently, traffic modelling for future stages of WestConnex has been undertaken as part of the environmental assessment for those projects and is based on the same BTS land use data. It should be noted that modelling for the project did consider a full WestConnex (2031) scenario (that assumed all WestConnex projects completed).

The traffic and transport assessment undertaken for the EIS provides detailed information on network effects of the M4 East, intersection performance and impacts on the eastern section of Parramatta Road. The intersections assessed for the EIS were selected as being representative of the impacts on the localities in their immediate vicinity.

Future base case traffic conditions and network assumptions are explained in the traffic and transport assessment. While not specifically mentioned in that section, the existing lane availability on Parramatta Road has been assumed to operate as two lanes in each direction for modelling purposes in 2021 between Concord Road and Haberfield and in 2031 between Concord Road and Camperdown.

5.7.8 Impact on network performance during operation

3,033 submissions raised issues regarding the performance of the road network during operation.

Issue description – operational performance

Submissions raised general concerns relating to the operational network performance for the project.

In summary, the submissions raised the following issues:

- General concern that project would create traffic problems
- Traffic volumes on local roads would be higher with the M4 East motorway (and full WestConnex motorway scheme in place) than they would be without them
- The project would exacerbate traffic issues by directing traffic on to already congested roads including roads within Haberfield, Dobroyd Parade, the City West Link, Victoria Road and Parramatta Road
- Concerns that the project would increase congestion.

Response

Once completed, the project would provide immediate operational benefits in relieving congestion along the M4 and Parramatta Road, between Homebush Bay Drive at Homebush and Wattle Street (City West Link) and Parramatta Road at Haberfield/Ashfield, including reduction in travel times and improvements in the level of road safety. Further benefits would be realised when the M4–M5 Link (which is subject to separate planning approval) is operating.

Current traffic levels on roads surrounding the project have been considered in the Traffic and Transport Assessment. A detailed description of the assessment is included in Appendix G of the EIS. The assessment has been summarised in Chapter 8 of the EIS.

The assessment concluded that the project would result in large reductions in vehicle delay along the corridor between Homebush Bay Drive in the west, and City West Link and Haberfield/Leichhardt in the east. However, the project would also result in some higher traffic densities downstream of the project on- and off-ramps on Parramatta Road and Wattle Street.

The assessment has also identified benefits on the parallel route along Queens Road and Gipps Street. The project would also provide additional route options along the corridor and therefore increase network resilience in the event of incidents.

Reductions in eastbound and westbound traffic volumes provide opportunities for increased cross movements along the corridor. Delays are forecast to substantially reduce at the majority of intersections assessed.

Issue description – operational performance of the project at specific interchanges

Submissions raised concerns relating to the operational performance for the project around the Wattle Street and Parramatta Road interchanges.

In summary, the submissions raised the following issues:

- The project would result in congestion along key roads including Parramatta Road and the City West Link
- Traffic would bottleneck at the tunnel entry and exit in Haberfield
- The project would increase traffic numbers and congestion in Haberfield
- The project has not considered impacts to roads around entry and exit portals at Wattle Street
- Object to the right hand turn at Waratah Street at Haberfield which would result in traffic congestion
- The project would result in heavy congestion on Parramatta Road east of the tunnel entry and exits between Haberfield and Leichhardt

- The project would cause significant queuing back into the tunnel because of traffic lights at Waratah Street, resulting in unacceptable traffic delays.

Response

The impact of the project on operational network performance is outlined in section 8.4 of the EIS and detailed in the Traffic and Transport Assessment in Appendix G of the EIS.

Mid-block performance

2021 results indicate that level of service along Parramatta Road would improve significantly along the section of road between the existing M4 and Dalhousie Street with small deteriorations to the east and west of this section. This reflects the extent of the project and the fact that a larger number of vehicles would be able to access Parramatta Road east of the project due to the increased capacity provided.

It is noted that some of the higher traffic densities are observed downstream of the project ramps on Parramatta Road and Wattle Street. This provides an indication both of the extra capacity provided to take vehicles to those locations, and of potential exit and merge issues.

2031 levels of service demonstrate the impact of the M4–M5 Link, as there would be a small reduction in traffic density east of the project on- and off-ramps on Parramatta Road (whereas there was an increase in 2021) although a level of service (LoS) F rating remains on all these mid-blocks. The exception is westbound to Sloane Street where density increases substantially due to the provision of a bus lane in the 2031 'do something' scenario. There would be limited change on Dobroyd Parade east of Timbrell Drive, reflecting no significant fall in volumes due to the M4–M5 Link.

Intersection performance

In the 2021 AM peak, primarily due to vehicles using the project tunnel, there would be a substantial increase in delay at the Dobroyd Parade and Timbrell Drive intersection (from LoS D to F). Queuing at this intersection would extend all the way through Waratah Street and onto the Wattle Street off-ramp. However, there would be substantial reductions in delay at the key intersections of Parramatta Road with Great North Road, Parramatta Road with Wattle Street, and Wattle Street with Ramsay Street. The operational performance of traffic at these three intersections would improve from a highly congested LoS F to LoS D or LoS B, depending on the location.

Traffic volume increases east of the Parramatta Road on- and off-ramps would result in higher levels of delay at all intersections, particularly Sloane, Norton and Crystal streets which are all LoS F. These delays are likely to result in blocking through upstream intersections and ultimately lead to significant congestion at Dalhousie Street close to the merge. Resultant delays would lead to lengthy eastbound queues impacting the tunnel and potentially upstream intersections on Parramatta Road such as Bland Street.

During the 2021 PM peak, intersection performance would be similar to the AM peak with substantial improvement in performance at key intersections such as Parramatta Road and Wattle Street, balanced by significant additional delays at Timbrell Drive and Dobroyd Parade. While queuing at Dobroyd Parade and Timbrell Drive would not be as severe as the morning peak, congestion remains likely to impact operations at Waratah Street and lead to delays on the Wattle Street off-ramp.

East of the Parramatta Road on- and off-ramps, there would be a substantial increase in delay at the Hume Highway intersection with Parramatta Road, mainly due to a significant increase in right turn demand. Queuing at this intersection would impede operations at adjacent intersections such as Dalhousie Street and Sloane Street, and is expected to lead to lengthy queuing on the Parramatta Road off-ramp and into the tunnel. Notwithstanding impacts from the Hume Highway intersection, other Parramatta Road intersections such as at Sloane, Norton and Crystal streets would also experience a significant deterioration in performance.

In the 2031 AM peak, the Dobroyd Parade and Timbrell Drive intersection would also continue to experience increased delays and LoS F, despite having a lower demand following the opening of the M4–M5 Link. This would be caused by changes in travel patterns, such as the increased demand for right turning from Timbrell Drive, and the reduction in delay elsewhere, allowing more of the vehicle demand to actually reach the intersection. However, delays would be significantly less than in 2021 before the introduction of the M4–M5 Link.

The introduction of the M4–M5 Link would have a significant beneficial impact on all Parramatta Road intersections east of the project, particularly at Crystal Street and Norton Street which go from LoS F to LoS C/D. While experiencing a significant reduction in average delay of more than 40 seconds, the Hume Highway and Parramatta Road intersection would remain congested (LoS F) with the potential for queues to reach the M4 East and Parramatta Road merge point and tunnel ramps.

In the 2031 PM peak shows there would be a significant increase in delay at Dobroyd Parade and Timbrell Drive intersection. As with the AM scenarios, the introduction of the M4–M5 Link would generate significant benefits at the Parramatta Road intersections east of the on- and off-ramps. This would particularly be the case at the Hume Highway, Norton Street and Crystal Street intersections which, while remaining LoS F, would have a reduction in average delay by more than 100 seconds each when compared to the 'do minimum' scenario.

Issue description – operational performance around the Concord Road interchange

Submissions raised concerns relating to the operational performance for the project around the Concord Road interchange.

In summary, the submissions raised the following issues:

- The project would result in traffic congestion from the change of Concord Road / M4 into an interchange
- The proposed on-ramp from Parramatta Road onto the M4 would have significant traffic impacts on this section of Parramatta Road.

Response

An assessment of traffic impacts around the Concord Road interchange during operation is detailed in Chapter 8 and the Traffic and Transport Assessment in Appendix G of the EIS. Operational traffic volumes and intersection performance during project operation in 2021 and 2031 have been modelled.

The assessment shows that during the 2021 AM peak period, conditions on Concord Road remain highly congested but proposed intersection improvements at Patterson Street and Parramatta Road provide additional right turn capacity and help to maintain similar levels of delay despite significant increases in traffic volumes.

During the 2021 PM peak period, delays would be similar with increases at the Concord Road/Parramatta Road and Concord Road/Patterson Street intersections balanced by sizable reductions in delay at the Sydney Street/Concord Road and Parramatta Road/M4 Motorway intersections.

During the 2031 AM peaks, limited impacts are expected in this area due to increased capacity of the scheme (with the addition of the M4–M5 Link) which generally matches the increased volumes attracted by the scheme. The 2031 PM peak shows volume increases on Concord Road which lead to significant increases in delay at the already congested Concord Road/Parramatta Road and Concord Road/Patterson Street intersections. This would result in lengthy queues and access and egress issues at the project ramps on Concord Road.

Issue description – operational performance at the Homebush Bay Drive interchange

Submissions raised concerns relating to the operational performance for the project around the Homebush Bay Drive interchange.

Response

The project would not result in any significant changes to the arrangement of the intersection with on- and off-ramps only to be adjusted at this intersection. These changes would result in more capacity at the intersection on the ramps. The M4 Widening project also includes the construction of a new 'G Loop' from the southbound carriageway to the M4 westbound. This new ramp would remove an existing turning movement across the northbound traffic on Homebush Bay Drive, which would result in delays in travel along the road. The removal of this movement would improve congestion at the intersection.

Table 5.4 provides an outline of the level of service of the three intersections which make up the Homebush Bay Drive intersection. **Table 5.4** shows that existing interchange would generally operate at a better level of service than it currently is. The change in performance for the 2021 (no project) scenario is largely due to the inclusion of the G Loop as part of M4 Widening which removes one of the key conflicting movements at the interchange. Overall the inclusion of the project in 2021 and 2031 would result in an improvement or maintenance of the performance of the interchange when compared to the scenario in these years where no project is constructed.

Table 5.4 Homebush Bay Drive interchange performance

Intersection	Level of service				
	Current	2021 (no project) [1]	2021 (with project) [1]	2031 (no project) [2]	2031 (with project) [2]
AM peak					
Eastbound M4 on-ramp	A	B	A	A	A
Eastbound M4 off-ramp	D	C	C	C	C
Westbound M4 on- and off-ramps	D	B	A	B	B
PM peak					
Eastbound M4 on-ramp	A	A	A	A	A
Eastbound M4 off-ramp	C	B	B	D	B
Westbound M4 on- and off-ramps	D	B	A	C	B

Note: 1. Includes the operation of M4 Widening works (i.e. the G Loop)

2: include the operation of the remaining WestConnex components.

Issue description – traffic and congestion impacts on the Sydney CBD

Submissions raised concerns that the project would allow more vehicles into the Sydney CBD resulting in traffic congestion and parking issues.

Response

The project is not intended to enable more vehicles to enter the Sydney CBD. The project and WestConnex are being considered in response to existing traffic issues along the M4 and Parramatta Road corridor. The aim of WestConnex is to remove vehicles from surface roads (such as Parramatta Road), particularly those movements which are simply travelling through to destinations further away (eg Sydney Airport or Port Botany).

Issue description – congestion of local streets from 'rat-running'

Concerns were raised regarding the operation of the project and changes to local roads would cause vehicles to use alternative routes (rat-runs) resulting in significant traffic congestion in local streets. Streets mentioned include Ramsay Street, Marion Street, Foster Street, Flood Street, Waratah Street, Chandos Street, Hawthorne Parade, St Davids Road and Walker Avenue.

Concerns that impacts to local roads were not assessed as part of the traffic impact assessment.

Response

The operational traffic modelling assessment included analysis of impacts to local roads within the study area.

In 2021, it can be seen that volumes along Parramatta Road between Concord and Haberfield/Ashfield are expected to reduce significantly with the introduction of the project. In addition to this the majority of parallel routes, or rat-runs, including Gipps Street and Paisley Road also show a decrease in throughput.

The EIS is assessed by the DP&E and if approved, construction of the project would be subject to various conditions of approval, with deliverable dates based on the pre and post construction project schedule. More specifically, conditions that are applicable to operational traffic would typically include a requirement for the proponent to prepare a Road Network Performance Review Plan. The plan would be used to monitor traffic patterns and operations, and develop road network mitigation improvements for areas where consequent traffic performance is at unsatisfactory levels before, during and after construction of the project.

Issue description – impact on access for Martin Street residents

Concerns were raised in relation to the impact on access for Martin Street residents due to the proposed arrangements at Martin Street, Waratah Street and Wattle Street at Haberfield.

Submissions suggested design changes to Martin Street access.

Response

As described in **section 7.7** of this report, it is proposed to reopen the western end of Martin Street at Ramsay Street, and permit all movements at this intersection.

To complement this arrangement and preserve residential amenity, the left turn from the eastern end of Martin Street onto Wattle Street would be closed, effectively preventing vehicles from using Martin Street to bypass the traffic lights at Ramsay Street and Wattle Street. This change to the project would ensure continued acceptable access for residents of Martin Street.

Issue description – right turn from Wattle Street into Ramsay Street

Submissions objected to the installation of a right hand turn from Wattle Street into Ramsay Street, stating that it would increase congestion and provide an alternative route for cars to avoid traveling on WestConnex and the City West Link.

Response

Currently, vehicles travelling east on Wattle Street are able to turn right at Waratah Street to access the eastern part of Haberfield. As described in section 5.5.4 of the EIS, a dedicated right turn bay would be provided at the Waratah Street signalised intersection for traffic exiting the eastbound mainline tunnel only. Eastbound Wattle Street surface traffic (not originating from the eastbound mainline tunnel) would not be able to turn right at this intersection.

To cater for Wattle Street surface traffic that may wish to access the eastern part of Haberfield, a right turn from Wattle Street eastbound into Ramsay Street would be provided. If this was to be removed, the next available right turn on the City West Link would be at James Street at Leichhardt.

During operation traffic volumes on Ramsay Street are expected to decrease. This reduction occurs due to the relocation of traffic to the M4 East.

Issue description – management of traffic during operation

Submission raised concerns on how traffic would be managed during operation of the project to reduce impacts on residents.

Request that a plan to discourage traffic through Haberfield that the project would encourage.

Response

The project would include a requirement to prepare a Road Network Performance Review Plan. The plan would be used to monitor traffic patterns and operations, and develop road network mitigation improvements for areas where consequent traffic performance is at unsatisfactory levels before, during and after construction of the project.

Issue description – management of operational impacts on Parramatta Road

Submission requests that operational traffic impacts on Parramatta Road are mitigated. The submission recommends similar measures to those used on the Lane Cove tunnel such as the provision of a bus lane and cyclist infrastructure.

Response

As outlined in section 5.9.3 of the EIS, the project includes the provision a seven metre wide, central running mass transit corridor along Parramatta Road in the vicinity of the Parramatta Road interchange. This corridor would not be used at opening of the project, however in the future it would potentially be used for mass transit such as buses or light rail.

The project would also remove traffic along the Parramatta Road corridor, particularly east of Burwood, which would allow for improvements in bus services along Parramatta Road.

Traffic modelling undertaken for the 2021 'do something' scenario includes a revised layout along Parramatta Road including the provision of kerbside bus lanes between Burwood Road and Chandos Street (east of Bland Street), and the retention of two through traffic lanes in each direction. Improvements to the bus system would be the responsibility of Transport for NSW.

Potential future changes to the Parramatta Road pedestrian and cycling environment would also be considered and developed as part of the complementary Parramatta Road Urban Transformation Program.

Issue description – project would not enhance movements across Parramatta Road

Submissions object to the project, stating that both the Parramatta Road/Wattle Street and Wattle Street/Ramsay Street intersections would operate at level of service F. This would not fulfil the project objective of 'Enhance movements across the Parramatta Road corridor which are currently restricted'.

Submissions raise concerns that the M4 East project is expected to generate more traffic on Parramatta Road than the current case without the M4 East tunnel.

Response

During the 2021 AM and PM peaks, operation of the project is anticipated to result in substantial reductions in delay at the key intersections of Parramatta Road with Wattle Street and Wattle Street with Ramsay Street. These intersections go from highly congested level of service F conditions to B/D.

Capacity restrictions at the Dobroyd Parade/Timbrell Drive and Parramatta Road/Hume Highway intersections are likely to block through adjacent intersections and lead to significant queuing on the project off-ramps in 2021. However, the opening of the M4–M5 Link would significantly reduce this congestion.

Once completed, the project would provide immediate operational benefits in relieving congestion along the Parramatta Road corridor between Homebush Bay Drive and the City West Link including reduction in travel times and improvements in the level of road safety. Further benefits would be realised when the M4–M5 Link (which is subject to separate planning approval) is operating.

Issue description – M4 is not easily accessible

Submissions raise concerns that the project does not provide easy access to the M4 westbound for residents 167-173 Parramatta Road at North Strathfield.

Response

The building at 167-173 Parramatta Road at North Strathfield is in close proximity to Concord Road. Vehicles would be able to turn left onto Concord Road, and utilise local roads such as Princess Avenue, Napier Street and/or Nelson Street to be able to travel southbound on Concord Road and use the proposed M4 westbound on-ramp.

This type of movement is not uncommon for properties fronting directly onto arterial roads where it is not possible to turn right.

Issue description – concerns regarding access for residents at 151 Parramatta Road

Submissions raise concerns around driveway access / egress for residents at 151 Parramatta Road Haberfield.

Response

The project does not propose to alter existing access arrangements at 151 Parramatta Road Haberfield.

Section 8.2.3 of the EIS presents existing road network performance information including information for the eastbound section of Parramatta Road between Bland and Dalhousie Street (on to which 151 Parramatta Road adjoins). Section 8.4.1 of the EIS summarises the network performance modelling results for the 2021 and 2031 am and pm peaks. These sections present network information in the form of midblock level of service (LoS). Level of Service (LoS) is a measure to determine the operational conditions and efficiency of a roadway or intersection. The definition of LoS generally outlines the operating conditions in terms of speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and road safety. Table 6.1 shows the six levels of service for mid-block carriageway locations, ranging from LoS A–F, with LoS A representing optimum operating conditions (free flow) and LoS F the poorest (forced or breakdown in flow).

The midblock LoS for the section of Parramatta Road (eastbound) between Bland and Dalhousie Street is presented in **Table 5.5**.

Table 5.5 Summary of midblock performance for the eastbound section of Parramatta Road between Bland street and Dalhousie Street, Haberfield

	Existing conditions	2021 'do something'	2031 'do something'
AM peak hour LoS	D	C	C
Pm Peak hour LoS	D	C	B

The results demonstrate that operational network performance along the section of Parramatta Road adjacent to 151 Parramatta Road are expected to improve with the project. Consequently access to this property is expected to continue to operate at existing or improved levels.

Issue description – significant traffic issues as drivers seek to avoid the toll

Submissions raised concerns that the project would generate significant traffic issues as drivers seek to avoid the toll.

Submissions raised concerns that heavy vehicles would be more likely to use Parramatta Road to avoid the toll.

Submissions raised concerns that there is not legal explanation of how trucks would be forced to use the tunnels.

Request that a toll or fine system is imposed to ensure heavy vehicles use the tunnel and do not try to avoid the toll by using local roads.

Response

The traffic model and analysis of the traffic and transport impacts presented in the EIS include provisions to account for toll avoidance.

SMC and Roads and Maritime Services conducted preference surveys to understand the value people in Sydney place on travel time savings associated with major infrastructure improvements. The

WestConnex Road Traffic Model (WRTM) includes tolling and general cost parameters that reflect the findings from these surveys. The WRTM also considers that different motorists place different values on paying tolls to make time savings, including heavy vehicle motorists.

The EIS demonstrates that the project would have operational network benefits even when considering potential toll avoidance.

The project does not include a legal mechanism that forces trucks to use the tunnel. Trucks would be incentivised to use the tunnel through the travel time savings associated with the project.

Issue description – queuing at tunnel exits

Concerns that capacity restrictions on existing roads such as the City West Link will result in queuing at tunnel exits.

Response

Detailed assessments have been undertaken to ensure that queuing on the tunnel exit ramps at Haberfield would not extend into or impact on the mainline tunnel.

Issue description – closure of Timbrell Drive Bridge will impact traffic flows

Submissions raise concerns that closure of the Timbrell Drive Bridge would have significant impacts on traffic flows.

Response

The project does not propose to close any part of Timbrell Drive.

Issue description – Parramatta Road intersections would continue to operate poorly

Submissions raised concern that Parramatta Road intersections would continue with an extremely poor level of service.

Response

The traffic assessment concluded that the project would result in large reductions in vehicle delay along the corridor between Homebush Bay Drive in the west, and City West Link and Haberfield/Leichhardt in the east. However, the project would also result in some higher traffic densities downstream of the project on- and off-ramps on Parramatta Road and Wattle Street.

During the 2021 AM peak, intersection conditions on Parramatta Road east of Concord undergo substantial reductions in levels of delay and are forecast to provide a level of service B/C from the pre-existing F despite the reduction of through capacity due to allowance for bus lane provision. This is achieved through the transfer of traffic to the project. Conditions during the 2021 PM peak are expected to remain similar.

During the 2031 AM peak, conditions east of Concord continue to provide greatly improved performance with the project in place; however, level of service F would continue to be experienced at Parramatta Road/Wentworth Road due to high turning volumes, and also at Gipps Street/Burwood Road. Benefits continue to be provided at intersections east of Concord during the 2031 PM peak with the exception of Parramatta Road/Shaftesbury Road where large increases in right turn demand combined with reductions in through capacity due to the bus lane provision, lead to additional delay and deterioration in level of service.

Issue description – right turn bay from Concord Road to Patterson Street

The right turn bay from Concord Road to Patterson Street would not be large enough to accommodate turning traffic, resulting in traffic queuing along the single northbound lane across Concord Road bridge.

Response

In the 2021 AM peak, conditions on Concord Road remain highly congested but the proposed intersection improvements at Patterson Street and Parramatta Road would provide additional right turn capacity and help to maintain similar levels of delay, despite significant increases in traffic volumes.

During the 2021 PM peak, northbound queuing from the Patterson Street intersection may block through the Sydney Street intersection and lead to queues extending onto the northbound off-ramp and back to the highly congested Concord Road and Parramatta Road intersection. However, overall delays would be similar with increases at the Concord Road and Parramatta Road and Concord Road and Patterson Street intersections balanced by sizable reductions in delay at the Sydney Street and Concord Road and Parramatta Road and M4 intersection.

During the 2031 AM peak, impacts would be limited. However, during the PM peak, traffic volume increases on Concord Road would lead to significant increases in delay at the already congested Concord Road and Parramatta Road and Concord Road and Patterson Street intersections.

During operation of the project, a network and corridor optimisation approach would be adopted to manage delay and queuing impacts with optimisation works occurring at a number of locations including the Concord Road corridor between Patterson Street and Parramatta Road in Concord.

Issue description – request for a traffic study

Submissions request that a traffic study is undertaken at the Parramatta Road and Dalhousie Street intersection (Parramatta Road exit) and Wattle Street and Waratah Street (City West Link exit) intersections to ensure the design allocates sufficient phase times for turning movements.

Response

A traffic assessment has been undertaken for the project including an assessment of intersection performance at the Parramatta Road and Dalhousie Street and the Wattle Street and Waratah Street intersections at Haberfield. The results of this traffic assessment are presented in Chapter 8 of the EIS and Appendix G (Traffic and transport assessment) of the EIS.

Issue description – managed motorways

Submissions request the Proponent ensure all features of a managed (smart) motorway are able to be operational on opening of the Project.

Response

The M4 East is being designed to accommodate smart motorways technology. The roll-out of the smart motorways scheme is the subject of an ongoing Roads and Maritime project.

Issue description – tunnel closure for maintenance

Submissions request the Proponent ensure the M4 East is designed and operated to minimise both the number of times and the duration it is closed for maintenance.

Response

A key design objective of the M4 East 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.

5.7.9 Impacts on pedestrians and cyclists during operation

438 submissions raised issues regarding impacts on pedestrians and cyclists during operation.

Issue description – impacts to safety as a result of increased traffic

Submissions raised concerns around pedestrian and cyclist safety as a result of increased traffic on local roads surrounding the project. Specific issues raised include:

- Pedestrian safety concerns from additional traffic rat-running on Waratah Street in the vicinity of Dobroyd Point Public School
- Pedestrian safety concerns from additional traffic rat-running on Chandos Street, Rogers Avenue, Dalhousie Street and St Davids Road in the vicinity of Haberfield Public School, pre-schools and childcare centres
- Safety concerns for pedestrians and cyclists using Reg Coady Reserve
- General pedestrian safety concerns in Haberfield and Ashfield.

Response

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.

No changes are proposed to the operation and functionality of pedestrian facilities along Waratah Street. As such, there is not anticipated to be any increased risk to the safety of pedestrians from the operation of the project. Further information regarding Dobroyd Point Public School is provided in **section 6.5.8.**

As the majority of road network changes associated with the project would occur underground and at existing intersections, there would be limited change to pedestrian facilities on surface roads.

Pedestrian and cyclist facilities that would be modified by the project have been considered in the EIS and are outlined in section 5.9.2 of the EIS.

Issue description – changes to pedestrian access

Concerns were raised regarding changes to pedestrian access to Ashfield Park and Timbrell Park stating that access would be negatively impacted by the project.

Response

As the majority of road network changes associated with the project would occur underground and at existing intersections, there would be limited change to pedestrian facilities on surface roads during operation, including those around Ashfield Park and Timbrell Park. Significant impacts to pedestrian access at Timbrell Park and Ashfield Park is not anticipated.

Improvements to pedestrian facilities may occur as part of potential future changes to Parramatta Road to be implemented as part of the Parramatta Road Urban Transformation Program.

Issue description – concerns relating to cyclists

Submissions raised concerns relating to cyclists for the project.

In summary, the submissions raised the following issues:

- The project has not considered cyclist needs
- Request that the project provide improved and safe cyclist facilities
- Object to cyclists having to use the motorway shoulder as a cycleway
- Object to outdated and unsafe cyclist facilities.

Response

Provisions for cyclists are discussed in section 5.9.2 of the EIS and summarised below.

A new one-way eastbound cycleway would be provided to the north of the M4. The cycleway would generally have a width of two metres, and would be designed in accordance with Australian Standards, Austroads Design Standards, Guides and Codes, and the Roads and Maritime supplements.

As a result of continued design development at the Homebush Bay Drive interchange, the cycleway as described in section 5.9.2 of the EIS would be modified. This is discussed further in **section 7.2** of this report.

While design development continues, it is currently proposed that the cycleway would start about 300 metres west of Homebush Bay Drive. It would connect to the existing special events bus connection road as a shared cycleway and bus lane along Shirley Strickland Avenue, Rod Laver Drive and the existing underpass under Homebush Bay Drive. Existing gates that restrict use of the bus connection road by vehicles other than buses would be replaced with removable bollards to allow this route to be used by cyclists at all times.

The modified re-routed cycleway would travel under the Homebush Bay Drive on-ramp via an underpass, rather than an overpass as described in the EIS. The off-road section of the re-routed eastbound cycleway has been shortened, and would connect back into the M4 shoulder on the eastbound Homebush Bay Drive on-ramp connection to the surface M4 about 150 metres east of the underpass. The two metre shoulder provision for cyclists would continue for the full length of the connection to the existing M4.

The cycle connection would be identified with bicycle symbols on the shared sections to alert buses. Cyclists entering from Homebush Bay Drive southbound would use the access road to the motorway operations complex and join the cycleway east of the cycleway overbridge. Cyclists travelling northbound on Homebush Bay Drive would be required to access the cycleway via the internal road network at Sydney Olympic Park to join the cycleway before it crosses beneath Homebush Bay Drive.

For westbound cyclists, a new cycleway ramp would connect to the existing M4 from Queen Street at North Strathfield, between the Main North Rail Line and Concord Road. This ramp would connect to the existing westbound shoulder of the M4, and would cross the new single lane on-ramp at Powells Creek. A two metre-wide nearside shoulder would be provided adjacent to the westbound Homebush Bay Drive off-ramp. The shoulder would connect with a proposed westbound cycleway to divert cyclists permanently off the M4 and onto a new bypass of the Homebush Bay Drive interchange (which is subject to planning approval and would be delivered as part of the M4 Widening project).

Cyclists would not be permitted in the mainline tunnels. Additionally, potential future changes to the Parramatta Road pedestrian and cycling environment would be considered and developed as part of the complementary Parramatta Road Urban Transformation Program.

Further information in relation to Dobroyd Point Public School is provided in **section 6.5.8**.

Issue description – provision for pedestrians

Submissions raised concerns relating to the provision of pedestrians for the project.

In summary, the submissions raised the following issues:

- The design should provide pedestrian paths which are a short and easy walk to Strathfield Station and retain existing pedestrian paths
- Pedestrian and vehicle overpasses on exits from tunnels onto City West Link and Parramatta Road would seem necessary to assist traffic flow.

Response

As the majority of road network changes associated with the M4 East project occur underground and at existing intersections, relatively limited changes would impact pedestrian facilities. However, the project would involve realignment and alterations to a number of roads, and adjustments to existing pedestrian and cycle facilities would therefore also be required. Pedestrian and cyclist facilities for the project are outlined in section 5.9.2 of the EIS.

Issue description – eastbound cycleway at Homebush Bay Drive

Submissions object to the plan for the new east bound cycleway at the Homebush Bay Drive stating that it is unsafe because of the number of right turns, lack of space to accommodate bi-direction bus flow and conflict with traffic and parking during major events at Sydney Olympic Park.

Response

There are limited opportunities for cyclist to traverse from the M4 Motorway west of the Olympic Park precinct to re-join to the M4 Motorway east of Homebush Bay Drive. As the Australia Avenue/ Underwood Road roundabout is unsuited to safe use by cyclists the, only viable option is to utilise the Mouse Hole underpass.

It is acknowledged that operational measures will need to be put in place during major events at Sydney Olympic Park to manage the shared use of the Mouse Hole underpass by cyclists and buses. These measures should include bollards and signage on the cycleway to advise cyclists during relevant event times.

During other periods when the Mouse Hole underpass or Rod Laver Drive are closed to vehicles (buses), additional gates could be provided to enable use by cyclists.

Continuation of the cycleway east to the Mouse Hole is subject to further design development which will address cyclist safety and security matters, including lighting.

SMC will consult with Sydney Olympic Park Authority during the coming months to identify mutually acceptable solutions to the above matters.

Issue description – cyclist safety

Submissions request that subject to the outcome of the risk analysis, where bicycles are expected to use the M4 East road shoulder, the Proponent shall install a minimum one metre wide buffer strip of chevron line markings within the road shoulder, immediately to the left of the carriageway edge line, to enhance the safety of cyclists, incident responders, maintenance workers and the travelling public.

Response

Cyclists currently utilise the shoulder of the M4 Motorway and no changes are proposed to this arrangement as part of the M4 East scheme with the exception of at Homebush Bay Drive, as detailed above. No cyclists would be permitted in the M4 East tunnels.

5.7.10 Traffic safety during operation

15 submissions raised issues regarding traffic safety during the construction period.

Issue description – street signage in Wattle Street

Submissions suggested street signage in Wattle Street should be addressed.

Response

As described in section 13.5.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report), for operational signage to be installed for the project, potentially affected receivers would be consulted on the final signage in relation to its location and associated impacts where applicable.

Issue description – safety turning into or out of Walker Avenue at Haberfield

Submissions raised concerns regarding the safety of turning into or out of Walker Avenue.

Response

At the completion of construction of the project, there would be no change to existing vehicle access at either end of Walker Avenue.

Issue description – length of tunnel and impact on driver safety

Submissions raised concerns regarding the length of the tunnel and its impact on driver safety.

Response

Section 6.3.2 of the Urban Design, Landscape Character and Visual Impact Assessment in Appendix L of the EIS considers the design intent and design response for tunnel interiors.

The project proposes location identifiers on near side linings that inform motorists' orientation to above ground features. These location markers are also proposed to include a section of linear feature lighting in the roof providing an additional layer of interest.

These events are proposed to occur at a mid-tunnel point at Concord in both eastbound and westbound tunnels, about two minutes along the journey at 80 kilometres per hour. The location identifiers would be coordinated with tunnel safety features to ensure that legibility of safety features would not be compromised.

In addition, the project incorporates lighting strategies to reduce the potential impacts of driver monotony within tunnels. The would include feature coloured lighting used in conjunction with coloured lining panels within breakdown bays, as well as potential strip feature lighting at tunnel location identifier sites to provide a subtle change in character within the tunnel that relates to a specific function or location.

Issue description – introduction of more traffic to the network and decrease safety

Submissions raised concerns that the project would introduce more traffic to the network and decrease road safety.

Response

The traffic and transport assessment conducted for the project (summarised in chapter 8 of the EIS) includes an assessment of road safety. This assessment was confined to the existing M4 and Parramatta Road corridors where existing data can be used to estimate future behaviour.

The assessment demonstrated that after construction of the project, there would be a clear overall road safety benefit on the corridor with a 32 per cent reduction in crash costs in 2021 from $14.95 million to $10.2 million annually. This reduction in crash costs is less pronounced in 2031 due to the large volume increases on the project but nevertheless a reduction of approximately 25 per cent is observed with costs falling from $16.31 million to $12.22 million per annum.

Additionally, the project design and construction would incorporate design reviews and road safety audits in compliance with Roads and Maritime guidance to follow best practice in reducing crash risks.

Issue description – detour routes for heavy vehicles not permitted in tunnels

Submission requests that the Proponent ensure the lane widths on detour routes are sufficiently wide to safely cater for large trucks, including petrol tankers that are not permitted in the tunnels, so as to minimise the potential for conflict with other vehicles and vulnerable road users, such as cyclists and pedestrians.

Response

Presently, around 6000 heavy vehicles travel on Parramatta Road (in both directions) east of the M4 Motorway; during an average weekday (24 hours). These vehicles, which vary in size and include petrol tankers, travel on roads that would be classified as a detour route when the M4 East project opens to traffic. Consequently, future detour routes are existing roads that are sufficiently wide enough to safely cater for large trucks, as they currently travel along these routes.

Notwithstanding, the M4 East would remove a large proportion of heavy vehicles from the existing road network, and hence the project would provide a safer environment by minimising the potential for conflict with other vehicles and vulnerable road users, such as cyclists and pedestrians.

Issue description – tunnel safety features

Submissions request the Proponent install a continuous line of profiled line marking [raised markings] as an edge line outside the tunnels to delineate the traffic lanes from the road shoulder and provide both a visual and audible alert to any motorist deviating from the carriageway.

This will improve safety for anyone using the road shoulder, such as broken down vehicles, cyclists (where permitted), or maintenance workers, and will improve delineation, particularly at night and in wet weather.

Response

The project design standards are listed in Section 5.2.1 of the EIS. New works will be designed generally in accordance with Australian Standards, Austroads Design Standards, Guides and Codes, and the Roads and Maritime supplements to these documents. Existing roads and structures where no works are proposed as part of the project would not be modified to meet current standards.

5.7.11 Incident response during operation

Two submissions raised issues regarding incident response (i.e. accidents) during operation.

Issue description – impact of one incident on the road network

Submissions raised concerns that one incident or accident would bring the road network to a standstill.

Response

In addition to assisting with network performance improvements, the project would provide an additional route along the corridor and would therefore increase network resilience in the event of incidents.

Issue description – actions for incident response

Submission requests the Proponent ensure the M4 East detour routes maintain sufficient capacity to cater for the high traffic volumes that will be diverted to the surrounding streets, whenever WestConnex is closed. The Proponent must develop incident response plans and procedures that enable bus lanes to be temporarily suspended in response to major incidents affecting the M4 East.

Response

Section 11.2 of *Appendix G: traffic and transport assessment* provides details of an optimisation strategy and potential infrastructure requirements that would be developed and implemented to manage and mitigate operational traffic impacts for affected intersections and roads in the study area.

5.7.12 Integration with public transport during operation

19 submissions raised issues regarding how the project integrates with the public transport networks during operation.

Issue description – consideration of interaction with existing public transport

Submissions raised concerns that the project has not considered the interaction of the project with existing and future public transport infrastructure, including light rail.

Submission requested further information on how the project will integrate with current (eg light rail) and future public transport.

Concerns were raised that the new alignment of Wattle Street would affect the bus timetable during the operation of the project.

Response

The impact of the project on existing and future public transport services during operation is addressed in section 8.4.2 of the EIS.

The *NSW Long Term Transport Master Plan* (Transport for NSW 2012a) provides the overarching strategy for Sydney's transport future. The Plan recognises the importance of the Parramatta Road corridor as the main connection between the Sydney CBD and Western Sydney. Potential improvements for the corridor come from the long term Master Plan through the Parramatta Road Urban Transformation Program.

Transport for NSW intends to operate a new high frequency bus route between Burwood and the CBD, via Parramatta Road. Bus frequency has yet to be confirmed; however, a guide of 15 to 20 buses per hour in 2021, and 20 to 30 buses per hour in 2031 has been provided.

The operational modelling has assumed that bus lanes would be provided between Burwood Road and east of Bland Street to coincide with the opening of the project. Further provision of bus lanes to the east is also assumed to coincide with the opening of the M4–M5 Link.

A high level analysis has been undertaken to understand the potential level of bus delays at signalised intersections with and without the project. The results indicated that, in 2021, time savings for buses of up to 14 minutes in the westbound direction are achievable. Other time savings vary between three and six minutes. In 2031, AM time savings increase to five to 15 minutes and the PM peak is five to 11 minutes. Bus delays in 2031 'do something' scenarios rise only marginally with the exception of eastbound during the PM peak. This is mainly a result of delays at the Wattle Street intersection due to a high left turn demand to the M4–M5 Link ramps and the absence of a dedicated left turn provision.

The project would amend the priority for buses serving Olympic Park via the underpass at Homebush Bay Drive. Bus would be required to give way to vehicles on the M4 eastbound on-ramp. The operation of this ramp would be subject to further discussions between SMC, Roads and Maritime and Sydney Olympic Park Authority (SOPA).

A re-design of the Parramatta Road corridor is not being delivered at part of the project. However, the project would create the opportunity to investigate how existing road space and transport operations could be reconfigured or rebalanced (eg improved east-west and north-south movements) to improve public transport access, services and patronage along and across the Parramatta Road corridor.

Provision of bus lanes, as part of a separate project, could lead to an increase in the number of services. Combined with the reduction in bus travel times, this would have the potential to improve public transport patronage along the corridor.

As described in Chapter 3 of the EIS, Transport for NSW has begun planning for improved transport in the Parramatta Road corridor under its Parramatta Road Corridor Transport Improvement Program. The program includes a series of projects to promote an integrated multimodal transport system and realise urban renewal in the corridor.

At the Parramatta Road interchange, the project allows for future provision of a seven metre-wide, central-running mass transit corridor on Parramatta Road. This could be used for bus services, or a possible future light rail service.

Options for improving public transport along Parramatta Road are at a preliminary stage. More detailed work would be undertaken by Roads and Maritime and Transport for NSW to investigate public transport improvements and intersection treatments that could be delivered on Parramatta Road after the opening of the project. These potential public transport improvements do not form part of this project and would be subject to separate planning processes and approvals as appropriate.

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 TfNSW Bureau of Statistics and Analytics. The STM uses projections of population and employment for the Greater Metropolitan Area of Sydney and forecasts mode choice between car, rail, bus, light rail and ferry modes for future infrastructure scenarios. The modelling with STM for the project 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. As such, the assessment incorporates the effects of future demands for public transport.

No regular Sydney Buses bus services use Wattle Street; however, two routes cross it at Ramsay Street. Therefore, buses travelling near Wattle Street would be affected by any congestion at the Wattle Street and Ramsay Street intersection. The impact of the project on operational network performance is outlined in section 8.4 of the EIS and detailed in the Traffic and Transport Assessment in Appendix G of the EIS. There would be substantial reductions in delay at the key intersections of Parramatta Road with Great North Road, Parramatta Road with Wattle Street, and Wattle Street with Ramsay Street. The operational performance of traffic at these three intersections would improve from a highly congested LoS F to LoS D or LoS B, depending on the location.

Issue description – provision of bus lanes

Submissions raised concerns regarding the provision of bus lanes along Parramatta Road, stating that bus lanes would not be delivered until 2031.

Response

The provision of additional bus services and infrastructure between Burwood and the Sydney CBD is the scope of an investigative project that is separate to the project, and is currently being evaluated by Transport for NSW. The traffic impact assessment undertaken for the project makes allowance for a reduction of general traffic lanes on Parramatta Road and assumes the kerbside lane is converted to a bus lane. This network change results from the Parramatta Road Urban Renewal Strategy which, while not part of the project, is facilitated by its implementation.

5.7.13 Moving the bottleneck

47 submissions raised issues about moving an existing bottleneck to a new location.

Issue description – relocation of existing bottle necks

Submissions raised concerns that instead of mitigating traffic issues, the project would just relocate the existing bottle necks elsewhere (eg from the M4 to Wattle Street and Parramatta Road, and from Concord Road to the City West Link).

Response

It is clearly acknowledged that Parramatta Road is currently congested during peak periods, with typically long delays that impact traffic efficiency along the transport corridor. One of the main catalysts for this congestion is a ‘bottleneck’ is the termination of a major urban motorway onto a signal controlled arterial road. This ‘bottleneck’ would progressively relocate or dissipate with the staged implementation of WestConnex projects.

Specifically, the M4 East Project would initially relocate the motorway connection east to Parramatta Road and Wattle Street where portals connect with the existing road network. The respective operational impacts and management measures of implementing this 'do something' (2021) scenario is documented in Chapter 10 and Chapter 11 of *Appendix G: traffic and transport assessment.*

Subsequent WestConnex projects are anticipated to mitigate adverse impacts resulting from construction of the project. However, these fundamentally stem from a shift in existing operational inefficiencies on Parramatta Road and the surrounding local network; in addition to considerable growth in population and employment levels. The project is essentially the first of three stages that would provide the missing link on the Sydney motorway network between central and western Sydney. Importantly, a well-connected and high capacity motorway network, which complements an all-encompassing public and active transport network, is a fundamental piece of infrastructure for a world-class city like Sydney.

5.7.14 Cumulative Impacts

195 submissions raised concerns about cumulative traffic and transport impacts associated with the project.

Issue description – assessment of long term cumulative traffic impacts

Submissions requested that long term cumulative traffic impacts should be included in the assessment considering future road projects such as the M4–M5 Link, the New M5 and the new harbour tunnel.

Response

Cumulative impacts associated with the construction of the project are outlined in section 8.5 of the EIS. The operational traffic modelling for the 2031 'do something' scenario assumes the completion of all WestConnex projects. This therefore represents a cumulative traffic impact assessment for WestConnex.

The Western Harbour Tunnel is at an early stage of project planning, Traffic volume data is not currently available to enable its consideration as part of a cumulative impact assessment.

Issue description – assessment of cumulative impacts from the M4 East and the New M5

What are the cumulative impacts of both the M4 East Motorway and New M5 on traffic throughout the Inner West? The regional and local impacts of this should be modelled across the inner West for 2021.

Response

Cumulative impacts associated with the construction of the project are outlined in section 8.5 of the EIS. The operational traffic modelling for the 2031 'do something' scenario assumes the completion of all WestConnex projects. This therefore represents a cumulative traffic impact assessment for WestConnex.

An additional 'do something' scenario incorporating the project and the New M5 was strategically assessed to determine the potential impacts on traffic volumes and patterns within the study area (inclusive of King Georges Road Interchange Upgrade and the M4 Widening projects). The results indicated no significant difference in volumes within the study area as a result of the New M5. No further analysis was therefore undertaken.

5.8 Air quality

5.8.1 Dust generation during construction

45 submissions raised issues regarding the dust generation during construction.

Issue description – dust during construction

Submissions raised general concerns about impacts of dust from construction works and the impact of dust on the local residents, and specifically regarding:

- The management measures to be undertaken and their effectiveness
- Impacts on local residents in Haberfield and near the Concord Road Interchange
- The increase in dust from construction affecting children at Haberfield Public School.

Response

The Air Quality Assessment was undertaken in accordance with the relevant requirements of the SEARs, issued by the Secretary of DP&E for the project. The Air Quality Assessment Report in Appendix H of the EIS presents the assessment of the impacts of both construction and operation of the project. Potential impacts on local air quality from dust produced during construction 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 9.9 of the EIS as amended in **Chapter 8** (Revised environmental management measures) of this report. These include:

- Undertaking regular site inspections to monitor dust and recording inspection results
- Layouts of construction ancillary facilities so that machinery and dust causing activities are located away from receptors, as far as is possible
- Ensuring an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate
- Implementing dust control measures (including wetting or covering the stockpile) where a stockpile has the potential to generate dust
- A CAQMP will be prepared for the project as part of the CEMP which will describe how these management measures will be implemented during construction to minimise dust and air pollutant emissions, and the monitoring and reporting that will be undertaken to demonstrate the effectiveness of the measures.

Issue description – consumption of home-grown vegetables

A submission questioned whether it would be safe to continue growing and consuming vegetables at the property at 24 Walker Avenue despite dust generated during construction.

Response

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in section 9.9 of the EIS as amended in **Chapter 8** (Revised environmental management measures) of this report. These include undertaking regular site inspections to monitor dust and recording inspection results. A CAQMP will be prepared for the project as part of the CEMP which will describe how these management measures will be implemented during construction to minimise dust and air pollutant emissions, and the monitoring and reporting that will be undertaken to demonstrate the effectiveness of the measures.

Issue description – monitoring of PM

How will $PM_{2.5}$ and PM_{10} be monitored and mitigated by an independent body, and what PM triggers are set to halt construction work?

Response

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in section 9.9 of the EIS as amended in **Chapter 8** (Revised environmental management measures) of this report. A CAQMP will be prepared for the project as part of the CEMP which will include these management measures and the requirements of any condition of approval received for the project. The CAQMP will be prepared in consultation with the NSW Environment Protection Authority (EPA) to ensure that the relevant standards for management of construction air impacts – including particulate matter – are addressed. The implementation of the plan will be overseen and audited by the independent Project Environment Representative (ER), who would have the authority to stop work if any relevant conditions of approval set for the project were likely to be breached. Any complaints regarding these issues would be regulated by the EPA.

5.8.2 Emissions from plant and equipment during construction

14 submissions raised issues regarding the emissions from plant and equipment during construction.

Issue description – production of emissions during construction

Submission raised concerns about the production of emissions from diesel-fuelled machinery and vehicles during construction, and specifically regarding:

- Trucks from the construction site at the Haberfield tunnel portal will have pollution impacts on Northcote Street, Ramsay Street Haberfield and Bland Street Ashfield.
- How will the property at 24 Walker Ave be protected from increased diesel emissions from machinery during construction?

Response

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in section 9.9 of the EIS as amended in **Chapter 8** (Revised environmental management measures) of this report. A CAQMP will be prepared for the project as part of the CEMP which will 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.

Issue description – mitigation of impacts on The Infants' Home

A submission raised specific concerns regarding the mitigation of impacts of construction on the day-to-day operations of The Infants' Home with the location of the tunnel's main construction site, immediately to the east of the centre being a particular concern. The Infants' Home is likely to be adversely impacted by noise, fugitive emissions and dust from this site.

Response

The Air Quality Assessment Report in Appendix H of the EIS provides the assessment of the impacts of both construction and operation of the project. Potential impacts on local air quality from dust produced during construction 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.

The Infants' Home was included in the community receptors (Receptor Code SR25) as shown in Table 9.10 of Chapter 9 of the EIS. The community receptors were considered in the air quality and human health risk assessments to be particularly sensitive and a more detailed approach was used to calculate the total concentrations of each pollutant.

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in section 9.9 of the EIS as amended in **Chapter 8** (Revised environmental management measures) of this report. These include undertaking regular site inspections to monitor dust and recording inspection results. A CAQMP will be prepared for the project as part of the CEMP which will describe how these management measures will be implemented during construction to minimise dust and air pollutant emissions, and the monitoring and reporting that will be undertaken to demonstrate the effectiveness of the measures.

- Local councils would be consulted during the preparation of the CAQMP and key stakeholders such as The Infants' Home prior to commencement of operations at the construction sites.

5.8.3 Odour impacts during construction

No concerns about odour impacts during construction were raised in submissions.

5.8.4 Cumulative construction impacts

One submission raised regarding cumulative construction impacts.

Issue description – cumulative construction impacts to air quality

One submission raised concerns regarding the duration of construction impacts near Carrington Street, North Strathfield with WestConnex following three years of construction impacts from the North Strathfield Rail Underpass, potentially resulting in six years of disruption and air quality impacts.

Response

A CEMP, including the CAQMP would be prepared which will include management measures and procedures to minimise the impacts of construction activities. The CAQMP would be developed and implemented in consultation with the EPA and local councils. Several measures have been specifically developed to manage dust and other impacts of construction and these are section 9.9 of the EIS as amended in **Chapter 8** (Revised environmental management measures) of this report. Two management measures have been developed to deal with cumulative impacts, as follows:

- Undertaking 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
- Undertaking regular on-site and off-site inspection, where receptors are nearby, to monitor dust and record inspection results.

5.8.5 General air quality

2,859 submissions raised issues with the general air quality.

Issue description – general concerns for air quality

The following concerns were raised in submission with regard to air quality as a result of the project:

- Reduction in air quality in the vicinity of the project including Haberfield and Lewisham, and the wider Inner West
- WestConnex will increase road capacity, directly increasing vehicle kilometres travelled and therefore emissions will increase. The project would result in high levels of pollution including from induced traffic
- Air quality impacts from ventilation outlets and increased traffic in residential areas, public spaces, and schools and specifically at Haberfield Public School, The Infants' Home child care facility and the aged care facility at 169-171 Parramatta Road at Ashfield.

Response

Projections of road transport emissions in Sydney show that vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to improvements in emission-control technology. These reductions are predicted to occur in spite of increases in vehicle kilometres travelled.

The traffic modelling does include induced traffic demand arising from the implementation of the WestConnex project. This inclusion flows through to the air quality modelling and human health risk assessment.

The worst case for traffic is the do minimum option. Parramatta Road is essentially at capacity in 2015, and there is no plausible scenario that would lead to a significant increase in traffic along Parramatta Road.

Figure 5.2 presents the predicted change in annual average $PM_{2.5}$ between 2014 and 2021 without the project – i.e. this is the improvement delivered by a cleaner fleet only. It includes population growth and urban renewal.

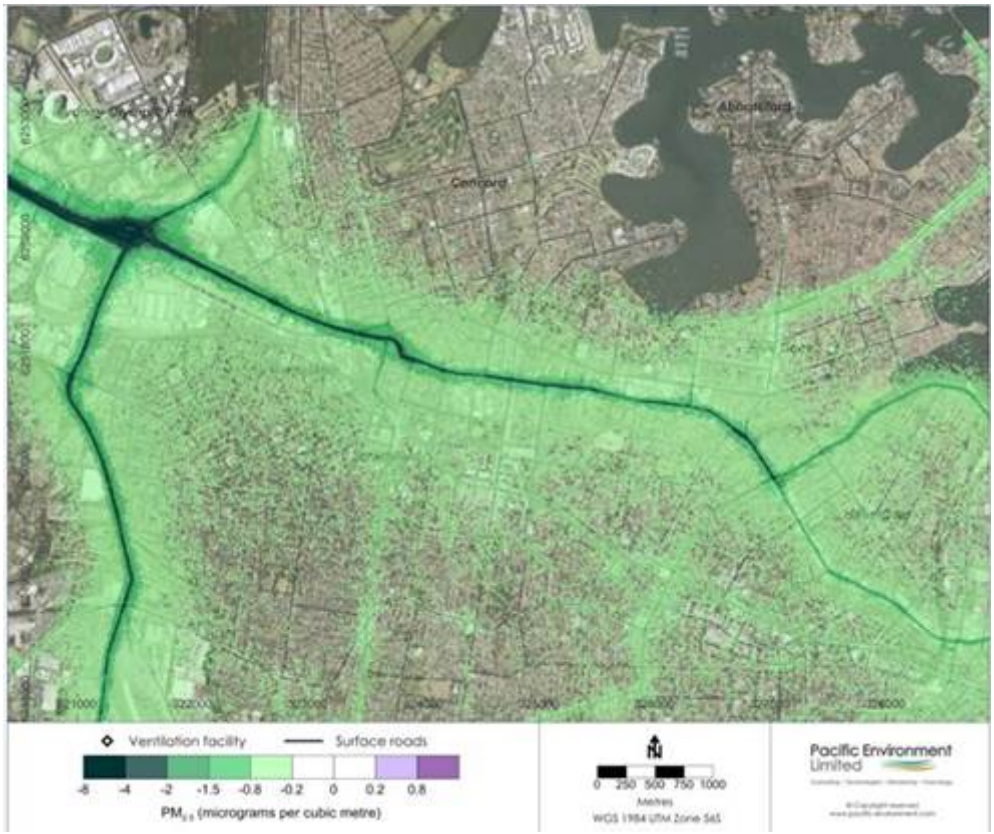

Figure 5.2 Contour map for change in annual mean $PM_{2.5}$ (2021-DM minus 2014)

A hypothetical worst case where the M4 East delivers no relief along Parramatta Road (which is not a plausible scenario) would result in the improvement provided by a cleaner fleet. There is no plausible scenario that would lead to a worsening of air quality along Parramatta Road due to M4 East for the complete WestConnex.

There is an overall reduction in pollutant concentrations throughout the community due to the project, however there are small areas where there is an increase. These locations, and amount of change, are shown in Figure 8-69 to 8-71 in the Air Quality Assessment Report in Appendix H of the EIS.

The contribution of emissions due to the ventilation outlet is negligible compared to surface road emissions. Analysis of the ventilation outlet contribution to the total concentrations of air pollutants has shown that this component of the total is extremely small (e.g. Figures 8-35 and 8-51 of the Air Quality Assessment Report) and would be undetectable.

Issue description – impact to air quality of proposed on-ramp from Parramatta Road

A specific concern was raised about the impact of the proposed new on-ramp from Parramatta Road (east of Station Street) onto the M4 will have a major adverse impact on the amenity and quality of the public open space at the southern section of Arnotts Reserve and the surrounding residences, including air quality impact during construction and operation.

Response

The Air Quality Assessment Report presents plots of the predicted changes in various pollutants for each stage of the project, including this area. Public open space is included in this modelling, which shows improvement to air quality around many parts of the road network that currently suffer from congestion. Refer to Figures such as 8-39 and 8-47 in the Air Quality Assessment Report for more details.

Issue description – exceedance of proposed national air quality standards

Submissions raised specific concerns regarding the exceedance of proposed national air quality standards specifically:

- That the EIS shows the air quality, specifically $PM_{2.5}$, at the 31 sites modelled across the M4 East area will greatly exceed the proposed national standard of 8 micrograms per cubic metre of air by 2021
- WestConnex will be an additional source of fine particulate pollution added to an existing background level which exceeds current standards.

Response

The project results in a general decrease in $PM_{2.5}$ concentrations along the affected corridor (Figure 8-68 of the Air Quality Assessment Report in Appendix H of the EIS). As noted in the Air Quality Assessment Report (section F.9.9), there is considerable uncertainty in the background value for annual mean $PM_{2.5}$, as measured concentrations are dependent on the measurement technique that is used. A value of 8 $\mu g/m^3$ (the value of the NEPM advisory standard) was used to reflect this uncertainty. Therefore, by definition, the predicted concentrations at all locations in the study area exceed the criterion. However, this is not because of the project; it is the existing situation. It is predicted that the project will result in a decrease in annual $PM_{2.5}$ concentrations at the majority of locations.

Issue description – planting of trees as a mitigation measure

A submission requested the planting of trees to mitigate against air pollution from traffic.

Response

Landscaping, including trees and shrubs, will be provided in some areas of the project, as shown in Chapter 13 of the EIS. An Urban Design and Landscape Plan would be prepared for the project to present an integrated landscape and design for the project. This plan will be prepared in consultation with the local councils and the community.

5.8.6 Operational assessment methodology

57 submissions raised issues with the operational assessment methodology.

Issue description – public transport as a preferable investment

Submissions object to the project, stating that investment in public transport is preferable to investment in new motorways and asked why modelling was not carried out to compare the impact of WestConnex with a public transport system in the long term.

Response

Chapter 3 of the EIS discusses the public transport improvements that will be facilitated by, or developed in parallel with the project. The need for the project in addition to these public transport initiatives is also discussed in **section 5.3.1** of the report.

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.

The alternatives that were considered were selected based on their capacity to meet the objectives of the project and their performance with reference to other transport, environmental, engineering, social and economic factors. This included a qualitative assessment of a public transport and freight rail improvements alternative (Alternative 3).

No further studies are proposed as the Transport Master Plan identifies WestConnex as a project that will support Sydney's economic and population growth into the future.

Issue description – lack of currently air quality monitoring to be used as a baseline

Submissions raised concerns regarding the apparent lack of current air quality monitoring near the proposed ventilation outlets as a baseline to demonstrate the impacts of the project.

Response

As discussed in section 9.5.6 of the EIS, there are five air quality monitoring stations in the project area that were established in 2014. These stations are at the following locations:

- Wattle Street at Haberfield
- Edward St at Croydon
- Bill Boyce Reserve at Homebush
- Concord Oval at Concord
- St Lukes Park at Concord.

All of the stations except St Lukes Park are located at roadsides or near roads. In addition, data from other urban background monitoring stations managed by OEH and Roads and Maritime, have been used to assess the current background air quality.

An air quality monitoring scheme will be developed and implemented in consultation with key stakeholders to confirm the EIS predictions that there will be no detectable change in air quality due to emissions from the ventilation outlets.

Issue description – concerns regarding the estimation of vehicle emissions

Concerns were raised in submissions about the estimation of vehicle emissions, in particular diesel emissions, on which the air quality modelling is based. Submissions stated that:

- The EIS should have considered the effect of a growing diesel vehicle fleet, the significant lag in the implementation of vehicle emissions standards in Australia, and the failure of those standards to set particle number limits, given that modern diesel vehicles are emitting an increasing number of particles, orders of magnitude greater than some older petrol vehicles. It is particle number, rather than mass, which is of greater importance when assessing the health impacts of ultrafine particles
- Given recent revelations about misrepresentation of vehicle emissions, impacts of the project on air quality should be reconsidered
- Assumed improvements in vehicle emissions is integral to the modelling on pollution around the stack due to improvements in new car technology, yet the bulk of the emissions are recognised to come from trucks. The modelling for this should be published for critical analysis by the community.

Response

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. Further details about the data sources and models are in Table 8-4, Table 8-5, and Appendix J to the Air Quality Impact Assessment (Appendix H of the EIS).

In recent years a considerable amount of attention has focussed on ‘ultrafine’ particles (UFPs). These are particles with a diameter of less than 0.1µm. Whilst there is some evidence that particles in this size range are associated with adverse health effects, it is not currently practical to incorporate them into an environmental impact assessment. There are several reasons for this, including the rapid transformation of such particles in the atmosphere, the need to treat UFPs in terms of number rather than mass, the lack of robust emission factors, the lack of robust concentration-response functions, the lack of ambient background measurements, and the absence of air quality standards.

In relation to concentration-response functions, the WHO Regional Office for Europe (2013) has stated the following:

'… the richest set of studies provides quantitative information for $PM_{2.5}$. For ultrafine particle numbers, no general risk functions have been published yet, and there are far fewer studies available. Therefore, at this time, a health impact assessment for ultrafine particles is not recommended.'

The health impacts of particles have been assessed in accordance with current guidelines, as required under the SEARs. Given the limited information relating to ultrafine particles, the assessment has focused on pollutants for which there is sufficient supporting research. This is discussed in section 6.9.1 of the Human Health Risk Assessment.

The air quality assessment sources data from tests for the Diesel National Environmental Protection Measure (Diesel NEPM), COPERT, and ARTEMIS. These assemble data from real-world studies by governments and non-government organisations, and use these to develop emission factors. The EIS does not use certification tests or regulatory limits to predict emissions, and is therefore unaffected by manufacturers' recent statements.

Improvements to vehicle emissions are assumed based on uptake of existing technology. That is, the rate of turnover observed in the fleet is known to remove older vehicles and bring lower emissions cars and trucks into the fleet. Improvements to both the car and the truck fleet will occur. New technology – that is, beyond what is currently legislated for – has not been assumed, and therefore predicted impacts are expected to be conservative. Details of the emissions modelling are provided in Section 8.2 and Appendix E of the Air Quality Impact Assessment (Appendix H), particularly E.2.3 on fleet data.

The EIS assessment adopted the vehicle emissions model developed by the EPA for calculation of emissions from surface roads. Details regarding the implementation of the model are presented in section 8.2.3 of Appendix H. Full details regarding the EPA emissions model are available in *Technical Report 7 On-Road Mobile Emissions: Results* available from the EPA website at http://www.epa.nsw.gov.au/air/airinventory2008.htm.

Issue description – concerns regarding the range of pollutants modelled

Submissions raised concerns regarding the range of pollutants modelled and averaging intervals, specifically that the EIS does not adequately address the long term impacts of air pollution resulting from increased traffic volumes.

Response

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 described in Chapter 9 and Appendix H of the EIS. The contribution of non-exhaust emissions (such as from tyres and brake pads) were also considered in the Air Quality Impact Assessment when reviewing particulate matter.

Assessment of air quality and health impacts uses a range of averaging periods, taking into consideration risks from short-term or long-term exposure. Higher concentrations may arise for short periods, however stricter guidelines are typical set for longer periods to limit long-term and cumulative exposure. The assessment is consistent with guidance available from enHealth and the NSW Approved Methods that provide for consistent assessment of these factors. These include assessment of 24 hours and annual mean as described in Appendix H of the EIS.

Issue description – lack of consideration of the full impact of the pollutants

Submissions raised concerns that the EIS does not take into consideration the full extent of the pollutants that are generated from cars, including heavy metals, odours, and other noxious gases.

Response

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 assessed in the Human Health Risk Assessment and the Air Quality Impact Assessment described in Chapter 9 and

Appendix H of the EIS. The contribution of non-exhaust emissions (such as from tyres and brake pads) were also considered in the Air Quality Impact Assessment when reviewing particulate matter. Specifically:

- Metals and compounds would be a component of particulate matter; where the change in particulate matter is small, the change in metals and compounds would be negligible
- Odour impacts are addressed in section 8.4.10 of the Air Quality Impact Assessment in Appendix H. There are not expected to be any significant, predictable or detectable changes in odour as a result of the project
- The Commonwealth Department of Environment and Heritage (DEH 2003) conducted a detailed review of all the different VOCs that are present in vehicle emissions and evaluated these in relation to toxicity and the concentration in emissions. From this review a select number of VOCs were identified as those that are of importance for the assessment of exposure. These are the VOCs included in the Human Health Risk Assessment.

Issue description – concerns regarding the time intervals assessed

Submissions raised concerns regarding the assessment of 15 minute or 1 hour exposure intervals not peak exposure levels. For children who are attending Haberfield Public School for at least six and often up to eight hours a day, at an elevated receptor location, they will be exposed to this in far greater concentrations.

Response

The Air Quality Assessment Report in Appendix H of the EIS addresses the assessment criteria (and time periods) in the NSW Approved Methods.

The key pollutants from vehicles and averaging times have been addressed in both the Air Quality Impact and Human health Risk Assessment. The assessment is consistent with guidance available from enHealth (enHealth 2012) and the NSW Approved methods. These include assessment of 24 hours and annual means as described in Appendix H of the EIS.

The project has been designed to reduce surface road congestion, and hence emissions. A hypothetical 'worst case' scenario, in which the M4 East delivers no relief along Parramatta Road (which is not a plausible scenario), would result in no improvement in addition to that provided by a cleaner fleet. There is no plausible scenario that would lead to a worsening of air quality along Parramatta Road due to the M4 East project for the complete WestConnex. The contour map in **Figure 5.3** shows the difference in annual mean $PM_{2.5}$ between the predicted levels with and without the project in 2031. The lighter green colour shows the areas where reductions in pollutant levels are predicted to occur. Further detailed results for all criteria pollutants using longer averaging times from eight hours to annual means are provided in Appendix K of the Air Quality Assessment Report Appendix H of the EIS.

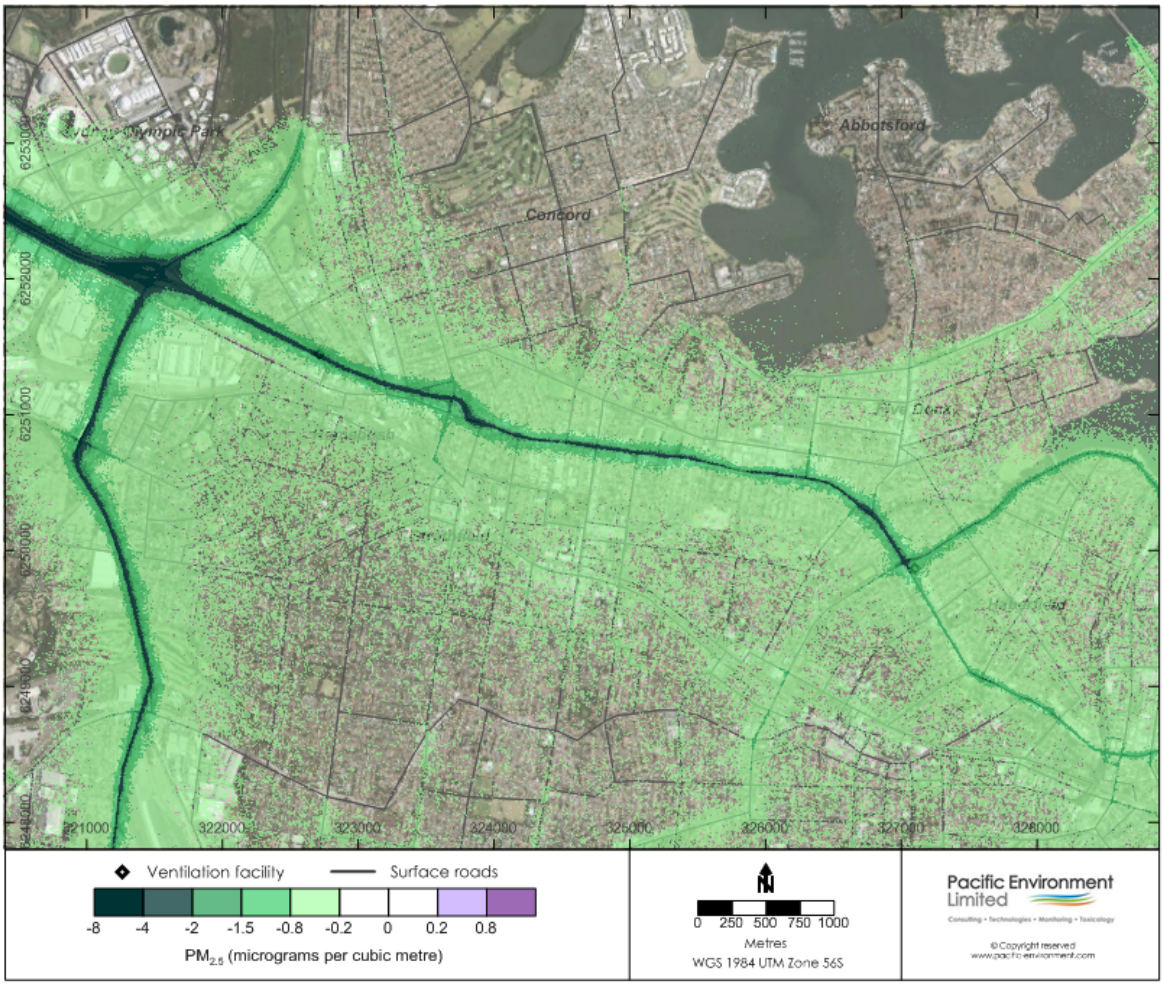

Figure 5.3 Contour map for change in annual mean $PM_{2.5}$ (2031-DM minus 2014)

Dispersion modelling was undertaken across the whole M4 East domain for two additional heights: 10 metres and 30 metres. This part of the assessment did not cover all pollutants and averaging periods. The focus was on annual average $PM_{2.5}$ concentrations in the 2031-DSC (cumulative scenario with the project and all other stages of WestConnex complete. The GRAL model was used to predict $PM_{2.5}$ concentrations associated with surface roads and tunnel ventilation outlets. The results indicate that the changes in the annual average $PM_{2.5}$ at 10 metres (the height of a two story building), no receptor locations would experience an increase of more than an annual average concentration of 0.5µg/m^3.

Issue description – averaging times for particulate matter.

Data reported against the current standard of 25 µg/m^3 (24-hour average) does not give an accurate picture of the peak hour traffic emissions, which would be well above the standard; the fact that children are walking to school near several of these sites in the morning peak hour means they are being daily exposed to dangerous emission levels.

Response

The assessment includes peak traffic periods. It should be noted that it is possible for levels to be below a 24-hour average criteria, even with occasional short periods where levels are above the numerical values of the criteria. A 24-hour average criteria applies to the average concentration over 24 hours, not to shorter time periods.

Issue description – health risks associated with air quality

An objection to the significant air pollution health risks from the Project considering modern diesel exhaust consists mostly of particles sized $PM_{0.5}$ and smaller. There is no measurement in the M4 EIS of the quantity of these particles that drivers will be exposed to in WestConnex's tunnels.

Response

In recent years a considerable amount of attention has focussed on 'ultrafine' particles (UFPs). These are particles with a diameter of less than 0.1µm. Whilst there is some evidence that particles in this size range are associated with adverse health effects, it is not currently practical to incorporate them into an environmental impact assessment. There are several reasons for this, including the rapid transformation of such particles in the atmosphere, the need to treat UFPs in terms of number rather than mass, the lack of robust emission factors, the lack of robust concentration-response functions, the lack of ambient background measurements, and the absence of air quality standards. Consequently the Air Quality Assessment Report (Appendix H of the EIS) does not report on concentrations of particulate matter smaller than 2.5µg in diameter.

In relation to concentration-response functions, the WHO Regional Office for Europe (2013) has stated the following:

> *'… the richest set of studies provides quantitative information for $PM_{2.5}$. For ultrafine particle numbers, no general risk functions have been published yet, and there are far fewer studies available. Therefore, at this time, a health impact assessment for ultrafine particles is not recommended*.'

Issue description – concerns with modelling method chosen

Further concerns were raised in submissions that there was no modelling of estimates for any pollutants in a scenario where the traffic on Parramatta Road is more than the modelled forecast of a "53% reduction" (by 2021) along the Concord to Haberfield section.

Response

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 modelling includes induced traffic demand arising from the implementation of the WestConnex project.

The expected traffic scenarios included in the operational air quality assessment were summarised in Table 5-2 of the Air Quality Assessment Report. The worst case for traffic is the 'Do Minimum' scenario. In this scenario Parramatta Road is essentially at capacity, and there is no plausible scenario that would lead to a significant increase in traffic along Parramatta Road. Projections of road transport emissions in Sydney show that vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to improvements in emission-control technology. These reductions in emissions are predicted to occur in spite of an increase in vehicle kilometres travelled.

Figure 5.2 presents the predicted changes in annual average $PM_{2.5}$ between 2014 and 2021 without the project – i.e. this is the improvement delivered by a cleaner fleet only. The traffic projections on which these predictions are based include the effects of population growth and urban renewal.

A hypothetical worst case where the M4 East delivers no relief along Parramatta Road (which is not a plausible scenario) would result in the improvement provided by a cleaner fleet. There is no plausible scenario that would lead to a worsening of air quality along Parramatta Road due to M4 East for the complete WestConnex.

Issue description – assessment ignores current air quality levels

Submission raised concerns that the assessment ignores the current elevated (or above guideline) air quality levels at numerous hot spots on Parramatta Road.

Response

The background levels of NSW criteria assessment pollutants and $PM_{2.5}$ are described in Chapter 9 of the EIS and in more detail in Appendix H. Air quality in the project area is predicted to improve with the project compared to the future state without it.

Issue description – no modelling of different scenarios

Submissions raised concerns that there was no modelling of different scenarios of the ventilation outlets at different heights is not modelled (higher ventilation outlets mean greater dispersion levels).

Response

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 Table 8-30 of Appendix H of the EIS. The lower outlets resulted in concentrations that were around 1.5 times greater, on average, than the higher outlet. 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.

Issue description – representation of data from the OEH and WDA monitors

Submissions query why the data from the OEH monitors and the WDA St Lukes Park Concord is claimed to be representative of air quality while the data from the other four WDA monitoring sites are downplayed.

Response

The OEH monitoring sites and the WDA monitoring site at St Lukes Park Concord are sited to record the general urban background air quality, away from the influence of particular sources of pollution such as traffic on busy roads or industrial sources. The use of data from these sites provides a more representative background level on which to base the assessment of impacts on residential neighbourhoods away from major roads.

The other four WDA sites have been selected to provide information on the contribution of surface traffic to air pollution. Details about the sites, the roles they play, and the data recorded, can be found at http://www.westconnex.com.au/library/air_quality/index.html.

Issue description – incorrect assumptions regarding traffic and air pollution

The assumptions that the project will simultaneously increase traffic as well as reduce air pollution (fine particle $PM_{2.5}$ emissions) are incorrect.

Response

Projections of road transport emissions in Sydney show vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to improvements in emission control technology. These reductions occur despite increases in vehicle kilometres travelled.

The project has been designed to reduce surface road congestion hence emissions. There is an overall reduction in emissions from surface roads due to the project. There is an overall reduction in pollutant concentrations throughout the community due to the project, with small areas where there is an increase. These locations, and amount of change, are shown in Figure 8-69 to 8-71 in Appendix H of the EIS.

Issue description – lack of modelling on Dobroyd Parade

Submissions raised concerns about the lack of specific air quality modelling of the impacts of the additional traffic on Dobroyd Parade, caused by the Wattle Street tunnel portals and additional lanes, and the failure to address air pollution at traffic lights and intersections along Dobroyd Parade.

Response

The modelling domain included the roads described. The modelling also took into account the operation of the traffic on each road by time of day, including low-speed, 'stop-start' operation where this occurred. For ease of viewing, the contour plots do not show changes in air quality where the

changes are small. The lack of a visible change in concentration in this area (for example on Figure 8-63 of the EIS) reflects where the level of change is minor and is therefore not highlighted on the maps.

Issue description – EIS does not meet the SEARs

Submissions raised concerns that the EIS does not meet the Secretary's Environmental Assessment Requirements (SEARs) in a number of areas and particularly in regard to:

- The assessment needed to model a fuller range of traffic scenarios for the corridor, including possible "rat runs" used to avoid tolls and thus changing the air quality at those points
- The estimates of the "induced demand" in traffic modelling was too conservative
- Assessment of worst case scenarios for ambient air quality from induced traffic congestion at locations near tunnel entrance and exit portals was not considered, and
- Assessment of worst case scenarios for ambient air quality from traffic forecasts does not include a scenario for much higher traffic flows on the surface of Parramatta Road in 2021 and 2031 and beyond
- Only one "expected traffic scenario" has been considered for surface roads, this may not be representative of worst-case scenarios which may entail greater traffic volumes.

Response

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 modelling includes induced traffic demand arising from the implementation of the WestConnex project.

The modelling domain included locations near tunnel entrance and exit portals. The modelling also took into account the operation of the traffic on each road by time of day, including low-speed, 'stop-start' operation where this occurred.

The worst case for traffic is the do minimum option. Parramatta Road is essentially at capacity in 2015, and there is no plausible scenario that would lead to a significant increase in traffic along Parramatta Road.

Projections of road transport emissions in Sydney show vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to uptake of improved emission control technology. These reductions occur despite increases in vehicle kilometres travelled.

Figure 5.2 presents the predicted change in annual average $PM_{2.5}$ between 2014 and 2021 without the project – i.e. this is the improvement delivered by a cleaner fleet only. It includes population growth and urban renewal.

A hypothetical worst case where the M4 East delivers no relief along Parramatta Road (which is not a plausible scenario) would result in the improvement provided by a cleaner fleet. There is no plausible scenario that would lead to a worsening of air quality along Parramatta Road due to M4 East or for the complete WestConnex.

Issue description – benefits of the project

Submissions questioned the benefits of the project, in terms of some reduced pollutant concentrations at particular points (as shown on contour maps (Fig K-98, K-99, K- 100), depend on completion of Stage 3 of the project, which may not eventuate. If Stage 3 is not completed, the levels of $PM_{2.5}$ throughout many parts of Haberfield, Ashfield and Leichhardt will exceed current advisory and new standards.

Response

Projections of road transport emissions in Sydney show that vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to improvements in emission-control technology. These reductions are predicted to occur in spite of increases in vehicle kilometres travelled.

The NSW Government is committed to continuing to work with the Commonwealth to implement cleaner fuels and cleaner vehicles. 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 completion of M4-M5 Link project in 2023 is a commitment of the NSW Government and confirmed in the updated WestConnex Strategic Business Case released in November 2015 which is available at www.westconnex.com.au.

Issue description – ignores recommendations of the National Clean Air Act

This assessment appears to ignore some of the actions recommended in the new National Clean Air Act, including initiatives to reduce localised emissions.

Response

The EIS provides an assessment of air quality impacts and identifies potential management measures specific to the project and within the reasonable control of the project proponent.

The Air Quality Assessment Report (Appendix H of the EIS) was undertaken in accordance with the relevant requirements of the SEARs. The NSW Advisory Committee on Tunnel Air Quality – chaired by the NSW Chief Scientist and Engineer and including representatives from the NSW Environment Protection Authority, NSW Health, Roads and Maritime and NSW Department of Planning and Environment (DP&E) – was consulted during development of the air quality assessment methodology. The assessment was based on the 2021 and 2031 'do minimum' and 'do something' scenarios described in the EIS for the traffic assessment.

Issue description – standards on which the assessment is based

Assessment of the environmental and health impacts of the proposed motorway should be based on the strictest standards currently being considered by Australia's environment ministers, not on standards that are significantly less strict.

Response

The Ambient Air Quality Standards that are under consideration by Australia's environment ministers would be applicable to the National Environment Protection (Ambient Air Quality) Measure and the draft National Plan for Clean Air and National Clean Air Agreement. These standards would be used for the strategic management of background air quality and would not necessarily be adopted by each state or territory jurisdiction for project level assessment criteria. The air quality criteria used for the assessment of projects in NSW are determined by the NSW EPA and Department of Planning and Environment.

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.Issue description

Issue description – omission of short-term averaging periods

The AQIA has provided data only for the averaging times that are relevant for the regulatory assessment against air quality criteria. However, model predictions of short-term periods is required for the Human Health Risk Assessment (Human Health Risk Assessment) in this EIS. This omission seriously compromises both the AQIA and Human Health Risk Assessment in this report, both of which are critical to the overall validity (or lack thereof) of this entire EIS.

Response

The Air Quality Assessment Report generated data for all averaging periods required for the human health assessment, although only those results relevant for comparison to air quality criteria were presented in the report. The inputs to the Human Health Risk Assessment, including all required averaging periods, were provided directly to the Human Health consultant via data files, which have been provided to NSW Health for review.

Issue description

The air pollutant emission rates applied in the dispersion model appear to have been averaged across three time periods through each day. If this is correct, peak 1-hour average ground-level concentrations of air pollutants are likely to have been underestimated.

Response

Hourly varying emission rates were used for ventilation outlets.

Issue description

Insufficient information has been provided to enable a detailed review of the model inputs.

Response

Refer to the responses to the NSW Chief Scientist and Engineer (**section 4.12** of this report) for additional detail and sensitivity testing of model inputs.

Issue description – measurement and modelling of ultrafine particles

Submissions raised specific concerns regarding the assessment of $PM_{2.5}$ and ultrafine particles, stating that by assuming that the effects of ultrafine particles on health are adequately represented by those of $PM_{2.5}$ fails to recognise the difference in dispersal of ultrafine particles versus $PM_{2.5}$ and that the GRAL model did not include independent testing for $PM_{2.5.}$

This was stated to be because of time constraints; modelling should not be so rushed by the project's timeframe that data testing for $PM_{2.5}$ is not included. Additionally $PM_{2.5}$ testing should have been included because that it is known that finer particles (<=$PM_{2.5}$) can remain suspended in the air and be carried over large distances and have the potential to cause impacts in areas far from the source (Senate Standing Committee On Community Affairs Inquiry Into The impacts On Health Of Air Quality In Australia, NSW Environment Protection Authority Submission, September 2013, p13).

Submissions raised questions regarding the measurement and modelling of ultrafine particulates by concentration rather than number and specifically that air monitoring stations recording emissions from the WestConnex M4 stacks will use the same standards (as the M5E) and the effects of the smaller particles on health will remain hidden.

Response

In recent years a considerable amount of attention has focussed on 'ultrafine' particles (UFPs). These are particles with a diameter of less than 0.1µg. Whilst there is some evidence that particles in this size range are associated with adverse health effects, it is not currently practical to incorporate them into an environmental impact assessment. There are several reasons for this, including the rapid transformation of such particles in the atmosphere, the need to treat UFPs in terms of number rather than mass, the lack of robust emission factors, the lack of robust concentration-response functions, the lack of ambient background measurements, and the absence of air quality standards.

In relation to development of standards for UFPs, and health assessments for UFPs, the WHO Regional Office for Europe (2013) has stated the following:

> *'… the richest set of studies provides quantitative information for $PM_{2.5}$. For ultrafine particle numbers, no general risk functions have been published yet, and there are far fewer studies available. Therefore, at this time, a health impact assessment for ultrafine particles is not recommended.'*

'….Although there is considerable evidence that ultrafine particles can contribute to the health effects of PM, for ultrafine particles (measured by the number of particles) the data on concentration–effect functions are too scarce to evaluate and recommend an air quality guideline.'

There are a number of reasons why $PM_{2.5}$ was not included in the model evaluation exercise, but these do not relate to time constraints. Most importantly, it is very difficult to evaluate dispersion model performance for $PM_{2.5}$ near roads because the contribution of the road is small relative to the background. This difficulty is compounded by uncertainties in the measurements. $PM_{2.5}$ measurements are highly dependent on the instrument that is used. This is reflected in the historical trend in $PM_{2.5}$ at the OEH sites (see Figure F-17 of the AQIA – Appendix H of the EIS), where there has been an increase in concentration due to a change of instrument type. The changes due to instrument type are larger than the model increments in $PM_{2.5}$.

Issue description – lack of predictions in the EIS

Submissions object to the lack of predictions in the EIS in regard to air quality due to the ventilation outlets in isolation - rather than model averaging pollutant levels across a much wider area; specifically:

- Lack of definitive data being provided on the exact locations of the individual tunnel exhaust stacks, the anticipated volume of pollutants that will be exhausted from each individual stack, the anticipated impacts such pollutants.

Response

The locations and descriptions of the ventilation outlets for the tunnel are shown in Chapters 4 Project Development and Alternatives and 9 Air Quality of the EIS. The contributions of the ventilation outlets were presented in chapter 9 of the EIS with more detail in Appendix H.

Contour plots presenting the changes in air quality due to emissions from the ventilation outlets alone (ie not including changes in surface traffic) are provided below for the M4 East ventilation outlets. Results for 2031 cumulative (worst case) are shown in **Figure 5.4** (eastbound outlet) and **Figure 5.5** (westbound outlet). The contributions from the surface road network and the background are not included in these plots. **Figure 5.6** to **Figure 5.15** show annual mean NOx, maximum 24-hour mean PM_{10} and $PM_{2.5}$ and annual mean PM_{10} and $PM_{2.5}$, for both eastbound and westbound outlets.

The presentation of these contour plots is slightly different to those for the full GRAL M4 East domain. The latter were designed to show changes in air pollution across a wide area. The geographical area covered by each of these ventilation outlet plots (two kilometres by two kilometres grid) was much smaller than the full GRAL domain. This allowed more local detail, with isopleths and concentration values, to be shown more clearly in the maps.

The results presented for the 2031 cumulative scenario show that the contributions from the ventilation outlets are very low for all pollutants and are orders of magnitude below their relevant limits.

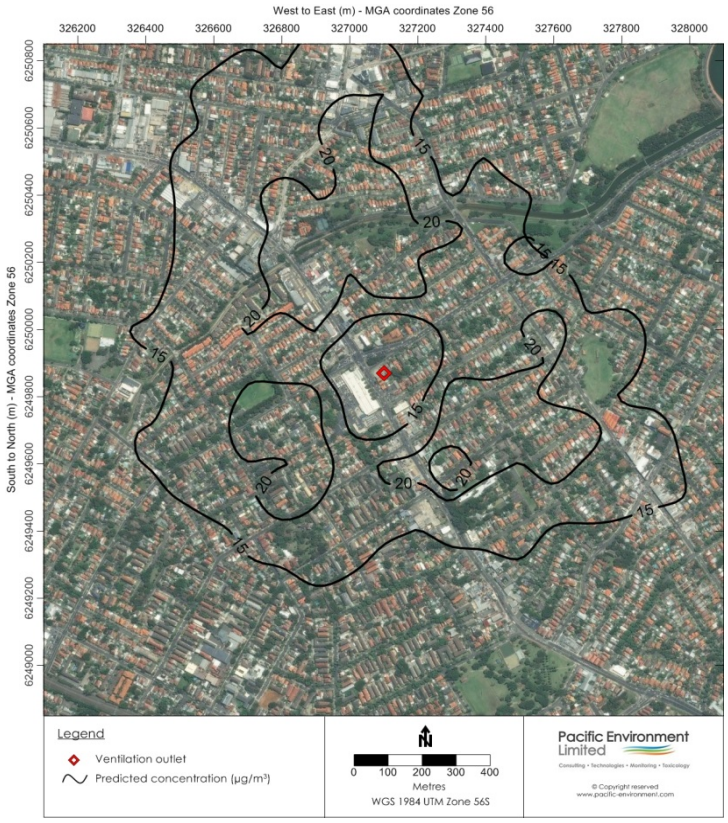

Figure 5.4 Contour plot showing maximum 1-hour mean NOx for ventilation outlets only (Eastbound outlet, 2031-DSC)

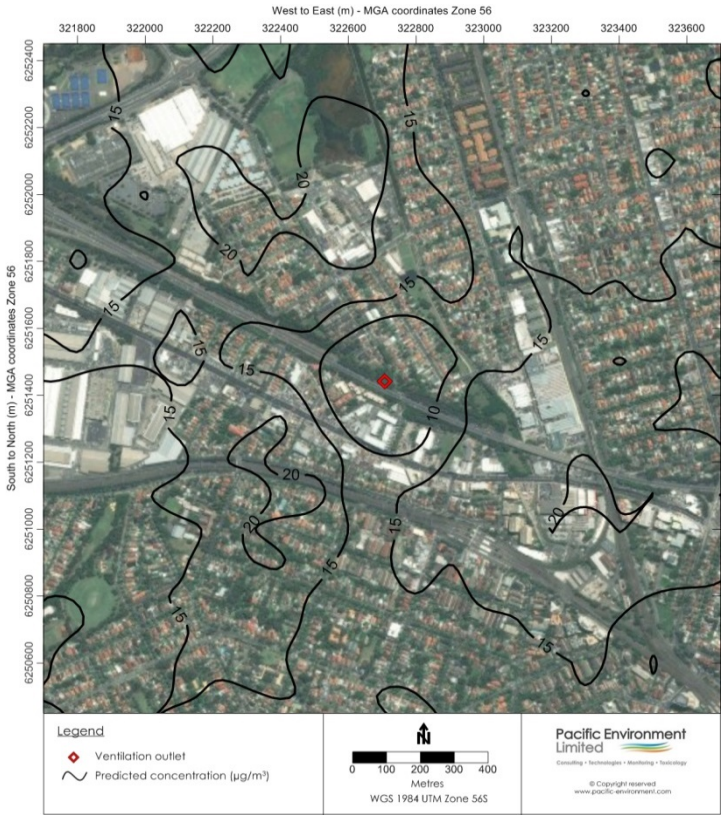

Figure 5.5 Contour plot showing maximum 1-hour mean NOx for ventilation outlets only (Westbound outlet, 2031-DSC)

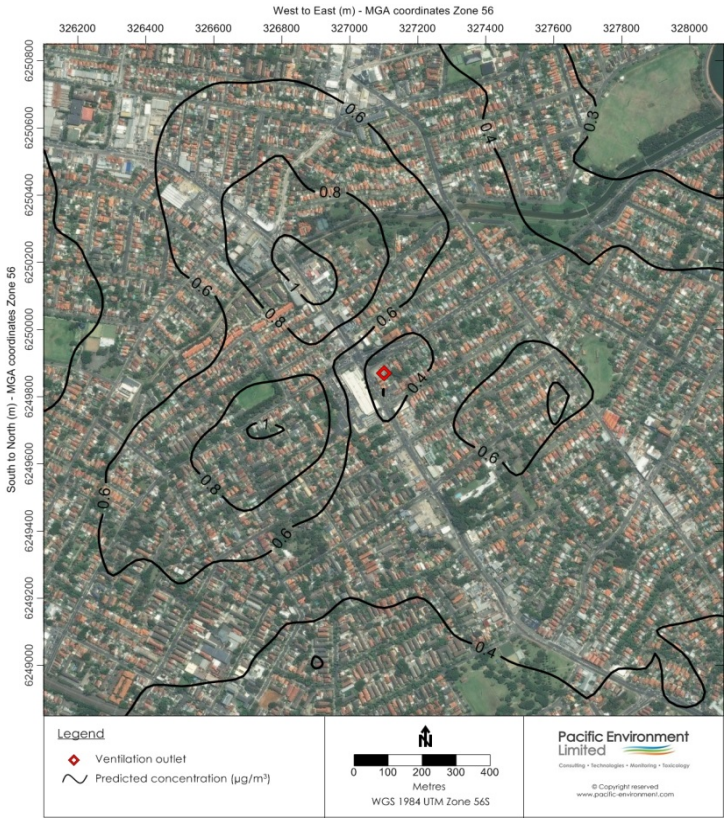

Figure 5.6 **Contour plot showing annual mean NOx for ventilation outlets only (Eastbound outlet, 2031-DSC)**

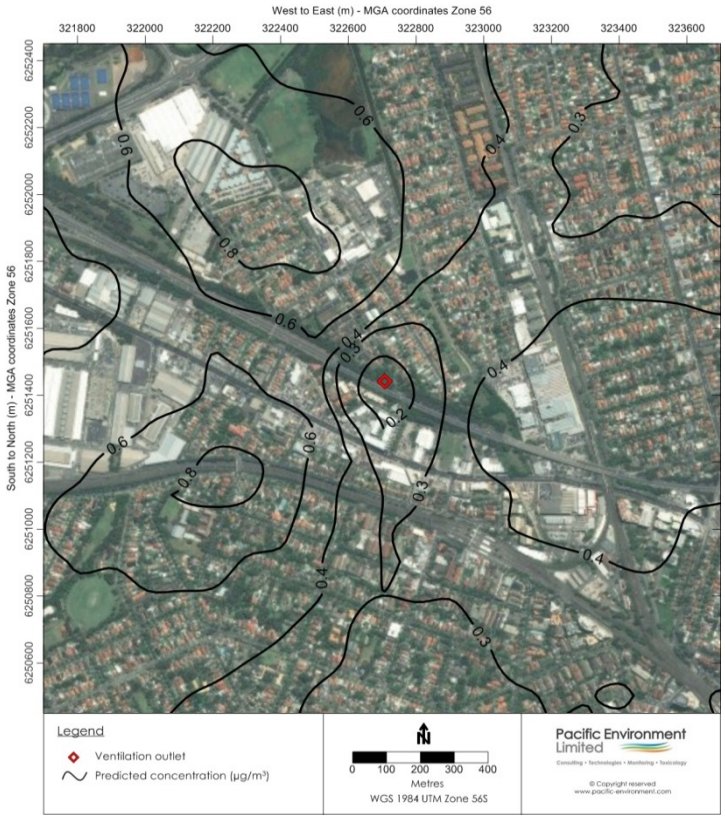

Figure 5.7 **Contour plot showing annual mean NOx for ventilation outlets only (Westbound outlet, 2031-DSC)**

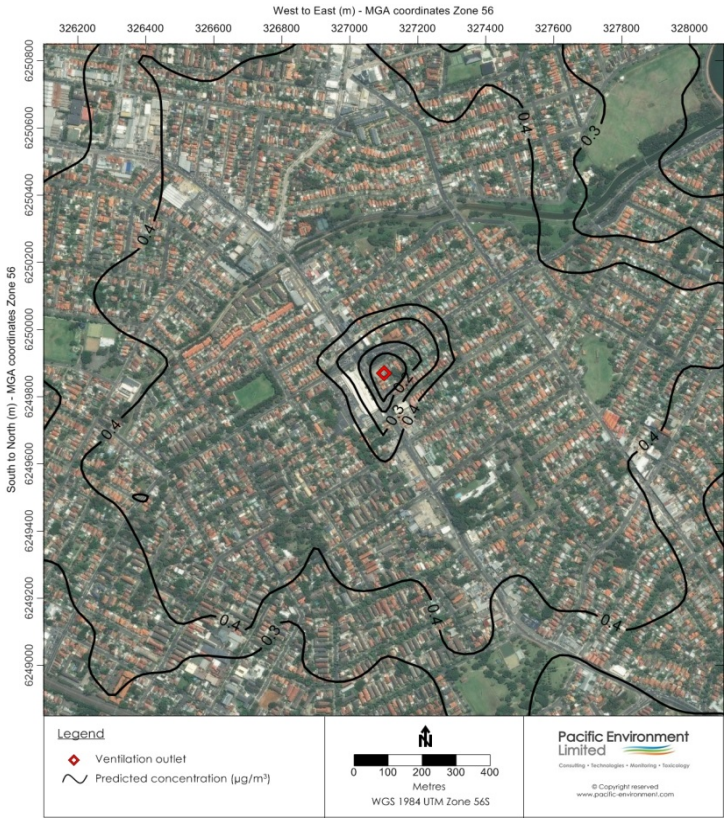

Figure 5.8 Contour plot showing maximum 24-hour mean PM10 for ventilation outlets only (Eastbound outlet, 2031-DSC)

Figure 5.9 Contour plot showing maximum 24-hour mean PM10 for ventilation outlets only (Westbound outlet, 2031-DSC)

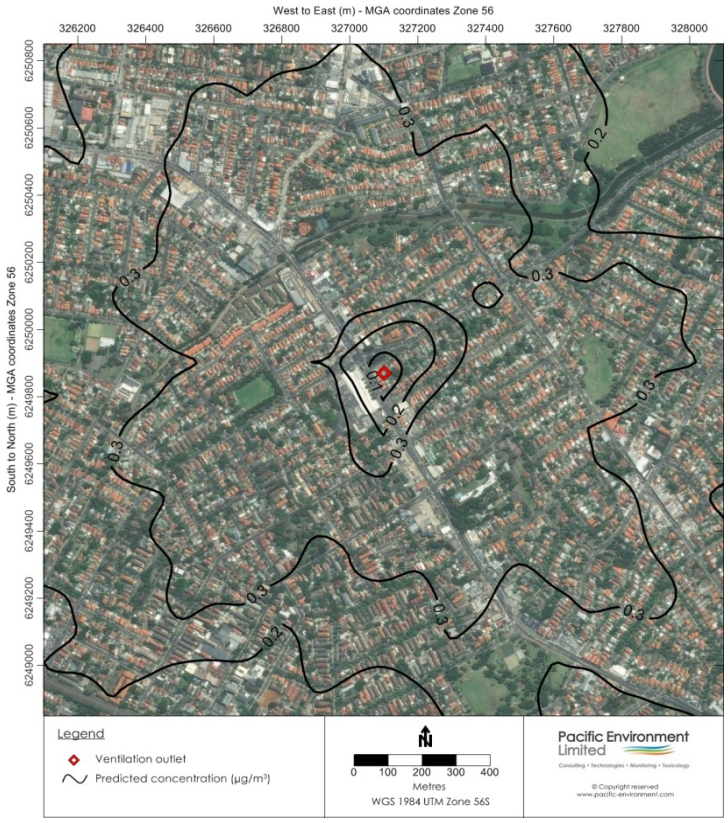

Figure 5.10 Contour plot showing maximum 24-hour mean PM2.5 for ventilation outlets only (Eastbound outlet, 2031-DSC)

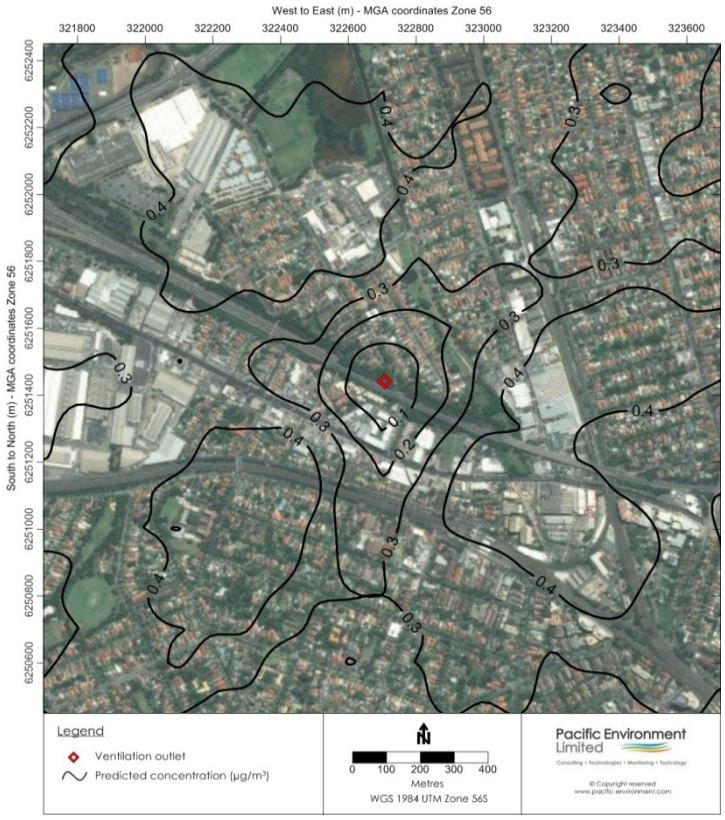

Figure 5.11 Contour plot showing maximum 24-hour mean PM2.5 for ventilation outlets only (Westbound outlet, 2031-DSC)

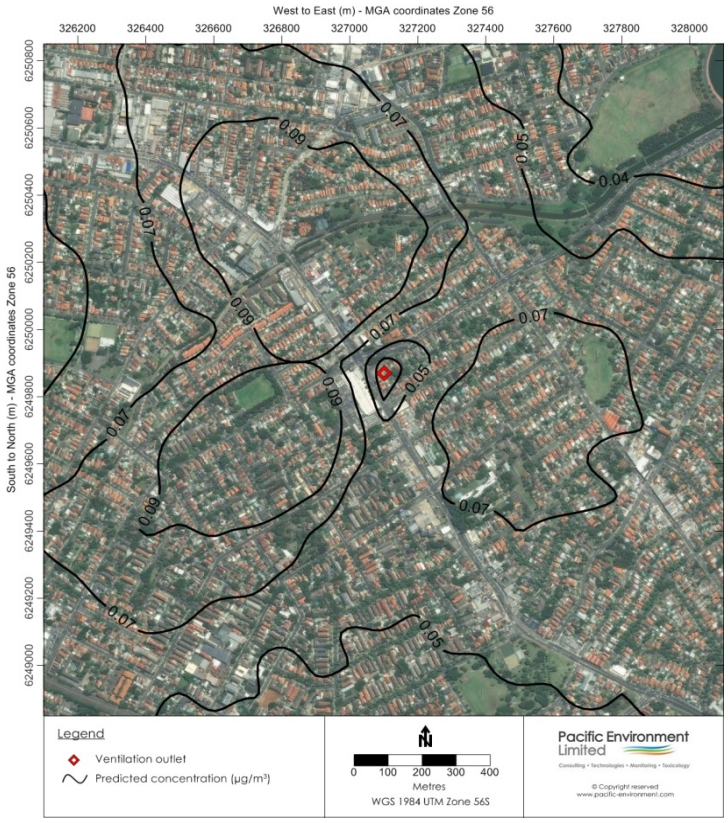

Figure 5.12 Contour plot showing annual mean PM10 for ventilation outlets only (Eastbound outlet, 2031-DSC)

Figure 5.13 Contour plot showing annual mean PM10 for ventilation outlets only (Westbound outlet, 2031-DSC)

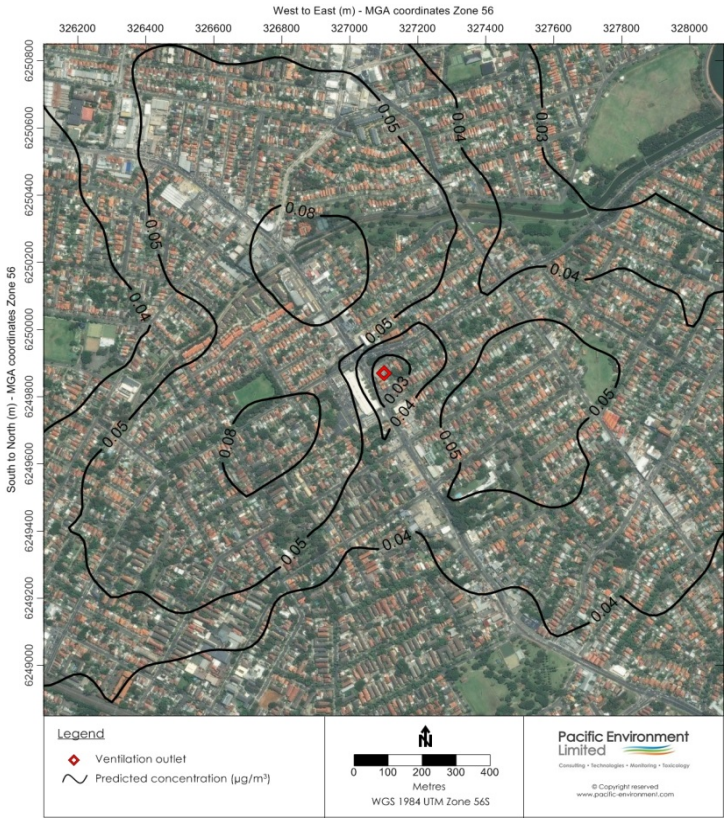

Figure 5.14 Contour plot showing annual mean PM2.5 for ventilation outlets only (Eastbound outlet, 2031-DSC)

Figure 5.15 Contour plot showing annual mean PM2.5 for ventilation outlets only (Westbound outlet, 2031-DSC)

Issue description

A submission raised concerns that the air quality modelling does not take into account changes in climate.

Response

The aim of the EIS, and the air quality modelling as part of this, is to provide a suitable understanding of the consequences of proceeding with the project or not. The air quality modelling and assessment focuses on a short time frame, for which a number of key variables were not available at the time of modelling. This is discussed in section 24.2.1 of the EIS, where it was determined that an 'internally consistent climate future' approach should be applied, and this approach has been followed for the air quality assessment.

Issue description – inappropriate use of Bureau of Meteorology data

Submissions raised concerns regarding the appropriateness of using the Bureau of Meteorology data from Canterbury Racecourse to model the atmospheric conditions for dispersion of the plume at Wattle Street at Haberfield; this may not be appropriate, given the location of the very large Parramatta River to the east of the stack and thus different terrain compared to Canterbury; more suitable local data should have been collected for such a major project.

Response

The selection of the meteorological station was based on multiple criteria, including: location relative to the project; adjacent land use and therefore representativeness of the wider study area, taking into account surface roughness factors; compliance with Australian Standards for siting; advice from data holders; analysis of consistency of changes in wind speeds and wind directions that would indicate whether the data provided a reliable trend; reliability and completeness of the data set. Based on this assessment, Canterbury Racecourse station was selected as providing the best available data.

The air quality report and associated Appendix H provide significant detail on the chosen meteorological dataset, as well as the other datasets that were analysed to support the site selection. Appendix H details all meteorological data included in the initial analysis (data from three OEH stations and five BoM stations) and provides reasons why these were not chosen for dispersion modelling.

The OEH Chullora and Rozelle sites showed inconsistencies in dominant wind direction through six years of data, and non-compliance with the Australian Standards for siting. Additional information regarding these sites was provided by OEH. An investigation of the data by OEH showed that differences in the dominant wind patterns at these sites were probably due to a variety of factors, including change in surroundings (i.e. new buildings and trees in the area surrounding the stations), sensor alignment issues and instrument replacements which occurred around the same time that the data analysis showed a shift in the dominant wind patterns (i.e. 2011/2012).

The data from the OEH monitoring station at Earlwood were not selected for modelling as they were not considered representative of the wider study area showing a low annual average wind speeds and high percentage of calms. Further analysis of the stability class data from this site showed an unusually high percentage of G stability class (very stable) and a low percentage of D class (neutral) conditions (see **Figure 5.16**). The Earlwood station is located in a valley surrounded by a densely populated residential area, which may explain the data from this site.

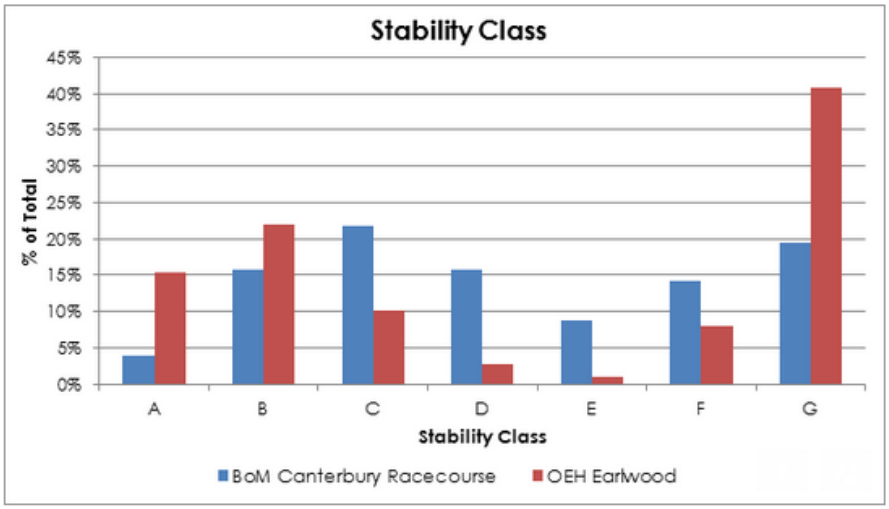

Figure 5.16 Stability class distributions for the BoM Canterbury Racecourse and OEH Earlwood sites

The BoM Sydney Airport and Fort Denison data were also analysed but not selected for modelling. The annual average wind speeds recorded at these sites were very high (monthly averages over the year are shown in **Figure 5.17**) and the percentage of calms was very low due to the topography surrounding these sites (e.g. large fetch open water). Although the data at these sites may be reliable, they were considered to only be representative of the specific locations, and not suitable for representing the wider M4 East study area.

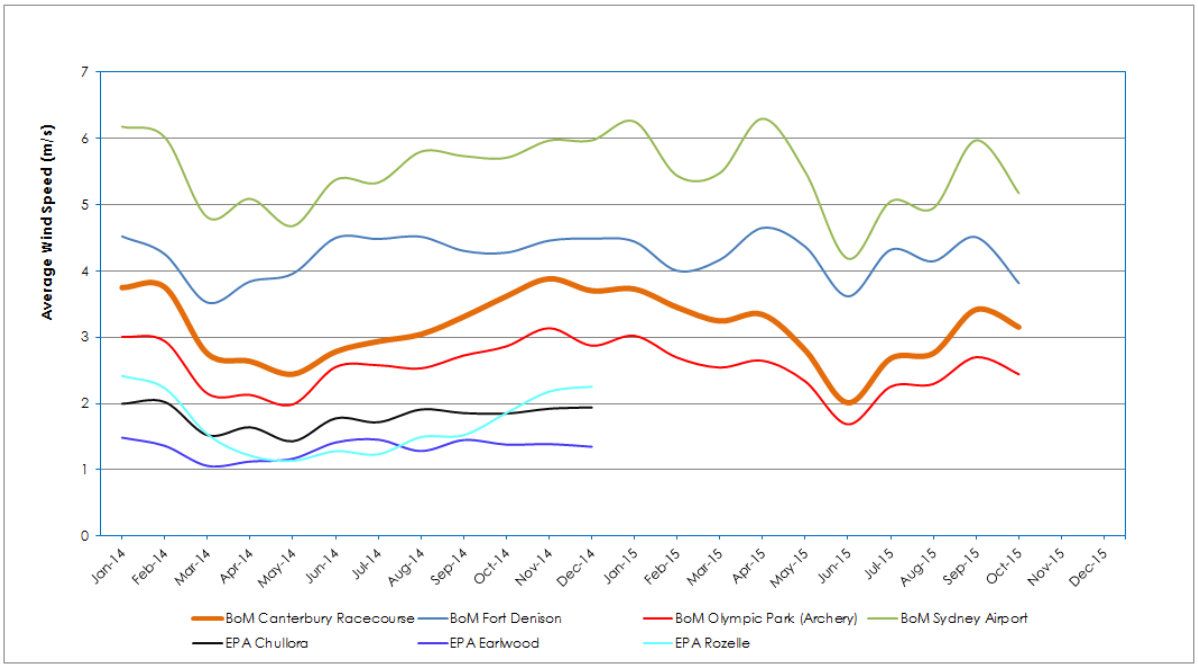

Figure 5.17 Monthly average wind speeds at BoM and OEH sites

The only other data potentially suitable for modelling were from the BoM Sydney Olympic Park (Archery Centre) site. However, data were only available for four years, as the site was commissioned in 2010. Due to this, and the fact that the BoM Canterbury Racecourse station is located more centrally to the entire WestConnex project area, the Canterbury Racecourse site was considered to be more appropriate. As shown in Figure B, the general wind patterns that are seen over the course of a year at other stations, are reflected in the Canterbury Racecourse data.

Issue description – concerns regarding lack of ability to predict impacts

Concerns were raised in submissions regarding the lack of acknowledgement of the uncertainties and limits to accurately predicting the future impacts of the project.

Specific concerns were raised in submission regarding the balance between conservative estimates and over-conservative estimates of key inputs in the air quality emissions and dispersion model used, the GRAL (Graz Lagangian).

Response

In response to comments regarding the performance of the GRAMM/GRAL model sensitivity testing was undertaken to determine the potential consequences of changes to the assumptions, data and calculations used in the AQIA Sensitivity testing is detailed in Section 8.8 of the AQIA, with additional sensitivity testing of the meteorological data detailed in **section 4.1.11** (Issue 1) and **4.1.13** (Issue 1) of this Submissions Report.

5.8.7 Operational ventilation system

1,614 submissions raised issues regarding the operational ventilation system.

Issue description – failure to filter the emissions from ventilation outlet

Submissions raised the concern that the failure to filter the emissions from the ventilation outlet is irresponsible, poses an unacceptable health risk and is not 'best practice". Submissions object to the lack of filtration in ventilation outlets given the location of outlets less than 500 metres from public schools, childcare centres and nursing homes in the west, south west and inner west suburbs on the WestConnex route. Specific issues raised are;

Filtration should be provided regardless of cost, in particular for the most dangerous element ($PM_{2.5}$), because a filter that, for example, reduces pollution by 5% is considered valuable if it is your children that are affected.

Response

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment is in the Air Quality Assessment Report (Volume 2B Appendix H, Section 10.2.2). This 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. 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 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 – specific local impacts of ventilation outlets

Submissions raised concerns regarding the specific local impacts of ventilation outlets in the impacts on Haberfield which would be severe and cannot be reasonably mitigated. Submissions requested that the height of the ventilation outlets should be increased and the change in pollution levels be assessed as pollutants would be dispersed more widely.

Response

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 Appendix H of the EIS.

Sensitivity tests were carried out for both the western and eastern ventilation outlets, using heights 5 metres above and below the height used in the assessment, and the results are presented in Table 8-30 of Appendix H of the EIS. The lower outlets resulted in concentrations that were around 1.5 times greater, on average, than the higher outlet. The heights of the ventilation outlets as assessed, are effective in dispersing pollutants, balanced with the impact on visual amenity if the outlet heights were increased

Issue description – decrease in air quality in close proximity to portals

Submissions raised concerns about a decrease in the air quality in close proximity to the tunnel portals as air is forced out with the traffic. There is concern over the air quality of the air emitted from the Wattle Street tunnel portal in particular due to queuing of traffic.

Response

The project is designed to draw fresh air in through the portals, rather than allow air to be forced out. The design incorporates jet fans to provide air flow against the direction of traffic flow where required, this is illustrated in Figure 5.23 of the EIS which provides an indicative tunnel ventilation system, as described in Section 5.6.

The exception to this will be a fire inside the tunnel close to the portal where smoke could be forced from the portal to protect people inside the tunnel.

Issue description – objection to the use of ventilation outlets

Submissions objected to the use of ventilation outlets stating that overseas practices are much more advanced in mitigating the impacts on surrounding residents for example the Channel Tunnel and Mont Blanc Tunnel don't have stacks and asked why the tunnel will not be built without a ventilation outlet.

Response

- The venting of emissions from the exit portals of road tunnels is the usual practice for tunnels around the world including in several cities such as Stockholm, Oslo, Vienna, Madrid and Hong Kong. Elevated ventilation outlets are used in some cases in urban tunnels longer than around two kilometres to ensure that both in-tunnel and outdoor air quality criteria are met (ACTAQ TP06).
- Improvements in vehicle emissions over the last few decades have meant that the need for elevated ventilation outlets is reduced and some jurisdictions, such as Switzerland, the Netherlands and Hong Kong have removed them from their recent designs or use them only for fire emergencies. However, these tunnels use portal emissions to ventilate the tunnel.
- A key operating requirement for NSW tunnels is the avoidance of portal emissions. This means that all tunnel air must be expelled from elevated ventilation outlets.
- Note that the Channel Tunnel is an electrified rail tunnel and so the ventilation system is not comparable with a road tunnel. The Mont Blanc tunnel, like many other rural European tunnels, is deep under a mountain, 2,480 metres under the surface at its deepest point. The provision of ventilation outlets is not practical for Mont Blanc.

Issue description – concerns regarding how far pollutants will be dispersed

Submissions raised concerns regarding how far pollutants will be dispersed from the outlets and the potential impacts are expected. Concerns were raised that elements such as seasons, climate, different plumes, and wind flows were not all addressed in the assessment and that secondary pollutants of oxidants would be produced in photochemical reactions.

Response

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 AQIA, and Appendix H of the AQIA reviews the sensitivity of the model to these inputs, and hence the significance of the meteorology in determining impacts.

Contour plots indicating dispersal of pollutants from the western and eastern ventilation outlets are shown in **Figure 5.4** and **Figure 5.5.**

Issue description – concern regarding the western ventilation stack

Submission raised concern that the western ventilation stack is to take the overflow from the eastern ventilation outlet.

Response

The western ventilation outlet is designed to only vent the airflow from the westbound tunnel and the eastern ventilation outlet is designed to vent only the airflow from the eastbound tunnel. There is a separate tunnel for each direction of traffic flow and there is no air flow connection between.

Issue description – lack of detailed design of the ventilation outlet

Submissions object to the lack of detailed design of the ventilation outlet with no height or orientation to be able to comment appropriately on the actual visual impacts. Submissions stated that the project would have localised negative impacts caused by ventilation stacks along the route of the project.

Response

The ventilation outlets are described in Chapter 5 of the EIS, see Figures 5.21 and 22 and Table 5.3. There are only two ventilation outlets, one at each end of the project and the air quality assessment has shown that the contribution to air change in levels of air pollution from these outlets is very low as shown in Chapter 9 and, for example, Figure 8-57 in Appendix H.

Issue description – additional air quality control methods within the design

Submissions state that there should be appropriate capacity within the ventilation design to ensure that additional air quality control methods can be incorporated should any future additional methods be required.

Response

The tunnel ventilation system will be designed with high levels of conservatism and redundancy to ensure compliance with air quality goals and limits.

5.8.8 In-tunnel air quality

265 submissions raised issues regarding the in-tunnel air quality.

Issue description – in-tunnel pollution not included in the EIS

Submissions objected that the EIS does not mention in-tunnel pollution and that details of the levels of in-tunnel pollutants, in particular $PM_{2.5}$ and $PM_{0.5}$ are not included in this EIS.

Response

$PM_{2.5}$ from both exhaust and non-exhaust sources were modelled for the assessment of in-tunnel air quality as described in Section 9.2.1 and Appendix L to the Air QualityAssessment (Appendix H of the EIS).

Issue description – use of smoky vehicle surveillance cameras

Submissions raised concerns that the background levels of $PM_{2.5}$ are high and that smoky vehicle surveillance cameras should be placed in the tunnel.

Response

The tunnels would include a smoky vehicle detection system.

Issue description – EIS does not meet the SEARs

Submissions raised concerns that the EIS does not meet the SEARS because the justification for in-tunnel air quality control measures, including filtration should have been provided to support the proposed measures, yet two of the most recent tunnels built overseas, the Madrid M30 Ring Road and the Hong Kong Wanchai tunnel (both utilising air purification systems in their design) are not seen as best practice for the WestConnex project with no justification given.

There is concern that the finalised plans for the filtration system will not be adequate for in tunnel air quality and that it is unsatisfactory.

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 will be designed with high 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 will be effective in ensuring compliance with the in-tunnel air quality criteria. 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 10.2.2 of the Air Quality Assessment Report (Appendix H of the EIS).

Issue description – addition of extra outlets

Submission raised concerns that the suggestion of adding extra outlets has not been implemented.

Response

Additional outlets are not required to ensure compliance with air quality criteria. Additional outlets would increase the amount of energy used for the project with little or no benefit.

Issue description – congestion will back up into the tunnel

Concerns were raised in submissions that traffic congestion on Dobroyd Parade and the City West Link will back up into the tunnel, resulting in less air movement and worse air pollution in the tunnel.

Response

Traffic management plans would be developed in consultation with the Transport Management Centre from which the traffic signalling system and major incidents on Sydney's roads are managed. Implementation of traffic control measures to ensure that no traffic is backed up in the tunnels would be coordinated between the M4 East Motorway Control Centre and the Transport Management Centre.

In addition to these preventative measures, the ventilation system has been designed to comply with air pollution limits for in-tunnel and outlets under all traffic cases. Congested traffic with speeds of 20km/hr is reported as the 'capacity traffic' scenario in Table 8-9 of the Air Quality Assessment Report and has been assessed in detail in the Ventilation Report, which is Appendix L of Appendix H. The 'regulatory worst-case' (Section 8.5 of the Air Quality Assessment Report) also assesses the consequences for the broader community, should ventilation outlets operate at these levels.

5.8.9 Impacts due to operation of ventilation facilities

71 submissions raised issues regarding impacts associated with the operation of ventilation outlets without mentioning any specific facility.

Issue description – location of ventilation outlets

Submissions objected to the location of ventilation outlets near schools, childcare centres and homes.

Response

Analysis of the ventilation outlet contribution, 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 Air Quality Assessment Report in Appendix H of the EIS.

Sensitive receptors such as schools, child care centres and hospitals are defined as 'community receptors and were subject to detailed assessment in both the air quality assessment (Chapter 9 and Appendix H) and the Human Health Risk Assessment (Chapter 11).

Issue description – use of emergency ventilation facility

Submissions requested details of when the emergency ventilation facility will be used.

Response

Detailed emergency management plans will be prepared and agreed with the tunnel operator and emergency services prior to tunnel opening. These plans will detail operational protocols for traffic management and emergency systems.

In general terms, the ventilation system will have the capacity to manage in-tunnel and ambient air quality for almost all conceivable emergency scenarios. The exception is in the case of a fire where the safety of in-tunnel occupants will be the priority and smoke may in some cases need to be emitted from the tunnel at the tunnel portals or from the emergency ventilation facility at Cintra Park.

5.8.10 Impacts due to operation of the western ventilation facility

Seven submissions raised concerns regarding impacts due to operation of the western ventilation facility.

Issue description – construction of an unfiltered ventilation outlet

Submissions object to the construction of an unfiltered ventilation outlet being constructed near Underwood Rd at Homebush due to health concerns regarding potential air pollution.

Response

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment is in the Air Quality Assessment Report (Volume 2B Appendix H, Section 10.2.2). This determined that there was no beneficial impact on ambient air quality by implementing tunnel air filtration. 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 (e.g. Figures 8-35 and 8-51 of the Air Quality Assessment Report 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, ie vehicle emissions controls, is significantly more effective in improving local and regional air quality (ACTAQ 2014 TP08, NHMRC 2008).

5.8.11 Impact due to operation of the eastern ventilation facility

99 submissions raised regarding impacts due to operation of the eastern ventilation facility.

Issue description – location of eastern ventilation facility

Submissions object to the positioning of the eastern ventilation facility in the vicinity of sensitive receivers including Haberfield Public School, child care centres, aged care facilities, residences and people at the Juvenile Justice Centre, and request evidence that the ventilation outlet will not impact upon these sensitive receivers.

Response

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment is in the Air Quality Assessment Report (Volume 2B Appendix H, Section 10.2.2). This determined that there was no beneficial impact on ambient air quality by implementing tunnel air filtration. 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 Air Quality Assessment Report at Appendix H of the EIS.

Sensitive receptors such as schools, child care centres and hospitals are defined as 'community receptors and were subject to detailed assessment in both the air quality assessment (Chapter 9 and Appendix H) and the Human Health Risk Assessment (Chapter 11). Figure 6-3 and Figure 6-5 of the Human Health Risk Assessment (Appendix J of the EIS) show the assessed health impacts for these community receptors.

Issue description – location of ventilation outlets

Submissions request that the ventilation outlets should be filtered and relocated away from nearby school and childcare centre, and asked why an alternate site was not selected, such as the south-west corner of the Parramatta Rd/West link intersection or Bunnings and the industrial site in its surrounds.

Response

The air quality assessment (Chapter 9 and Appendix H) demonstrates that the ventilation outlets will disperse emissions effectively with negligible impact on local and regional air quality.

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 (e.g**.** Figures 8-35 and 8-51 of the Air Quality Assessment Repot (Appendix H of the EIS)). Removal of this component would result in no material change in air quality in the surrounding community.

A number of siting options for the ventilation outlet were considered. The selection process for the number and location of outlet facilities is detailed in section 4.5.2 of the EIS.

Issue description – health impacts of the eastern ventilation outlet

Submissions from residents of Haberfield, in particular from Walker Avenue, Wattle and Ramsay Streets, express concern about the impacts of the eastern ventilation outlet and the potential air quality impacts on the health of children at Haberfield Public School and The Infants' Home and local residents.

Response

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment is in the Air Quality Assessment Report (EIS Volume 2B Appendix H, Section 10.2.2). This determined that there was no beneficial impact on ambient air quality by implementing tunnel air filtration. 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 Appendix H of the EIS.

Sensitive receptors such as schools, child care centres and hospitals are defined as 'community receptors' and were subject to detailed assessment in both the Air Quality Assessment (Chapter 9 and Appendix H) and the Human Health Risk Assessment (Chapter 11).

Issue description – public exhibition of the ventilation outlet design

Submissions asked when the overall design of the ventilation outlet will be placed on public exhibition for the community to review and comment on its features, design, and overall impact on the suburb of Haberfield and its surrounding.

Response

The design of the ventilation outlet was described in Appendix L – Urban Design and Visual Impact Assessment, of the EIS which was exhibited as part of the EIS. The period of exhibition was from 9 September to 2 November 2015. Any refinements required to address management measures or Conditions of Approval would be undertaken during detailed design.

Issue description – consideration of the impacts of the eastern ventilation outlet

Submissions raised specific concerns regarding the impacts of the eastern ventilation outlet on Haberfield Public School and requested that consideration should be given to increasing the height of the stack and requested that air condition with particulate filters be installed at Haberfield Public School.

Response

The height of the ventilation outlet has been assessed as providing an appropriate balance between effective dispersion and visual impact of a higher outlet. Sensitivity tests were carried out for both the western and eastern ventilation outlets, using heights 5 metres above and below the heights used in the assessment, and the results are presented in Table 8-30 of the Air Quality Assessment Report (Appendix H of the EIS). The lower outlets resulted in concentrations that were around 1.5 times greater, on average, than the higher outlet. 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.

The results of the air quality modelling show that there would be minimal but positive change in air quality at Haberfield Public School. The analysis of health impacts for community receptors, that is, sensitive receptors, are detailed in the Human Health Risk Assessment and in particular are shown in Figures 6-3 and 6-5 of the Human Health Risk Assessment. In particular, this shows improved health outcomes for Haberfield Public School.

Issue description – height of the eastern ventilation outlet (C8)

Submissions requested an explanation as to why the height of the ventilation outlet at Haberfield will be only 25 metres instead of 30.5 metres stating that the proposed location for the outlet is not at the highest point in the area, so it's unclear why this location was selected. Submissions stated that the height of the ventilation stack to reduce the impact of emissions on the local area and increases the likelihood that emissions will be dispersed more widely.

Response

The location of the outlet is largely determined by the engineering design of the underground components of the ventilation system, including its connections to the relevant tunnel and proximity to portals. The height is then adjusted according to the ground level. As identified in Table 8-16 of the Air Quality Assessment Report (Appendix H of the EIS), the eastern ventilation facility (comprising both the M4 East and M4-M5 Link outlets) is 25 metres in height. This height is above ground level (maximum height at RL 42 metres Australian height datum), as detailed in Table 5.3 in Chapter 5 of the EIS.

Sensitivity tests were carried out for both the western and eastern ventilation outlets, using heights 5 metres above and below the heights used in the assessment, and the results are presented in Table 8-30 of Air Quality Assessment Report (Appendix H of the EIS). The lower outlets resulted in concentrations that were around 1.5 times greater, on average, than the higher outlet.

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.

Issue description – inadequate impact assessment of the eastern ventilation outlet

Submissions raised concerns that the air quality impacts of the eastern ventilation outlet have not been adequately addressed in the EIS. The impacts of Stage 1 of WestConnex on the concentrations of NO_2, CO and PM_{10} have been mapped however specific attention needs to be given to the ventilation facilities. The EIS needs to illustrate how properties immediately adjacent to the eastern ventilation facility will not have as severe air quality impacts as properties at a further distance. This is due to the height of the ventilation outlets causing further dispersal of the tunnel exhaust fumes.

Response

Contour plots presenting the changes in air quality due to emissions from the ventilation outlets alone (ie not including changes in surface traffic) are produced above for the M4 East ventilation outlets. Results for 2031 cumulative (worst case) are shown in **Figure 5.4** (eastbound outlet) and **Figure 5.5** (westbound outlet). The contributions from the surface road network and the background are not included in these plots. **Figure 5.6** to **Figure 5.15** show annual mean NOx, maximum 24-hour mean PM_{10} and $PM_{2.5}$ and annual mean PM_{10} and $PM_{2.5}$, for both eastbound and westbound outlets.

The presentation of these contour plots is slightly different to those for the full GRAL M4 East domain. The latter were designed to show changes in air pollution across a wide area. The geographical area covered by each of these ventilation outlet plots (two kilometres by two kilometres grid) was much smaller than the full GRAL domain. This allowed more local detail, with isopleths and concentration values, to be shown more clearly in the maps.

The results presented for the 2031 cumulative scenario show that the contributions from the ventilation outlets are very low for all pollutants and are orders of magnitude below their relevant criteria.

Issue description – impact of wind patterns on dispersal of air toxins

Submissions object that the impacts of wind patterns on the dispersal of air toxins has not been adequately illustrated in the EIS. Specifically the impacts from prevailing winds (as illustrated in wind roses such as those provided in Figures H1 to H-18 in Appendix H) on the Eastern Ventilation stacks must be illustrated and addressed. Additional concerns were raised regarding the impact of the ventilation facility on Haberfield Public School in some weather conditions.

Response

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 AQIA, and Appendix H of the AQIA reviews the sensitivity of the model to these inputs, and hence the significance of the meteorology in determining impacts. Contour plots indicating dispersal of pollutants from the western and eastern ventilation outlets are shown in **Figure 5.4** and **Figure 5.5**.

Issue description – vegetative screening for properties

Concerns were raised in submissions that the design does not provide any screening (ie vegetation) for air pollution for properties located on Wattle Street to the north of Ash Lane. South of Ash Lane screening is provided.

Response

The need and provision for landscaping and visual screening of properties is discussed in **sections 5.13.4** and **5.13.5**. The relatively small amount of vegetation that could be provided in any landscaping opportunity in this location would not provide a measurable reduction in air pollution.

5.8.12 Impacts due to operation of other tunnel support facilities

Two submissions raised issues regarding the impacts on the operation of other tunnel support facilities.

Issue description – pollution from the air supply facility

Submissions raised concerns about air pollution from the air supply facility and how the release of toxic exhaust fumes would be managed.

Response

The air supply facility would only be used to draw clean air into the tunnels. On the rare occasion when a fire in the tunnel occurs, the direction of the fans would be reversed so that this facility would draw the smoke out of the tunnel. As with any fire, Fire and Rescue NSW would assess the risk to the local community and advise if any management measure, including evacuation, would be necessary.

5.8.13 Air quality improvement along Parramatta Road during operation of the project

298 submissions raised issues on the air quality improvement along Parramatta Road during operation of the project.

Issue description – WestConnex will not improve air quality

Submissions reject claims in the EIS that air quality along Parramatta Road would improve as a result of a reduction in vehicles, because cars will continue to use the corridor as it becomes a more appealing travel option once some vehicles begin using the tunnels. As the east-west traffic is projected to increase by 53% by 2031 across this part of Sydney there is concern that the claim that WestConnex will result in less pollution due to free-flowing traffic is false.

Other submissions state that the claims that WestConnex will benefit air quality via more free flowing traffic is unsubstantiated, particularly considering that traffic at Parramatta Rd is likely to come to a standstill as a result of induced traffic which is more likely to negatively impact air quality.

Response

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 modelling includes induced traffic demand arising from the implementation of the WestConnex project.

Expected traffic scenarios included in the operational air quality assessment were summarised in Table 5-2 of the Air Quality Assessment Report (Appendix H of the EIS). The worst case for traffic is the 'Do Minimum' scenario. Parramatta Road is essentially at capacity, and there is no plausible scenario that would lead to a significant increase in traffic along Parramatta Road. Projections of road transport emissions in Sydney show that vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to improvements in emission-control technology. These reductions in emissions are predicted to occur in spite of an increase in vehicle kilometres travelled.

Figure 5.18 below presents the predicted change in annual average $PM_{2.5}$ between 2014 and 2021 without the project – ie this is the improvement delivered by a cleaner fleet only. The traffic projections on which these predictions are based include the effects of population growth and urban renewal.

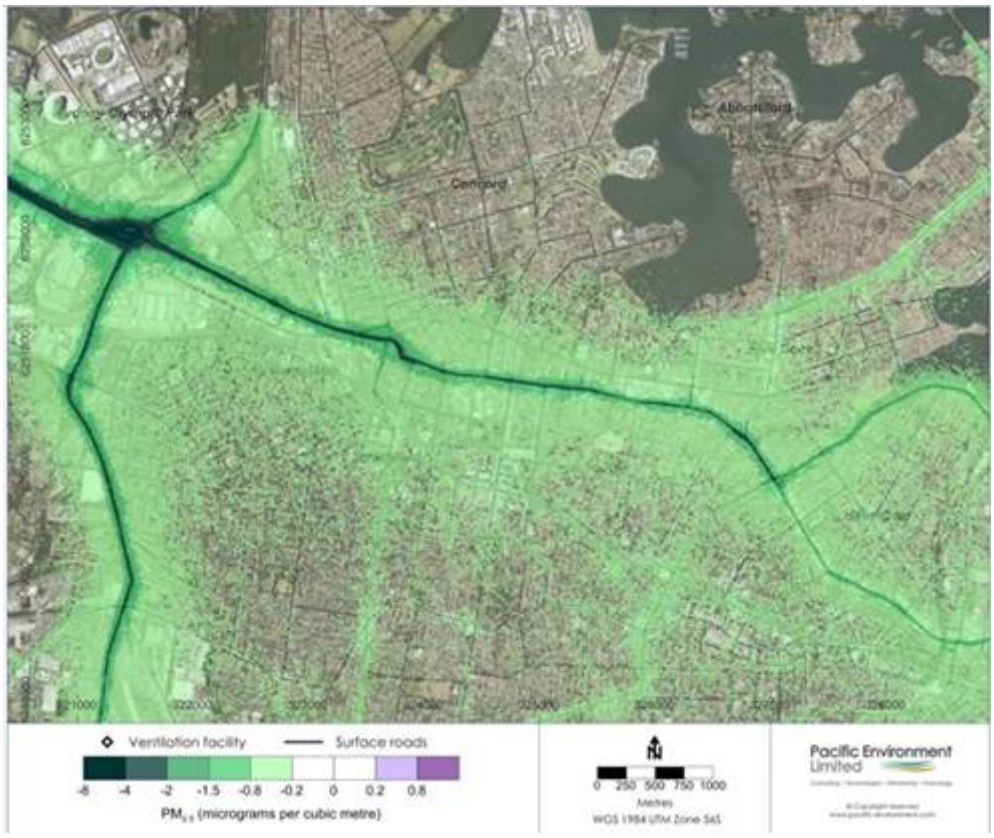

Figure 5.18 Contour map for change in annual mean $PM_{2.5}$ (2021-DM minus 2014)

5.8.14 Odour impacts during operation

Two submissions raised issues on the odour impacts during operation.

Issue description – odour impacts

One submission raised concern that the operation of the proposed water treatment plant and settlement ponds will have negative odour impacts upon the residents of Taylor Street, Canada Bay.

Response

During construction the settlement pond would be located near the canal not near the residences. The ponds are designed to capture water to allow for treatment of suspended solids prior to water entering the stormwater system. The basins must be emptied regularly to ensure that capacity is maintained in the case of a large rain event or spill in the tunnel. As such the basins will not be left for the water to become stagnant, thereby preventing odour.

5.8.15 Impacts due to operation of surface roads

959 submissions raised issues regarding the impacts on the surface roads due to operation.

Issue description – inaccurate claim that air pollution will be reduced

Submissions claim that the assumption in the EIS that traffic will be more free-flowing as a result of the project and therefore reduce air pollution is inaccurate.

Response

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 modelling includes induced traffic demand arising from the implementation of the WestConnex project.

Expected traffic scenarios included in the operational air quality assessment were summarised in Table 5-2 of the AQIA. The worst case for traffic is the 'Do Minimum' scenario. Parramatta Road is essentially at capacity, and there is no plausible scenario that would lead to a significant increase in traffic along Parramatta Road. Projections of road transport emissions in Sydney show that vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to improvements in emission-control technology. These reductions in emissions are predicted to occur in spite of an increase in vehicle kilometres travelled.

Figure 5.18 presents the predicted change in annual average $PM_{2.5}$ between 2014 and 2021 without the project – ie this is the improvement delivered by a cleaner fleet only. The traffic projections on which these predictions are based include the effects of population growth and urban renewal.

Issue description – increase in air pollution

Submissions raised concerns that there will be increased air pollution from increased traffic on both major roads such as Parramatta and Victoria Roads, and re-direction of traffic to new areas, including 'rat runs' through local streets. In addition concerns were raised in submissions regarding the build-up of air pollution at surface road intersections in particular the stop sign at the intersection of Julia and Bland Streets.

Response

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 modelling includes induced traffic demand arising from the implementation of the WestConnex project.

Expected traffic scenarios included in the operational air quality assessment were summarised in Table 5-2 of the AQIA. The worst case for traffic is the 'Do Minimum' scenario. Parramatta Road is essentially at capacity, and there is no plausible scenario that would lead to a significant increase in traffic along Parramatta Road. Projections of road transport emissions in Sydney show that vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to improvements in emission-control technology. These reductions in emissions are predicted to occur in spite of an increase in vehicle kilometres travelled.

Figure 5.18 presents the predicted change in annual average $PM_{2.5}$ between 2014 and 2021 without the project.

Issue description

Submissions raised concerns about local impacts of increased traffic on local roads, such as:

- Increased traffic on Waratah St near Dobroyd Point Public School will put children in danger from pollution
- Mitigation of increased pollution at 24 Walker Avenue from the widening of Wattle Street.

Response

The Air Quality Assessment Report (Appendix H of the EIS) presents plots of the predicted changes in various pollutants for each stage of the project, including these sites:

- Dobroyd Point Public School has been identified as a community receptor (SR23), and has had targeted air quality modelling and Human Health Risk Assessment undertaken. The results are shown Figure 8-24 – 8-34 of the Air Quality Assessment Report, and then in Figure 6.3 and Figure 6.5 of the Human Health Risk Assessment (Appendix M of the EIS). Where increases in health risk occur, they remain within the tolerable/acceptable risk level. Further information relating to Dobroyd Point Public School is provided in **section 6.5.8.**
- The property identified at Walker Ave has not been identified as a sensitive receptor. Visual inspection of the contour plots in the AQIA for 1-hour NO2, annual mean PM_{10}, 24-hour average PM_{10}, annual mean $PM_{2.5}$, and maximum 24-hour average $PM_{2.5}$ show either an improvement, or insufficient change to be highlighted on the maps. The Human Health Assessment considered the potential health impacts associated with changes in air quality (specifically nitrogen dioxide and particulates) at over 10,000 locations within the local community (including 24 Walker Ave) and concluded they are low and essentially negligible. Therefore, there are no air quality impacts requiring mitigation.

Issue description – increased congestion at the Concord Road interchange

Submissions raised concerns regarding the significant potential for increased congestion and regular gridlock at the Concord Road interchange, impacting local air quality.

Response

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 modelling includes induced traffic demand arising from the implementation of the WestConnex project.

The air quality modelling then builds on the traffic modelling. As the traffic modelling recognises induced demand and changes to congestion, this is then reflected in the air quality modelling and Human Health Risk Assessment.

The expected traffic scenarios included in the operational air quality assessment were summarised in Table 5-2 of the Air Quality Assessment Report (Appendix H of the EIS). The worst case for traffic is the 'Do Minimum' scenario. In this scenario Parramatta Road is essentially at capacity. Projections of road transport emissions in Sydney show that vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to improvements in emission-control technology. These reductions in emissions are predicted to occur in spite of an increase in vehicle kilometres travelled.

The modelling domain included the roads described. The modelling also took into account the operation of the traffic on each road by time of day, including low-speed, 'stop-start' operation where this occurred. For ease of viewing, the contour plots do not show changes in air quality where the changes are small. The lack of a visible change in concentration in this area (for example on Figure 8-63 of the EIS) reflects where the level of change is minor and is therefore not highlighted on the maps.

Issue description – EIS does not meet the SEARs

Submissions state that the EIS does not meet the Secretary's Environmental Assessment Requirements (SEARs) because air quality data collected at 31 locations indicate that the changes in air quality component $PM_{2.5}$ to be above the current standard (average 24-hour of 25µg/m^3). The project will not improve readings at most sites by 2021 and 2031. Thus the project not only ignores the current health dangers of elevated $PM_{2.5}$, but will add to levels in several locations.

Response

The project results in a general decrease in $PM_{2.5}$ concentrations along the affected corridor (Figure 5-28). As noted in the Air Quality Assessment Report (section F.9.9), there is considerable uncertainty in the background value for annual mean $PM_{2.5}$, as measured concentrations are dependent on the measurement technique that is used. A value of 8 µg/m^3 (the value of the NEPM advisory standard) was used to reflect this uncertainty. Therefore, by definition, the predicted concentrations at all locations in the study area exceed the criterion. However, this is not because of the project; it is the existing situation. It is predicted that the project will result in a decrease in annual $PM_{2.5}$ concentrations at the majority of locations.

Issue description – pollution arising from the portals and ventilation outlets

Submissions question the claim in the EIS that there will be no emissions from tunnel portal sites when it is thought that any congestion on the feeder road into a portal entrance or the exit point will produce concentrated sites of emissions, in particular from the on/off ramps near Haberfield.

A further concern raised in submissions is regarding the location of two portals and a ventilation outlet within 500 metres of schools resulting in three polluting sources, releasing emissions continuously on the students affecting their life and learning.

Submissions expressed concern that concentrated pollution levels, including significant heavy metals will disperse out from the entry/exit portals and directly impact surrounding homes, businesses, people and the natural environment

Response

For the purposes of assessment, the emissions were considered in terms of the surface network, and the tunnels. This is appropriate as the ventilation system is designed to limit the emission of air from the tunnel through the exit portal by the use of fans ‘pulling‘ the air back against the flow of traffic. This is independent of whether or not there is congestion on the surface roads around the tunnels.

For surface roads, the air quality modelling built on the traffic modelling, taking into account the operation of the traffic on each road by time of day, including low-speed, 'stop-start' operation where this occurred. The information provided therefore includes consideration of congestion including at the on/off ramps.

The air quality modelling included all sources of pollutants, the ventilation outlets, traffic on surface roads and the background levels, to predict the air quality for the different scenarios. The results of this modelling are presented in contour maps in Chapter 9 and Appendix K of Air Quality Assessment Report at Appendix H of the EIS. The figures show the predicted changes with and without the project in 2021 and 2031.

Exceedances of some air quality criteria (one-hour NO_2, 24-hour PM_{10}, annual $PM_{2.5}$ and 24-hour $PM_{2.5}$) were predicted to occur at a small proportion of receptors both with and without the project. However, because there was a general reduction in the distribution of predicted concentrations along the project corridor, the numbers of receptors with exceedances decreased with the project.

Issue description – choice of road surface

Submission questioned whether the type of road surface to be used on the project has been chosen to minimise the creation of particulate matter.

Response

The use of current road design standards will reduce generation of non-exhaust particulate matter by maximising curve radii and minimising grade changes where possible. Further to this, vehicles will not be stopping and starting at traffic lights. The smoother vehicle movement will reduce tyre wear on cornering and climbing or descending and stopping and starting. Brake wear will also be reduced through good road design.

The primary function of the wearing surface itself is skid resistance for safety purposes but balanced with not being excessively abrasive for tyre wear. These requirements govern the road pavement surface design. For this reason, there have been no additional criteria specified to reduce tyre wear other than those normally adopted.

Issue description – EIS does not meet the SEARs

Submissions claim that the EIS does not meet the SEARS because details of proposed tunnel design and management measures to address air quality in the vicinity of portals is not addressed, especially for a worst-case scenario where surface traffic on Parramatta Road is not reduced by the completion of the project.

Response

The ventilation systems for the tunnel are designed to exhaust air through the elevated ventilation outlets at each end of the project and not through the portals. Therefore there is no need t to assess air quality impacts from portal emissions. However, detailed assessment of air quality outside of the portals was undertaken including scenarios where traffic changed around the tunnel portals.

Issue description

Residents of the apartment block complex 167-173 Parramatta Rd North Strathfield claim that pollutants (such as coarse and fine particles) will be increased due to the on ramp to the M4, as all vehicles pollutants will much more easily travel downwards from the ramp, while currently pollutants must travel upwards, resulting in a reduced quantity and severity.

Response

The on-ramp to the M4 in this location is a downhill entry ramp. Road gradient influences traffic emissions, and this is taken into account in the calculations. Emissions are lower on downhill road sections, such as this one, than on uphill ones.

Visual inspection of the contour plots in the Air Quality Assessment Report (Appendix H of the EIS) has been undertaken for this property, as its location between the existing M4 and Parramatta Road, adjacent to the Concord Road intersection, means it will already be affected by surface road emissions. The review considered for 1-hour NO_2, annual mean PM_{10}, 24-hour average PM_{10}, annual mean $PM_{2.5}$, and maximum 24-hour average $PM_{2.5}$ (Figures 8-47, 8-55, 8-63, 8-71, 8-79 of the Air Quality Assessment Report) show either an improvement, or insufficient change to be highlighted on the maps. The Human Health Risk Assessment considered the potential health impacts associated with changes in air quality (specifically nitrogen dioxide and particulates) at over 10,000 locations within the local community (including 167-173 Parramatta Rd) and concluded they are low and essentially negligible.

5.8.16 Ongoing air-monitoring

26 submissions raised concerns regarding the ongoing air-monitoring.

Issue description – ongoing air monitoring

Submissions request a commitment from the NSW Government to ongoing monitoring of air quality both during and post-construction to ensure compliance with regulatory requirements, including independent testing to ensure that air quality is improved and not worsened. In addition, monitoring should continue for at least two years after project opening, the proponent should be required to revisit the management measures if they are shown to be inadequate. Submissions also request that the monitoring data be made public.

Submissions state that it is important that air quality monitoring be conducted during the operation of the tunnel to capture impacts of the likely congestion at the portals. Submissions also requested monitoring of emission levels outside the portals on Parramatta Road between Liverpool St and Tebbutt St, where Parramatta Rd reduces to two lanes, and City West Link at Timbrell Drive/Mortley Ave

Response

During operation, continuous in-tunnel monitoring will be undertaken to demonstrate on-going compliance with the in-tunnel emission limits. Continuous monitoring will also be undertaken in the ventilation outlets to demonstrate on-going compliance with the emission limits. Monitoring will include exit velocity and temperature.

An air quality monitoring scheme will be developed and implemented in consultation with key stakeholders to confirm the EIS predictions that there will be no detectable change in air quality due to emissions from the ventilation outlets. Monitoring results will be reviewed after an appropriate period to determine if there is a need to continue monitoring.

All relevant monitoring results will be made publicly available.

5.8.17 Operational cumulative impacts

Issue description – contribution to cumulative health impacts

Submissions claim that the project will contribute to cumulative health impacts from traffic pollution from future development in the area.

Response

The assessment considers the effects of future development in the area to traffic and hence emissions. The traffic modelling is based on 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. This projects 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

Issue description – location of M4-M5 Link ventilation outlet

Submissions raised concerns that the future M4-M5 Link ventilation outlet is located in the same area [as the eastern ventilation facility], dumping additional pollution in the one area.

Response

The cumulative impact of the M4-M5 Link project and ventilation outlets was assessed and the results presented in Chapter 9 and Appendix H of the EIS. In summary, the results in 2031 for the cumulative impacts of both projects were very similar to the 2031 results for the M4 East alone. This is due to the high background contributions relative to those of the projects, while the contributions from all ventilation outlets are very low to negligible.

Issue description – air quality modelling

Submissions raised concerns that the air quality modelling does not seem to include the cumulative impacts of the motorway's interaction with other roads.

Response

The traffic modelling includes the interactions of the motorway with the broader surface road network. The air quality assessment builds on this, and analysed the interaction of the M4 East with around 6,000 road links in the study area. The results of the Air Quality Assessment Report presented in Chapter 9, and in more detail in Appendix H of the EIS include the contributions from these 6,000 surface road links in addition to the ventilation outlets.

Issue description – separate EIS for each stage

Submissions object to the process of a separate EIS for each stage of the project on the basis that it is flawed, given that the air quality impacts (and thus the health impacts) will be considered in isolation from each other, rather than as an entirety. Each stage of the project will, over time, induce more traffic and thus add to the total pollution in the locality. Some parts of the areas already experience $PM_{2.5}$ and NO_2 levels above current standards (let alone the new NEPM standards) and could thus experience even higher levels following completion of all stages. Given there are currently no standards for non-vehicle emissions (eg road surface emissions), any induced traffic will add to this dangerous source of particles as well.

Response

A cumulative assessment of the local and regional air quality due to the operation of the M4 East and the possible future WestConnex M4-M5 Link was undertaken and presented in Chapter 9 (section 9.8) and the Air Quality Assessment Report at Appendix H of the EIS. Both exhaust and non-exhaust emissions, and induced traffic, were included in the analysis.

5.9 Noise and vibration

5.9.1 Airborne noise during construction

226 submissions raised issues regarding airborne noise during construction.

Issue description – noise impacts

Submissions raised concerns regarding noise impacts. In summary, issues raised include:

- Concern regarding construction noise impacts on dwellings and communities
- Concern regarding construction noise impacts on the amenity of public open space
- Concern regarding construction noise impacts on educational facilities
- Duration of construction noise and exceedances of noise management levels
- Noise and vibration levels during construction should be in accordance with the EPA guidelines.

Response

The EIS provides an assessment of construction noise in section 10.4 and Appendix I. 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 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.

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 10.7 of the EIS.

In accordance with the ICNG, the assessment of construction noise impacts is based on a worst-case assessment methodology which assumes that all equipment would be operating simultaneously. As it would be unlikely that all equipment would operate simultaneously, construction noise levels would be lower than the predicted worst case scenario. In addition, in most cases the worst-affected receiver is located immediately adjacent to the works and this does not necessarily represent the potential typical noise impacts to the community at receivers located further away from the works.

In developing construction methodologies and a construction program for the project, the aim has been to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers. This has required a balance between the speed of construction activities and the ability to reasonably and feasibly maintain impacts within acceptable limits. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during the detailed design process.

Where noise exceedances are expected during both standard work hours and out of hours, the ICNG recommends strategies for noise mitigation and control. The strategies to mitigate construction noise described in section 10.8.1 of the noise and vibration impact assessment in Appendix I of the EIS (and amended in **Chapter 8** (Revised environmental management measures) of this report) have been designed to minimise, to the fullest extent practicable, noise during construction, and include:

- Prior to the commencement of construction, a Construction Noise and Vibration Management Plan (CNVMP) will be prepared consistent with the requirements of the ICNG and would include:
  - Identification of nearby residences and other sensitive land uses
  - Description of approved hours of work
  - Description and identification of all 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
  - An overview of the community consultation required for identified high impact works.
- Acoustic sheds would be erected at the Underwood Road tunnel site (C3), Concord Road tunnel site (C5), Cintra Park tunnel site (C6) and Northcote Street tunnel site and would be reviewed during construction planning to determine the attenuation level required
- Consideration of the installation of acoustic hoarding/barriers around the perimeter of construction ancillary facilities and work areas to assist in reducing noise impacts. The noise and vibration assessment in the EIS identifies that the installation of temporary hoarding typically reduces noise levels by between five dBA and 10 dBA, with reductions based on hoarding heights with a variable height of between 2.1 metres and 4.5 metres. These will be further refined through detailed design and approved through the ancillary facilities management plan (AFMP) process
- Construction methods and scheduling would also assist in ameliorating construction noise and vibration impacts. As far as reasonable and feasible, daytime construction hours (7.00 am to 6.00 pm on weekdays and 8.00 am to 1.00 pm on Saturdays) would be adhered to for activities concentrated in a single area and for excavation, demolition or rock breaking activities. This does not include activities associated with tunnelling works which are proposed to operate continuously for 24 hours per day, seven days per week (to minimise the overall duration of the construction works and potential impacts on the community) and activities which are required to be undertaken out of hours for safety reasons or to minimise disruption to road networks.

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 – impact of daytime construction activities

Concerns were raised that construction noise could impact on persons that work from home or that work irregular hours which require them to sleep during the daytime period, and requests for details with regards compensation for persons impacted.

Response

Section 10.4 of the EIS includes a noise and vibration assessment for the construction of the project. The construction noise assessment has been undertaken in accordance with the SEARs and is consistent with the ICNG. All construction noise impacts have been based on a worst case assessment, which assumes that all modelled equipment would operate simultaneously.

The noise assessment includes daytime criteria in accordance with the ICNG to assess potential worst-case noise impacts during this period. While the higher ambient noise levels during the daytime result in a higher allowable noise from construction before exceeding the noise management levels (NMLs), the assessment still considers receivers as sensitive during the daytime period.

Although the construction timeframes show activities extending for relatively long durations over the construction phase, in practice noise impacts would be intermittent within these durations and would generally be expected to move along the alignment, resulting in impacts being experienced for a significantly shorter duration. However, where activities are associated with static sites such as construction ancillary facilities, impacts on adjacent receivers would be expected to be experienced for longer periods than the main road works.

Management measures have been developed to, where feasible and reasonable, ameliorate construction noise and vibration impacts on receivers. These are provided in 10.7.2 of the EIS.

Issue description – inadequate assessment of noise impacts

Submissions raised concern that noise impacts during construction on properties along Wattle Street south of Ash Lane have not been adequately addressed.

Response

Construction noise impacts for properties located on Wattle Street to the south of Ash Lane have been assessed as part of Noise Catchment Area 14 (NCA 14). Section 10.4.1 of the EIS provides an assessment of the worst-cast noise exceedances predicted during construction within each of the identified NCAs. This assessment includes consideration of a number of different construction scenarios.

Impacts on properties within NCA 14 are predicted in most construction scenarios, with exceedances of criteria to be greater than 25 dBA during some scenarios. As noted in the EIS, this assessment is a worst case assessment meaning that noise levels are likely to be lower than those predicted in the EIS. Management measures would also assist in reducing impacts further, as far as reasonable and feasible and are described in section 10.7.2 of the EIS and amended in **Chapter 8** (Revised environmental management measures) of this report.

Issue description – request for noise barriers

Submissions requested that noise barriers be erected around construction sites.

Response

Section 10.8.3 of the noise and vibration impact assessment in Appendix I of the EIS identifies construction noise management measures. These include consideration of temporary acoustic hoarding/barriers around the perimeter of sites where construction is concentrated in a single area, including construction ancillary facilities.

Table 47 of the noise and vibration impact assessment at Appendix I of the EIS outlines the effectiveness of temporary acoustic hoarding within each of the NCAs. In the majority of NCAs the hoarding would result in a reduction in the number of highly noise affected properties. There is, however, a number of locations where hoarding would result in an increase in the number of properties affected. The installation of hoarding therefore is required to be considered on a site by site basis. This includes installing hoardings of different heights based on local conditions.

In addition to acoustic hoardings, where possible, buildings at construction ancillary facilities would be positioned to minimise noise impacts (for example, along the edge of sites to act as a noise barrier. Acoustic sheds would also be provided at tunnelling sites. These would further reduce noise levels at construction ancillary facilities.

A summary of particular areas of concern raised by submissions consists of:

Walker Avenue

NCAs 14, 15 and 18 include receivers in Walker Avenue. The assessment of the inclusion of acoustic hoarding shows that the number of highly noise affected properties would be reduced to none in NCAs 14 and 18, and reduced from 11 to three for NCA 15.

Cintra Park

Acoustic hoarding at Cintra Park (within NCA 12) would reduce the number of highly noise affected properties to zero.

Concord Road interchange

NCAs 06, 07, 08, 09 and 11 include receivers in the vicinity of the Concord Road interchange. The assessment of the inclusion of acoustic hoarding shows that the number of highly noise affected receivers would be reduced to one in NCA 06 and 08. In NCA 11 there would be one residual highly noise affected receiver. For NCA 07 and NCA 09, there are no highly noise affected receivers under the construction ancillary facility – General worksites scenario.

Issue description – Noise impacts from Cintra Park tunnel site (C6)

Negative construction noise impacts due to the use of Cintra Park as a construction site. This site would operate 24 hours per day and therefore not offer any respite to the noise. Noise impacts would result from the following:

- Heavy vehicles moving around the site 24 hours a day, seven days a week
- Vehicle wash down outside acoustic sheds and grids for cleaning truck tyres
- Noise from workers.

Response

The use of Cintra Park as a construction site would result in some impacts on the surrounding residents. Exceedances of the noise criteria would be greater than 25 dBA for some receivers under certain construction scenarios. Predicted noise levels (see NCA 12 in Tables 10.16 and 10.18 in the EIS) are worst case and assume all equipment is operating simultaneously. Acoustic hoarding and an acoustic shed would be installed at this construction site which would assist in reducing noise impacts. Additional management measures outlined in section 10.7 of the EIS and amended in **Chapter 8** (Revised environmental management measures) of this report would be implemented to further reduce noise impacts.

Issue description – management of noise impacts

Submissions requested details of management measures that would be implemented to manage construction noise impacts on a dwelling at 24 Walker Avenue.

Response

Section 10.7.2 of the EIS as amended by **Chapter 8** (Revised environmental management measures) of this report describes the environmental management measures that would be implemented during construction of the project to manage construction noise impacts on nearby receivers as far as reasonable and feasible.

The property at 24 Walker Avenue is located within NCA18 and adjacent to the Wattle Street and Walker Avenue civil site (C9). For construction concentrated in a single area, such as at the C9 civil site, installation of acoustic hoarding/barriers around the perimeter of the site would be considered to assist in reducing noise impacts. The noise and vibration assessment in the EIS identifies that the installation of temporary hoarding typically reduces noise levels by between five dBA and 10 dBA, with reductions based on hoarding heights with a variable height of between 2.1 metres and 4.5 metres.

In addition, the dwelling at 24 Walker Avenue has been identified as being eligible for consideration for at-property treatment to mitigate operational noise impacts. As detailed in section 10.7.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report), property treatments identified for the operational phase of the project would be considered for installation as early as possible where they would improve construction noise levels.

Issue description – impact of construction work outside standard construction hours

Concern was raised in relation to the impact of construction work outside standard construction hours, in particular at night, on the aged care facility at 169-171 Parramatta Road, Haberfield.

Response

An assessment of the construction noise and vibration impacts of the project is presented in section 10.4 of the EIS and includes prediction of the extent (if any) to which the NML would be exceeded for each relevant time period.

Road construction and temporary road and intersection modifications would be likely to involve out-of-hours works to minimise impacts on traffic and reduce safety risks for construction workers. Activities associated with road works during night-time periods are predicted to produce worst case NML exceedances of more than 20 dBA at residential receivers (which includes the aged care facility), particularly where works are located immediately adjacent to receivers.

Section 10.8 of the noise and vibration impact assessment included in Appendix I of the EIS identifies the strategies described in the ICNG for construction noise mitigation and control which are applicable to the project. The strategies have been designed to minimise, to the fullest extent practicable, noise during construction.

Environmental management measures specific to road construction works required to be undertaken at night include:

- Programming of night works to minimise the number of consecutive nights that work affects the same receivers (where feasible)
- Scheduled works to avoid as far as possible the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers
- Undertaking noise monitoring at sensitive receivers during critical periods to identify and assist in managing high risk noise events.

Additional noise management 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.

Issue description – noise impact from Parramatta Road on-ramp

The on-ramp from Parramatta Road (east of Station Street) onto the M4 Motorway would result in construction noise impacts on the public open space area at the southern extent of Arnotts Reserve and neighbouring dwellings.

Response

An assessment of the construction noise and vibration impacts of the project is presented in section 10.4 and in Appendix I of the EIS and includes prediction of the extent (if any) to which the NML would be exceeded for each relevant time period.

The southern extent of Arnotts Reserve is located within NCA05 (refer to Figure 12 of Appendix I of the EIS). Noise and vibration impacts associated with the construction of the project in NCA 05 are summarised in section 14.5.2 of Appendix I of the EIS.

Although the assessment has identified exceedances of the NMLs for residential receivers within this NCA under some construction scenarios (daytime exceedances of over 20 dBA and night time exceedances of up to 20 dBA), these impacts have been determined based on a worst-case assessment scenario which assumes that all plant and equipment would be operating simultaneously. In fact, construction noise levels would be often lower than the predicted worst case scenario, as it would generally be unlikely that all plant and equipment would operate simultaneously.

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 dBA.

Section 10.6 of the noise and vibration assessment at Appendix I details the predicted exceedances at the nearest noise sensitive receivers for the range of construction scenarios associated with the project. Generally, exceedances for other sensitive receivers - which includes passive recreation areas - are predicted to be moderate (up to 15 dBA). It should be noted, however, that the southern extent of Arnotts Reserve would not be used as a passive recreation area during construction, as it would be used for the Powells Creek civil site (C4).

Section 14.5.2 of Appendix I of the EIS and section 10.7.2 of the EIS and 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 – noise impacts on Haberfield Public School

Submissions relating to potential construction noise impacts on Haberfield Public School and associated management measures, including:

- That a pre-construction noise assessment be undertaken
- That management measures be implemented prior to the commencement of construction
- That the school be provided with compensation for electricity costs associated with using air conditioners, where noise impacts mean that windows cannot be opened
- A noise monitoring station be established at Haberfield Public School and that the monitoring data be made available to the school and the P&C
- That work schedules be amended to limit disturbance to students
- Reduce construction noise where the school complains of disruption to students and/or teachers.

Response

A pre-construction assessment of the construction noise and vibration impacts of the project has been completed and is presented in section 10.4 and Appendix I of the EIS.

Haberfield Public School is located within NCA 19 (refer to Figure 12 of Appendix I of the EIS). A detailed noise assessment at the nearest noise sensitive receivers is included in section 10.4.1 of the EIS.

Haberfield Public School is identified in NCA 19 as an educational facility. The assessment found that Haberfield Public School would experience predicted day time exceedances of the NML of up to 25 dBA for demolition, work area establishment, and road construction work, and moderate NML exceedances of up to 17 dBA during temporary intersection work, operation of the civil and tunnel construction sites, and construction of the eastern ventilation facility. Temporary hoarding around the construction sites near NCA 19 would assist in ameliorating noise impacts from the operation of the construction sites.

The construction zone for the Parramatta Road civil site (C10) is around 150 metres from the closest buildings associated with Haberfield Public School and would be shielded to some degree by existing buildings. Construction noise is also generally expected to decrease significantly past the first and second row of receivers.

The EIS includes a commitment to, when working adjacent to schools, schedule particularly noisy activities outside normal school hours, where practicable.

Ongoing noise monitoring during the construction of the project would be undertaken on a case-by-case basis and would involve monitoring at the commencement of the construction activities and then periodically throughout the construction program. Once noise levels have been established through monitoring of a particular activity in a particular location, there is no benefit to undertaking continuous noise monitoring. The requirement for and conditions under which noise monitoring would take place would be described in further detail in the CNVMP to be prepared prior to the commencement of the works.

Section 10.7.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) identifies the suite of strategies for construction noise mitigation and control which are applicable to the project.

Issue description – construction noise and associated management measures

Submissions noted that residents of the apartment building at 167-173 Parramatta Road at North Strathfield would be subject to construction noise impacts during the day and night time periods, including some residents who work from home. Submissions asked what management measures would be employed to ameliorate impacts.

Response

An assessment of the construction noise and vibration impacts of the project is presented in section 10.4 and Appendix I of the EIS.

The apartment building at 167-173 Parramatta Road at North Strathfield is located within NCA 11. A detailed noise assessment at the nearest noise sensitive receivers and a summary of the construction noise impacts within NCA 11 is included in section 10.6 and section 14.10 respectively of Appendix I of the EIS.

Having regard to the NMLs established for NCA 11, high exceedances (greater than 20 dBA) are predicted at this receiver during the most noise intensive scenario of work area establishment works during the daytime and during the night-time.

As described in Table 31 of the noise and vibration impact assessment at Appendix I of the EIS, the estimated duration of work area establishment works at any one locality is around two to four weeks. Exceedances of the NML associated with these works would therefore be temporary.

High night-time NML exceedances during tunnel site operations are also predicted at this receiver (greater than 20 dBA). These predicted exceedances have been identified as being sufficiently high to justify the provision of an acoustic shed at the Concord Road tunnel site (C5) to reduce noise. Appendix R5 of the noise and vibration impact assessment at Appendix I of the EIS shows the predicted construction noise from tunnelling sites with and without the use of management measures such as an acoustic shed.

Reasonable and feasible management measures as described in section 10.7.2 of the EIS, (as amended in **Chapter 8** (Revised environmental management measures) of this report), would be identified and implemented during the project to further minimise noise impacts to receivers.

In addition, the ground and first floors of the building at 167-173 Parramatta Road have been identified as being eligible for consideration for at-property treatment to mitigate operational noise impacts. As detailed in section 10.7.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report), property treatments identified for the operational phase of the project would be considered for installation as early as possible where they would improve construction noise levels (refer to measure NV8 in **Chapter 8** (Revised environmental management measures) of this report).

Issue description – acoustic sheds

Submissions raised concerns in relation to acoustic sheds and whether they would require air conditioning, given they would be enclosed by a roof. Concerns were raised about noise levels generated by air conditioning units.

Response

Consideration of nearby sensitive receivers would be considered when planning the site layout and designing the acoustic enclosure. It is envisaged that the mechanical plant noise sources would be controllable through common engineering methods. Selected mechanical equipment would be reviewed and assessed for conformance with established criteria at the detailed design stage of the project when specific plant and equipment selection is finalised.

Issue description – impacts of construction noise on The Infants' Home

Submissions expressed concern regarding the impacts of construction noise on The Infants' Home at Haberfield.

Response

A pre-construction assessment of the construction noise and vibration impacts of the project has been completed and is presented in section 10.4 and Appendix I of the EIS.

The Infants' Home is located within NCA 13 (refer to Figure 12 of Appendix I of the EIS). A detailed noise assessment at the nearest noise sensitive receivers is included in section 10.4.1 of the EIS.

The Infants' Home is identified in NCA 13 as a child care centre. The assessment found that The Infants' Home would experience predicted day time exceedances of the NML of up to 15 dBA for all construction scenarios. Temporary hoarding around the construction sites near NCA 13 would assist in ameliorating noise impacts from the operation.

The eastern ventilation facility site (C8) is about 120 metres from the closest buildings associated with The Infants' Home and would be shielded to some degree by existing buildings, in particular Bunnings.

The EIS includes a commitment to, when working adjacent to schools, schedule particularly noisy activities outside normal school hours, where practicable.

Issue description – construction noise impacts near the Concord Road interchange

Concerns were raised regarding the construction noise impacts of exceedances of the NML of more than 25 dBA for receivers within NCA 6 and NCA 7, near the Concord Road interchange.

Response

Section 14.6.2 and section 14.7.2 of the noise and vibration impact assessment at Appendix I of the EIS summarises the anticipated NML exceedances for NCA 06 and NCA 07 respectively. High NML exceedances during both the daytime and night-time periods are expected during certain construction activities for NCA 06 and NCA 07.

Temporary acoustic hoardings would be provided where the Concord Road civil and tunnel site would be adjacent to residential properties. This would significantly reduce noise impacts from the construction ancillary facility. In addition, predicted noise impacts from the tunnel site are sufficient to require the provision of an acoustic shed to reduce noise impacts.

The acoustic shed and acoustic hoarding would reduce worst-case night-time NML exceedances below the NML for all receivers in NCA 06 and all except three receivers within NCA 07.

The ICNG requires that where exceedances of the NML are anticipated for sensitive receivers, feasible and reasonable management measures are developed. Based on the assessment of construction noise impacts presented in section 10.4 and at Appendix I of the EIS, a range of noise management measures have been recommended to reduce and control potential construction noise impacts.

Additional noise management measures during out of hours work would be determined on a case-by-case basis from individual receiver predictions during the construction phase and may consist of offers of alternative accommodation, monitoring, individual briefings, letter box drops, project specific respite offers, phone calls and specific notifications.

Issue description – specific management measures

Concerns were raised regarding the specific management measures that would apply to the property at 74 Concord Road at North Strathfield during the construction period.

Response

A pre-construction assessment of the construction noise and vibration impacts of the project has been completed and is presented in section 10.4 and Appendix I of the EIS.

The dwelling at 74 Concord Road at North Strathfield is located within NCA 07 (refer to Figure 12 of Appendix I of the EIS). A detailed noise assessment at the nearest noise sensitive receivers is included in section 10.4.1 of the EIS.

The assessment found that receivers within NCA 07 would experience predicted day time exceedances of the NML of over 20 dBA for all construction scenarios. Temporary hoarding around the construction sites near NCA 07 would assist in ameliorating noise impacts from the operation.

The assessment also found that predicted noise impacts from the tunnel site at this location are sufficient to require the use of an acoustic shed to reduce noise impacts. With the acoustic shed and acoustic hoarding at this location, worst-case night time NML exceedances within NCA 07 are predicted to be minor (less than 10 dB) at three receivers.

The ICNG requires that where exceedances of the NML are anticipated for sensitive receivers, feasible and reasonable management measures are developed. Based on the assessment of construction noise impacts presented in section 10.4 and at Appendix I of the EIS, a range of noise management measures have been recommended to reduce and control potential construction noise impacts.

Additional noise management measures during out of hours work would be determined on a case-by-case basis from individual receiver predictions during the construction phase and may consist of offers of alternative accommodation, monitoring, individual briefings, letter box drops, project specific respite offers, phone calls and specific notifications.

Issue description – noise from tunnelling works

Submissions queried the results presented in Table 10.21 of the EIS for NCA 13 and NCA 21, where these results have shown a reduction in the number of highly affected receivers where temporary acoustic hoarding would be installed, but instead showed an increase.

Response

Due to a transcription error, the heading for the second column in Table 10.21 of the EIS was incorrectly stated. The correct heading should read ‘Reduction of highly noise affected receivers through implementation of acoustic hoarding’, as was presented in the corresponding Table 47 of the noise and vibration impact assessment at Appendix I of the EIS.

The copy of Table 10.21 in **section 6.5.4** of this report presents the correct column heading for this table. The corrected column heading is shown in **bold.**

While the incorrect column heading was presented in Table 10.21 of the EIS, the number which corresponds with the reduction of highly noise affected receivers and the number of highly noise affected receivers (with hoarding) were based on the correct reduction numbers and residual numbers as presented in Table 47 of the noise and vibration impact assessment at Appendix I of the EIS and are correct, and there is no need for further environmental assessment.

Issue description – noise from demolition works

Submissions requested further detail be provided on the measures proposed to manage noise impacts associated with a number of construction scenarios, noting that under the Transport for NSW Construction Noise Strategy, some of the exceedances of the noise management levels would be classified 'highly intrusive'. The submission recommended that at a minimum, highly affected receivers be offered respite.

Response

The environmental impact statement provides an assessment of construction noise in section 10.4.1. This assessment has been carried out in accordance with the relevant guidelines including the Interim Construction Noise Guidelines (DECCW, 2009).

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. In the case of the construction scenarios assessed within the EIS, the environmental impact statement provides mitigation measures including scheduling to limit works outside of daytime construction hours as much as feasible and reasonable.

Further information on proposed construction noise mitigation and management measures is provided in **Chapter 8** (Revised environmental management measures) of this report.

Opportunities for additional feasible and reasonable mitigation measures to protect local amenity and reduce construction noise impacts would be considered during the detailed design process as part of the development of Construction Noise and Vibration Management Plan.

5.9.2 Ground-borne noise during construction

15 submissions raised issues relating to ground-borne noise impacts as result of tunnelling activities.

Issue description – noise from tunnelling works

Concerns were raised regarding noise from tunnelling works, particularly during the evening and night time periods where they would exceed criteria. Concern was also raised in relation to the duration of tunnelling activities.

Response

The EIS provides an assessment of construction noise in section 10.4 and Appendix I, including consideration of potential ground-borne noise from tunnelling activities. This assessment has been carried out in accordance with the SEARs and relevant guidelines including the ICNG.

This assessment includes the worst-case predicted $L_{Aeq(15minute)}$ internal ground-borne noise levels from excavation of the main road tunnels together with all access ramp connections to the various surface intersections using roadheaders.

The assessment indicates that there would be exceedances of the ground-borne noise criteria during the evening and night-time periods. 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. Approximate exceedances of the night time noise management level of 35 dBA $L_{Aeq(15minute)}$ at a particular location as each roadheader passes would be:

- 10 days where a slant distance (three-dimensional slant distance from the tunnel crown to a sensitive receiver situated above the alignment) of approximately 20 metres from the tunnels is apparent
- 11 days where a slant distance of approximately 15 metres from the tunnels is apparent
- 13 days where a slant distance of approximately 10 metres from the tunnels is apparent.

Tunnelling would typically progress along the alignment at around 30 metres per week and it is anticipated that worst-case ground-borne noise impacts would be discernible for a relatively short period of time (i.e. several days) at each affected receiver. As the tunnelling works progress, a particular receiver's exposure to ground-borne noise would noticeably reduce.

Further information on proposed construction noise management measures is provided in section 10.7.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report). Management measures specific to ground-borne noise include:

- Vibration intensive construction works would be confined to the less sensitive daytime period (9.00 am to 12.00 pm or 2.00 pm to 5.00 pm) as far as reasonably practicable, or in accordance with the environment protection licence
- A detailed ground-borne vibration assessment would be undertaken following further geotechnical investigations. This will include developing the vibration site law for the project.

Opportunities for additional feasible and reasonable management measures to reduce ground-borne noise impacts would be considered during detailed design as part of the development of the Construction Noise and Vibration Management Plan.

Issue description – noise from construction activities

Noise from construction activities such as drilling and blasting would have a significant impact on the ability for persons on the southern side of Walker Avenue between Parramatta Road and Ramsay Street to work from home.

Response

The EIS provides an assessment of ground-borne noise including noise from rockbreaking (drilling) and blasting in section 12.6 of the noise and vibration impact assessment at Appendix I of the EIS. The assessment found the potential for ground-borne noise impacts from these activities where receivers are situated above the tunnels. Generally, the following ground-borne noise levels are likely from rockbreakers working at various distances from receivers:

- A slant distance of 20 metres results in around 61 dBA
- A slant distance of 40 metres results in around 47 dBA
- A slant distance of 60 metres results in around 39 dBA.

The assessment also identified that audible ground-borne noise as a result of impulsive blasting may impact on receivers above the tunnelling works. Blasting has been proposed to assist in the excavation of tunnel benches and cross passages as the impacts (in terms of ground-borne noise and vibration) are of a shorter duration for nearby sensitive receivers compared to the ground-borne noise and vibration impacts associated with rockbreakers.

Potential impacts from rockbreaking and blasting would be limited to impacts arising from works at discrete locations within the tunnels. Consideration of the potential ground-borne noise impacts from these activities would be carried out during the detailed design stage of the project. This would include consideration of equipment size in order to minimise impacts.

5.9.3 Vibration from surface works during construction

76 submissions raised issues regarding vibration in relation to surface works.

Issue description – vibration impacts

Submissions identified that the noise and vibration assessment in the EIS states that the project would result in vibration impacts throughout the construction period. Concerns were raised that this would impact on people's lifestyle, cause stress and anxiety, affect amenity, and disturb normal indoor activities and sleep patterns with consequent impacts on health and wellbeing.

Submissions also raised concerns about the potential for vibration from surface works to impact on buildings.

Response

The potential for vibration impacts from surface works is assessed in section 10.4.4 and Appendix I of the EIS. Safe working distances from certain plant and equipment are in Table 56 of the noise and vibration impact assessment at Appendix I of the EIS.

Based on expected plant and equipment to be used during surface works (refer to the list of plant items in Table 56 of Appendix I of the EIS), the key vibration generating equipment is expected to be a vibratory roller and a hydraulic hammer to conduct road works (including construction of shaft at the Underwood Road tunnel site). 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).

In practice, vibration impacts from most construction activities would be intermittent during construction.

The assessment indicates that up to 203 buildings may be within the BS 7385 safe working distances for residential and light commercial building types, should a large rockbreaker be used at the outer extents of the construction footprint. The vibration impacts presented in the assessment should be considered conservative as it is unlikely that a rockbreaker would be required at all locations.

Safe working distances would be complied with as far as feasible and reasonable, and may involve using smaller equipment when working close to existing structures. However, there is the potential that vibration intensive equipment may be required to be used within safe working distances and this may be unavoidable due to the work required and the prevalent geological site conditions.

If the use of vibration intensive plant and equipment cannot be avoided within the safe working distances for human comfort, the following procedure would apply:

- Vibration monitoring or attended vibration trials would be undertaken at the outset of these works to ensure that levels are within relevant criteria
- The feasibility of rescheduling the hours of major vibration generating plant to less sensitive times such as 9.00 am to 12.00 pm or 2.00 pm to 5.00 pm would be investigated, where appropriate or in accordance with the environment protection licence.

In addition, 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. Further, all heritage items located within the safe working distance would be investigated to determine if these structures are structurally unsound, to assist with determining the applicable criteria for each item.

Issue description – independent vibration monitoring during construction

Submissions requested that independent vibration monitoring be undertaken during construction.

Response

As described above, vibration monitoring would be undertaken where vibration intensive work would be undertaken with the specified safe working distances. Monitoring would be undertaken by or on behalf of the contractor by suitably qualified personnel.

5.9.4 Vibration from tunnelling works during construction

26 submissions raised issues regarding vibration in relation to tunnelling works.

Issue description – explanation of terminology

Submissions requested explanation of terminology in the vibration assessment, including:

- What is a receiver?
- Please explain the 'vibration damage goals'
- What is a safe working distance for human comfort?

Response

A receiver is defined in the *NSW Industrial Noise Policy* (EPA 2000) as 'the noise-sensitive land use at which noise from a development can be heard'. It is a common terms in noise and vibration assessment. For the purposes of the vibration assessment receivers include both structures (buildings and dwellings) and humans (with regards to human comfort) which may experience vibration as a result of construction.

Section 10.3.2 of the EIS outlines vibration damage goals, and explains that British Standard (BS) 7385:Part 2-1993 *Evaluation and Measurement for Vibration in Buildings Part 2* sets guide values for vibration based on the lowest vibration levels above which damage has been credibly demonstrated. Table 10.6 in section 10.3.2 of the EIS shows the recommended guideline limits for transient vibration to minimise risk of cosmetic damage to residential and industrial buildings.

Table 10.9 in section 10.3.2 of the EIS outlines the recommended safe work distances for specific construction plant. These distances are contained within Transport for NSW's *Construction Noise Strategy* (2012d). The recommended safe working distances in Table 10.9 were developed to be consistent with BS 7385 and *Assessing Vibration: A technical guideline* (DEC 2006). The aim of the recommendations is to minimise the likelihood of cosmetic damage to buildings and disturbance or annoyance to humans. Two groups of safe working distances are provided:

- Cosmetic damage – work undertaken at distances greater than these safe working distances would not be expected to result in even cosmetic damage to buildings
- Human response – work undertaken at distances greater than these safe working distances would not be expected to result in adverse comment or disturbance to building occupants. The human response safe working distances are conservative, developed with reference to the more stringent objectives for continuous vibration for typical residential buildings.

Issue description – summary of issues relating to vibration from tunnelling works

In summary, the submissions raised the following issues:

- Tunnelling would result in vibration which has the potential to damage property and surface and subsurface infrastructure
- Requests to identify the management measures that would be used to manage construction vibration impacts
- What is the predicted timing and duration of higher vibration levels as a result of tunnelling?
- What measures will be taken to protect our home from this?
- The proposed management measures in the EIS are not adequate to mitigate the potential vibration impacts. They do not discuss ways to reduce or eliminate vibration impacts or provision of respite
- Who can local residents contact if they have any concerns regarding the tunnelling vibrations?

Response

An assessment of vibration from tunnelling works is provided in section 10.4.4 and Appendix I of the EIS.

Table 57 of Appendix I of the EIS presents the findings of the construction vibration assessment for cosmetic damage and human comfort vibration for the project. In relation to cosmetic damage, the assessment identified that all buildings would be outside the recommended safe working distance for the highest vibration plant items associated with tunnelling (roadheader and rock anchor drill).

In relation to human comfort, the assessment identified a low risk of annoyance from the proposed tunnelling works using a roadheader and rock anchor drill, with all receivers being located outside of the nominated safe working distance for human comfort, except for three receivers in NCA02 near the tunnel dives at the western end of the project.

Impacts associated with blasting for tunnel construction are outlined in section 10.4.5 of the EIS. Blasting is proposed as an excavation technique because the vibration impacts from blasting are of a much shorter duration for nearby sensitive receivers compared to the duration of vibration impacts associated with mechanical excavation methods such as roadheaders or rockbreakers. Blasting would be restricted to the following hours:

- 9.00 am to 5.00 pm Monday to Friday
- 9.00 am to 1.00 pm Saturday
- No blasting on Sundays and public holidays
- Unless otherwise approved by the EPA.

Based on vibration site law developed from blasting of the northern section of the Sydney Harbour Tunnel and the typical 30 metres depth of the tunnel, the predicted vibration level for a maximum instantaneous charge of 10 kilograms is 12 millimetres per second. The measures blast emissions data indicates a dominant frequency of the vibration signal of around 20 Hertz at a distance of 30 metres.

The use of a maximum instantaneous charge of 10 kilograms would meet the cosmetic building damage guidelines (i.e. 26 millimetres per second); however, it would exceed the human comfort criteria (ie 10 millimetres per second) unless otherwise approved by the EPA. In order to achieve the criteria, a maximum instantaneous charge of seven kilograms would be required to be used.

Further investigations into predicted noise and vibration level 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.

Building condition 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.

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 due to the works.

Residents can contact the project hotline if they have concerns about tunnelling activities.

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 where necessary.

Further detail regarding the environmental management measures which would be implemented to manage construction vibration impacts from tunnelling works are identified in **Chapter 8** (Revised environmental management measures) of this report.

Vibration impacts during operation are discussed in **section** 5.9.12 of this report.

Issue description – impact of tunnelling on Haberfield Public School

Tunnelling would result in vibration which has the potential to adversely impact on the students and staff of Haberfield Public School.

Response

As described above, an assessment of vibration from tunnelling works is provided in section 10.4.4 and Appendix I of the EIS.

Haberfield Public School is located within NCA 19. Table 57 of Appendix I of the EIS presents the findings of the construction vibration assessment for cosmetic damage and human comfort vibration for the project under the tunnelling works scenario. In NCA 19, all buildings would be outside the recommended safe working distances for human response. Vibration from tunnelling is therefore not expected to result in disturbance at Haberfield Public School.

Issue description – tunnels located below The Ranch Heritage Conservation Area

The project involves a number of tunnels being located below The Ranch Heritage Conservation Area. There are concerns about vibration impact on these properties due to tunnelling works.

Response

As described above, an assessment of vibration from tunnelling works is provided in section 10.4.4 and Appendix I of the EIS.

The Ranch Heritage Conservation Area is located within NCA 13 and is comprised of properties in Page Avenue and Earle Avenue, nine houses in Henry Street, and the residential properties facing Frederick Street between Henry Street and Parramatta Road.

Table 57 of the noise and vibration impact assessment at Appendix I of the EIS presents the findings of the construction vibration assessment for cosmetic damage and human comfort vibration for the project. In NCA 13, all buildings would be outside the recommended safe working distances for human response.

Issue description – vibration impacts from road headers

Roadheaders would generate vibration impacts for receivers in the vicinity of the Concord Road civil and tunnel site (C5).

Response

As described above, an assessment of vibration from tunnelling works is provided in section 10.4.4 and Appendix I of the EIS.

Receivers in the immediate vicinity of the Concord Road interchange construction site are located within NCA 06, NCA 07 and NCA 08. Table 57 of the noise and vibration impact assessment at Appendix I of the EIS presents the findings of the construction vibration assessment for cosmetic damage and human comfort vibration for the project. All buildings would be outside the recommended safe working distances for human response in NCA 06, NCA 07, and NCA 08.

Issue description – independent vibration modelling during construction

Independent vibration monitoring should be undertaken during construction.

Response

In accordance with the environmental management measures for noise and vibration included in section 10.7.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report), where vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials would be undertaken at the outset to ensure that levels are within the criteria.

Additionally, 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.

Monitoring would be undertaken by or on behalf of the contractor by suitably qualified personnel.

5.9.5 Impacts from blasting

Two submissions raised issues regarding the use of blasting as part of tunnel construction.

Issue description – exceedances of recommended levels

Submissions raised concern that blasting activities would result in exceedances of the recommended levels for at least five per cent of blasts.

Response

As outlined in section 10.3.2 of the EIS, the criteria outlined in *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZEC 1990) would be applied to the project. These guidelines state that up to five per cent of blasts during a 12 month period can exceed the criteria. Where possible, the project would avoid exceedances of the criteria. A detailed blasting assessment would be undertaken during detailed design once blasting methods are confirmed further.

Issue description – property damage resulting from blasting

Submissions raised concern that blasting could result in property damage.

Response

Section 10.4.5 of the EIS outlines the maximum instantaneous charges which are required to meet the cosmetic damage criteria. Further investigations would be undertaken to confirm whether this amount would be sufficient to ensure that properties are not damaged as a result of blasting.

Section 5.10.8 of this report outlines how property damage is to be minimised during construction, including existing condition surveys for properties potentially affected by blasting.

Issue description – higher vibration criterion

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 conservation measure in the first instance.

Response

Section 13.8.1 of the noise and vibration impact assessment at Appendix I of the EIS establishes the project blasting criteria for human comfort. The criteria presented have been developed in accordance with the ICNG, which specifies that the assessment should be based on the levels in the *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZECC 1990). Further, guidance for the establishment of vibration limits designed to safeguard human comfort in relation to blasting have been derived from Table J4.5(A) in Appendix J of AS2187.

As stated in section 13.8.2, it is recommended that a human comfort vibration limit of 10 mm/s (peak particle velocity) be applied to the project, based on project blasting operations lasting less than 12 months.

The blast vibration criteria defined in ANZECC 1990 are considered conservative, and were developed to protect communities exposed to long-term blasting operations, such as communities adjacent to mine sites. By comparison, the construction of the project would have a shorter duration of blasting, and blasting would not be undertaken in a single or centralised area for any extended period of time. Instead, blasting would take place along the alignment, which would mean that any one receiver would be affected for a short proportion of the overall project.

Issue description – confirmation of blasting criteria

Submissions recommended that, in order to appropriately address the environmental risk analysis requirements as specified by the SEARs, if nomination of appropriate criteria for the control of damage from blasting requires further site inspection then this should be conducted as part of the EIS process. Delaying this until detailed design is not adequate given the potential impacts to the heritage and the concerns about this in the community.

Response

Chapter 28 of the EIS details the manner in which the environmental issues for project were identified and evaluated through an environmental risk analysis process. The environmental risk analysis has been prepared in accordance with the SEARs for the project.

A summary of the environmental risk analysis is provided in Table 28.3 of the EIS. In relation to noise and vibration, the risk analysis identified that during the construction stage of the project, impacts could be generated by activities within the corridor (including tunnelling works and surface works) and from the operation of the construction site compounds.

The proposed mitigation includes the preparation of a construction noise and vibration management plan would be prepared and implemented in accordance with the Interim Construction Noise Guideline. Following the implementation of mitigation, the EIS acknowledges that intrusive noise and vibration is still likely to occur at some locations, however residual impacts are considered to be moderate with the application of a construction noise and vibration management plan.

The preparation of a construction noise and vibration management plan and associated development of feasible and reasonable work practices at the detailed design stage of the project is consistent with the ICNG and projects of a similar scale.

The potential impacts as a result of blasting associated with the construction of the project are assessed in section 13.8.2 of the noise and vibration impact assessment at Appendix I 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.* AS 2187 recommends the frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2, BSI, 1993*, as they "are applicable to Australian conditions". The AS 2187 criteria are presented in Table 52 of the noise and vibration impact assessment.

As stated in the assessment, the confirmation of the appropriate criteria for heritage buildings would be undertaken during detailed design having regard to the determination in BS 7385 that buildings of historical value should not be assumed to be more sensitive to vibration impacts (unless it is structurally unsound).

Further investigations into predicted noise and vibration level 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.

Building condition 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.

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 due to the works.

5.9.6 Construction traffic noise

33 submissions raised issues regarding traffic noise during construction.

Issue description – traffic noise during construction

Submissions raised concern regarding traffic noise during construction. In summary, issues raised included:

- There would be noise impacts from construction vehicles, including heavy trucks and light vehicles, in residential streets and vehicles transporting workers to construction sites
- There would be noise impacts from construction vehicles, including trucks, accessing construction ancillary facilities

- The amenity of residential streets would be impacted by construction traffic
- Information was requested on the management measures to mitigate increases in traffic movements for local residents during construction.

Response

Section 10.4.3 of the EIS predicts traffic noise increases on roads affected by construction traffic.

The ICNG does not provide specific guidance in relation to acceptable noise levels associated with construction traffic. Therefore, the permissible noise increase criteria described in the *NSW Road Noise Policy* (DECCW 2011) (RNP) has been adopted. Under the RNP, an increase of up to two dBA is a minor impact that is considered barely perceptible to the average person. Where the road traffic noise levels are predicted to exceed two dBA 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.

Construction traffic noise levels are shown in Table 10.22 of the EIS for heavy vehicles and light vehicles. 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 receivers along the proposed routes with the exception of two local roads, which heavy vehicles may use at times during construction:

- Underwood Road tunnel and civil site (C3) - Short Street East (daytime and night-time)
- Powells Creek civil site (C4) - Powell Street (daytime only).

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
- Spoil removal would be minimised between 10.00 pm and 7.00 am
- Induction and training would be provided to relevant staff and subcontractors outlining their responsibilities with regard to noise.

Issue description – additional traffic noise as a result of 'rat-running'

Concerns were raised regarding additional traffic noise during construction caused by an increase in 'rat running'.

Response

The traffic data assessed as part of the operational noise assessment incorporates population and employment projections, and growth in demand (regional growth, vehicle trips attracted from competing routes and induced demand as a result of improved travel times).

The potential for 'rat-running' during construction would depend on the finalised construction program and would be considered as part of the CNVMP.

5.9.7 Construction noise from out-of-hours work

35 submissions raised issues regarding noise from out of hours works during construction.

Issue description – impacts on residents

Submissions 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.

Response

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 the five tunnel construction sites.

The majority of tunnelling works outside of standard construction hours would occur within an acoustic shed.

A number of other construction activities would also be undertaken outside of standard construction hours. A description of these is provided in Table 6.22 of the EIS along with a rationale for undertaking these activities out-of-hours.

The assessment of construction noise and vibration presented in section 10.4 of the EIS includes a prediction of the extent (if any) to which the $L_{A1(1minute)}$ levels are exceeded, where night-time works are proposed. Table 10.14 to Table 10.19 of the EIS identify that the $L_{A1(1minute)}$ levels exceed the sleep disturbance criteria for the worst case exceedance during all construction scenarios where works are proposed at night. These impacts would not be experienced within all NCAs.

The project includes feasible and reasonable management measures to reduce the potential noise impact to nearby receivers, including the provision of an acoustic shed for tunnelling sites.

Issue description – provision of mean and peak noise levels

A submission requested that the mean and peak predicted construction noise levels for the property at 1 Cove Street at Haberfield, between the hours of 6.30 pm and 6.30 am be provided.

Response

Cove Street at Haberfield is located within NCA14. The construction noise impact assessment detailed in section 10.4 and Appendix I of the EIS predicts exceedances in NCA14 for some construction scenarios. Further details of these exceedances are provided in section 10.4 and Appendix I of the EIS and proposed management and management measures are provided in section 10.7 of the EIS. Noise management levels are predicted to be exceeded at NCA14:

- During temporary road and intersection modifications during the evening and night-time periods
- During the operation of construction ancillary facilities, during evening and night-time periods
- During road construction, during evening and night-time periods
- During the operation of tunnel construction ancillary facilities, during evening and night-time periods.

The sleep disturbance assessment presented in Table 10.14 to Table 10.19 of the EIS indicates that the $L_{A1(1minute)}$ levels exceed the sleep disturbance criteria for the worst case exceedance during all construction scenarios where works are proposed to be undertaken at night.

Issue description – construction hours and noise constraints

Query regarding the construction hours and associated noise constraints during construction.

Response

Construction work hours are described in section 6.7.2 of the EIS. In accordance with the SEARs for the project a construction noise and vibration assessment has been undertaken consistent with the *ICNG and Assessing Vibration: a technical guideline*. The assessment is presented in section 10.4 of the EIS. The assessment includes consideration of feasible and reasonable work practices to minimise noise impacts during construction. These measures are identified in section 10.4.1 and 10.7.2 of the EIS.

Issue description – 24 hour construction

Submission raised concern in relation to 24 hour construction. Specific issues raised include:

- 24 hour construction at number of locations is not acceptable, including the handling of spoil
- 24 hour tunnel activities at the tunnelling sites would include the use of trucks travelling along roads at night
- Can spoil haulage occur only during the daytime period to minimise impacts on residents sleeping.

Response

Spoil haulage from and concrete delivery to the following tunnelling sites (as outlined in Table 6.22 of the EIS) is required to occur 24 hours per day in order to support the 24 hour tunnelling activities:

- Concord Road civil and tunnel site (C5)
- Cintra Park tunnel site (C6)
- Northcote Street tunnel site (C7)
- Eastern ventilation facility site (C8).

In addition, concrete deliveries are required 24 hours a day to support tunnelling works at Underwood Road civil and tunnel site (C3).

As outlined in Table 6.22 of the EIS, the reasons why tunnelling and therefore haulage is required 24 hours a day is 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 is therefore required 24 hours a day, seven days a week.

At all tunnel sites (excluding the eastern ventilation facility site), stockpiling and spoil handling would occur within acoustic sheds, reducing potential impacts.

All spoil haulage from these four construction ancillary facilities would be confined to arterial roads. Use of these roads is justified as they currently experience heavy traffic volumes at all times of the day (include the movement of trucks).

Undertaking tunnelling 24 hours per day assists in minimising the overall length of construction and the duration of any associated amenity impacts on the local community.

Issue description – restriction of construction hours

Construction hours should be restricted. Suggestions include restricting construction works to the standard construction hours.

Response

Standard construction hours are specified in the Interim Construction Noise Guidelines (DECCW, 2009a) as:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm Saturday

- No works on Sundays or public holidays
- Unless otherwise approved by the EPA.

As described above, to minimise the overall length of the construction period, tunnelling works would be carried out continuously for 24 hours per day, seven days per week. As a result, tunnel support activities at the five tunnel support sites would also be required up to 24 hours per day and seven days per week. The exception to this would be blasting activities, which would only be undertaken during the following hours:

- 9:00 am to 5:00 pm Monday to Friday
- 9:00 am to 1:00 pm Saturday
- At no time on a Sunday or on a public holiday.

Other construction activities would also be undertaken outside of standard construction hours to:

- Minimise unacceptable traffic impacts on and disruptions to the road network
- Minimise disturbance to surrounding land owners and commercial properties
- Ensure the safety of the construction workers, motorists and the general public
- Or as otherwise approved by the EPA.

All activities that are anticipated to be undertaken outside of standard construction hours are listed in Table 6.22 of the EIS.

Issue description – surface road works to be undertaken out of hours

Submissions queried that the opening paragraph on road construction in the EIS states that new road works would be undertaken within the construction footprint, however out of hours works would be likely to minimise impacts to traffic and reduce safety risks for workers. If the works are being conducted entirely within the construction footprint, then why would there be potential impacts to traffic and workers safety? Does this actually mean that new road works would be undertaken within areas that are currently in use for road operations?

Response

The construction footprint for the project is described in section 6.3 of the EIS and includes the total area required for construction, including below ground works and surface works. As stated in section 6.4.3 of the EIS surface earthworks and structures would include the following surface works:

- Widening, realignment and resurfacing of the existing M4 east of the Homebush Bay Drive interchange
- New and modified ramps on the existing M4 at Homebush Bay Drive, Powells Creek and Concord Road
- Realignment of Wattle Street and associated side roads
- Realignment of Parramatta Road and associated side roads.

During construction of the project, traffic management measures would be put in place to maintain the functionality of surrounding roads, and to protect the safety of pedestrians, cyclists, motorists and construction personnel. Further detail regarding traffic management is provided in section 6.6. of the EIS.

Issue description – management of impacts from out of hours works

Submissions recommended a number of management measures relating to out of hours works, including:

- That the results of noise monitoring undertaken during the construction of the project be used to inform the changes to construction practices to manage potential impacts on sensitive receivers
- That penalties be applied to the contractor where noise from construction of the project exceeds the night-time criteria

- That out of hours works only be undertaken when it can be demonstrated that no other options are safe or the impacts to the surrounding receivers are absent or minimal.

Response

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 the five tunnel construction sites.

The majority of tunnelling works outside of standard construction hours would occur within an acoustic shed.

A number of other construction activities would also be undertaken outside of standard construction hours. A description of these is provided in Table 6.22 of the EIS along with a rationale for undertaking these activities out-of-hours.

The assessment of construction noise and vibration presented in section 10.4 of the EIS includes a prediction of the extent (if any) to which the $L_{A1(1minute)}$ levels are exceeded, where night-time works are proposed. Table 10.14 to Table 10.19 of the EIS identify that the $L_{A1(1minute)}$ levels exceed the sleep disturbance criteria for the worst case exceedance during all construction scenarios where works are proposed at night. These impacts would not be experienced within all NCAs.

The project includes feasible and reasonable management measures to reduce the potential noise impact to nearby receivers, including the provision of an acoustic shed for tunnelling sites.

Ongoing noise monitoring during the construction of the project would be undertaken on a case-by-case basis and would involve monitoring at the commencement of the construction activities and then periodically throughout the construction program. Once noise levels have been established through monitoring of a particular activity in a particular location, there is no benefit to undertaking continuous noise monitoring.

The requirement for and conditions under which noise monitoring would take place would be described in further detail in the CNVMP to be prepared prior to the commencement of the works.

5.9.8 Property damage and existing condition surveys

476 submissions raised issues in regard to property damage during construction and also the need for property existing condition surveys.

Issue description – concern relating to property damage

Construction of the project could damage buildings (including heritage-listed buildings) due to both surface and tunnelling works. The following queries were made:

- General concern that a large number of properties would be susceptible to cosmetic damage
- Requests that building condition surveys should be undertaken as part of the EIS process given the significant number of receivers which are expected to be impacted
- Which properties has the assessment identified as being susceptible to potential damage from vibration as a result of the tunnelling works
- Can assurance be provided that tunnelling would not damage property?
- How would impacts be minimised and if they occur, rectified?
- Impacts on heritage-listed buildings and the costs associated with repair
- Impacts on dwellings which are not heritage listed but which have aesthetic qualities
- Who will be responsible for cost of any works resulting from impacts?
- Will properties be assessed (at no cost to residents) for their existing condition prior to works commencing?

- Community consultation regarding vibration impacts on buildings has not been undertaken
- Surface conditions should be monitored for the duration of the tunnelling works to ensure adverse impacts are identified.

Response

Vibration impacts on properties due to tunnelling activities are discussed in **section 5.10.4** of this report, while impacts due to settlement are discussed in **section 5.17** of this report.

As outlined in **Chapter 8** (Revised environmental management measures) of this report, building condition 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
- Within 50 metres of surface works.

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 due to the works.

The cost of these building condition surveys would be borne by the construction contractor.

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 the cost of Roads and Maritime.

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 where necessary.

The preparation of a construction noise and vibration management plan and associated feasible and reasonable work practices at the detailed design stage of the project is consistent with the ICNG and projects of a similar scale.

Issue description – damage caused by exploratory investigations

A submission asserted that the exploratory excavations undertaken to date have caused property damage.

Response

No reports of damage from exploratory excavations have been received.

Site works have included geotechnical and contaminated land investigations and site inspections. The Review of Environmental Factors for the investigations identifies that the borehole drilling is not expected to generate vibration levels greater than 0.2mm/s – based on these levels it is unlikely that these works would have resulted in damage to the property.

If the resident believes that damage has been caused by the project it is recommended they contact the project hotline so that further investigations can be undertaken, including more accurately identifying the works which may have resulted in the damage.

Issue description – validity of existing condition survey

The existing condition survey would not be independent as it would be undertaken by representatives of the construction contractor.

Response

Pre-construction property condition surveys would be conducted by qualified professionals who are contracted by the contractor through a competitive tender process. Pre-construction property condition surveys would record the condition of the property before construction work commences.

This would be done in case of the unlikely event that construction works cause damage to a property or structure. The pre-construction survey would then provide a baseline condition of the property for comparison.

The project will also establish an Independent Property Impact Assessment Panel (which would be approved by the NSW Department of Planning and Environment) which will be comprised of geotechnical and engineering experts independent of the design and construction team. The Panel would be responsible for independently assisting with the resolution of property damage disputes (should they arise) as well the establishment of ongoing settlement monitoring requirements.

Issue description – impact of vibration on The Infants' Home

A submission raised concern regarding the impacts of vibration on The Infants' Home at Ashfield and requested that a dilapidation report be undertaken prior to construction.

Response

As a number of buildings within The Infants' Home site are located within 50 metres of the preferred project corridor, in accordance with the management measures described in **Chapter 8** (Revised environmental management measures) of this report, these buildings would be subject to building condition surveys before and after construction.

5.9.9 Cumulative noise impacts during construction

13 submissions raised issues regarding cumulative noise impacts during construction.

Issue description – cumulative noise impacts would be unacceptable

Submissions raised concern that the cumulative noise impacts during construction from the Northcote Street tunnel site, the eastern ventilation facility, the Wattle Street and Walker Avenue civil site and the Parramatta Road civil site would be unacceptable.

Response

Cumulative noise impacts resulting from the cumulative operation of multiple construction scenarios is assessed in section 10.6.1 of the EIS.

The prediction of cumulative noise levels from more than one construction scenario operating close to another scenario within the proposal 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 practice, the noise levels would vary due to the fact that plant and equipment would move about the worksites and there would be times when some plant and equipment would not be operating.

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.

5.9.10 Operational assessment methodology including modelling

14 submissions raised issues regarding the adequacy of the noise assessment.

Issue description – results of the noise and vibration assessment

Submissions asked when the construction noise and vibration assessment was undertaken and what the results were.

Response

To quantify and characterise the existing ambient noise environment, a baseline noise monitoring survey was undertaken from 26 March to 9 April 2014. The measured noise levels were used to establish existing road traffic noise levels to allow for validation of the operational noise model, and as a basis for assessing potential noise impacts during construction.

The noise and vibration impact assessment was completed in September 2015, and was based on the preferred design.

The results of the noise and vibration impact assessment for both construction and operation are presented in Chapter 10 and Appendix I of the EIS.

Issue description – noise and vibration assessment study area

Concerns were raised that the study area for the noise and vibration assessment does not consider potential for increased noise along the City West Link and the suburbs of Haberfield, Leichhardt, Lilyfield and Annandale. Submissions requested that the study area for the noise and vibration assessment be extended to cover all roads where the project would cause a significant increase in traffic volumes, and failure to do so limits the efficacy of the EIS in assessing impacts of the project.

Response

The assessment of noise from the operation of the proposal has been assessed in accordance with the guidelines provided in the *NSW Road Noise Policy* (RNP) (NSW Environment Protection Authority (EPA), 2011), as interpreted by Roads and Maritime in the Noise Criteria Guideline (NCG) (Roads and Maritime, 2014b). The NCG provides a consistent approach to identifying road noise criteria for Roads and Maritime projects and meets the intention of the RNP. Guidance for additional noise mitigation is taken from the Noise Mitigation Guideline (NMG) (Roads and Maritime, 2014b). Guidance for assessing the potential for sleep disturbance from maximum noise events is taken from Practice Note iii in the Environmental Noise Management Manual (ENMM) (Roads and Maritime, 2001). Noise from operation of proposed fixed operational facilities is assessed with guidance from the *NSW Industrial Noise Policy* (INP) (EPA, 1999b).

The study area for the assessment of noise from the operation of the proposal was determined in accordance with these guidelines.

Issue description – existing noise levels on Wolseley Street at Haberfield

Concerns were raised regarding the accuracy of background noise measurements on Wolseley Street at Haberfield, as it appears this measurement forms the basis from which an acceptable noise level is derived. This area is currently undergoing temporary works and concern was raised that this unusual noise level would skew the background noise results.

Response

Chapter 10 and Appendix I of the EIS provide a noise and vibration impact assessment. Section 3.4 and section 3.5 of the noise and vibration impact assessment at Appendix I of the EIS describe the process to quantify and characterise the existing ambient noise environment across the project area.

Unattended and attended noise monitoring was undertaken from 26 March to 9 April 2014.As a result, any current construction work in the vicinity of Wolseley Street at Haberfield would not have influenced the background noise results at this location.

Issue description – modelling and assessment methodology

Submissions expressed concern that the modelling and assessment methodology did not consider the noise generated by vehicles entering and leaving the tunnel.

Response

Section 10.5.1 of the EIS provides an assessment of the impacts of road traffic noise during operation. The operational noise assessment was undertaken in accordance with the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014b). Practice Note iii in the ENMM (RTA 2001) was used for the assessment for sleep disturbance.

This assessment considered the road traffic noise generated by vehicles entering and leaving the tunnel within the project area, as well as other traffic using surface roads that would be upgraded as part of the project.

Issue description – lack of consideration of noise generated by diesel vehicles

Concerns were raised that the EIS does not consider in sufficient detail the noise impacts of a greater number of diesel vehicles, which are much noisier than petrol vehicles, using the project.

Response

Section 10.5 and Appendix I 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 above the criteria identified in the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014b).

In accordance with the RNP and NCG, traffic data for the Build and No Build assessment scenarios for both project opening and the future design year has been used in the assessment of operational road noise.

Section 5.2 of the noise and vibration technical paper describes the four effective noise sources which comprise a 'CAR' source with height of 0.5 metres above pavement and three 'TRUCK' sources at three separate heights representing the noise emission from truck tyres (0.5 metres), truck engines (1.5 metres) and truck exhausts (3.6 metres). These sources are included in the noise prediction model for the project. The noise model accuracy for predicting road traffic noise levels was validated for this project (refer to section 5.4 of the noise and vibration technical paper) by comparing predicted noise levels with measured noise levels. This process was based on the noise monitoring undertaken for this project in 2014 and therefore includes the current mix of diesel and petrol vehicles on the road network.

Issue description – attended noise monitoring detail

Submissions requested confirmation of the times of day, evening and night that the attended noise monitoring was undertaken.

Response

Detailed observation notes for the attended ambient airborne noise measurements are included in Appendix C of the noise and vibration impact assessment at Appendix I of the EIS.

Issue description – attended noise monitoring detail

Submissions requested clarification on Table 10.3 from the EIS, states out that the noise management levels (NMLs) for construction works during standard hours should be the rating background level (RBL) +10dBA and the rating background level +5dBA for out of hours works however, not all of the NMLS for the project have been accurately calculated in Table 10.4 when compared to the measured INCG RBLs in Table 10.2.

Response

Due to a transcription error, the background noise monitoring results in Table 10.2 of the EIS for noise monitoring locations L18, L19, L20, L21, L22 and L23 were incorrectly stated. The correct results were presented in Tables 7 and 8 of the noise and vibration impact assessment in Appendix I of the EIS.

The copy of Table 10.2 in **section 6.5.4** of this report presents the correct background noise monitoring results for these locations. The results that have changed are shown in **bold**.

While the incorrect results were presented in Table 10.2 of the EIS, the noise management levels that were derived from the background noise monitoring results and presented in Table 10.4 and Tables 10.13 to 10.19 of the EIS were based on the correct background noise levels. Therefore the assessment of impacts presented in the EIS is correct, and there is no need for further environmental assessment.

Issue description – attended noise monitoring detail

Submissions requested clarification on whether the NMLs for sleep disturbance in Table 10.4 of the EIS were internal or external levels.

Response

Section 4.6 of the noise and vibration impact assessment at Appendix I of the EIS describes the protocol for assessing the potential for sleep disturbance. The sleep disturbance NMLs presented in Table 10.4 is determined for the façade of the building and so are external.

5.9.11 Operational traffic noise

343 submissions raised issues regarding traffic noise during the operation of the project.

Issue description – amenity impacts resulting from operation

Submissions raised concern that increased noise from project operation would affect a large number of residential properties and neighbourhood amenity.

Response

Section 10.5 and Appendix I 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 above the criteria identified in the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014b).

Appendix N to the noise and vibration impact assessment in Appendix I of the EIS consists of a series of tables which present the operational traffic noise modelling results for receivers around the project. The tables include predicted noise levels with and without the project for the nominal year of opening (2021) and 10 years after the nominal year of opening (2031), and under different noise mitigation scenarios. These tables are summarised in Table 10.24 of the EIS.

The tables indicate that, without the project, many receivers located in the vicinity of the project would be subject to significant noise impacts as a result of traffic on the existing road network without the implementation of operational noise mitigation. Table 10.24 of the EIS shows that the project is predicted to result in an overall reduction in the number of receivers where exceedances of the noise criteria are experienced during both the daytime and night-time periods. These reductions would be as a result of reductions in the number of vehicles using some surface roads such as the existing M4 (east of the tunnel portals), Parramatta Road (east of Concord Road), and Wattle Street (north of Ramsay Street).

The EIS identifies a reduction in the overall number of receivers that would experience exceedances as a result of the proposed management measures that form part of the project (low noise pavement and noise barriers). Following the installation of these measures, a total of 310 receivers (total floors) would still be eligible for consideration for additional mitigation. These properties are detailed in Appendix N of the noise and vibration impact assessment at Appendix I of the EIS, and shown in Figure 10.6 and Figure 10.7 of the EIS. They include:

- 284 residential receivers on first or second floor (227 individual lots)
- 26 other sensitive receivers on a first or second floor (20 individual lots).

Section 10.7.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) describes applicable at-property treatments for these groups. The requirement for at-property treatment would be finalised during detailed design, following property inspections as required.

Issue description – noise management measures

General queries regarding the noise management measures that would be implemented when the project is operational.

Response

Operational noise management measures are described in section 10.7 of the EIS.

As described in section 5.8.6 of the EIS, noise barriers would be constructed to minimise noise impacts and low noise pavement would be used for new and modified sections of the existing M4. The location of noise barriers and low noise pavement is shown in Figure 10.6 and Figure 10.7 of the EIS.

In addition, environmental management measures have been identified in section 10.7.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) to manage potential operational road noise impacts. These include:

- 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 (at-property treatment) would be considered. A full list of receivers considered eligible for consideration for at-property acoustic treatments based on the design of the project presented in the EIS is included in the noise and vibration impact assessment in Appendix I. Confirmation of these receiver locations will be undertaken during detailed design
- Within 12 months of commencement of operation, operational traffic noise would be monitored at sensitive receivers to compare actual noise performance of the project against predicted noise performance. If the traffic noise levels are above the predicted levels, consideration of additional feasible and reasonable management measures would be undertaken.

To manage noise from operational ancillary facilities, they would be designed to meet project specific noise criteria derived in accordance with the NSW Industrial Noise Policy.

Issue description – noise impacts within the vicinity of the Concord Road interchange

Concerns were raised that the project would result in noise impacts in the vicinity of the Concord Road interchange. The following specific concerns were raised:

- EIS states that noise levels at the Concord Road interchange would remain the same, and do not believe this would be the case
- Once homes on Young Street are removed, homes along Sydney Street would be exposed to operations along the M4
- Increased congestion as a result of the interchange would result in traffic noise impacts on sensitive receivers in the vicinity
- The elevation of the Concord Road interchange would result in operational road noise impacts on residences in the vicinity including the multi-unit development at 167-17 Parramatta Road at North Strathfield.

Response

Section 10.5 and Appendix I 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 above the criteria identified in the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014b).

The project would result in exceedances in noise criteria in the vicinity of the Concord Road interchange. Acquisition and subsequent demolition of front row properties adjacent to the Sydney Street off-ramp would contribute to these exceedances through a reduction in screening to receivers at the rear.

As outlined in section 10.5.1 of the EIS, following the implementation of mitigation such as noise barriers and low noise pavement noise exceedances are considered to be limited to a few properties located on Sydney Street and Carrington Street, while most properties along Concord Road are expected to experience exceedances of criteria. These properties are all eligible for further consideration for at-property treatments in order to further minimise noise impacts.

All noise barriers considered included consideration of varying heights. Heights selected provide the maximum benefit for the surrounding residents.

A number of additional noise barriers were considered as part of the noise and vibration assessment (refer to section 8.3 of Appendix I of the EIS), including barriers on the eastern side of Concord Road, northern side of Sydney Street, and the southern side of Sydney Street at tunnel portals, in addition to those proposed in the EIS. The location of these barriers and the justification as to why each barrier was not considered feasible is presented in **Table 5.6**.

Table 5.6 Noise barriers considered in design but not adopted

Location	Reason not adopted
Eastern side of Concord Road	Some reductions were achieved, however barriers would impact access to the church on Concord Road and would also result in the sterilisation of residual land along Concord Road by restricting views and access to properties
Northern side of Sydney Street	Some reductions were achieved, however a barrier may potentially sterilise future use of the adjacent land by restricting visibility and/or access. Therefore, at property treatments were recommended for the triggered receivers instead of a barrier.
Southern side of Sydney Street at tunnel portals	No change in the number of impacted receivers, with only two benefiting from a barrier

The assessment of operational road noise has applied a conservative assumption that no congestion in the Build case would be apparent. Noise levels would be expected to be lower where congestion is apparent when the project is operational.

The receiver at 167-173 Parramatta Road at Concord is located within NCA 11. Existing noise levels within NCA 11 are dominated by Parramatta Road and the existing M4, with predicted noise levels in the No Build scenario of greater than 65 dBA in the daytime and night-time.

The EIS identifies that without mitigation, 14 receivers (consisting of eight individual buildings) would experience exceedances of the criteria within NCA 11. This will be confirmed during detailed design.

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. It was found that low noise pavement was not considered to be viable due to the low speed traffic environment (i.e. vehicles stopping or accelerating from lights). Consideration of noise barriers was also not feasible due to access requirements of properties located along Parramatta Road.

A total of 14 receivers (eight individual buildings) qualify for consideration of at-property treatment within NCA 11. This includes the multi-unit development at 167-171 Parramatta Road at North Strathfield.

As described in section 5.13 and section 7.4 of Appendix I to the EIS, counts for consideration of at-property treatment include the ground and first floor levels only. This is consistent with advice received from Roads and Maritime as it is generally not feasible and reasonable to provide at-receiver noise mitigation to multi-unit residential receivers. Where residential receivers are identified as exceeding the NCG criteria in multi-storey apartment buildings, feasible and reasonable review of architectural treatments would be completed during detailed design.

Issue description – operational noise impacts on properties

Concerns were raised that noise impacts during operation on properties along Wattle Street south of Ash Lane have not been adequately addressed. The inclusion of low noise pavement is not a suitable management measure.

Response

Operational noise impacts for properties located on Wattle Street to the south of Ash Lane have been assessed as part of NCA 14. Section 10.5.1 of the EIS outlines the predicted noise levels within NCA 14. **Table 5.7** outlines the number of properties located within NCA which would experience exceedances of the noise criteria (without noise mitigation).

Table 5.7 Number of receivers experiencing operational traffic noise exceedances within NCA 14 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
14	11	18	16	18	11	22	20	20

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. It was found that low noise pavement was not considered to be viable due to the low speed traffic environment (i.e. vehicles stopping or accelerating from lights). Consideration of noise barriers was also not feasible due to access requirements of properties located along Wattle Street (including those located south of Ash Lane).

The EIS identifies a total of eight residential properties and one church are eligible for consideration for at-property treatment along Wattle Street as further mitigation (low noise pavement or noise barriers) would not result in a reduction. The residential properties along Wattle Street (south of Ash Lane) would be eligible for consideration for at-property treatment; however, this may change subject to detailed design.

Issue description – noise impacts of heavy vehicle traffic through the tunnel

Concerns were raised that heavy vehicle traffic through the tunnel would cause noise impacts.

Response

Operational noise impacts were assessed in section 10.5.1 of the EIS. This assessment included the use of the project tunnels by heavy vehicles.

Issue description – noise impacts from the operation of the tunnel on properties

Concerns were raised about noise impacts due to the operation of the tunnel on properties near Neich Parade at Burwood.

Response

The project would be located within tunnel near Neich Parade at Burwood, and therefore operational noise impacts are not considered likely. Neich Parade is located in NC 11. As outlined in section 10.5.1 of the EIS, noise impacts within NCA 11 would be reduced as a result of a reduction in traffic along Parramatta Road.

Issue description – operational traffic noise level and management measures

A submission requested the predicted operational traffic noise levels at a dwelling at 24 Walker Avenue, whether this would be greater than the levels currently experienced, how effective the noise barrier at this location would be, and what management measures are proposed at this property for noise and vibration (0338).

Response

Operational noise impacts for properties located on Walker Avenue to the south of Wattle Street between Parramatta Road and Allum Street have been assessed as part of NCA 14. Section 10.5.1 of the EIS outlines the predicted noise levels within NCA 14. **Table 5.8** outlines the number of receivers located within NCA 14 that would experience exceedances of the noise criteria (without noise mitigation).

Table 5.8 Number of receivers experiencing operational traffic noise exceedances within NCA 14 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
14	11	18	16	18	11	22	20	20

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. The change in noise levels with mitigation for receivers in NCA14 is presented in **Table 5.9**.

Table 5.9 Number of receivers experiencing operational traffic noise exceedances within NCA 14 (with mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
14	**11**	**18**	**9**	**8**	**11**	**22**	**10**	**13**

A total of eight receivers are eligible for consideration for at-property treatment within NCA14, as the proposed noise barrier would not reduce the noise levels to meet the NCG controlling criterion. This includes the residential property at 24 Walker Avenue.

Section 7.4 and section 7.5 of Appendix I to the EIS includes a discussion of applicable at-property treatments for these groups. The requirement for at-property treatment would be finalised during detailed design, following property inspections as required.

Issue description – noise impacts from increases in traffic

Submissions raised concern that operational noise as a result of increases in traffic would result in sleep disturbance for nearby residents.

Response

The Road Noise Policy (DECCW, 2011) provides guidance on the assessment of sleep disturbance, which is reproduced in section 4.6 of the noise and vibration impact assessment at Appendix I of the EIS and includes the following summary:

From the research on sleep disturbance to date it can be concluded that:

- Maximum internal noise levels below 50-55 dBA are unlikely to awaken people from sleep
- One or two noise events per night, with maximum internal noise levels of 65-70 dBA, are not likely to affect health and wellbeing significantly.

Section 10.5.1 and Appendix I of the EIS assesses the operational noise impacts of the proposal including the predicted noise levels for sensitive receivers.

The maximum noise assessment carried out for the project indicates a potential increase in maximum noise levels in the following locations:

- NCA 03 – Receivers south of the M4 adjacent to the new westbound M4 bridge, where the existing noise barrier section would not block line of sight to an elevated heavy vehicle exhausts on the new bridge. Typical increases of between five dBA and more than10 dBA are predicted. It is noted that some receivers are eligible for consideration for at property treatments in this catchment as part of the project
- NCA 02 – Receivers north of the M4 adjacent to the new eastbound M4 bridge, where the operational noise barrier would be located to reduce the dominant L_{Aeq} noise source (the main carriageways), but would not provide screening from elevated heavy vehicle exhausts on the new bridge. Typical increases of between two dBA and more than10 dBA are predicted. It is noted that some receivers are eligible for consideration for at property treatments in this catchment as part of the project
- NCA 05 – Receivers south of the M4 adjacent to the new westbound on-ramp, at the adjacent multi-storey receiver on Powell Street. Typical increases of around three dBA are predicted. It is noted that receivers are not eligible for consideration for at property treatments in this catchment as part of the project.
- NCA 09 – Receivers east of the new Concord Road interchange, where the new on- and off-ramps would be closer to receivers and elevated heavy vehicle exhausts would be above the proposed noise barrier height. Screening has also been reduced due to removal of the front row of buildings. Indicatively, typical increases of between four dBA and more than10 dBA are predicted. It is noted that some receivers are eligible for consideration for at property treatments in this catchment as part of the project
- NCA 21 – Receivers south of the Parramatta Road interchange, where screening would be reduced due to the removal of the front row of buildings, and the road alignment would be closer to receivers to the south. Typical increases of between six dBA and more than 10 dBA are predicted. It is noted that some receivers are eligible for consideration for at property treatments in this catchment as part of the project
- NCA 18 – Receivers south of Wattle Street, adjacent to access gaps in the proposed noise barriers, where the road would be closer to receivers. Typical increases of between five dBA and more than 10 dBA are predicted. It is noted that some receivers are eligible for consideration for at property treatments in this catchment as part of the project.

The above assessment was based on the preferred design presented in the EIS. As described in **section 7.2** of this report, an alternative design for the Homebush Bay Drive interchange and associated bridges is now proposed. The noise assessment for this design change has concluded that the reconfiguration and associated noise barriers would lessen maximum noise levels in some NCAs by about five to seven dBA – namely the predominantly commercial NCA01 (north) and predominantly residential NCA02 and NCA03. The reconfiguration would also increase maximum noise levels in other areas by about nine dBA – namely the predominantly commercial NCA01 (south). Predicted maximum noise levels at receivers further away from the main areas of change – namely NCA04 and NCA05 – would not change materially.

The proposed noise barrier designs would reduce the scale of maximum noise levels for receivers, mainly located north of the existing M4, and parts east of Wattle Street.

Detailed investigation of maximum noise levels would be undertaken during detailed design, including consideration of feasible and reasonable noise mitigation on the basis of maximum noise levels.

Issue description – noise impacts from increases in traffic on Dobroyd Parade

Submissions raised concern that additional traffic on Dobroyd Parade as a result of the Wattle Street tunnel portals would result in noise impacts along Dobroyd Parade. This has not been sufficiently assessed in the EIS.

Response

Section 10.5 and Appendix I 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 above the criteria identified in the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014).

The NCG requires consideration of the surrounding road network where the proposed project is predicted to increase noise levels by more than two dBA at receivers from the No Build to Build scenarios. The impacted surrounding road network is then assessed as a project road where noise levels have increased by more than two dBA.

Generally, roads where design or engineering changes are proposed have been considered as project roads, and roads where no design or engineering changes are proposed have been modelled as non-project existing roads.

The assessment of operational road noise considers potential increases in traffic noise on the surrounding road network within the extent of works of the project. This approach meets the principles of the NCG.

Issue description – management of noise measures

Concerns were raised that noise impacts as a result of the operation of the project would need to be mitigated to manage potential impacts on the aged care facility at 169-171 Parramatta Road, Haberfield.

Response

Operational noise impacts for the aged care facility located at 169-171 Parramatta Road at Haberfield have been assessed as part of NCA 20. Section 10.5.1 of the EIS outlines the predicted noise levels within NCA 20. **Table 5.10** outlines the number of receivers located in NCA20 which would experience exceedances of the noise criteria (without noise mitigation).

Table 5.10 Number of receivers experiencing operational traffic noise exceedances within NCA 20 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
20	46	35	43	31	58	43	58	39

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. Low noise pavement or noise barriers on this section of Parramatta Road are not considered reasonable as the traffic speeds are relatively low and interrupted (traffic lights), and access requirements would reduce the efficacy of noise barriers.

The EIS identified a total of 17 receivers (13 individual buildings) qualify for consideration of at-property treatment within NCA20 as feasible and reasonable mitigation would not reduce the noise levels to meet the NCG controlling criterion. This includes the aged care facility at 169-171 Parramatta Road. Note however that this may change subject to detailed design.

Section 7.4 and Section 7.5 of Appendix I to the EIS includes a discussion of applicable at-property treatments for these properties. The requirement for at-property treatment would be confirmed during detailed design, following property inspections as required.

Issue description – operational noise impacts from the Powells Creek on-ramp

The Powells Creek on-ramp from Parramatta Road (east of Station Street) onto the M4 would result in operational noise impacts on the public open space at the southern extent of Arnotts Reserve and neighbouring dwellings.

Response

Section 10.5.1 and Appendix I 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 above the criteria identified in the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014b).

Noise and vibration sensitive receivers have been identified in accordance with relevant guidelines. This includes identification of outdoor open areas (passive and active open recreation). Table 5 of the noise and vibration impact assessment at Appendix I of the EIS details receivers other than residential and commercial receivers that would be sensitive to noise as a result of the operation of the proposal. The southern extent of Arnotts Reserve is not identified as a sensitive receiver, because this area is currently fenced off and not accessible to the public. Strathfield Council has recently concluded remediation of this site, with the intention of developing the site for public open space.

Arnotts Reserve (Allen Street, Homebush) was not identified as a sensitive receiver in the EIS noise and vibration technical paper however it is noted that no increase in noise is predicted due to the project in this area (the project is anticipated to result in a reduction in traffic on the M4 motorway in this section).

Issue description – provision of mean and peak noise levels

A submission requested the mean and peak predicted operational noise levels for the property at 1 Cove Street at Haberfield, between the hours of 6.30 pm and 6.30 am.

Response

Section 10.5 and Appendix I 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 above the criteria identified in the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014).

In accordance with the relevant guidelines, operational noise metrics have been used to model and assess airborne noise from road traffic. These are described in section 4.2 of the noise and vibration impact assessment at Appendix I of the EIS and include:

- $L_{Aeq(15hour)}$ – the 'energy average noise level' evaluated over the daytime period (7.00 am to 10.00 pm). The L_{Aeq} can be compared to the average of all noise events occurring in the relevant time period
- $L_{Aeq(9hour)}$ – the 'energy average noise level' evaluated over the night-time period (10.00 pm to 7.00 am)
- L_{Amax} – The maximum noise level from road traffic noise occurring at a particular location.

Predicted noise levels for all assessed scenarios are shown in Appendix H and Appendix I of the noise and vibration impact assessment at Appendix I of the EIS for the No Build and Build (without mitigation) scenarios respectively.

Appendix N to the noise and vibration impact assessment in Appendix I of the EIS consists of a series of tables which present the operational traffic noise modelling results for receivers around the project. The tables include predicted noise levels with and without the project for the nominal year of opening (2021) and 10 years after the nominal year of opening (2031), and under different noise mitigation scenarios. These tables are summarised in section 10.5.1 of the EIS.

Operational noise impacts for properties located on Cove Street have been assessed as part of NCA 14. Section 10.5.1 of the EIS outlines the predicted noise levels within NCA 14. **Table 5.11** outlines the number of properties located within NCA which would experience exceedances of the noise criteria (without noise mitigation).

Table 5.11 Number of receivers experiencing operational traffic noise exceedances within NCA 14 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
14	11	18	16	18	11	22	20	20

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. The change in noise levels with mitigation for receivers in NCA14 is presented in **Table 5.12**.

Table 5.12 Number of receivers experiencing operational traffic noise exceedances within NCA 14 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
14	11	18	9	8	11	22	10	13

The EIS identified a total of eight residential properties are eligible for consideration for at-property treatment within NCA14 as feasible and reasonable mitigation does not reduce the noise levels to meet the NCG controlling criterion. No properties on Cove Street at Haberfield have been identified as eligible for consideration for at-property treatment; however, this may change subject to detailed design.

Table 10.27 in section 10.5 of the EIS describes the maximum noise levels measures at each of the monitoring locations. The maximum noise assessment did not identify a potential noise increase in maximum noise levels for properties within NCA 14 north of Wattle Street.

Issue description – operational noise to remain within the EPA guidelines

A submission was received stating that operational noise as a result of the project should be maintained within the EPA guidelines.

Response

The operational noise assessment detailed in section 10.5 of the EIS considers the potential increase in operational traffic noise and feasible and reasonable management measures where receivers are above the criteria assigned using Roads and Maritime's Noise Criteria Guideline (NCG) (Roads and Maritime 2014b). Roads and Maritime's NCG provides practical implementation of the intention of the Road Noise Policy (DECCW 2011). Roads and Maritime's Noise Mitigation Guideline (NMG) (Roads and Maritime 2014b) provides guidance in managing and controlling road traffic generated noise and describes the principles to be applied when reviewing noise mitigation. The use of these policy and guideline documents is consistent with the SEARs for the project.

In accordance with management measure OpNV3 as described in **Table 8.1** of this report, within 12 months of commencement of operation, operational traffic noise would be monitored at sensitive receivers to compare actual noise performance of the project against predicted noise performance. If the traffic noise levels are above the predicted levels, consideration of additional feasible and reasonable management measures would be undertaken. Guidance for additional noise mitigation would be derived from the NMG.

Issue description – changes to amenity as a result of noise impacts

Concerns were raised that traffic noise would increase substantially along Dobroyd Parade (City West Link), which is evidenced by the need to construct a noise barrier at this location between Waratah Street and Crane Avenue, Haberfield. Noise impacts at this location would result in changes to amenity for residences in the vicinity.

Response

Section 10.5 and Appendix I 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 above the criteria assigned using Roads and Maritime's NCG. Roads and Maritime's NCG provides practical implementation of the intention of the Road Noise Poilcy (DECCW 2011).

Predicted noise levels for all assessed scenarios are shown in Appendix H and Appendix I of the noise and vibration impact assessment at Appendix I of the EIS for the No Build and Build (without mitigation) scenarios respectively.

Operational noise impacts for receivers in the vicinity of Wattle Street and Dobroyd Parade (City West Link) have been assessed as part of NCA 17. Section 10.5.1 of the EIS outlines the predicted noise levels within NCA 17. **Table 5.13** outlines the number of properties located within NCA which would experience exceedances of the noise criteria (without noise mitigation).

Table 5.13 Number of receivers experiencing operational traffic noise exceedances within NCA 17 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
17	38	38	43	39	39	40	43	40

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. Low noise pavement is not considered reasonable at this location as traffic speeds are relatively low and interrupted (traffic lights).

For receivers north-west of Waratah Street, the EIS recommends a five metre high noise barrier along Wattle Street has been identified as the optimum height to reduce noise impacts, the details of which will be further refined as detailed design continues. The construction of this noise barrier would reduce the overall number of receivers that experience exceedances. **Table 5.14** outlines these reductions.

Table 5.14 Number of receivers experiencing operational traffic noise exceedances within NCA 17 (with mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
17	38	38	28	31	39	40	26	30

The EIS identifies a total of 25 receivers (20 individual buildings) would be eligible for consideration for at-property treatment within NCA17 as feasible and reasonable mitigation would not reduce the noise levels to meet the NCG controlling criterion. Note that this may change subject to detailed design.

Section 7.4 and section 7.5 of Appendix I to the EIS includes a discussion of applicable at-property treatments for these groups. The requirement for at-property treatment would be confirmed during detailed design, following property inspections as required.

Issue description – operational noise impacts on residences

Concerns were raised that increased noise from project operation would affect residences on Edward Street at Concord.

Response

Operational noise impacts for receivers on Edward Street at Concord, east of those dwellings which would be acquired for the project and which form part of NCA 08, have been assessed as part of NCA 09. Section 10.5.1 of the EIS outlines the predicted noise levels within NCA 09. **Table 5.15** outlines the number of properties located within the NCA which would experience exceedances of the noise criteria (without noise mitigation).

Table 5.15 Number of receivers experiencing operational traffic noise exceedances within NCA 20 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
09	72	74	71	75	73	74	71	76

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. A noise barrier of three metres in height has been recommended to the east of the Concord Road interchange. The provision of this noise barrier would be subject to further considerations during detailed design such as construction limitations, urban design, community preference and overshadowing.

With the noise barriers, the EIS identifies one receiver (one individual building) qualifies for consideration of at-property treatment within NCA-09; however, this may change subject to detailed design.

Section 7.4 and section 7.5 of the noise and vibration impact assessment at Appendix I to the EIS include a discussion of applicable at-property treatments for these properties. The requirement for at-property treatment would be confirmed during detailed design, following property inspections as required.

Issue description – operational noise impacts on Haberfield Public School

Submissions were concerned about operational noise impacts on Haberfield Public School, and requested that a noise monitoring station be established at the school and management measures be employed where the noise exceeds an acceptable level.

Response

Section 10.5 and Appendix I 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 above the criteria assigned using Roads and Maritime's Noise Criteria Guideline (NCG) (Roads and Maritime 2014b). Roads and Maritime's NCG provides practical implementation of the intention of the Road Noise Policy (DECCW 2011).

With reference to Appendix N in the EIS noise and vibration technical paper, noise levels at the school are predicted to reduce as a result of the project. This is due to a forecast decrease in traffic on Parramatta Road. As discussed in section 4.4 and 15.1 of the noise and vibration technical paper, external criteria for other sensitive receivers (including educational facilities) have been derived using a 10 dBA factor to convert internal to external noise levels. For some non-residential receivers this assumption may be overly conservative as the facade area to window ratios are often larger when compared to residential receivers, or windows may not be openable are triggered due to a cumulative limit exceedances. The EIS recommended that this should be investigated further at detailed design.

In accordance with management measure OpNV3 as described in **Table 8.1** of this report, within 12 months of commencement of operation, operational traffic noise would be monitored at sensitive receivers to compare actual noise performance of the project against predicted noise performance. If the traffic noise levels are above the predicted levels, consideration of additional feasible and reasonable management measures would be undertaken.

Issue description – noise impacts from Wattle Street portals

Concerns were raised that increased noise from project operation would result in unacceptable impacts on residences in the vicinity of the Wattle Street portals at Haberfield.

Response

Section 10.5 and Appendix I 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 above the criteria assigned using Roads and Maritime's Noise Criteria Guideline (NCG) (Roads and Maritime 2014). Roads and Maritime's NCG provides practical implementation of the intention of the Road Noise Policy (DECCW 2011).

Noise and vibration sensitive receivers have been identified in accordance with relevant guidelines. Operational noise impacts on sensitive receivers from the Wattle Street portals at Haberfield have been assessed as part of NCA 14 and NCA 15. Section 10.5.1 of the EIS outlines the predicted noise levels within these two NCAs. Table 10.24 of the EIS outlines the number of properties located within NCA 14 and NCA 15 which would experience exceedances of the noise criteria (without noise mitigation).

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at these locations to reduce noise levels.

The EIS identifies a total of 10 receivers (nine individual buildings) within NCA14 and 18 receivers (16 individual buildings) within NCA 15 are eligible for consideration for at-property treatment as feasible and reasonable mitigation does not reduce the noise levels to meet the NCG controlling criterion. Note that this may change subject to detailed design.

Section 7.4 and section 7.5 of Appendix I to the EIS includes a discussion of applicable at-property treatments for these properties. The requirement for at-property treatment would be confirmed during detailed design, following property inspections as required.

Issue description – noise impacts from increases in traffic on Ramsay Street

Concerns were raised that increased noise from traffic as a consequence of operation of the project would affect residences on Ramsay Street at Haberfield, east of Wattle Street.

Response

Operational noise impacts for receivers on Ramsay Street at Haberfield east of Wattle Street have been assessed as part of NCA 18. Section 10.5.1 of the EIS outlines the predicted noise levels within NCA 18. **Table 5.16** outlines the number of properties located within the NCA which would experience exceedances of the noise criteria (without noise mitigation).

Table 5.16 Number of receivers experiencing operational traffic noise exceedances within NCA 18 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
18	35	38	37	38	35	38	38	41

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. Low noise pavement is not considered reasonable on Wattle Street as the traffic speeds are relatively low and interrupted (traffic lights). A noise barrier of five metres in height has been recommended to the east of Wattle Street to reduce noise impacts at adjacent receivers.

With the noise barrier, the EIS identifies eight receivers (six individual buildings) qualify for consideration of at-property treatment within NCA 18. This includes three receivers on Ramsay Street east of Wattle Street. Note that this may change subject to detailed design.

Section 7.4 and section 7.5 of Appendix I to the EIS includes a discussion of applicable at-property treatments for these properties. The finalised requirement for treatment would be confirmed during detailed design, following property inspections as required.

Issue description – increase in operational noise due to removal of existing structures

The removal of existing structures would increase the operational noise impacts on receivers on Walker Avenue at Haberfield.

Response

Section 10.5 and Appendix I of the EIS provide an operational noise assessment. This assessment considers the potential increase in operational traffic noise and feasible and reasonable management measures where receivers are above the criteria assigned using Roads and Maritime's Noise Criteria Guideline (NCG) (Roads and Maritime 2014). Roads and Maritime's NCG provides practical implementation of the intention of the Road Noise Policy (DECCW 2011).

The detailed noise modelling undertaken for the assessment has included consideration of the acquisition and subsequent demolition of existing structures, and the potential change in noise impacts where structures to be demolished currently provide screening.

Operational noise impacts for properties located on Walker Avenue to the south of Wattle Street between Parramatta Road and Allum Street have been assessed as part of NCA 14. Section 10.5.1 of the EIS outlines the predicted noise levels within NCA 14. **Table 5.17** outlines the number of receivers located within NCA 14 that would experience exceedances of the noise criteria (without noise mitigation).

Table 5.17 Number of receivers experiencing operational traffic noise exceedances within NCA 14 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
14	11	18	16	18	11	22	20	20

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. The change in noise levels with mitigation for receivers in NCA14 is presented in **Table 5.18**.

Table 5.18 Number of receivers experiencing operational traffic noise exceedances within NCA 14 (with mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
14	11	18	9	8	11	22	10	13

A total of eight receivers are eligible for consideration for at-property treatment within NCA14, as the proposed noise barrier would not reduce the noise levels to meet the NCG controlling criterion.

Section 7.4 and section 7.5 of Appendix I to the EIS includes a discussion of applicable at-property treatments for these groups. The requirement for at-property treatment would be finalised during detailed design, following property inspections as required.

Issue description – noise impacts and management measures specific to a dwelling

Concerns were raised around the noise impacts during operation on the property at 74 Concord Road at North Strathfield as a result of the Concord Road interchange, including a request detail on the specific management measures that would apply at this dwelling.

Response

Operational noise impacts for properties located on the western side of Concord Road have been assessed as part of NCA 07. Section 10.5.1 of the EIS outlines the predicted noise levels within

NCA 07. **Table 5.19** outlines the number of properties located within NCA which would experience exceedances of the noise criteria (without noise mitigation).

Table 5.19 Number of receivers experiencing operational traffic noise exceedances within NCA 07 (without mitigation)

NCA	2021 'do minimum'		2021 'do something'		2031 'do minimum'		2031 'do something'	
	Day	Night	Day	Night	Day	Night	Day	Night
07	71	71	78	78	71	72	78	78

The assessment then considered the implementation of additional mitigation including low noise pavement and noise barriers at this location to reduce noise levels. It was found that low noise pavement was not considered to be viable due to the low speed traffic environment (i.e. vehicles stopping or accelerating from lights). Consideration of noise barriers to the east of Concord Road was also undertaken as part of the assessment, however, based on further feasible and reasonable considerations the barrier may potentially sterilise future use of the adjacent land by restricting visibility and/or access. Consideration of at-property treatment for the triggered receivers has therefore been recommended.

A total of 70 receivers are eligible for consideration for at-property treatment within NCA 07 as further mitigation (low noise pavement or noise barriers) would not result in a reduction, including the residential property at 74 Concord Road at North Strathfield.

Section 7.4 and section 7.5 of Appendix I to the EIS includes a discussion of applicable at-property treatments for these properties. The finalised requirement for treatment would be confirmed during detailed design, following property inspections as required.

5.9.12 Operational vibration

Six submissions 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).

5.9.13 Provision and location of noise barriers

429 submissions raised issues in relation to the provision and location of noise barriers.

Issue description – request for a noise barrier

Submissions requested that a noise barrier be provided to protect residents along the western side of Wattle Street (14 to 24 Wattle Street located between Parramatta Road and Ash Lane). Properties north of Ash Lane have thick vegetation to provide screening for noise. Should a noise barrier not be incorporated, property adjustments such as higher front fence to act as a noise barrier and visual screening and internal landscaping should be provided.

Response

Provision of a noise barrier along Wattle Street south of Ash Lane was considered, however would not be effective due to the requirement to provide access to properties. This would provide gaps in the noise barrier that would allow noise to travel through and affect the dwellings located behind the noise barrier. No alternate barriers (eg earthen embankments) were considered feasible due to the proximity of dwellings to Wattle Street.

As a noise barrier is not suitable to mitigate noise in this location, residential receivers located south of Ash Lane are eligible for further consideration for at-property treatment (refer to **section 5.9.14**).

Whilst noise reduction may be achieved through vegetation in sufficient density and depth, there are also other considerations in evaluation its effectiveness such as the permanence of unprotected vegetation. Future changes in land use and land clearing can prevent the long term objectives being met if relying on unprotected vegetation.

Issue description – request for a noise barrier at multiple locations

Submissions raised concern that there is lack of noise barriers proposed adjacent to the project, and requested the provision of noise barriers at a number of locations including:

- At Wentworth Road South and Pomeroy Street at Homebush
- At the Concord Road interchange, including consideration of extending the noise barrier NW_CONCORD_01B for the length of the elevated ramp over Concord Road
- Above the on- and off-ramp tunnels at the Concord Road interchange
- At the back of houses at in the northern end of Carrington Street at North Strathfield
- Along the front of the remaining houses in Sydney Street at North Strathfield
- Along Wattle Street
- Along Walker Avenue at Haberfield, including receivers next to future use portals of M4–M5 link
- Between Waratah Street and Martin Street at Haberfield
- At the eastern ventilation facility at Haberfield
- At Frederick Street at Ashfield
- At the Cintra Park fresh air supply and water treatment facility
- In the vicinity of the Parramatta Road interchange at Ashfield (including Loftus Street and Chandos Street).

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.

Vegetation should be planted on or adjacent to noise barriers to improve noise reduction and the visual amenity of any noise barriers.

Response

A number of noise barriers were considered as part of the noise and vibration assessment (refer to section 8.3 of the Noise and Vibration Assessment in Appendix I of the EIS) in addition to those proposed in the EIS. The location of these barriers is outlined in **Table 5.20**, with the locations of the

barrier shown on Figures 10 and 11 of Appendix I of the EIS. **Table 5.20** also provides justification as to why each barrier was not considered feasible.

Table 5.20 Noise barriers considered in design but not adopted

Location	Reason not adopted
Southern side of M4 near residents at Welfare and Flemington Streets	Barrier would only result in reduction in noise at one property and therefore a 219 metre barrier cannot be justified
Along eastern side of Concord Road to Patterson Street (continuation of barrier at on-ramp)	Reduction in noise was achieved at some properties, however barriers were not considered feasible as they would result in the sterilisation of residual land by restricting views and access to properties
Northern side of Sydney Street	Some reductions were achieved, however barriers would impact access to the church on Concord Road and would also result in the sterilisation of residual land along Concord Road by restricting views and access to properties
Southern side of Sydney Street at tunnel portals	No change in the number of impacted receivers, with only two benefiting from a barrier
Wattle Street between Martin Street and Waratah Street (number of small barriers)	The number of small barriers (to allow driveway access) would likely result in overshadowing and visual impacts and would be ineffective due to gaps in the barrier
Southern side of Parramatta Road at new Parramatta Road interchange (two barriers either side of Chandos Street)	Reduction in noise was achieved at some properties, however barriers were not considered feasible as they would result in the sterilisation of residual land by restricting views and access to properties

Where noise barriers were not considered feasible, at-property treatment would be considered at properties which are eligible (refer to Figure 10.7 in the EIS).

The noise barrier assessment included consideration of varying heights. The noise barrier heights selected provide the maximum feasible and reasonable benefit for surrounding receivers.

Whilst noise reduction may be achieved through vegetation in sufficient density and depth, there are also other considerations in evaluation its effectiveness such as the permanence of unprotected vegetation. Future changes in land use and land clearing can prevent the long term objectives being met if relying on unprotected vegetation.

The design of noise barriers would be developed during detailed design to ensure that the urban design and landscape objectives of the project are met.

The visual impacts of noise barriers, including bulk and scale, were assessed in section 13.4.4 of the EIS. The assessment concluded that noise barrier selection along the project is considered to be appropriate and in context with areas along the project, while also integrating with existing noise barriers. The design of noise barriers would be further developed during detailed design to ensure that are sympathetic with the surrounding area. The design of noise barriers is considered to be consistent with the WestConnex Urban Design Framework.

The use of vegetation to provide a visual screening to any noise barriers would also be considered as part of detailed design.

Issue description – impact of vegetation removal on noise levels

Concerns were raised that removal of vegetation along Parramatta Road would result in increased noise levels.

Response

Whilst noise reduction may be achieved through vegetation in sufficient density and depth, there are also other considerations in evaluation its effectiveness such as the permanence of unprotected vegetation. Future changes in land use and land clearing can prevent the long term objectives being met if relying on unprotected vegetation.

Noise impacts along Parramatta Road are discussed in section 10.5.1 of the EIS.

Issue description – noise management on residual land

Submissions stated that, where open space is provided on the residual land on the western side of Walker Avenue, noise management measures would be required.

Response

Residual land is described in section 12.1.2 of the EIS as land used for construction but not containing permanent operational infrastructure and therefore potentially available for redevelopment following construction.

As described in section 6.5.10 of the EIS, residual land on Walker Avenue required for the construction of the project and forming part of the Wattle Street and Walker Avenue civil site (C9) would be rehabilitated and either landscaped, or potentially redeveloped, subject to a separate planning approval. Matters relating to noise mitigation would be assessed as part of any separate planning approval for the use of residual land at this location.

Issue description – request for low noise pavement

Submissions requested that low noise pavement be installed along the City West Link in Haberfield, extending to Hawthorne Canal.

Response

Low noise pavement is not considered to be viable along the City West Link due to the low speed traffic environment (i.e. vehicles stopping or accelerating from lights). Consideration of mitigation along the City West Link beyond the extent of the project would be required to be considered as part of Roads and Maritime's Noise Abatement Program.

Issue description – request for noise barriers

Submissions requested that noise barriers be installed along both sides of the M4 viaduct at North Strathfield.

Response

This section of the M4 is not altered as part of the project and therefore the installation of noise barriers in this location is not proposed. Consideration of noise barriers in this location would be required to be considered as part of Roads and Maritime's Noise Abatement Program.

Issue description – request for details relating to noise barriers

Submissions requested details in relation to the height of noise barriers and distances between the barriers and residential properties.

Response

The EIS includes an assessment of the need for, location and height of noise barriers for the project. Consistent with the requirements of the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014b), noise barriers have been considered where receivers exceed noise goals identified in these guidance documents. Noise barriers have been proposed for the project, as part of a broader suite of noise management measures, with the aim of achieving the noise criteria.

This assessment would be revised during detailed design to ensure that noise barriers are designed and installed where required. This would include confirmation of the location and height of new permanent noise barriers.

Issue description – impacts of noise barriers

A submission raised concern about the potential impacts of noise barriers, including overshadowing, bulk, relative scale and blocking of sunlight.

Response

The overshadowing impacts of noise barriers were assessed in section 12.4.3 of the EIS, and shadow diagrams were included in Appendix K of the EIS. The shadow diagrams only show the shadows cast by the proposed infrastructure and do not factor in any other structures (e.g. existing buildings and vegetation). The shadow diagrams are therefore considered to be worst case.

The assessment concluded that, overall, residential properties affected by overshadowing from permanent operational components of the project would receive a minimum of three hours of direct sunlight in habitable rooms and in at least 50 per cent of principal private open space between 9.00 am and 3.00 pm on 22 June. The exception to this is at 21 Short Street West and 167-173 Parramatta Road.

Where existing residential development currently receives less than this requirement, such as at 21 Short Street, access to sunlight would not be unreasonably reduced.

Detailed overshadowing analysis would be undertaken during detailed design to confirm the exact nature of any overshadowing impacts and to confirm the number of dwellings that would be affected.

The visual impacts of noise barriers, including bulk and scale, were assessed in section 13.4.4 of the EIS. The assessment concluded that noise barrier selection along the project is considered to be appropriate and in context with areas along the project, while also integrating with existing noise barriers. The design of noise barriers would be further developed during detailed design to ensure that are sympathetic with the surrounding area. The design of noise barriers is considered to be consistent with the WestConnex Urban Design Framework (RMS 2013a).

Issue description – request for detail of design and composition of noise barriers

Submissions requested details of the composition of noise barriers, including the material, style and colour.

Response

Section 13.4.4 of the EIS includes an assessment of key urban design elements of the project, including the proposed noise barriers, against the objectives of the WestConnex Urban Design Framework. The outcome of this assessment found that the preferred design is generally consistent with the objectives and design principles set by the framework as well as relevant Roads and Maritime design guidelines.

The design of noise barriers, including selection of materials, style and colour will be further developed during detailed design to ensure that they are sympathetic with the surrounding area and in accordance with the WestConnex Urban Design Framework (RMS 2013a).

Issue description – commencement of noise management before construction

Submissions requested that noise management measures be installed prior to construction commencing.

Response

Section 10.7.2 (as amended in **Chapter 8** (Revised environmental management measures) of this report) describes management measures to be implemented, and includes:

- Permanent noise barriers would be scheduled for completion as early as possible in order to minimise construction noise
- Property treatments identified for the operational phase of the project would be considered for installation as early as possible where they would improve construction noise levels.

The program for installation of noise mitigation would be confirmed during detailed design.

5.9.14 At-property acoustic treatment

42 submissions raised issues regarding the provision of at-property acoustic treatment for properties likely to experience impacts.

Issue description – consideration of at-property acoustic treatments

Submissions were received requesting that all affected properties be considered for at-property acoustic treatments, to be implemented prior to the commencement of construction.

Response

Section 10.5 and Appendix I 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 above the criteria assigned using Roads and Maritime's Noise Criteria Guideline (NCG) (Roads and Maritime 2014b). Roads and Maritime's NCG provides practical implementation of the intention of the Road Noise Policy (DECCW 2011).

Receivers eligible for consideration for at-property treatment are identified in Appendix N and shown in Figures 10.6 and 10.7 of the EIS. Receivers eligible for at-property treatment would be confirmed during the detailed design phase.

The types of at-property treatment that would be considered at each eligible property would be informed by an inspection of the property and consultation with the affected landowner. Broadly, two categories of at-property treatments would be considered:

- Type 1 – for exceedances of up to 10 dBA over the NCG 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 dBA over the NCG target, at-property treatments may include the treatments listed for Type 1 above, plus additional upgrades to windows and doors.

Issue description – consideration of architectural treatments

A submission requested consideration of architectural treatment for properties located on the eastern side of Walker Avenue between Parramatta Road and Walker Avenue (NCA18).

Response

The noise and vibration assessment undertaken as part of the EIS (refer to Appendix I of EIS) identified the properties which are eligible for further consideration for at-property treatments.

As shown on Figure 10.7 of the EIS, one dwelling on the eastern side of Walker Avenue between Parramatta Road and Ramsay Street has been identified as being eligible for consideration for at-property treatment.

Issue description – consideration of architectural treatments

A submission requested consideration of architectural treatment for properties located on Wattle Street south of Ash Lane.

Response

The residential receivers located on Wattle Street south of Ash Lane are eligible for consideration for at-property treatment as part of the project. Consultation with impacted landowners would be undertaken to discuss the eligibility of at-property treatment. This would include additional assessment based on the final design.

Issue description – consideration of architectural treatments

A submission requested consideration of architectural treatment for properties located on Ramsay Street east of Wattle Street.

Response

The noise and vibration assessment undertaken as part of the EIS (refer to Appendix I of EIS) identified the properties which are eligible for further consideration for the at-property treatments.

As shown on Figure 10.7 of the EIS, dwellings at 150, 152, 154 and 251 Ramsey Street are eligible for consideration for at-property treatment based on noise levels at these properties during operation.

Issue description – request for noise abatement

A submission raised concern that, due to the project, an application under the Roads and Maritime Services noise abatement program has been rejected. The submission requested that double glazing be considered for their property and not just window seals. Other properties on Wattle Street have qualified for the noise abatement program and therefore this property (24 Wattle Street) should also be provided with noise abatement prior to the start of construction.

Response

As part of the project, the property at 24 Wattle Street is eligible for consideration for at-property treatments. Consultation would be undertaken with the land owner during the design phase to confirm whether the property would be eligible for at-property treatments.

In line with management measure NV7 in section 10.7.2 (as amended in **Chapter 8** (Revised environmental management measures) of this report), at-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 construction noise levels.

Issue description – request for noise abatement

A submission requested confirmation as to whether the property at 1 Cove Street at Haberfield is eligible for at-property acoustic treatment. The submission requests double glazing of exposed windows, reinforcement of the stained glass at the front door and side windows, ducted air-conditioning and a payment subsidy to cover the cost of running air-conditioning.

Response

Section 10.5 and Appendix I of the EIS provide an operational noise assessment, including an assessment of potential traffic noise increases. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise management measures where receivers above the criteria assigned using Roads and Maritime's Noise Criteria Guideline (NCG) (Roads and Maritime 2014). Roads and Maritime's NCG provides practical implementation of the intention of the Road Noise Policy (DECCW 2011).

Receivers eligible for consideration for at-property treatment are identified in Appendix N of the noise and vibration impact assessment at Appendix I of the EIS. No properties on Cove Street at Haberfield have been identified as being eligible for consideration for at-property treatment.

Issue description – eligibility for at-property treatment

Submission were received which questioned whether only the ground and first floors of this building would be eligible for at-property treatment.

Response

Roads and Maritime does not consider it reasonable to consider at-property treatment at properties over two storeys and therefore at this stage of the project only the first and second storey dwellings are considered eligible for consideration for at-property treatment. There would however be a further feasible and reasonable review of at-property treatments would be undertaken during detailed design for multi-storey dwellings to confirm the effectiveness of any treatments in reducing noise.

Issue description – request for at-property treatment prior to construction

A submission acknowledges that the unit block at 98 Chandos Street has been recommended for at-property treatment. The submission requests that this treatment include a combination of double glazing and sealing of all windows, and should occur prior to construction commencing to minimise noise impacts during the construction period. The submission also questions whether only the ground and first floors of this building would be eligible for at-property treatment.

Response

As outlined in section 7.5 of the noise and vibration impact assessment in Appendix I of the EIS, the following at-property treatments are typically considered by Roads and Maritime:

- Fresh air ventilation systems that meet the Building Code of Australia requirements with the windows and doors closed
- Upgrade windows and glazing and solid core doors on the exposed facades of the substantial structures only
- Upgrading window and door seals and appropriately treating sub-floor ventilation
- The sealing of wall vents
- The sealing of the underfloor below the bearers
- The sealing of eaves.

The types of at-property treatment that would be considered at each eligible property would be informed by an inspection of the property and consultation with the affected landowner. As described in section 7.5 of the noise and vibration impact assessment, two categories of at-property treatments would be considered:

- Type 1 – for exceedances of up to 10 dBA over the NCG 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 dBA over the NCG target, at-property treatments may include the treatments listed for Type 1 above, plus additional upgrades to windows and doors.

The type of at-property treatment for each eligible receiver would be determined during detailed design.

Roads and Maritime does not consider it reasonable to consider at-property treatment at properties over two storeys and therefore at this stage of the project only the first and second storey dwellings are considered eligible for consideration for at-property treatment. There would however be a further feasible and reasonable review of at-property treatments would be undertaken during detailed design for multi-storey dwellings to confirm the effectiveness of any treatments in reducing noise.

Issue description – request for at-property treatment

A submission requested that at-property acoustic treatment be provided at the dwelling at 19 Loftus Street at Ashfield.

Response

Section 10.5 and Appendix I of the EIS provide an operational noise assessment, including an assessment of potential traffic noise increases. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise management measures where receivers above the criteria assigned using Roads and Maritime's Noise Criteria Guideline (NCG) (Roads and Maritime 2014b). Roads and Maritime's NCG provides practical implementation of the intention of the Road Noise Policy (DECCW 2011).

Receivers eligible for consideration for at-property treatment are identified in Appendix N of the noise and vibration impact assessment at Appendix I of the EIS. The property at 19 Loftus Street at Ashfield would be eligible for consideration for at-property treatment.

Issue description – effectiveness of at-property treatments

Submissions raised concern that at-property acoustic treatment would not mitigate against noise impacts on areas outside of dwellings (i.e. verandahs, gardens, swimming pools).

Response

In accordance with the intent of the RNP, the underlying principle of the NMG is to preference at-road noise management measures over at-property measures. This principle has been applied in the assessment of feasible and reasonable management measures for receivers affected by noise as a result of the project (consideration of low-noise pavement and acoustic barriers). One of the advantages of at-road noise management measures is that the noise reduction to achieve noise levels below the established criteria are achieved at-road, or external to the property boundary.

Architectural property treatments are considered only where all feasible and reasonable alternative approaches have been exhausted.

Issue description – contact be made for those eligible for at-property treatments

Submissions requested contact be made as soon as possible with owners of those dwellings identified in the EIS as being eligible for consideration for at-property acoustic treatment.

Response

Confirmation of receivers eligible for at-property acoustic treatment would be undertaken during detailed design, at which point the process for consultation would be established.

Issue description – requested for at-property treatments at Haberfield Public School

Submissions requested that at-property acoustic treatment be installed at the Haberfield Public School.

Response

Section 10.5 and Appendix I of the EIS provide an operational noise assessment, including an assessment of potential traffic noise increases. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise management measures where receivers above the criteria assigned using Roads and Maritime's Noise Criteria Guideline (NCG) (Roads and Maritime 2014b). Roads and Maritime's NCG provides practical implementation of the intention of the Road Noise Policy (DECCW 2011).

Receivers eligible for consideration of at-property treatment are identified in Appendix N of the noise and vibration impact assessment at Appendix I of the EIS. Haberfield Public School has not been identified as being eligible for consideration of at-property treatment.

Issue description – identification of properties eligible for at-property treatments

Properties identified as being eligible for consideration for at-property treatment should be identified in the EIS.

Response

Figures 10.6 and 10.7 of the EIS show the receivers eligible for consideration for at-property treatment.

The locations of the receivers eligible for consideration of at-property treatment are also included in the full NCG assessment table for all assessed receivers in Appendix N (electronic copy) of the noise and vibration impact assessment in Appendix I of the EIS.

Issue description – at-property treatments to be applied prior to construction

Submissions were received contending that at-property acoustic treatments should be applied to receivers impacted by noise during the construction of the project.

Response

The EIS provides an assessment of construction noise in section 10.4 and Appendix I. 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).

Where noise exceedances are expected during both standard work hours and out of hours, the ICNG recommends strategies for noise mitigation and control. The strategies to mitigate construction noise described in section 10.8.1 of the noise and vibration impact assessment in Appendix I of the EIS have been designed to minimise, to the fullest extent practicable, noise during construction, and include:

- Prior to the commencement of construction, a Construction Noise and Vibration Management Plan (CNVMP) will be prepared consistent with the requirements of the ICNG and would include:

  - Identification of nearby residences and other sensitive land uses
  - Description of approved hours of work
  - Description and identification of all 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
  - An overview of community consultation required for identified high impact works.
- Acoustic sheds would be erected at the Underwood Road tunnel site (C3), Concord Road tunnel site (C5), Cintra Park tunnel site (C6), Northcote Street tunnel site (C7) and eastern ventilation facility site (C8) and would be reviewed during construction planning to determine the attenuation level required
- Consideration of the installation of acoustic hoarding/barriers around the perimeter of construction ancillary facilities and work areas to assist in reducing noise impacts. The noise and vibration assessment in the EIS identifies that the installation of temporary hoarding typically reduces noise levels by between five dBA and 10 dBA, with reductions based on hoarding heights with a variable height of between 2.1 metres and 4.5 metres
- Construction methods and scheduling would also assist in ameliorating construction noise and vibration impacts. As far as reasonable and feasible, daytime construction hours (7.00 am to 6.00 pm on weekdays and 8.00 am to 1.00 pm on Saturdays) would be adhered to for activities concentrated in a single area and for excavation, demolition or rock breaking activities. This does not include activities associated with tunnelling works which are proposed to operate continuously for 24 hours per day, seven days per week (to minimise the overall duration of the construction works and potential impacts on the community) and activities which are required to be undertaken out of hours for safety reasons or to minimise disruption to road networks.

Ongoing noise monitoring would be employed during construction at noise sensitive receivers to assist in identifying and managing high risk noise levels.

Issue description – request for information regarding at-property acoustic treatments

A submission requested information regarding the type of at-property acoustic treatment that would considered for the receiver at 74 Concord Road at North Strathfield.

The submission also requested that at-property acoustic treatment be employed prior to the commencement of construction.

In addition, the submission requested information regarding noise monitoring during and after construction.

Response

The receiver at 74 Concord Road at North Strathfield would be eligible for consideration for at-property treatment as part of the project. Consultation with impacted landowners would be undertaken to discuss the eligibility of at-property treatment. This would include additional assessment based on the final design.

As outlined in section 7.5 of the Noise and Vibration Impact Assessment in Appendix I of the EIS, the following at-property treatments are typically considered by Roads and Maritime:

- Fresh air ventilation systems that meet the Building Code of Australia requirements with the windows and doors closed
- Upgrade windows and glazing and solid core doors on the exposed facades of the substantial structures only
- Upgrading window and door seals and appropriately treating sub-floor ventilation

- The sealing of wall vents
- The sealing of the underfloor below the bearers
- The sealing of eaves.

The types of at-property treatment that would be considered at each eligible property would be informed by an inspection of the property and consultation with the affected landowner. As described in section 7.5 of the Noise and Vibration Impact Assessment, two categories of at-property treatments would be considered:

- Type 1 – for exceedances of up to 10 dBA over the NCG 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 dBA over the NCG target, at-property treatments may include the treatments listed for Type 1 above, plus additional upgrades to windows and doors.

The type of at-property treatment for each eligible receiver would be determined during detailed design.

In accordance with management measure OpNV3 as described in **Table 8.1** of this report, within 12 months of commencement of operation, operational traffic noise would be monitored at sensitive receivers to compare actual noise performance of the project against predicted noise performance. If the traffic noise levels are above the predicted levels, consideration of additional feasible and reasonable management measures would be undertaken.

With regards to the management measures which would be used to manage potential construction noise and vibration impacts, where noise exceedances are expected during both standard work hours and out of hours, the ICNG recommends strategies for noise mitigation and control. The strategies to mitigate construction noise described in section 10.8.1 of the Noise and Vibration Impact Assessment in Appendix I of the EIS have been designed to minimise, to the fullest extent practicable, noise during construction, and include:

- Prior to the commencement of construction, a Construction Noise and Vibration Management Plan (CNVMP) will be prepared consistent with the requirements of the ICNG and would include:
  - Identification of nearby residences and other sensitive land uses
  - Description of approved hours of work
  - Description and identification of all 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
  - An overview of the community consultation required for identified high impact works.
- Acoustic sheds would be erected at the Underwood Road tunnel site (C3), Concord Road tunnel site (C5), Cintra Park tunnel site (C6) and Northcote Street tunnel site and would be reviewed during construction planning to determine the attenuation level required
- Consideration of the installation of acoustic hoarding/barriers around the perimeter of construction ancillary facilities and work areas to assist in reducing noise impacts. The noise and vibration assessment in the EIS identifies that the installation of temporary hoarding typically reduces noise levels by between five dBA and 10 dBA, with reductions based on hoarding heights with a variable height of between 2.1 metres and 4.5 metres

- Construction methods and scheduling would also assist in ameliorating construction noise and vibration impacts. As far as reasonable and feasible, daytime construction hours (7.00 am to 6.00 pm on weekdays and 8.00 am to 1.00 pm on Saturdays) would be adhered to for activities concentrated in a single area and for excavation, demolition or rock breaking activities. This does not include activities associated with tunnelling works which are proposed to operate continuously for 24 hours per day, seven days per week (to minimise the overall duration of the construction works and potential impacts on the community) and activities which are required to be undertaken out of hours for safety reasons or to minimise disruption to road networks.

Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods to identify and assist in managing high risk noise events.

5.9.15 Noise impacts from operational ancillary facilities

Four submissions raised concerns regaring noise impacts associated with the operation of ancillary facilities to the project.

Issue description – noise impacts from the operation of the water treatment facility

Submissions raised concern regarding noise impacts resulting from the operation of the water treatment facility at Cintra Park.

Response

The operation of the water treatment facility is not expected to result in any significant noise impacts.

As described in section 9.9 of the Noise and Vibration Impact Assessment at Appendix I of the EIS the selection of specific mechanical plant for the ancillary facilities, including the water treatment facility, would be undertaken during detailed design. Common engineering methods would act to ameliorate potential noise impacts associated with mechanical plant (where required). These may consist of:

- Locating plant away from sensitive receivers where feasible and reasonable
- Acoustic barriers
- Silencers
- Acoustically lined ductwork.

The mechanical equipment associated with the water treatment plant would be reviewed and assessed for conformance with established criteria during detailed design.

Issue description – noise impacts from the operation of the fresh air facility

Submissions raised concern that the noise impacts of the fresh air facility at Cintra Park would be 31dBA LWA over the criteria.

Response

Section 10.5.2 of the EIS outlines the potential noise impacts of the fresh air facility located at Cintra Park. The operational noise goal for this facility is 45 dBA as outlined in Table 10.28 of the EIS. As details of the facility are yet to be determined, no modelling was undertaken. Instead modelling determined the sound power level of the proposed equipment which is required in order to achieve compliance with the criteria at the nearest residence. This resulted in a sound power level of 76 dBA $L_{WA.}$ The project would be designed to meet the criteria

Common engineering methods would be implemented to ameliorate potential noise impacts associated with mechanical plant (where required). These may consist of:

- Locating plant away from sensitive receivers where feasible and reasonable
- Acoustic barriers
- Silencers
- Acoustically lined ductwork.

The mechanical equipment associated with the water treatment plant would be reviewed and assessed for conformance with established criteria during detailed design.

Issue description – noise impacts from the operation of the ventilation facilities

Submissions raised concern that predicted noise levels for the operational ancillary facilities, including ventilation facilities, have not been modelled, and queried whether the operating controlling noise goal was achievable and what contingencies would be in place if the noise goal was not able to be achieved.

Response

As described in section 10.5.2 of the EIS, predicted noise levels for the western ventilation facility, the fresh air supply facility at Cintra Park and the eastern ventilation facility have not been modelled as the details of plant and equipment for these facilities would be confirmed during the detailed design stage. The assessment has therefore provided the maximum allowable sound power levels for plant and equipment at the ventilation facilities in order to achieve compliance at the nearest receiver.

The operation of the ventilation facilities is not expected to result in any significant noise impacts.

As stated in section 9.9 of the noise and vibration impact assessment at Appendix I of the EIS the selection of specific mechanical plant for the ancillary facilities, including the ventilation facilities, would be undertaken during detailed design. Common engineering methods would act to ameliorate potential noise impacts associated with mechanical plant (where required). These may consist of:

- Locating plant away from sensitive receivers where feasible and reasonable
- Acoustic barriers
- Silencers
- Acoustically lined ductwork.

The mechanical equipment associated with the ventilation facilities would be reviewed and assessed for conformance with established criteria during detailed design.

5.9.16 Cumulative noise impacts during operation

Three submissions raised cumulative noise impacts during operation.

Issue description – inadequate assessment of cumulative operational impacts

The cumulative noise impacts from operational traffic associated with the project and operational traffic associated with the wider road network have not been adequately assessed in the EIS.

Response

Section 10.5 and Appendix I of the EIS provide an operational noise assessment, including an assessment of potential traffic noise increases. This assessment considers the expected increase in traffic numbers and feasible and reasonable noise management measures where receivers above the criteria identified in the RNP (DECCW 2011) as interpreted by Roads and Maritime in the NCG (Roads and Maritime 2014b).

As described in section 26.4.3 of the EIS, 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 assessment concluded that the project as part of WestConnex would result in a reduction in the total number of properties where exceedances are to be experienced when compared with the 'no build' scenario for 2031 (ie without the project). This is largely due to sections of the corridor where vehicles would divert from surface roads (predominantly Parramatta Road) into the M4 East tunnels. Overall, 78 per cent of receivers would see a reduction in noise levels, while a further 19 per cent would only experience a minor increase (less than two dBA), which is barely noticeable to the average person.

Noise impacts would, however, increase in the vicinity of the Concord Road, Wattle Street and Parramatta Road intersections due to changed conditions (ie road closer to homes), increased traffic and a loss of structures that currently provide screening.

5.10 Human health

5.10.1 Assessment methodology

358 submissions raised issues regarding the methodology assessment.

Issue description – failure to meet SEARs

There are a number of areas in which the Human Health Risk Assessment fails to consider significant health impacts and risks associated with the M4 East project, and therefore cannot be considered fit for purpose.

Response

The Human Health Risk Assessment at Appendix J of the EIS has been undertaken to meet the requirements of the SEARs and has followed the guidelines specified within the SEARs.

Issue description – selection of project design

Given the proposed scale and longevity of the WestConnex project, including the M4 East, additional detail for how the chosen project design, relative to other options, minimises adverse health impacts should have been included in this EIS.

Response

Assessment of the project design and how this minimises impacts to the community is addressed elsewhere in the EIS, primarily in chapters 4 and 5. The Human Health Risk Assessment, as with the detailed assessments on air quality and noise, addresses the most appropriate design based on those evaluations. The Human Health Risk Assessment does not address all design options considered in the EIS.

Issue description – Compliance vs risk assessment

The EIS should have included appropriate justification for choosing a guideline over a different one. A scholarly justification should also have been provided for the selection of the guidelines used in the Human Health Risk Assessment with regards to what health effects are associated with a substance and how the guidelines are protective of acute and chronic health effects.

Response

The primary guidelines chosen were those specified in the SEARs, namely the *Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards* (enHealth, 2012) and *Air Quality in and Around Traffic Tunnels* (NHMRC, 2008). Details of selection of supplementary guidelines for other pollutants, and health endpoints, is presented for individual pollutants in Section 6 and Appendix A of the Human Health Risk Assessment. This includes consideration of the most current and robust health information in relation to characterising health effects associated with exposure to combustion emissions. Detail is provided in the Human Health Risk Assessment on the reasons why the various guidelines have been selected and why they are considered to be current and robust. The approach is consistent with that used for NorthConnex and has been discussed and agreed with NSW Health.

Issue description – irritation effects

Even though the irritation may be relatively mild, manifested as itchy eyes or a tingling nose, it can affect general amenity and wellbeing if it happens often and in conjunction with odour (see below). In this situation the effect should be considered adverse (NHMRC 2006). The risk of sensory irritation be assessed for all relevant compounds, and as a mixture.

Response

Irritation effects (where relevant) are captured in the guidelines adopted and used in section 6 of the Human Health Risk Assessment. As outlined in enHealth (enHealth 2012) guidance, the health based guidelines adopted for the assessment of acute and chronic health effects for VOCs and PAHs are derived from the most sensitive health endpoints relevant to the chemical and the duration of exposure, refer to Section 6.6 of the Human Health Risk Assessment. The way these guidelines are developed includes consideration of all health endpoints, including irritation. Where irritation is the most sensitive effect it will be the basis for the guideline. Where irritation is not the most sensitive effect it is not the basis for the guideline, however the guideline will be protective of irritation effects. The Human Health Risk Assessment provides references for the acute and chronic guidelines adopted. These source references provide further detail on all the health studies considered in the development of the guideline. The guidelines adopted in the Human Health Risk Assessment have been identified following guidance provided by enHealth (enHealth 2012).

Issue description – assessment of odour

Although a brief compliance assessment for odour was included in the air quality chapter of the EIS (Appendix H, Part 5, pg. 170-171), the assessment was conducted using 1-hour average concentrations for only three individual pollutants. The assessment is deficient in that biologically relevant exposure concentrations (brief exposures to peak concentrations) of mixtures of air pollutants have not been considered. Odour impacts be assessed for the mixture of relevant compounds.

Response

Odour impacts are addressed in section 8.4.10 of the Air Quality Impact Assessment Report in Appendix H of the EIS. There are not expected to be any significant, predictable or detectable changes in odour as a result of the project.

Issue description – lack of detail in the Human Health Risk Assessment

Submissions object to the lack of detail in the Human Health Risk Assessment as to how construction practices will ensure a negligible health effect on nearby residents from exposure to particulates during construction. For example drilling and grinding sandstone or other hard rock creates small biologically active silica particulates which have carcinogenic potential.

Response

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.

It is acknowledged there is potential for crystalline silica emissions to occur during tunnel excavation due to the high temperatures caused at the excavation face. The potential for crystalline silica to be released is primarily relevant to occupational exposure. The management and monitoring of silica dust would be undertaken in accordance with NSW and Australian guidelines under the contractor's safety management system.

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in Chapter 29 of the EIS and revised in **Chapter 8** (Revised environmental management measures) of this report. A CAQMP will be prepared for the project as part of the CEMP which will include these management measures and how they will be carried out during construction to prevent dust and air pollutant emissions during construction. . In addition, Safe Work Method Statements (SWMSs) will be prepared for the project as part of the project safety management system which will detail the implementation of mitigation measures for crystalline silica, and the monitoring and reporting that will be undertaken to demonstrate the effectiveness of the measures.

Issue description – Combining suburbs

Appendix F in the Human Health Risk Assessment presents the assessment of increased or decreased number of cases by suburb related to the population weighted change in modelled air concentration. Strathfield, Burwood and Ashfield have been combined and reported as one area without any explanation as to why this is the case provided in either the Appendix or the rest of the Human Health Risk Assessment.

These unexplained and, in WAG's opinion, unjustifiable decisions are likely to obscure the potential health impact to the Ashfield LGA as a whole, and on individual suburbs – particularly the ones that are likely to be the most heavily impacted by the M4 East.

Response

The calculation of the project's influence on the incidence of health indicators in the community considers the change in 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. The total change in incidence is the sum over the population in all of the study area.

To illustrate more refined statistical areas within the study area, the population incidence calculations have been undertaken for areas defined by the Australian Bureau of Statistics SA2, which are areas based on state suburb boundaries. Data is not available for smaller suburbs within SA2 areas. These calculations have been undertaken for the year 2021 for the primary health indicators. As discussed in the Human Health Risk Assessment , the secondary health indicators evaluated are contained within the calculations undertaken for the primary health indicators.

Table 5.21 presents a summary of the calculated change in population incidence for SA2 areas within the larger population areas of Strathfield – Burwood – Ashfield and Canada Bay. It is noted that no refinement of Leichardt and Bankstown has been undertaken as the population within the study area in these areas is small. The table presents the calculated change in incidence for each of the smaller SA2 suburb areas, the larger SA3 area and the total.

Table 5.21 Calculated change in incidence of primary health effects associated with changes in $PM_{2.5}$ concentrations – project in 2021, comparison between SA3 and smaller SA2 calculations

Statistical Area for Population	Change in incidence of health effects occurring in population assessed for the following Primary Health endpoints (cases per year)		
	Mortality all causes (long-term effects, ages 30+)	Cardiovascular hospitalisations (short-term effects, ages 65+)	Respiratory hospitalisations (short-term effects, ages 65+)
SA3: Strathfield – Burwood – Ashfield*	-0.22	-0.062	-0.014
SA2: Croydon Park – Enfield	-0.0092	-0.0029	-0.00064
SA2: Burwood – Croydon	-0.10	-0.033	-0.0073
SA2: Ashfield	-0.050	-0.011	-0.0024
SA2: Haberfield – Summer Hill	-0.017	-0.0066	-0.0015
SA2: Strathfield	-0.037	-0.012	-0.0027
SA2: Dulwich Hill – Lewisham	0.0016	0.00053	0.00012
SA2: Homebush	-0.010	-0.0018	-0.00039
SA3: Canada Bay*	-0.084	-0.024	-0.0052
SA2: Concord – Mortlake - Cabarita	-0.042	-0.014	-0.0030
SA2: Concord West – North Strathfield	-0.0058	-0.0017	-0.00037
SA2: Drummoyne – Rodd Point	-0.0026	-0.00082	-0.00018
SA2: Five Dock – Abbotsford	-0.035	-0.011	-0.0024
SA3: Leichardt*	-0.00052	-0.00010	-0.000022
SA3: Bankstown*	-0.00075	-0.00023	-0.000050
All Suburbs*	**-0.3**	**-0.09**	**-0.02**

* As assessed and presented in Table 6.22 of the Human Health Risk Assessment

Review of Table 5.21 shows that the calculations for each of the smaller statistical suburbs provides a subset of the larger SA3 calculation. There is no specific smaller suburb that has a large increase in incidence compared with others. The assessment of the larger SA3 areas in the Human Health Risk Assessment does not conceal any smaller variations in incidence in smaller statistical populations. Hence the assessment presented in the Human Health Risk Assessment in relation to all years and health endpoints is appropriate for the population evaluated.

The calculations show a decrease in incidence in most suburbs (i.e. improvement in health), with the changes in incidence (negative or positive) negligible (i.e. not measurable in any health statistics). This outcome remains unchanged from that presented in the Human Health Risk Assessment.

Issue description – management measures for asbestos removal

Submissions state that the Human Health Risk Assessment should have included a risk assessment for asbestos and a management plan for mitigating risks, given serious community concern has been expressed over issues with asbestos removal and treatment at Granville (M4 Widening) and at Alexandria (New M5).

Response

Prior to construction commencing, the contractor would prepare and implement an Asbestos Management Plan for the project. The plan would be prepared by a suitably qualified person. The plan would accord with:

- *Work Health and Safety Act 2011* (NSW)
- *Work Health and Safety Regulation 2011* (NSW)
- *Protection of the Environment Operations Act 1997* (NSW)
- *Protection of the Environment Operations (Waste) Regulation 1996* (NSW) – Clause 29 Special requirements relating to asbestos waste
- *The National Occupational Health and Safety Commission* (NOHSC) (2002). Code of Practice for the Safe Removal of Asbestos
- *WorkCover NSW (2011)*. Code of Practice - How to manage and control asbestos in the workplace.

The plan 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.

Issue description – pollution at tunnel entrance and exit

Concern about the Human Health Risk Assessment's definition of "portals" is too limited and makes the assumption that no pollution will occur at the tunnel entrance and exit. The submission states that queueing on the approach to the tunnel entry and exit will lead to the build-up of traffic pollution.

Response

"Portals" are defined to enable clear differentiation between the operation of the tunnels and surface traffic. The ventilation system would be designed and operated to ensure that the portals operate as air inlets, and hence pollution would not leave via the portals. However, the assessment does not presume that no pollution would arise from surface traffic in this area. The air quality modelling also assesses emissions from surface road traffic, including around the portals, and these results have been incorporated into the Human Health Risk Assessment.

It is clearly acknowledged that Parramatta Road is currently a highly congested route, with typically long delays that impact traffic efficiency along the transport corridor. One of the main catalysts for this congestion is a 'bottleneck' due to a reduction in lane numbers between the existing M4 and Parramatta Road. This 'bottleneck' would progressively relocate or dissipate with the staged implementation of WestConnex projects. This project is essentially the first of three stages that would provide the missing link on the Sydney motorway network between central and western Sydney.

The respective operational impacts and management measures of implementing this 'do something' (2021) scenario is documented in Chapter 10 and Chapter 11 of the Traffic and Transport Assessment in Appendix G of the EIS.

The 2031 future year ‘do something’ scenario assumes the completion of all WestConnex stages. As a result, there is a decrease in traffic volumes exiting the tunnel at these portals as further opportunities would be provided by the M4-M5 Link. Some of this additional road capacity is taken up by induced demand however this is only in the maximum range of seven to eight per cent. Overall, inclusive of induced demand, traffic volumes at these locations would be lower than without the project.

Issue description – considerations of Human Health Risk Assessment

Concerns were raised in submissions that the Human Health Risk Assessment does not consider a scenario including all risk factors for 2031 including 'induced traffic demand'.

Response

The traffic modelling includes induced traffic demand arising from the implementation of the WestConnex project. This induced demand is reflected in the air quality modelling and Human Health Risk Assessment.

The worst case for traffic is the do minimum option. Parramatta Road is essentially at capacity in 2015, and there is no plausible scenario that would lead to a significant increase in traffic along Parramatta Road.

Projections of road transport emissions in Sydney show vehicle emissions will decrease between 2011 and 2026 (section 9.5 of the EIS) due to uptake of improved emission control technology. These reductions occur despite increases in vehicle kilometres travelled.

Figure 5.19 presents the predicted change in annual average $PM_{2.5}$ between 2014 and 2021 without the project – i.e. this is the improvement delivered by a cleaner fleet only. It includes population growth and urban renewal.

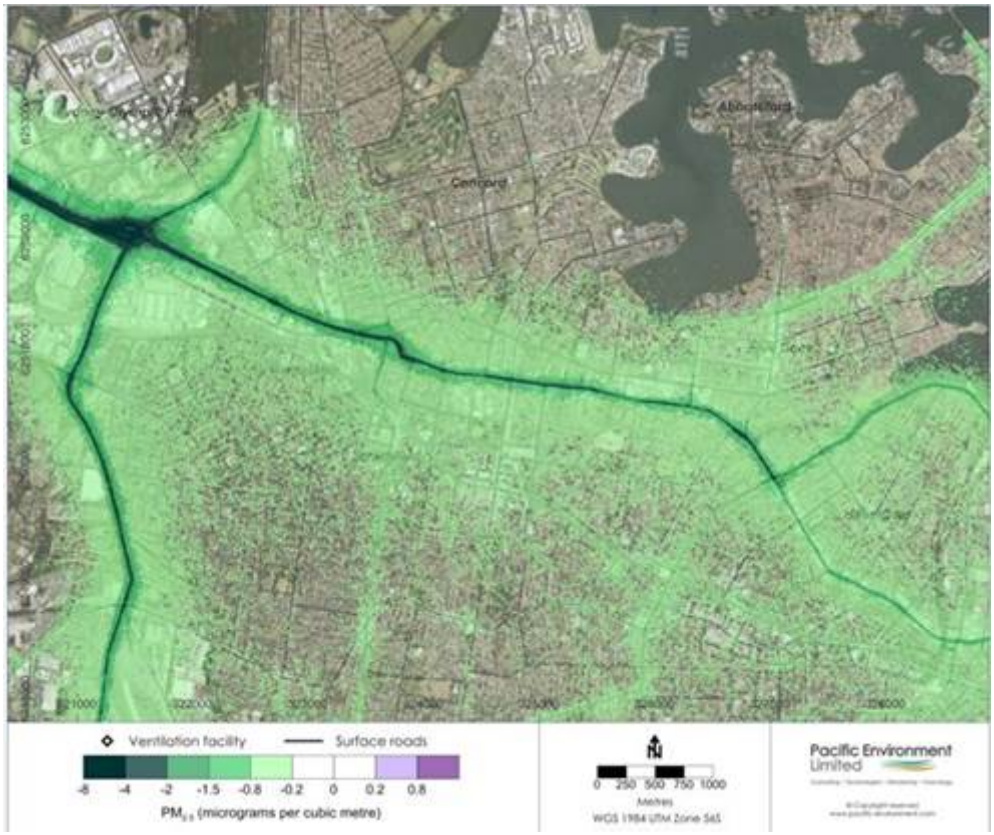

Figure 5.19 Contour map for change in annual mean $PM_{2.5}$ (2021-DM minus 2014)

A hypothetical worst case where the M4 East delivers no relief along Parramatta Road (which is not a plausible scenario) would result in the improvement provided by a cleaner fleet, and nothing further. There is no plausible scenario that would lead to a worsening of air quality along Parramatta Road due to M4 East and for the complete WestConnex scheme.

Issue description – new air quality guidelines

Concern raised that air quality standards or guidelines used in the EIS may be superseded by stricter ones at the end of 2015 - the new National Environment Protection (Ambient Air Quality) Measure (NEPM). Concerns were raised regarding the idea that other countries, including China, are actively lowering their fine particle air quality standards because of the links between such pollution and adverse human health, I find it unacceptable that Australia is continuing to ignore such an important issue for its population, especially given that we have such a high incidence of asthma-related diseases.

Response

The Ambient Air Quality Standards that are under consideration by Australia's environment ministers would be applicable to the National Environment Protection (Ambient Air Quality) Measure and the draft National Plan for Clean Air and National Clean Air Agreement. These standards would be used for the strategic management of background air quality and would not necessarily be adopted by each state or territory jurisdiction for project level assessment criteria. The air quality criteria used for the assessment of projects in NSW are determined by the NSW EPA and Department of Planning and Environment.

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 current 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 in the world is Scotland with a criterion of 18µg/$m^{3.}$.

Issue description – concentration of chemicals in emissions

Concern that levels of NO_2 and $PM_{2.5}$ are already higher than the guidelines and additionally a concern that the current Australian guidelines themselves are inadequate as health effects can occur with levels of exposure below the national environmental protection standards, hence there is a shift in the scientific community towards ensuring the lowest possible population exposure to vehicle emissions.

Response

The background levels of NSW criteria assessment pollutants and $PM_{2.5}$ are described in Chapter 9 of the EIS and in more detail in section 6.6 of Appendix H of the EIS. As noted, 1-hour NO_2 concentrations are predicted at times to exceed the NEPC guideline, without the project, as discussed in section 6.8.2 of the Human Health Risk Assessment and in the Air Quality Impact Assessment. The EIS – and therefore the Human Health Risk Assessment – assesses how the project affects this situation. The project results in a decrease in exceedances of the acute NEPC 1 hour NO_2 guideline. That is, air quality is predicted to improve with the project compared to the future state without it.

The project also results in a general decrease in $PM_{2.5}$ concentrations along the affected corridor (Figure 8-68). As noted in the air quality technical report (section F.9.9), there is considerable uncertainty in the background value for annual mean $PM_{2.5}$, as measured concentrations are dependent on the technique that is used. A value of 8 µg/m^3, which is the value of the NEPM advisory standard, was used as the background in the Air Quality Impact Assessment to reflect this uncertainty. Therefore, by definition, the predicted concentrations at <u>all</u> locations in the study area exceed the criterion. However, this is not because of the project; it is the existing situation. The project is predicted to reduce the number of locations exceeding the $PM_{2.5}$ criterion.

Further information is available in sections 8.3.8 and 8.48 of the AQIA in Appendix H, with a more detailed technical explanation in sections K-4 and K-7 of the AQIA.

Issue description – recommendation of further health studies

Concern was raised that the only two health studies conducted on tunnels in Sydney (Lane Cove and M5 tunnels) recommended that further, more appropriate studies be conducted it appears that RMS and NSW Health, are not serious about utilising the international and national research available relating to the serious health effects of traffic emissions on residents living near major roads.

Response

The Lane Cove Tunnel study (released by NSW Health on 30 November 2012), on respiratory health of residents living near the ventilation outlets and surrounding areas. The study examined the respiratory health of residents living near the tunnel and the impact of pollution and concluded that "any risk to respiratory health is minimal." The tunnel opened in 2007. The study was an independent study, undertaken by the Woolcock Institute, which monitored the respiratory health of 3000 people living near the tunnel in 2006, prior to its opening, then repeated in 2007 and 2008.

NSW Health's independent Air Pollution Expert Advisory Committee reviewed the findings and advised that no changes to the operation or management of the tunnel were needed and no further health studies were required at that time (www.health.nsw.gov.au/news/Pages/20121130_01.aspx).

A report released by NSW Health found that there was no increase in leukaemia or other cancers combined in residents living around the M5 East Tunnel stack. The final report analysed cancer rates among residents living in an area surrounding the M5 East ventilation outlet, centred on Turrella, from six years before the tunnel opened in December 2001 to six years after. Leukaemia rates were not high in this area compared to other areas in NSW and did not increase after the opening of the M5 Tunnel, nor was there any evidence of changes in rates for all cancers combined. (www.health.nsw.gov.au/news/Pages/20120723_01.aspx). The studies relating to air pollution and air quality can be accessed here: www.health.nsw.gov.au/environment/air/Pages/reports-studies.aspx. Monitoring of pollution from the tunnel ventilation stacks suggests that they have contributed very little to the overall levels of air pollution in the area, which are similar to background levels in other parts of Sydney. Although monitoring of leukaemia continues across NSW, no further study was specifically recommended in relation to the tunnel.

Issue description – contribution of the project to health costs

Submissions objected that the EIS did not identify the possible contribution of the project to the estimated health costs of the Sydney region.

Response

The project is not expected to increase health costs in the Sydney region.

Issue description – criticism of stated impacts and management measures

Concerns were raised that there is not enough conclusive evidence with respect to health effects or type of management measures as detailed design is not far enough advanced to determine the true impacts. In addition there is a lack of information or consideration within the EIS of the likely cumulative health and social impacts upon people who not only live within the project area, but who may both work, live and study within the current project area.

Response

The design of the project is sufficiently well advanced to enable the Human Health Risk Assessment to be undertaken. The scope of the assessment is outlined in section 3 of the Human Health Risk Assessment. Detailed assessment of health impacts on air quality are presented in section 6 of the Human Health Risk Assessment. A detailed assessment of impacts of noise is presented in section 8 of the Human Health Risk Assessment. Social impacts are addressed in section 9 of the Human Health Risk Assessment. The Human Health Risk Assessment considers the impacts to people living, working, studying and undertaking other activities in the study area, as well as the cumulative impact for multiple activities. An example of this approach is shown in Table 6-14 of the Human Health Risk Assessment.

Issue description – assessment of pollution abatement measures

The EIS does not assess the impacts on air quality (and resulting health impacts) with the inclusion of filtration, or other pollutant reduction measures, in the tunnel ventilation outlets and consequently the potential benefit to human health of including filtration has not been objectively assessed. In addition to providing potential physical/clinical benefits from reducing pollution exposure, there are psychological health benefits that should also be taken into consideration when evaluating the worth of installing pollution abatement measures in the outlets.

The EIS, including the AQIA and Human Health Risk Assessment must be amended to objectively assess the inclusion of pollution abatement equipment in tunnel ventilation outlets.

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.

Assessment of the need for and benefits of end-of-pipe pollution abatement equipment is in the Air Quality Assessment Report (EIS Volume 2B Appendix H, Section 10.2.2). 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 (e.g. Figures 8-35 and 8-51 of Air Quality Assessment Report). It is clear that removing this component would result in no material change in air quality in the surrounding community and the consequences for human health were not further assessed.

Issue description – estimation of vehicle emissions

Concerns were raised in submissions about the estimation of vehicle emissions, in particular diesel emissions, on which the air quality modelling is based. Submissions stated that;

- The EIS should have considered the effect of a growing diesel vehicle fleet, the significant lag in the implementation of vehicle emissions standards in Australia, and the failure of those standards to set particle number limits, given that modern diesel vehicles are emitting an increasing number of particles, orders of magnitude greater than some older petrol vehicles. It is particle number, rather than mass, which is of greater importance when assessing the health impacts of ultrafine particles
- Given recent revelations about misrepresentation of vehicle emissions, impacts of the project on air quality should be reconsidered
- Assumed improvements in vehicle emissions is integral to the modelling on pollution around the ventilation outlets due to improvements in new car technology, yet the bulk of the emissions are recognised to come from trucks. The modelling for this should be published for critical analysis by the community.

Response

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. Further details about the data sources and models are in Table 8-4, Table 8-5, and Appendix J to the Air Quality Impact Assessment (Appendix H of the EIS).

The health impacts of particles have been assessed in accordance with current guidelines, as required under the SEARs. There is currently limited guidance on the measurement of ultrafine particles for health impacts, and there are no robust epidemiological studies to support this. At this stage, the assessment has instead focused on pollutants for which there is sufficient supporting research. This is discussed in section 6.9.1 of the Human Health Risk Assessment.

The air quality assessment sources data from tests for the Diesel National Environmental Protection Measure (Diesel NEPM), COPERT, and ARTEMIS. These assemble data from real-world studies by governments and non-government organisations, and use these to develop emission factors. The EIS

does not use certification tests or regulatory limits to predict emissions, and is therefore unaffected by manufacturers' recent statements.

Improvements to vehicle emissions are assumed based on uptake of existing technology. That is, the rate of turnover observed in the fleet is known to remove older vehicles and bring lower emissions cars and trucks into the fleet. Improvements to both the car and the truck fleet will occur. New technology – that is, beyond what is currently legislated for – has not been assumed, and therefore predicted impacts are expected to be conservative. Details of the emissions modelling are provided in section 8.2 and Appendix E of the Air Quality Impact Assessment (Appendix H), particularly E.2.3 on fleet data.

Issue description – health indicators used in assessment

Concern was raised that the Human Health Risk Assessment relies on health indicators where data is five years old for the key health indicators and only hospitalisation data for respiratory indicators, and not included any GP data relating to consultations.

Response

The 2011 data used, as described in section 4.5.3 of Appendix J of the EIS used, is the latest data available in NSW. NSW Health only collects data on consultation from GPs regarding notifiable diseases; other potential indicators are not available from GP consultations.

Issue description – age of air quality data used

Concerns were raised in submissions that the Human Health Risk Assessment should have used more real-time local air quality data as a very high proportion of residents in this 48 square kilometre area live within 300 metres of one of these main roads, and so are exposed to much higher levels of NO_2 and PM than are claimed in the EIS.

Response

There are five air quality monitoring stations in the project area that were established in 2014. These stations are at the following locations;

- Wattle Street at Haberfield
- Edward Street at Croydon
- Bill Boyce Reserve at Homebush
- Concord Oval at Concord
- St Lukes Park at Concord.

All of the stations except St Lukes Park are located at roadsides or near roads and so reflect the exposure of the community to roadside pollutant concentrations. In addition, data from other urban background monitoring stations managed by the EPA and Roads and Maritime have been used to assess the current background air quality. The air quality assessment is therefore able to model urban background air quality, the contribution of air pollution from surface roads including busy main roads, and the proposed tunnel where relevant to the scenario. As a result, the Human Health Risk Assessment is able to assess residential exposure to all types of air pollution, including emissions from motor vehicles.

Issue description – collaboration of government departments to understand risks

Submission requested that intersectoral government planning departments, roads ministries, private developers, and the medical and scientific communities collaborate to ensure there is protection for public health and given the substantive known health risks, and emerging data on risks to health from ultrafine particulates, we urge policymakers to apply the precautionary principle to mitigate risks to public health.

Response

The issue of policy development is beyond the scope of the EIS.

Issue description – robustness of the Human Health Risk Assessment

Concerns were raised regarding the robustness of the Human Health Risk Assessment in particular that it is based on the WestConnex Road Traffic Model (WRTM), which relies on population and employment growth forecasts and on induced traffic modelling. The WRTM may have under-estimated the traffic forecasts along Parramatta Road and its validity and application is therefore questioned. Submissions state that therefore the EIS does not address the health risks of the very real potential for induced demand on Parramatta Road.

Response

The traffic modelling includes induced traffic demand arising from the implementation of the WestConnex project. This induced demand is reflected in the air quality modelling and Human Health Risk Assessment.

The worst case for traffic is the do minimum option. Parramatta Road is essentially at capacity, and there is no plausible scenario that would lead to a significant increase in traffic along Parramatta Road.

Projections of road transport emissions in Sydney show vehicle emissions will decrease between 2011 and 2026 (**section 9.5** of the EIS) due to uptake of improved emission control technology. These reductions occur despite increases in vehicle kilometres travelled.

Figure 5.20 presents the predicted change in annual average $PM_{2.5}$ between 2014 and 2021 without the project – i.e. this is the improvement delivered by a cleaner fleet only. It includes population growth and urban renewal.

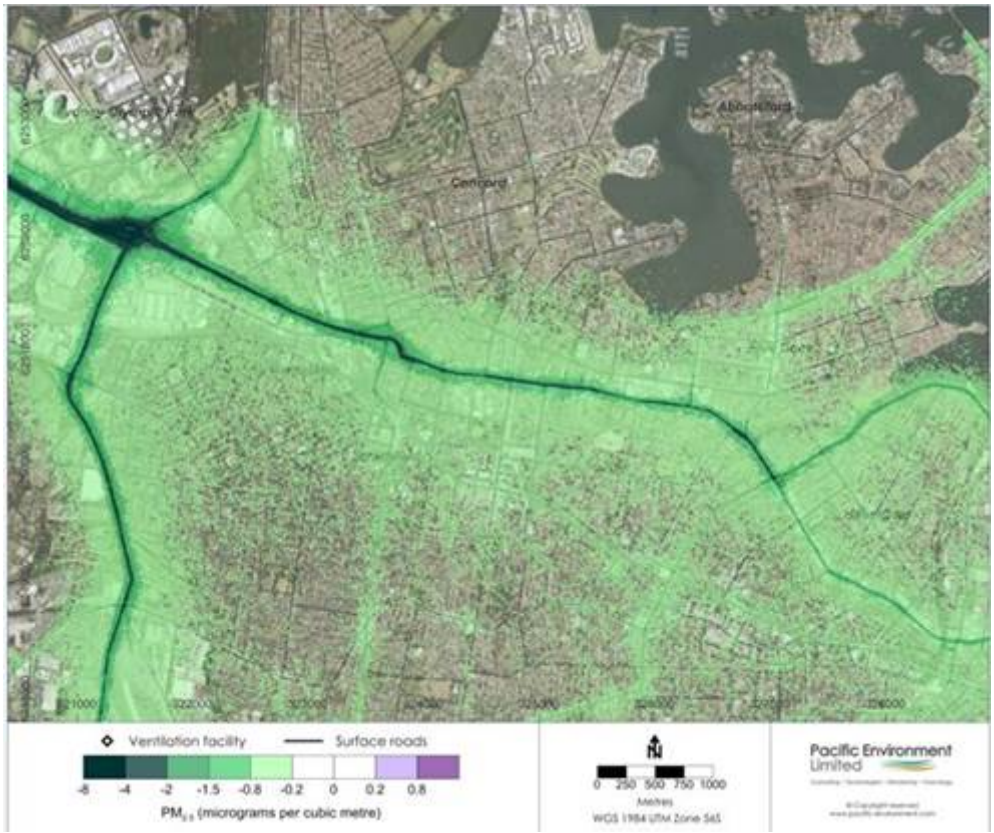

Figure 5.20 Contour map for change in annual mean $PM_{2.5}$ (2021-DM minus 2014)

A hypothetical worst case where the M4 East delivers no relief along Parramatta Road (which is not a plausible scenario) would result in the improvement provided by a cleaner fleet, and nothing further. There is no plausible scenario that would lead to a worsening of air quality along Parramatta Road due to M4 East for the complete WestConnex scheme.

Issue description – consideration of exposure from differing heights

Submissions raised concerns that the Human Health Risk Assessment does not consider the potentially different exposure profile for people who may be living above ground in medium and high-rise apartments, with the air quality modelling projecting only ground level concentrations.

Response

Further assessment has been undertaken in relation to potential health impacts at both 10 metres and 30 metres above the ground level, representative of potential exposures that may occur in multi-storey buildings. The assessment undertaken has evaluated impacts at 10 metres and 30 metres across the whole study area, regardless of whether a multi-storey building is present or not. Impacts that are derived from changes in emissions from surface roads are expected to decrease with height above the roadway, however in areas closest to the ventilation outlets there is the potential for increased impacts with height.

The assessment of potential impacts at 10 metres and 30 metres height has focused on the scenario with the greatest ventilation emissions, the year 2031 where cumulative impacts from all the WestConnex projects are included. The maximum change in $PM_{2.5}$ relevant to this scenario has been evaluated.

Table 5.22 presents the calculated risks associated with the maximum predicted change in $PM_{2.5}$ concentrations at a height of 10 metres and 30 metres above ground level throughout the study area. It is noted that these maximum impacts do not relate to existing multi-storey buildings, rather these are the maximum impacts anywhere in the study area, and have been included to evaluate potential future construction issues.

Table 5.22 Calculated individual risk associated with changes in $PM_{2.5}$ concentrations – cumulative scenario in 2031 for elevated receptors

Health Endpoint	Maximum calculated	
	10m height	30m height
Change in annual average concentration		
$PM_{2.5}$ ($\mu g/m^3$)	0.47	0.35
Primary health indicators: $PM_{2.5}$		
Mortality all causes (long-term effects, ages 30+)	3×10^{-5}	2×10^{-5}
Cardiovascular hospitalisations (short-term effects, ages 65+)	3×10^{-5}	3×10^{-5}
Respiratory hospitalisations (short-term effects, ages 65+)	8×10^{-6}	6×10^{-6}
Secondary health indicators: $PM_{2.5}$		
Mortality all causes (short-term effects, all ages)	2×10^{-6}	2×10^{-6}
Mortality, cardiopulmonary (long-term effects, ages 30+)	2×10^{-5}	2×10^{-5}
Mortality, cardiovascular (short-term effects, all ages)	7×10^{-7}	5×10^{-7}
Mortality, respiratory (short-term effects, all ages)	5×10^{-7}	3×10^{-7}
Asthma emergency department hospitalisations (1–14 years)	8×10^{-6}	6×10^{-6}
Negligible risks	$< 1 \times 10^{-6}$	
Tolerable/acceptable risks	$\geq 1 \times 10^{-6}$ and $\leq 1 \times 10^{-4}$	
Unacceptable risks	$> 1 \times 10^{-4}$	

The calculations presented in **Table 5.22** indicate the following:

- At a height of 10 metres within the study area, the maximum change in PM2.5 is lower than at ground level (refer to Table 6.2.4 in the Human Health Risk Assessment) and results in risks that are considered to range from negligible to tolerable/acceptable. The change at 10 metre height relates to changes in surface road emissions as illustrated in Figure 5.21 to Figure 5.22.
- At a height of 30 metres within the study area, the maximum change in PM2.5 is similar to the maximum change at 10 metre height, however the change is localised around the stack locations only, as shown in the following figure. The maximum change in PM2.5 concentrations at 30 metre height results in risks that are considered to range from negligible to tolerable/acceptable.

For the M4 East, future development of land (including re-zonings) in the vicinity of the ventilation facilities that may involve multi-story buildings would need to consider the air dispersion performance of the M4 East facilities.

Issue description – implementation of planning policies to reduce emission sources

The NSW Environment Protection Authority's submission to the Senate Standing Committee on Community Affairs Inquiry into the Impacts on Health of Air Quality in Australia (March 2013) outlines the dangers of traffic emissions and states that one of its strategies for exposure reduction has been to introduce planning policies to reduce exposure of sensitive land uses (such as residential) to high emission sources, such as busy roads (p16). There is no evidence of such planning policies being understood and informing the WestConnex proposal.

Response

Chapter 3 of the EIS provides the national and state policy context within which WestConnex has been developed. The future benefits for the Parramatta Road corridor are outlined and these include facilitation of improved public and active transport modes that would be consistent with reduction of vehicle emissions.

Issue description – consideration of the full extent of pollutants

Concerns were raised that the EIS does not take into consideration the full extent of the pollutants that are generated from cars, and does not consider the adverse health impacts of these pollutants. The EIS refers to 15 minute or 1 hour exposure intervals not peak exposure levels. Children who are attending Haberfield Public School will be exposed to this in far greater concentrations.

Response

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. Human Health Risk Assessment is consistent with the pollutants considered and modelling in the Air Quality Impact Assessment described in Chapter 9 and Appendix H of the EIS. The contribution of non-exhaust emissions (such as from tyres and brake pads) were also considered in the Air Quality Impact Assessment when reviewing particulate matter.

Assessment of air quality and health impacts uses a range of averaging periods, taking into consideration where risks are from short-term or long-term exposure. Higher concentrations may arise for short periods, however stricter guidelines are typically set for longer periods to limit long-term and cumulative exposure. The assessment is consistent with guidance available from enHealth and the NSW Approved Methods that provide for consistent assessment in light of these factors. These include assessment of 24 hours and annual means as described in Appendix H of the EIS.

Issue description – Averaging time used for calculation of incremental risk of NO2 and PM

The Human Health Risk Assessment has used a change in annual average NO2 and PM for assessment against the short-term health endpoints.

This is inappropriate, and is likely to be diluting the exposure and therefore the estimation of potential risk.

Response

The approach to the methodology for short-term changes is outlined in Appendix A of the Human Health Risk Assessment. The methodology has been checked and does not underestimate any short-term risks. The approach to the methodology for short-term changes is outlined in Appendix A of the Human Health Risk Assessment. The methodology has been checked (by calculating the risk for every short-term change and summing these up over a year for a specific receptor) and results in the same annual risk as presented in the Human Health Risk Assessment.

5.10.2 Impacts from the western ventilation outlet

Three submissions raised regarding issues on the health impacts from the western ventilation outlet.

Issue description – health impacts of the ventilation facilities at Homebush

Concerns were raised regarding the health impacts of the ventilation outlet at Homebush.

Response

Analysis of the ventilation outlet contribution 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 Appendix H of the EIS, and mapped in further detail below. This was assessed in detail in both the air quality assessment (Chapter 9 and Appendix H of the EIS) and the Human Health Risk Assessment (Chapter 11 of the EIS), with a particular attention to sensitive receptors such as schools, child care centres and hospitals which are defined as 'community receptors'. The analysis of health impacts for community receptors, that is, sensitive receptors, are detailed in the Human Health Risk Assessment and are shown in Figures 6-3 and 6-5 of the Human Health Risk Assessment.

Contour plots presenting the changes in air quality due to emissions from the ventilation outlets alone (ie not including changes in surface traffic) were produced for the western ventilation outlet, for the 2031 cumulative (greatest expected ventilation emissions case). The contributions from the surface road network and the background are not included in these plots. **Figure 5.21** to **Figure 5.26** show 1-hour mean NOx, annual mean NOx, maximum 24-hour mean PM_{10} and $PM_{2.5}$ and annual mean PM_{10} and $PM_{2.5}$, for the westbound outlet.

The presentation of these contour plots is slightly different to those for the full GRAL M4 East domain. The latter were designed to show changes in air pollution across a wide area. The geographical area covered by each of these ventilation outlet plots (two kilometres by two kilometres grid) was much smaller than the full GRAL domain. This allowed local detail, with isopleths and concentration values, to be shown more clearly in the maps.

The results presented for the 2031 cumulative scenario show that the contributions from the ventilation outlets are very low for all pollutants and are orders of magnitude below their relevant criteria. These are even lower for the other scenarios.

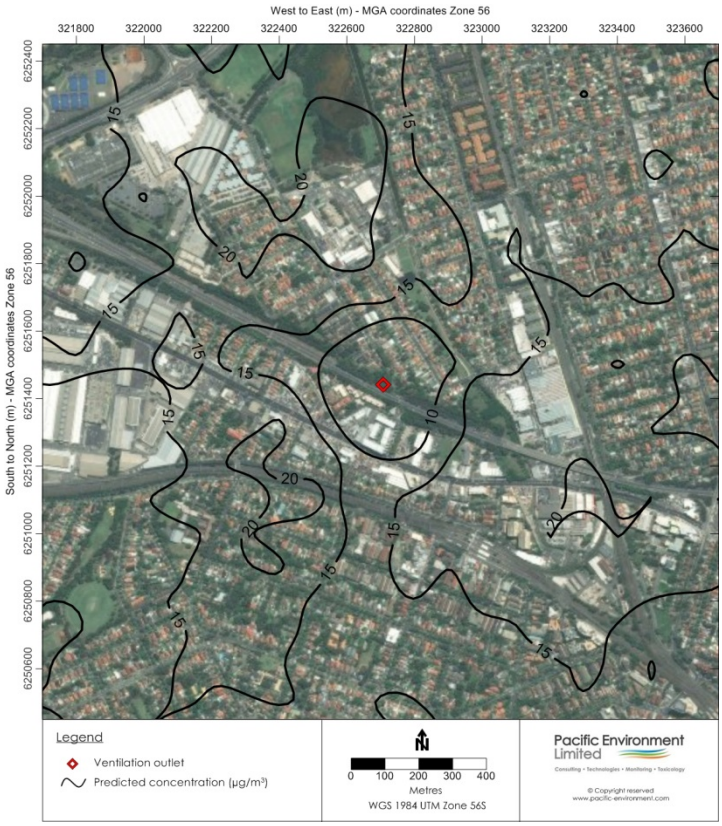

Figure 5.21 Contour plot showing maximum 1-hour mean NOx for ventilation outlets only (Westbound outlet, 2031-DSC)

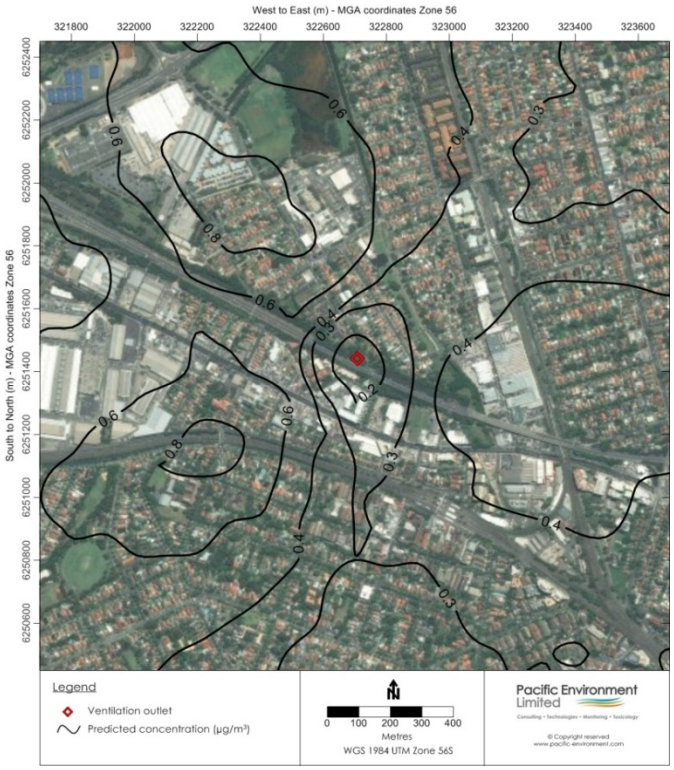

Figure 5.22 Contour plot showing annual mean NOx for ventilation outlets only (Westbound outlet, 2031-DSC)

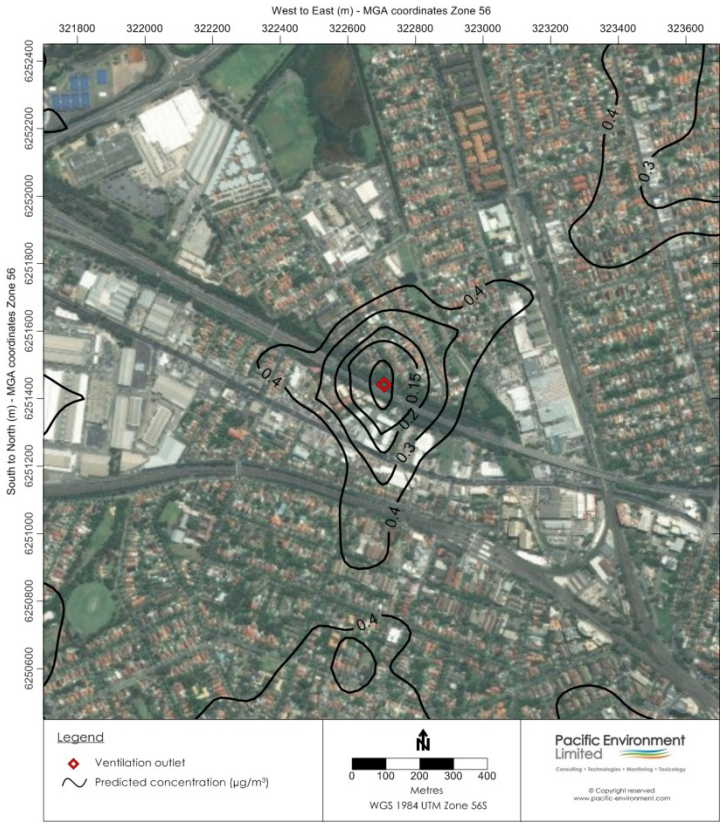

Figure 5.23 Contour plot showing maximum 24-hour mean PM_{10} for ventilation outlets only (Westbound outlet, 2031-DSC)

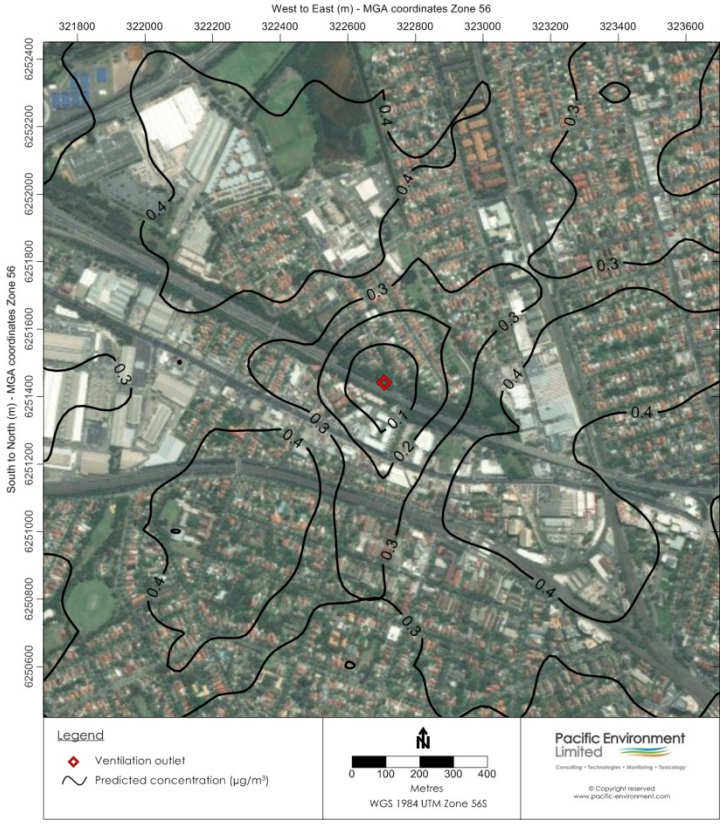

Figure 5.24 Contour plot showing maximum 24-hour mean $PM_{2.5}$ for ventilation outlets only (Westbound outlet, 2031-DSC)

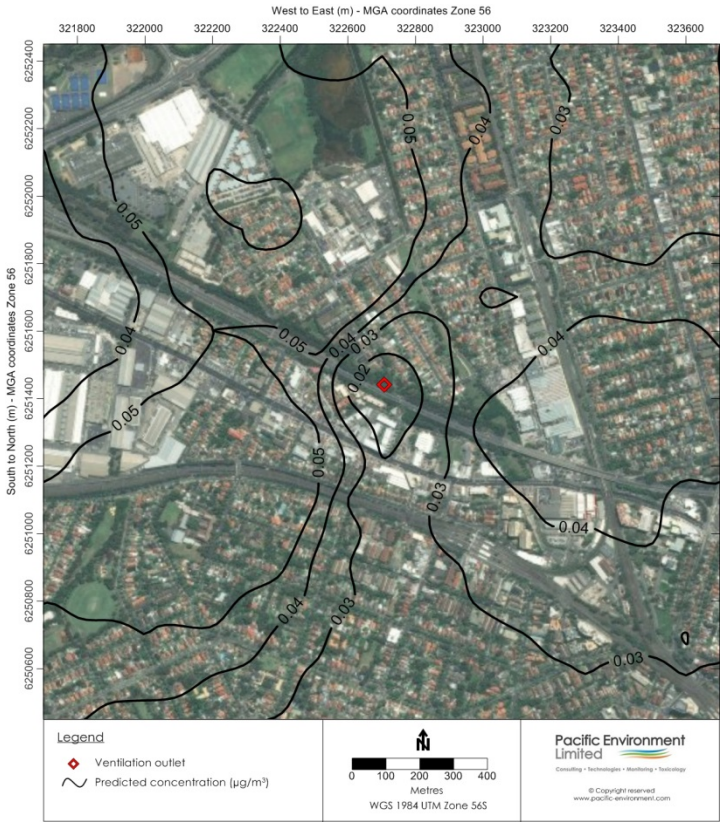

Figure 5.25 **Contour plot showing annual mean $PM_{2.5}$ for ventilation outlets only (Westbound outlet, 2031-DSC)**

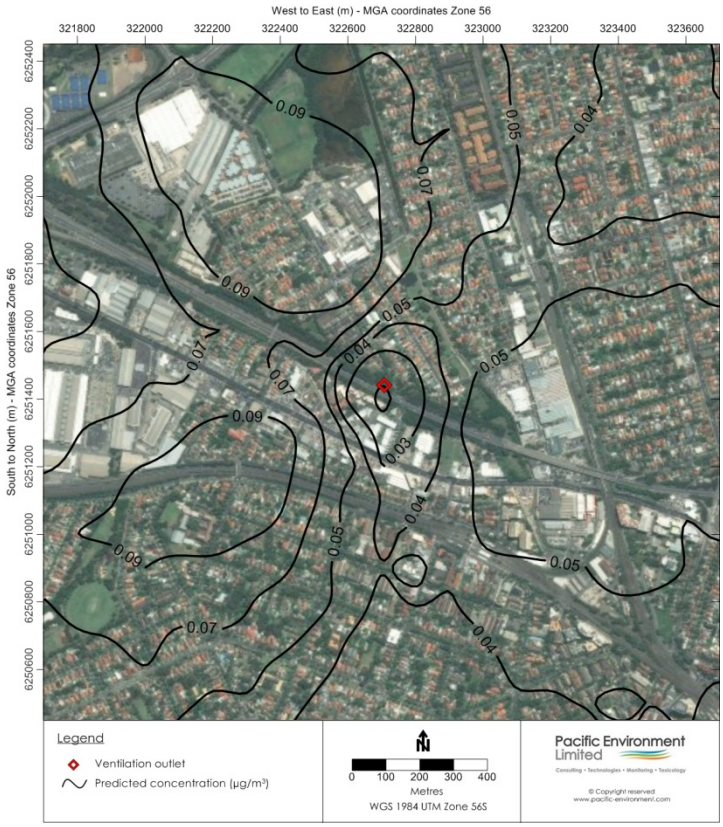

Figure 5.26 **Contour plot showing annual mean PM_{10} for ventilation outlets only (Westbound outlet, 2031-DSC)**

5.10.3 Impacts from the eastern ventilation outlet

19 submissions raised issues regarding the health impacts from the eastern ventilation outlet.

Issue description – positioning of the outlet

Submissions raised concerns that the positioning of the eastern ventilation building in Haberfield would lead to health impacts, especially given its proximity to the Infants' Home Ashfield and the impact of air pollutants on the health of children and elderly residents.

Response

Analysis of the ventilation outlet contribution 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 Appendix H of the EIS. This was assessed in detail in both the air quality assessment (Chapter 9 and Appendix H) and the Human Health Risk Assessment (Chapter 11), with a particular attention to sensitive receptors such as schools, child care centres and hospitals which are defined as 'community receptors'. The analysis of health impacts for community receptors, that is, sensitive receptors, are detailed in the Human Health Risk Assessment and in particular are shown in Figures 6-3 and 6-5 of the Human Health Risk Assessment. In particular, this shows improved health outcomes for the Infants Home Ashfield and Haberfield Public School.

Issue description – health of residents near the outlet

The health of the current and future residents near the proposed ventilation facility should be the main priority and consideration of the Baird Government, who will ultimately bear the responsibility and future compensatory health and legal claims should the facility be proven to increase the incidents of asthma attacks, respiratory issues and cancer related deaths.

Response

Noted.

Issue description – filtration of outlet

Concern that the ventilation outlets are not filtered especially considering that traffic pollution has been linked to higher rates of heart disease, lung cancer, and impaired lung development in children.

Submissions queried what management measures will be implemented to ensure pollutants and odour emissions above "safe" levels acceptable to regulatory health standards and organisations, given the eastern ventilation stacks and associated facilities are unfiltered.

Response

The Air Quality Assessment (Chapter 9 and Appendix H) demonstrates that the ventilation outlets will disperse emissions effectively with negligible impact on local and regional air quality.

Analysis of the ventilation outlet contribution, 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 Appendix H of the EIS. This was assessed in detail in both the air quality assessment (Chapter 9 and Appendix H of the EIS) and the Human Health Risk Assessment (Chapter 11 of the EIS), with a particular attention to sensitive receptors such as schools, child care centres and hospitals which are defined as 'community receptors'. The assessment has identified that removing this component or a part of this component would result in no material change or benefit to air quality in the surrounding community. 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 10.2.2 of the Air Quality Impact Assessment (Appendix H of the EIS).

Contour plots presenting the changes in air quality due to emissions from the ventilation outlets alone (ie not including changes in surface traffic) were produced for the M4 East ventilation outlets. Results for 2031 cumulative (greatest expected ventilation emissions case) for eastbound outlet are shown in **Figure 4.50, Figure 4.52, Figure 4.54, Figure 4.56, Figure 4.58** and **Figure 4.60** (in **chapter 4** of this report) show annual mean NOx, maximum 24-hour mean PM_{10} and $PM_{2.5}$ and annual mean PM_{10} and $PM_{2.5}$, for the eastbound ventilation outlet. The contributions from the surface road network and the background are not included in these plots.

The presentation of these contour plots is slightly different to those for the full GRAL M4 East domain. The latter were designed to show changes in air pollution across a wide area. The geographical area covered by each of these ventilation outlet plots (two kilometres by two kilometres grid) was much smaller than the full GRAL domain. This allowed more local detail, with isopleths and concentration values, to be shown more clearly in the maps.

The results presented for the 2031 cumulative scenario show that the contributions from the ventilation outlets are very low for all pollutants and are orders of magnitude below their relevant criteria. These are even lower for the other scenarios.

Issue description – health impacts of the outlet

Submissions believe the project will have an impact on the health of residents in the local area. How will air quality from the eastern ventilation outlet, including ventilation from the M4-M5 Link affect the youngest, the oldest and most vulnerable in my local area?

Response

Analysis of the ventilation outlet contribution, 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 Appendix H of the EIS. This was assessed in detail in both the air quality assessment (Chapter 9 and Appendix H of the EIS) and the Human Health Risk Assessment (Chapter 11 of the EIS), with particular attention to sensitive receptors such as schools, child care centres and hospitals which are defined as 'community receptors'. The analysis of health impacts for community receptors, that is, sensitive receptors, are detailed in the Human Health Risk Assessment and are shown in Figures 6-3 and 6-5 of the Human Health Risk Assessment.

5.10.4 In-tunnel health impacts

Four submissions raised issues regarding the in-tunnel health impacts.

Issue description – health impacts of tunnel users

Concerns about the health impacts on vehicle tunnel users from exposure to particulates and that there is technology overseas that uses more efficient filtration systems which are also cost effective so why aren't they being used?

Response

The tunnel ventilation system will be designed with high 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 will be effective in ensuring compliance with the in-tunnel air quality criteria. 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 10.2.2 of the Air Quality Assessment Report (Appendix H of the EIS).

Issue description

Submissions questioned that an 'in-tunnel' worst case exposure scenario that addresses ventilation decrease or failure has not been included in the Human Health Risk Assessment.

Response

Management of the ventilation system at all times is addressed elsewhere in the EIS. In-tunnel estimates of air pollution, at different vehicle speeds, are included in the assessment, in Section 7 of the Human Health Risk Assessment (Appendix M of the EIS), to address different levels of congestion within the tunnel.

Issue description

Concerns were raised that in-tunnel exposures for vehicle occupants and motorcyclists be assessed, and that the assessment should include considered of all reasonable and feasible mitigation measures. An objective assessment of all measures does not seem to have been provided.

Response

Details on the tunnel design relevant to minimising and managing in-tunnel exposures are presented in the Air Quality Assessment (Appendix H of the EIS). This includes mitigation measures to reduce generation of emissions, through design (summarised in 10.2.2 and 10.2.3 of the Air Quality Assessment, together with additional administrative controls that provide further benefit where these are available.

The assessment presented in Section 7 of the Human Health Risk Assessment has shown that the available in-tunnel criteria can be met. For pollutants with no criteria, the Human Health Risk Assessment has considered the available information that relates to short-duration exposures and potential health effects. There is insufficient data to establish robust health based guidelines, and the available science suggests that exposures should be minimised. Hence the Human Health Risk Assessment has recommended that where possible, minimising exposure is recommended. When in a car, such measures include closing windows and putting the ventilation system on recirculate. When on a motorbike it is noted that such measures cannot be implemented. However the time spent in the tunnel will be limited for motorbikes as 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 will limit exposures within the tunnel for motorbike riders. The assessment undertaken has shown that available in-tunnel criteria can be met. For pollutants with no criteria, where possible, minimising exposure is recommended

5.10.5 Benefits along Parramatta Road

One submission raised issues regarding the benefits along Parramatta Road.

Issue description – increased levels of $PM_{2.5}$ concentrations

The EIS does not meet the SEARS because air quality data collected at 31 locations indicate that the changes in air quality component $PM_{2.5}$ to be above the current standard (average 24-hour of 25µg/m3). The project will not improve readings at most sites by 2021 and 2031. Thus the project not only ignores the current health dangers of elevated $PM_{2.5}$, but will add to levels in several locations

Response

The Air Quality Assessment and the Human Health Risk Assessment were prepared in accordance with the relevant requirements of the SEARS. The project results in a general decrease in $PM_{2.5}$ concentrations along the affected corridor (Figure 8-68 of the Human Health Risk Assessment). As noted in the Air Quality Assessment (section F.9.9 in Appendix F of the Air Quality Assessment at Appendix H of the EIS), there is considerable uncertainty in the background value for annual mean $PM_{2.5}$, as measured concentrations are dependent on the measurement technique that is used. A value of 8 $\mu g/m^3$, which is the value of the NEPM advisory standard, was used in the Air Quality Assessment to reflect this uncertainty. Therefore, by definition, the predicted concentrations at all locations in the study area exceed the criterion. However, this is not because of the project; it is the existing situation. The project is predicted to reduce the number of locations exceeding the $PM_{2.5}$ criterion.

Further information is available in sections 8.3.8 and 8.48 of the Air Quality Assessment Report in Appendix H of the EIS, with a more detailed technical explanation in Sections K-4 and K-7 at Appendix K of the Air Quality Assessment Report.

5.10.6 Noise and vibration impacts

754 submissions raised issues regarding the health impacts of noise and vibration.

Issue description – concern over construction and operational impacts

Concerns were raised about the potential for noise and vibration impacts, including delivery trucks, to cause stress and anxiety, affecting sleep patterns and thus has follow-on impacts to health and wellbeing.

Objections were raised in submissions regarding the impact of years of 24-hour construction work will have on communities. Noise and vibration impacts would affect the enjoyment of outdoor spaces and disturb normal indoor activities.

Response

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 the five tunnel construction sites.

The majority of tunnelling works outside of standard construction hours would occur within an acoustic shed.

A number of other construction activities would also be undertaken outside of standard construction hours. A description of these is provided in Table 6.22 of the EIS along with a rationale for undertaking these activities out-of-hours.

The assessment of construction noise and vibration presented in section 10.4 of the EIS includes a prediction of the extent (if any) to which the $L_{A1(1minute)}$ levels are exceeded, where night-time works are proposed. Table 10.14 to Table 10.19 of the EIS identify that the $L_{A1(1minute)}$ levels exceed the sleep disturbance criteria for the worst case exceedance during all construction scenarios where works are proposed at night. These impacts would not be experienced within all NCAs.

The project includes feasible and reasonable management measures to reduce the potential noise impact to nearby receivers, including the provision of an acoustic shed for tunnelling sites.

With regards to construction traffic noise, section 10.4.3 of the EIS predicts traffic noise increases on roads affected by construction traffic. The ICNG does not provide specific guidance in relation to acceptable noise levels associated with construction traffic. Therefore, the permissible noise increase criteria described in the *NSW Road Noise Policy* (DECCW 2011) (RNP) has been adopted. Under the RNP, an increase of up to two dBA is a minor impact that is considered barely perceptible to the average person. Where the road traffic noise levels are predicted to exceed two dBA 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.

The assessment of construction traffic noise indicates that construction traffic is unlikely to result in a noticeable increase in L_{Aeq} noise levels at receivers along the proposed routes with the exception of two local roads, which heavy vehicles may use at times during construction:

- Underwood Road tunnel and civil site (C3) - Short Street East (daytime and night-time)
- Powells Creek civil site (C4) - Powell Street (daytime only).

Section 11.4 of Appendix I of the EIS identifies management 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 (ie 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 (except Underwood Road, Short Street East, Walker Avenue), 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, with the exception of Underwood Road, Short St East and Walker Avenue where half of the street is used for access)
- Spoil removal would be minimised between 10.00 pm and 7.00 am.

Issue description – health and educational impacts

Submissions raised concern with educational and health impacts on students of local schools from noise.

Response

The EIS provides an assessment of construction noise in section 10.4 and Appendix I. 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 receiver locations.

The noise and vibration impact assessment identified noise sensitive receivers within the study area, including 88 educational facility buildings (ie individual school buildings). The locations of these receivers are shown in Figure 10.1 of the EIS. In accordance with the ICNG, noise management levels (NMLs) for non-residential sensitive receivers have been derived and are included in Table 10.5 of the EIS. The NML $L_{Aeq(15minute)}$ for classrooms at schools and other educational institutions was identified as being an internal noise level of 45 dBA (55 dBA external level).

Noise levels resulting from the construction of the project have been predicted at surrounding receiver locations. In accordance with the ICNG, the assessment of construction noise impacts is based on a worst-case assessment methodology which assumes that all equipment would be operating simultaneously. As it would be unlikely that all equipment would operate simultaneously, construction noise levels would be lower than the predicted worst case scenario. In addition, in most cases the worst-affected receiver is located immediately adjacent to the works and this does not necessarily represent the potential typical noise impacts to the community, including educational facilities, at receivers located further away from the works.

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 10.7 of the EIS.

In developing construction methodologies and a construction program for the project, the aim has been to minimise the duration of the construction period while maintaining an acceptable and manageable amenity outcome for surrounding receivers. This has required a balance between the speed of construction activities and the ability to reasonably and feasibly maintain impacts within acceptable limits. Opportunities to further reduce construction timeframes while protecting local amenity would be considered during the detailed design process.

Where noise exceedances are expected during both standard work hours and out of hours, the ICNG recommends strategies for noise mitigation and control. The strategies to mitigate construction noise described in section 10.8.1 of the Noise and Vibration Impact Assessment in Appendix I of the EIS have been designed to minimise, to the fullest extent practicable, noise during construction, and include:

- Prior to the commencement of construction, a Construction Noise and Vibration Management Plan (CNVMP) will be prepared consistent with the requirements of the ICNG and would include:
  - Identification of nearby residences and other sensitive land uses
  - Description of approved hours of work

  - Description and identification of all 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
  - An overview of community consultation required for identified high impact works.
- Acoustic sheds would be erected at the Underwood Road tunnel site (C3), Concord Road tunnel site (C5), Cintra Park tunnel site (C6) and Northcote Street tunnel site (C7)
- Consideration of the installation of acoustic hoarding/barriers around the perimeter of construction ancillary facilities and work areas to assist in reducing noise impacts. The noise and vibration assessment in the EIS identifies that the installation of temporary hoarding typically reduces noise levels by between five dBA and 10 dBA, with reductions based on hoarding heights with a variable height of between 2.1 metres and 4.5 metres
- Construction methods and scheduling would also assist in ameliorating construction noise and vibration impacts. As far as reasonable and feasible, daytime construction hours (7.00 am to 6.00 pm on weekdays and 8.00 am to 1.00 pm on Saturdays) would be adhered to for activities concentrated in a single area and for excavation, demolition or rock breaking activities. This does not include activities associated with tunnelling works which are proposed to operate continuously for 24 hours per day, seven days per week (to minimise the overall duration of the construction works and potential impacts on the community) and activities which are required to be undertaken out of hours for safety reasons or to minimise disruption to road networks.

Ongoing noise monitoring would be employed during construction at noise sensitive receivers to assist in identifying and managing high risk noise levels.

Issue description – adverse noise and vibration impacts

A submission was concerned with the adverse noise and vibration impacts. Our bedroom window is adjacent to the stop sign at the intersection of Julia Street and Bland Street. I expect that there will be a large build-up of traffic at this stop sign waiting to get down the road because of the Project. This will cause considerable and unacceptable noise, vibration pollution and traffic congestion in this location, which will have an adverse effect on the health and wellbeing of residents.

Response

A small section of Bland Street near to the intersection with Parramatta Road would be used by heavy vehicles exiting the Parramatta Road civil site (C10). Heavy vehicles would make a right turn into Bland Street from the civil site and a left turn into Parramatta Road via the existing signalised intersection.

A maximum of 90 one-way movements of heavy vehicles would be generally shared equally across the two heavy vehicle exit points at the C10 site during the daytime (7.00 am to 6.00 pm). However, using a worst-case assessment methodology where all heavy vehicles used the Bland Street exit, the expected number of heavy vehicles exiting onto Bland Street would be around eight trucks per hour (90 trucks divided by 11 hours).

This worst-case contribution to the existing traffic at this intersection would result in minor delays. However, as the volume of traffic generated by construction is expected to be relatively low compared to existing traffic volumes, the impacts of this short-term increase in traffic are not expected to significantly impact network performance or road safety in this location. It is therefore unlikely that under normal operating conditions traffic would queue on Bland Street back to Julia Street.

With regards to construction traffic noise, the assessment of construction road traffic noise presented in Table 10.22 of the EIS identified that for receivers near to the Parramatta Road civil site (C10), the predicted traffic noise increase at the worst-affected receiver would be less than 0.5 dBA. Construction traffic noise impacts on receivers along Bland Street would therefore be negligible.

Section 11.4 of Appendix I of the EIS identifies management 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 (ie 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 (except Underwood Road, Short Street East and Walker Avenue), 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 (except Underwood Road, Short Street East and Walker Avenue)
- Spoil removal would be minimised between 10.00 pm and 7.00 am.

In addition, any foreseen impacts to performance or road safety at this location during construction would be mitigated through the provision of tailored traffic management plans and other measures.

5.10.7 General health impacts

1,828 submissions raised issues relating to health due to the project and WestConnex in general.

Issue description – health impacts of traffic emissions

Concerns were raised about the health impacts of traffic emissions particularly given the high numbers of residents, businesses, schools, and child and aged care facilities near the project route. Concerned about exacerbated air quality issues from the project and health effects on residents with respiratory problems, including asthma.

Submissions questioned the ability to guarantee health issues will NOT increase/arise when this [project] is up and running?

Response

The individual risks to community, workplace and residential receptors associated with changes in levels of fine particulates $PM_{2.5}$ and PM_{10} were calculated and are presented in Chapter 11 of the EIS. There are no calculated individual risks that are greater than $1x10^{-4}$, which is the threshold for 'unacceptable risk'.

The calculated individual risks in 2031 for the maximum impacted receptor and the maximum impacted residential and workplace receptors are in the range $7x10^{-7}$ and $5x10^{-5}$ and are considered to be in the range from negligible to tolerable/acceptable risk.

Overall, the operation of WestConnex will result in lower levels of risk to the community from traffic emissions compared to the risks without WestConnex, that is, with congested traffic on the surface road network.

Issue description – impacts of settlement ponds at Canada Bay

Submissions raise concern that the installation of settlement ponds near Taylor Street at Canada Bay will encourage an increase in mosquito and rat populations, which will impact negatively on residents in the vicinity.

Response

During construction the settlement ponds would be located near the canal, not near the residents, reducing the risk of mosquitos. The settlement ponds would also be dewatered regularly to ensure adequate capacity for large rainfall events or spills in the tunnel. This would also reduce the duration and of any standing water in which mosquitos could breed. Other pest control measures would include engaging a pest control company, picking up litter and ensuring that lids are used on bins containing kitchen waste.

Issue description – increased car use will lead to increased air pollution

Concerned that the building of WestConnex will increase car use and lead to increased air pollution, which will result in negative health impacts for the community, particularly as the population grows. Concerns were raised with the idea 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. The increase in pollution due to the project is completely unacceptable given the high numbers of residents, businesses, schools, and child and aged care facilities in the area.

WestConnex modelling an increase in particulates known to have an adverse impact on human health. This increase in pollutants, especially carcinogenic fine particulate matter, will impact residents in including Haberfield, Five Dock, Ashfield, Burwood, Strathfield, Concord, Canada Bay, Homebush and Flemington and those located in the schools, childcare centres and nursing homes located near the proposed unfiltered stacks.

Response

Overall, the operation of WestConnex will result in lower levels of risk to the community from traffic emissions, compared to the risks without WestConnex, that is, with congested traffic on the surface road network.

The project results in a general decrease in $PM_{2.5}$ concentrations along the affected corridor (Figure 8-68 of the EIS), compared with the future state without the project in 2031.

The individual risks to community, workplace and residential receptors associated with changes in levels of fine particulates $PM_{2.5}$ and PM_{10} were calculated and are presented in Chapter 11 of the EIS. There are no calculated risks individual risks that are greater than $1x10^{-4}$, which is the threshold for 'unacceptable risk'.

The calculated individual risks in 2031 for the maximum impacted receptor and the maximum impacted residential and workplace receptors are in the range $7x10^{-7}$ and $5x10^{-5}$ and are considered to be in the range from negligible to tolerable/acceptable risk.

Issue description – health impacts on those close to construction ancillary facilities

Concerns were raised about residents living close to the proposed construction ancillary facilities regarding the health, well-being and safety of family members during the construction phase, including but not limited to; fatigue, anxiety, depression and illnesses related to decreased air quality. During construction, due to the increased levels of traffic and waiting time, there will be significant impacts to our health, due to the increased levels of stress and anxiety.

Submissions raised concerns about that there was little or no suggestion on how these impacts will be mitigated.

Submissions object that the EIS does not identify, confirm or recommend specific air pollution mitigation for all the residents and businesses impacted by the construction zone around the Parramatta Road, Ashfield/Haberfield interchange site (on road surface and tunnel construction areas). By restricting the footprint of the project's impact to just 50 meters along the indicative route, the true number of properties and people adversely impacted is hidden and the true costs of mitigation avoided.

Response

Management measures to prevent the generation and emission of dust and air pollutants during construction are described in section 9.9 of the EIS as amended in **Chapter 8** (Revised environmental management measures) of this report. A Construction Air Quality Management Plan (CAQMP) will be prepared for the project as part of the CEMP which will describe how these management measures will be implemented during construction to prevent dust and air pollutant emissions, and the monitoring and reporting that will be undertaken to demonstrate the measures effectiveness.

Issue description – inconsistency in assessment

Concern raised that assessment of construction impacts lists 'Health of the community' as one of six considerations to be discussed, however there is no such section and there is an inconsistent assessment of level of impacts between the SIA (Appendix M) and EIA (Appendix N), and Chapter 14 Social and economic, raising concerns as to information left out of the 'main document'. This is disturbing.

Response

Chapter 11 (Human Health, pages 11-7) of the EIS describes the impacts of construction on human health and Chapter 14 of the EIS describes the social and economic benefits and impacts of construction on local communities. The Appendices G, M and N of the EIS provide further detail of the Human Health, Social and Economic Impact Assessments.

Issue description – concern over health of students at Haberfield Primary School

Submissions raised concerns for the health and safety of children needing to cross Parramatta Road to attend classes at Haberfield Primary School, especially during the long construction period. The noise, air quality, and dirt could seriously impact their overall wellbeing and effect their concentration in classes, as the school is located a few blocks away from all the underground blasting.

Response

Table 6.17 of the EIS states that the footbridge over Parramatta Road at Bland Street would be subject to ‘short-term’ closure. While not an error, further detail of this closure, including specific likely duration, is provided below.

The pedestrian footbridge work would be limited to relocating the southern stair access from the eastern side of the lift shaft to the western side, so the new westbound lanes of Parramatta Road can be accommodated to the east of the pedestrian bridge.

Stair construction work would generally be undertaken whilst maintaining access to the existing stairs and lift. Once the new stairs are complete, the existing stairs would be demolished. There would be interim closures of the adjacent footpaths and footbridge for safety reasons during periods of high risk activities eg crane lifts, concrete pours and demolition of the existing stairs.

Whilst the work program would involve about two months of work in this area, the footbridge would only be closed when high risk work activities are occurring. Traffic control plans and procedures would be implemented to ensure the safe access of both pedestrians and cars adjacent to the work areas, and provision of alternate pedestrian routes via the existing signalised crossing as described in the EIS. The footbridge is not anticipated to be closed full time over the duration of the two months.

It is intended to undertake the work on the footbridge stairs as part of ‘early works’ so that the work would be complete prior to the start of road construction work. This would ensure the safest, most efficient option for construction can be undertaken, and reduce the duration of footbridge closure and impacts on pedestrians and the local community.

A CAQMP and NVMP will be prepared as part of the CEMP for the construction of the project. The plans will be prepared to meet the requirements of any condition of approval received for the project and in consultation with the EPA to ensure that the relevant standards for management of construction air impacts are addressed. The implementation of the plans will be audited by the independent Project Environmental Representative, and any complaints or issues regulated by the EPA.

Issue description – adverse impacts to long-term users of the tunnel

Submission raises concerns that the EIS makes reference to the fact that there are signs of negative side effects to long term users of tunnels because of the increased levels of pollutants. If this is the case, this would also be the effect to local residents surrounding the vent stacks and tunnel exit/entries.

Response

The maximum increase in risk lies in the range considered to be tolerable/acceptable. The calculated risk is dominated by emissions derived from surface roads, not from the ventilation facilities. The project has been designed to reduce surface road congestion hence emissions. There is an overall reduction in emissions from surface roads due to the project. There is an overall reduction in pollutant concentrations throughout the community due to the project, with small areas where there is an increase.

The NSW Government is committed to continuing to work with the Australian Government to implement cleaner fuels and cleaner vehicles. 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 – limitations to types of vehicles permitted

Submissions suggested that the use of the road be limited to clean and quiet vehicles. The Government should consider the impact of diesel fuel on resident's health and move to limit the use of motorized transport rather than encourage it.

Response

As noted in the previous response, the NSW Government is committed to continuing to work with the Australian Government to implement cleaner fuels and cleaner vehicles. 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 – concerns relating to demolition buildings containing asbestos

Concerns were raised regarding the potential health impacts to residents as some of the houses to be acquired and demolished contain asbestos.

Response

The management of asbestos during demolition of buildings would be undertaken by appropriately qualified and licenced specialist contractor teams to protect the workforce and surrounding residents.

The contractor would prepare and implement an Asbestos Management Plan for the project. The plan would be prepared by a suitably qualified person. The plan would accord with:

- *Work Health and Safety Act 2011* (NSW)
- *Work Health and Safety Regulation 2011* (NSW)
- *Protection of the Environment Operations Act 1997* (NSW)
- *Protection of the Environment Operations (Waste) Regulation 1996* (NSW) – Clause 29 Special requirements relating to asbestos waste
- The National Occupational Health and Safety Commission (NOHSC) (2002). *Code of Practice for the Safe Removal of Asbestos*
- WorkCover NSW (2011). *Code of Practice - How to manage and control asbestos in the workplace*.

The plan 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.

Potential disposal sites for asbestos have not yet been identified, this would occur prior to commencing demolition works. The contractor would confirm that the disposal sites are licenced to receive this type of waste and that they have capacity.

Since access to the majority of properties to be demolished is not available to confirm if they contain asbestos or not, it is not possible at this stage to estimate the asbestos volume that would be generated by the project. This would be completed prior to commencing demolition works.

Where possible and practical, the contractor would initially soft strip a property as part of demolition, particularly for those properties which are heritage listed or contain asbestos. Once the asbestos and other items have been removed by the soft strip method, the remaining structure would be demolished using an excavator and other large plant.

Issue description – health impacts resulting from the tunnel

Submissions raised concerns that the tunnel would cause long term health effects, in particular, the extent and number of the impacts means that individuals, families and their properties will suffer significant cumulative impacts which the EIS confirms. These impacts include risks to health, critical loss of amenity and unacceptable noise. For example, impacts on access to the property, dust and noise, interference with daily activities, studying and conversation, leading to stress, annoyance and sleep disturbance as well as more significant health impacts

Concerns were raised that residents will suffer mental health and other non-specific health impacts as a result of financial stress and/or as a result of living in close proximity to construction zones and the resulting motorway.

Response

Within an urban environment there is a wide range of complex factors (acting and interacting at different scales) that can affect health and wellbeing. This is conceptualised in Figure 9-1 of Appendix J (presented by the International Council for Science and similar to that defined by the WHO) (International Council for Science (ICSU) 2011) to the EIS. The factors identified may result in either positive or negative impacts on health and wellbeing. It is noted that no single element or determinant acts in isolation. Health and wellbeing in the urban environment depends on the sum of the total interactions between many factors.

Where negative impacts have been identified, these impacts are either short-term (during construction only) and/or appropriate mitigation or management measures have been identified which would minimise impacts on the community.

Issue description – physical and psychological effect of the tunnel

Concern was expressed regarding the psychological and health effects of having tunnels underneath homes.

Response

There would be no discernible health effects expected from having tunnels underneath homes. The majority of the length of the tunnels will be tens of metres under the surface in hard rock as shown in Figures 5.10 to 5.13 in Chapter 5 of the EIS.

During construction, the tunnelling equipment would move about 30 metres per week and would be approximately 30 to 40 metres underground. If any ground-borne vibration was detectable, it would only be experienced by any one household for a small number of days. Noise and vibration management measures and information would be provided in the Construction Noise and Vibration Management Plans (CNVMPs) which will describe procedures for notifying residents of construction activities likely to affect their amenity through noise and vibration.

Issue description – psychological impact of compulsory acquisition

Concerns were raised about the observed major psychological impact of compulsory acquisition on those affected and the impact on those living in close proximity to the planned tollway.

Response

The services available to support residents who are being relocated as a result of property acquisition are detailed in section 6.2 of Appendix M (Social Impact Assessment), 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. Roads and Maritime have contacted residential and commercial tenants who are currently renting properties to be acquired for the project, to discuss timeframes for acquisition and compensation (where applicable).

Residents who are having their properties acquired or are relocating due to the M4 East project (egtenants) have been advised to contact WestConnex directly to discuss available support services.

Issue description – cumulative health impacts

Concerns were raised that the Project will add to cumulative health impacts of additional urban motorways

Response

Existing urban motorways are accounted for in the background measurements of air and noise. The EIS then considers additional urban motorways planned within the overarching WestConnex, as part of the Do Something Cumulative 2031 scenario. Further motorway development, or any other major development that could affect air, noise and health, would be the subject of further assessment and approval processes.

Issue description – project prevents healthy activities

Concerns were raised regarding the idea that the proposal prevents healthy activities such as walking, cycling, playing sport and scootering which are vital to the long term health of our residents and that greater reliance on road transport and further urban sprawl will increase the incidence of mental health problems. There will be reduced opportunities for regular exercise, an important anti-depressant, reduced quality of life for families, reduced opportunities for interpersonal contact which will exacerbate social isolation. Submissions raised concerns that the suburbs of Ashfield, Haberfield and Summer Hill will no longer be a communal lifestyle for all age groups causing stress and mental health problems and reduce quality of life.

Response

Social impacts are addressed in section 9 of the Human Health Risk Assessment Report in Appendix J of the EIS.

It is expected that during construction there will some impact to the local community as a result of increased travel times for vehicles, cyclists and bus passengers; reduced pedestrian roadside safety due to an increase in traffic; reduction in pedestrian and cyclist amenity.

These changes have the potential to result in increased levels of stress and anxiety in the local community. These impacts, however, are expected to occur during the period of construction only.

The existing pedestrian network is varied, with residential areas located off the main roadways providing good pedestrian facilities. Parramatta Road currently favours high volume traffic movements which impacts accessibility and travel times for pedestrians.

Some pedestrian footpaths will be closed during construction, however these closures will generally only affect one side of the road (allowing access to remain on the other side of the road). Where required safe alternate pedestrian access routes will be identified. Pedestrian access will be restored once construction is complete. Additional crossings will be provided at the off-ramp location on Concord Road and Powells Creek. In addition changes to signal timings due to changes in traffic volumes and distribution may lower the time taken to cross major intersections, potentially improving travel times and accessibility.

The existing cycle network comprises limited dedicated cycleways (targeted at leisure trips rather than commuter trips) and a mix of on-road options. There are significant gaps in north-south connections due to Parramatta Road and the M4. During construction, works will be undertaken to ensure that connectivity is maintained for cyclists. This will involve cycleway detours from the M4 onto local roads and other cycleways. Once the project is completed reduced traffic volumes would provide opportunities to improve cycling routes through the study area and these are being investigated as part of the Parramatta Road Urban Transformation Program.

Improved urban amenity and cycling infrastructure could likely attract more people to both recreational and commuter cycling, with consequent positive health benefits.

Improvements in public transport availability and especially efficiency will have broad social benefits. The use of public transport includes incidental exercise (eg walking to and from bus or train stops) increasing the chance of travellers meeting recommended daily physical activity targets.

Issue description – class action

Submissions stated that respondents will be seeking to bring about a class action in response to the health impacts that a lack of public protection will ultimately lead to.

Response

Noted, however there are no intolerable or unacceptable risks predicted in relation to community health.

Issue description – mental health impacts of the project

Concerns were raised that many people are depressed about what is happening to their communities and the EIS does not attempt to address the mental health impacts of the project on the local community.

Response

Within an urban environment there is a wide range of complex factors (acting and interacting at different scales) that can affect health and wellbeing. This is conceptualised in Figure 9-1 of Appendix J (presented by the International Council for Science and similar to that defined by the WHO) (International Council for Science (ICSU) 2011) to the EIS. The factors identified may result in either positive or negative impacts on health and wellbeing. It is noted that no single element or determinant acts in isolation. Health and wellbeing in the urban environment depends on the sum of the total interactions between many factors.

Where negative impacts have been identified, these impacts are either short-term (during construction only) and/or appropriate mitigation or management measures have been identified which would minimise impacts on the community.

Issue description – potential health impacts of contaminated waterways

Concern raised about potential health impacts that could arise from waterways contaminated with road runoff (heavy metals and carcinogens in brake and clutch dust, exhaust particulates etc.).

Response

The operational water quality impacts from the above ground permanent infrastructure associated with the project are assessed in section 15.4.2 of the EIS. These impacts would be predominantly due to an increase in runoff from a small increase of impervious area and the related mobilisation of pollutants from the carriageway. Although the project would result in a minor increase in impervious area, the project would also change traffic volumes on surface roads and would result in a reduction in the number of heavy vehicles on some of the surface roadways. As such, the additional operational impacts of the project on stormwater runoff pollutants would be marginal.

Section 15.5 of the EIS (as amended by **Chapter 8** (Revised environmental management measures) of this report) outlines the measures to mitigate potential water quality risks to the waterways during operation.

The interchanges and connections to existing roads including Homebush Bay Drive, Concord Road, Wattle Street and Parramatta Road east of Wattle Street would require the management of additional runoff from the widened carriageways in these areas. The following management measures are proposed:

- The water quality basin at Saleyards Creek would be designed to minimise impacts on the creek corridor and the setback area along this boundary should be appropriately landscaped
- A surface water quality monitoring program for the pre-construction, construction and operation of the project would be undertaken in accordance with the ANZECC Guidelines and RTA Guideline. The program would be periodically reviewed so that it provides appropriate information relevant to the project implementation phase
- The criteria for discharge from the mainline carriageways during operation would be based on Part N of the Strathfield Consolidated Development Control Plan 2005, which provides clear targets for water quality.

Water discharged from the tunnel during operation would require collection and treatment prior to discharge to any receiving environment. Relevant measures to treat this water would be identified and could include, for example, a treatment basin with appropriate settling and flocculation employed, and proprietary or mechanical treatment devices as relevant.

During operation, the proposed operational water quality treatment plant at the Cintra Park site would be configured to manage and treat tunnel water, to meet discharge objectives and criteria. Monitoring of discharge water quality and quantity would be undertaken during operation, the frequency and scope of which would be determined in consultation with the regulators and in accordance with operational licences and approval conditions.

5.11 Land use and property

5.11.1 Property acquisition

1,640 submissions raised issues regarding the acquisition of properties.

Issue description – Need to acquire and process

Concerns were raised regarding the need to acquire properties and the process to determine which properties would be acquired. Submissions were opposed to the acquisition of properties either in principle, or prior to approval being granted. Submissions also pointed to a perceived lack of consideration for disadvantaged people in the acquisition process, and argued that compensation should extend to rental tenants.

Particular properties identified include residential properties, apartments and social housing in Homebush, Concord and Haberfield, as well as businesses on Parramatta Road. Submissions also claimed that the map of affected properties excluded some properties to be acquired, providing the example of 'Louisa Cottage' at 142 Alt Street, Haberfield.

Response

Minimising the acquisition of private property was a key aim of the project design. In a number of locations, the preferred design reduced the number of private properties affected when compared to the preliminary concept design.

The property acquisition process for the project is undertaken in accordance with the relevant statutory requirements under *Land Acquisition (Just Terms Compensation) Act 1991* (NSW). Further information regarding the acquisition process is contained in the Roads and Maritime land acquisition information guide (Roads and Maritime 2014). Approval under the *Environmental Planning and Assessment Act 1979* (NSW) is not a prerequisite for this land acquisition process to commence.

Throughout the preliminary concept design, preferred design and EIS preparation process, meetings were held with affected property owners regarding the acquisition process. Ongoing consultation with affected property owners would take place during detailed design and through to construction. Future consultation arrangements are discussed in **Chapter 2** (Community involvement) of this report.

Under the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), only properties required for the construction of the project may 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 which has resulted in them needing to sell their property and 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 that Roads and Maritime becomes the buyer of the property that the owner cannot find in the market place. In such exceptional matters, the consideration for the purchase would be based on the market value of the property with each party being responsible for their own costs of sale. The owner's personal circumstances which Roads and Maritime may be willing to consider, does 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 SMC WestConnex M4 East Property team.

Properties proposed to be acquired for the project were identified in section 5.11 of the EIS. Subsequent alterations to the design of the project and implications for property acquisition are discussed in **Chapter 6** (Clarifications) and **Chapter 7** (Preferred infrastructure report) of this report.

Properties where land acquisition is proposed as part of the project are mapped in Figures 12.6 to 12.10 in section 12.3.1 of the EIS. Properties where subsurface acquisition is proposed, including the property at 142 Alt Street, Haberfield are mapped in Figures 12.11 to 12.16 in section 12.3.1 of the EIS. Subsurface acquisition is discussed further in **section 5.11.2** of this report.

Issue description – Acquisition below market value

A number of submissions raised the concern that properties would be acquired below market value.

Response

The property acquisition process for the project is undertaken in accordance with the relevant statutory requirements under the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW). Further information regarding the acquisition process is contained in the *Roads and Maritime Services land acquisition information guide* (Roads and Maritime 2014).

As outlined in section 6.2 of the Social Impact Assessment in Appendix M of the EIS, 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 proposal.

Where land acquisition is initiated by Roads and Maritime, the owner of each property affected is contacted by letter advising that:

- Their property is required for the project and Roads and Maritime wants to start the acquisition process
- An independent valuer instructed by Roads and Maritime will contact them to make an appointment to inspect their property for the purpose of carrying out a property valuation
- A valuation will be carried out before Roads and Maritime makes a formal offer to the landowner.

The owner may also choose to engage their 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.

When the acquisition of an entire property is initiated by Roads and Maritime, the total purchase price may also include, in addition to the market value, reasonable costs arising from the 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).

Recognising that the timeframe for property acquisition is not open-ended, SMC and Roads and Maritime have continued to liaise with and assist owners and tenants with the acquisition process.

Where property compensation offers are in dispute, they are resolved by negotiation. The Valuer General provides independent valuations for all properties which go to compulsory acquisition as instructed under the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).

Issue description – Acquisition of open space

Concerns were raised about the acquisition of public land and particularly open green space. These submissions objected to the use of the public land for the project on the grounds that their public use would be prohibited or restricted. Particular public land areas identified included public land in Homebush, Reg Coady Reserve, Timbrell Park, Cintra Park and Sydney Park.

Reg Coady Reserve was raised in one submission due to its use by student and staff from Dobroyd Point Public School and students and staff from the Western Suburbs Primary Schools Sports Association. The submission noted the use of Reg Coady Reserve and surrounding playgrounds, sporting fields and parklands (including Timbrell Park) by students and staff and questioned what alternatives would be available to the use of these areas.

Response

As described in section 12.3.1 of the EIS, acquisition and temporary lease of public land would occur for the construction of the project. Following construction and rehabilitation, the majority of this public land would be returned to the relevant local councils. The public land that would be affected includes:

- Bill Boyce Reserve at Homebush
- Part of the proposed future Arnotts Reserve at Homebush
- Cintra Park at Concord
- Part of Reg Coady Reserve at Haberfield.

Bill Boyce Reserve would be acquired for the establishment of Pomeroy Street civil site (C2) to support construction of the project. At the end of construction all the land would be rehabilitated and returned to Strathfield Council for reinstatement as public open space.

About 19 per cent of the proposed future Arnotts Reserve (between M4 and Parramatta Road), which is currently fenced off and not open to the public, would be leased during construction for the Powells Creek civil site (C4). In addition, about seven per cent of the reserve would be acquired for permanent operational infrastructure associated with the Powells Creek on-ramp. The majority of Arnotts Reserve would be rehabilitated and returned to Strathfield Council for use as open space following construction.

The project would result in the partial acquisition of one property (about 43 per cent of the property) which contains the current Cintra Park hockey field and an unsealed car park at Concord Oval. Relocation of the hockey field has been approved and construction of the new hockey field at St Lukes Park has commenced. The new hockey field at St Lukes Park would be in operation before the existing hockey field is closed and construction commences.

Following relocation of the hockey field, land at Cintra Park would change from active open space to a construction ancillary facility for the duration of construction. The majority of Cintra Park would be rehabilitated and returned to Canada Bay Council or the Crown (State of NSW) for use as open space following construction. The nature of this future open space would be determined in consultation with Canada Bay Council.

About six per cent of Reg Coady Reserve would be leased during construction. In addition, about 12 per cent of the reserve would be acquired for permanent operational infrastructure associated with the widening of Wattle Street. The area of Reg Coady Reserve to be leased would be rehabilitated following construction and returned to Ashfield Council for use as open space.

Reg Coady Reserve is situated in the south-west corner of Timbrell Park and separated by Dobroyd Canal (Iron Cove Creek). Reg Coady Reserve is significantly smaller than Timbrell Park, being constrained by Dobroyd Canal and Wattle Street, contains limited public amenities and does not contain any playgrounds or sporting field. The adjacent Timbrell Park, including its playground and sporting fields, would not be affected by land acquisition. No public land in the vicinity of Timbrell Park would be acquired other than the small fraction of Reg Coady Reserve.

Sydney Park would not be affected by the M4 East project. Issues outside the scope of the project, including issues relevant to other WestConnex projects, are discussed in **section 5.27** of this report.

Issue description – Partial property acquisition

Concerns were raised regarding partial property acquisition, with particular regard to potential social and economic impacts on residents.

Response

Partial acquisition would be undertaken in accordance with the relevant statutory requirements under *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), as described above.

5.11.2 Subsurface acquisition

Five submissions raised issues regarding subsurface acquisition beneath properties.

Issue description – Acquisition process and compensation

A number of submissions requested clarification regarding the need for subsurface acquisition and potential for associated compensation or acquisition of properties. Concerns were raised regarding the potential for impacts to properties and an associated preference for the tunnel corridor to be realigned so as not to require subsurface acquisition beneath residences.

Response

As stated in section 4.3.2 of the EIS, three tunnel corridor options were assessed against the project objectives. All three options would require subsurface acquisition beneath residences.

As described in section 12.3.1 of the EIS, sub-surface acquisition involves the acquisition of land below the ground surface, as opposed to the acquisition of properties and dwellings. In the case of the project, subsurface acquisition would be necessary for excavation of the mainline tunnels, on- and off-ramps, and construction access tunnels. Properties where subsurface acquisition is proposed are mapped in Figure 12.11 to Figure 12.16 of the EIS. As described in **Chapter 7** (Preferred infrastructure report) of this report, additional subsurface property acquisition is proposed at the Concord Road interchange and proposed changes to the Wattle Street interchange discussed in have implications for property acquisition, including subsurface acquisition.

Roads and Maritime has the authority to acquire subsurface land, under the *Roads Act 1993* (NSW), by a compulsory acquisition process. The steps for the compulsory acquisitions are set out in the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).

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 Services land acquisition information guide* (Roads and Maritime 2014) sets out in detail the compensation provisions of the Act relating to subsurface acquisition.

Structural or cosmetic damage to properties as a result of the tunnel is extremely unlikely, however a free property condition survey is available to properties directly above the tunnel and those within a 50 metre buffer zone before construction starts as a record of the existing condition. A post condition survey will also be completed and in the unlikely event any damage is attributed to the project, repairs will be undertaken at no cost to the property owner.

Section 5.3 of this report discusses the alternatives considered for the location of the tunnel corridor. **Section 5.12.4** of this report addressed concerns about development potential for properties affected by subsurface acquisition.

5.11.3 Utility and road impacts

Eight submissions raised issues regarding impacts to utilities and access arrangements at properties.

Issue description – Provision of new access to properties

Concerns were raised regarding the potential of the construction and operation of the project to limit access to properties. Submissions pointed to potential issues accessing properties in the vicinity of the Wattle Street and Ramsay Street intersection. Property adjustments were requested such as:

- Provision of a turning bay on the property at 154 Ramsay Street at Haberfield
- Provision of alternate access to The Infant's Home via Frederick Street, Ashfield, as the Bunnings building on the corner of Parramatta Road and Frederick Street would be acquired for the project
- Repurposing of existing M4 entrance as access to apartment block complex at 167-173 Parramatta Road.

Response

Subsequent alterations to the design of the project and implications access in the vicinity of the Ramsay Street and Wattle Street are discussed in **Chapter 7** of this report.

The existing access to the property at 154 Ramsay Street at Haberfield would not be impacted and therefore alternate access, including a turning circle, would not be necessary to maintain access.

The submission from The Infants' Home incorrectly states that the Bunnings building would be acquired for the project. The project would involve subsurface acquisition only beneath the Bunnings site. Given this, there would be no impact or need to provide alternative access to The Infants' Home.

The existing M4 entrance would be removed for the project. 167-173 Parramatta Road would be accessible from its existing access point from Parramatta Road.

Ongoing consultation with affected property owners would take place during detailed design and through to construction. Future consultation arrangements are discussed in **section 5.6** of this report.

Issue description – Impacts to public utilities

Concerns were raised regarding a perceived lack of discussion of impacts to public utilities in the EIS.

Response

As stated in section 5.1 of the EIS, alterations or relocations of existing utilities are not within the scope of the EIS and would require separate assessment and approval as required. Consultation was undertaken with providers of services including electricity, gas, water and telecommunications. The topics of this consultation are summarised in section 7.3.2 of the EIS, and included a discussion of the processes in place within each service provider to oversee the alteration or relocation of utilities prior to the start of construction. These activities would be subject to separate assessment and approval.

5.11.4 Future development impacts and opportunities

448 submissions raised issues regarding future development around the project including the use of residual land.

Issue description – Future use of residual land

A number of submissions raised concerns about the ownership and use of residual land. Some submissions argued that residual land should be returned to the original owner (or auctioned) while others advocated the reuse of residual land as green space. Submissions regarding property acquisition in Leichhardt and Ashfield in particular raised the concern that they would be subject to higher density development than previously zoned. A number of submissions advocated particular uses of particular areas of residual land, including:

- Residual land at Concord Road civil and tunnel site (C5) as open space
- Residual land at the Northcote Street tunnel site (C7) as open space
- Residual land at the Wattle Street and Walker Avenue civil site (C9) as open space
- Residual land at the Parramatta Road civil site (C10) as open space, as well as the potential integration of residual land to the garden at 98 Chandos Street.

Response

The future use of residual land and associated rezoning does not form part of the project. These matters would be determined by Roads and Maritime in conjunction with the relevant authorities, including government agencies and local councils.

Existing public land areas temporarily acquired for construction including Bill Boyce Reserve, part of Arnotts Reserve, Cintra Park and part of Reg Coady Reserve would be reinstated to their pre-construction condition at the end of construction and returned to the relevant local councils. The acquisition and temporary use of these areas is discussed in **section 5.11.1** of this report.

Issue description – Future ownership of dwellings

Concerns were raised regarding the future ownership of dwellings on acquired land.

Response

As described in section 12.3.1 of the EIS, the project would require acquisition of a number of residential and commercial properties. All buildings on properties acquired for the project would be demolished.

The future use of residual land and associated rezoning does not form part of the project. These matters would be determined by Roads and Maritime in conjunction with the relevant authorities, including government agencies and local councils.

Issue description – Urban renewal of Parramatta Road

Concerns were raised that the project would not facilitate the urban renewal of Parramatta Road, arguing that the project and WestConnex would:

- Lead to traffic growth on Parramatta Road
- Not provide additional public transport on Parramatta Road
- Not provide access between urban renewal areas and WestConnex.

Response

As described in section 12.4.2 of the EIS, the project, as part of WestConnex, would be a catalyst for the urban renewal of Parramatta Road in line with the Parramatta Road Urban Transformation Program.

The Parramatta Road Urban Transformation Program is a NSW Government initiative involving the local councils of Auburn, Ashfield, Burwood, City of Canada Bay, City of Sydney, Holroyd City, Leichhardt, Marrickville, Parramatta City and Strathfield. The program aims to provide housing, jobs, open spaces and public amenity improvements in the Parramatta Road Corridor.

The *Draft Parramatta Road Urban Transformation Strategy* is expected to facilitate $28 billion in development value over the first 20 years. The strategy provides a broad timeframe for the transformation of Parramatta Road, with urban amenity improvements works expected to commence in 2017 and development approvals and construction are expected to commence in 2018.

Limited access between identified urban renewal precincts and WestConnex would not preclude urban renewal. A key element of the program is the provision of improved public transport on Parramatta Road. The project, as part of WestConnex, would reduce traffic on Parramatta Road and thereby allow for improved public transport.

Issues raised in submissions relating to traffic growth are discussed in **section 5.7** of this report.

Issue description – Development potential above tunnel

Concerns were raised about reduction in development potential due to subsurface acquisition.

Response

As described in section 12.3.1 of the EIS, in most cases, subsurface acquisition would not affect the future use of property at the surface, under current council planning controls. Subject to council regulations and approvals, property owners would generally be able to:

- Carry out improvement such as installing a swimming pool
- Dig deeper foundations for a new building, second storey additions, etc.

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 Services land acquisition* guide (Roads and Maritime 2014) sets out in detail the compensation provisions of the Act relating to subsurface acquisition.

Properties located above the tunnels away from Parramatta Road are generally currently zoned for low density residential which means that the development potential of this land is limited by existing planning controls.

5.11.5 Property values

1,175 submissions raised issues regarding impacts to property values as a result of the project.

Issue description – Devaluation of properties by surface infrastructure

A number of submissions argued that nearby properties would be devalued by the project. Factors perceived to contribute to this devaluation included:

- Visual impact of infrastructure
- Increased pollution from vehicles and ventilation outlets
- Increased traffic and associated hazards
- Reduced amenity of nearby open space
- Restriction of development by subsurface acquisition.

Response

Property values are driven by a range of factors. For example, business property values are generally driven by factors such as access or proximity to markets and products, customer access, and visibility while residential property values are more heavily influenced by liveability as reflected by local amenity and accessibility to employment, transport and social infrastructure.

Future movements in the value of a property are also difficult to predict 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. For the above reasons changes in property values as a result of the project are difficult to predict. There is currently no evidence suggestion that property values would be reduced as a result of the project.

Issue description – Devaluation of properties by tunnel

A number of submissions criticised the alignment of the tunnel corridor for its potential to diminish property values and perceived benefits for commercial developers on Parramatta Road.

Response

As stated in section 4.3.2 of the EIS, three tunnel corridor options were considered. In addition to reduced project cost and favourable ground conditions, the preferred option was selected as it would only cross beneath Parramatta Road for a short distance, preserving the majority of the corridor for future urban renewal in line with the Parramatta Road Urban Transformation Program.

The Parramatta Road Urban Transformation Program is a NSW Government initiative involving the local councils of Auburn, Ashfield, Burwood, City of Canada Bay, City of Sydney, Holroyd City, Leichhardt, Marrickville, Parramatta City and Strathfield. The program aims to provide housing, jobs, open spaces and public amenity improvements in the Parramatta Road Corridor.

For properties located above the tunnels for the project, based on previous road tunnels in Sydney and other states in Australia, there is no evidence that these projects have resulted in a reduction in property values solely because there is a tunnel below the property.

Properties located above the tunnels away from Parramatta Road are generally currently zoned for low density residential which means that the development potential of this land is limited by existing planning controls.

5.11.6 Overshadowing

Seven submissions raised issues regarding potential overshadowing impacts of the project.

Issue description – Overshadowing of properties

A number of submissions concerned the potential for infrastructure to overshadow private residences. The following places in were raised in the submissions:

- Residences adjacent to Concord Road interchange at North Strathfield
- Residences adjacent to Cintra Park at Concord
- Residences on the corner of Parramatta Road and Wattle Street at Haberfield
- Buildings on the corner of Parramatta Road and Wattle Street generally
- Residences on Walker Avenue, backing onto Wattle Street at Haberfield.

A general point was also raised about the lack of provision of relative levels of noise barriers and adjacent properties.

Response

Project infrastructure with the potential to overshadow residences includes noise barriers and other supporting infrastructure such as ventilation facilities and electrical substations. Overshadowing impacts of project infrastructure are described in section 12.4.3 of the EIS, based on shadow diagrams provided in Appendix K of the EIS. The date simulated in the assessment (22 June) was selected as it represents the shortest day of the year (the winter solstice) in the southern hemisphere and therefore provides a 'worst case' for impact assessment of overshadowing impacts. It is noted that the shadow diagrams are indicative and may not represent the final extent of shadowing.

As stated in section 12.4.3 of the EIS, some residences at North Strathfield located adjacent to the Concord Road interchange would be subject to overshadowing and may not receive a minimum of three hours sunlight between 9.00 am and 3.00 pm on 22 June.

Shadows from facilities at Cintra Park would usually be contained to the park, except for one hour per day (2.00 pm to 3.00 pm) when shadows would be cast into the back yards of some residential properties on Taylor Street in Concord. Affected properties would receive a minimum of three hours of sunlight within their principal private open space between 9.00 am and 3.00 pm. Shadow diagrams of facilities at Cintra Park are presented in Appendix K of the EIS.

A noise barrier labelled NW_WATTLE_01A was recommended to mitigate noise impacts at sensitive receivers, including residences on Walker Avenue. The optimised noise barrier as described in section 5.8.6 of the EIS would be located on the southern side of Wattle Street, 374 metres long and five metres high. Shadows from noise barrier would be cast into the yards at the rear of properties on Walker Avenue. The shadows would not affect more than half of a given yard at a given time, and affected properties would receive the minimum three hours of sunlight within their yards between 9.00 am and 3.00 pm. Shadow diagrams of this noise barrier are presented in Appendix K of the EIS.

The noise and vibration assessment recommended noise barriers to mitigate noise impacts at sensitive receivers. The location, length and height of the recommended noise barriers were determined in line with Roads and Maritime *Noise Mitigation Guideline*. Details including the location, length and height of recommended noise barriers are provided in section 8.3 of Appendix I.

As outlined in section 12.5 of the EIS (and amended in **Chapter 8** (Revised environmental management measures) of this report), the contractor would be required to develop solar access and overshadowing reports to assess refinements in construction planning and detailed design and their potential overshadowing impacts.

5.12 Urban design and visual amenity

5.12.1 Construction light spill

Two submissions raised issues regarding light spill during construction.

Issue description – lighting at construction ancillary facilities

Concern raised that impacts due to lighting within construction ancillary facilities during 24 hour operations would affect property at 7 & 7A Taylor Street at Five Dock.

Response

As described in section 6.7.2 of the EIS, the project would require some night works. Night works would be required at all tunnelling sites, and would potentially be required at other sites in order to carry out 24 hour tunnelling as part of the project.

Section 13.3.3 of the EIS considers the potential for light spill impacts during construction.

In general light spill would be managed to minimise impacts on adjoining properties by the use of cut-off and directed lighting (see section 13.5.2 of the EIS, as amended in **Chapter 8** (Revised environmental management measures) of this report). Lighting within ancillary facilities would be turned off or reduced to a level which maintains site safety, whenever the facility is not in use.

The potential light spill impacts at the Cintra Park site would be reduced by implementing the management measures described above.

It is noted that properties adjoining the Cintra Park site are already subject to some light spill impacts from the current use of the hockey field at night. Existing vegetation along the eastern side of the park would provide some protection against potential light spill impacts during construction. This screening would not be removed. All construction ancillary facilities would include boundary hoarding, where practical, which would further reduce any light spill that may occur.

Issue description – lighting at Northcote Street tunnel site

Submission raised concern that light pollution would arise from the Northcote Street tunnel site (C7) and impact neighbouring properties.

Response

As detailed in section 6.7.2 of the EIS, the project would require some night works. Such works would be required at all tunnelling sites, however night works would also potentially be required at other sites in order to support any other night works occurring as part of the project.

Construction light spill impacts are discussed in section 13.3.3 of the EIS and management measures are provided in section 13.5.2 as amended in **Chapter 8** (Revised environmental management measures) of this report. These measures include:

- Cut-off and directed lighting would be used to ensure glare and light spill are minimised
- Lighting within ancillary facilities would be turned off or reduced to a level which maintains site safety, whenever the facility is not in use.

In addition, impacts of light spill from the Northcote Street site would be reduced due to the existing lighting along Parramatta Road and the existing commercial buildings. Works at this site would also largely be contained to the acoustic shed which is to occupy a large percentage of the site.

5.12.2 Construction visual impact

32 submissions raised issues regarding visual impacts during construction.

Issues description – visual impacts of works at Cintra Park

Concern has been raised that works at Cintra Park would cause visual impacts at property 7 & 7A Taylor Street at Five Dock, as the living areas face towards the park. Views from this property would be dominated by a construction site.

Response

Section 13.3.2 and Appendix L of the EIS considers the potential for visual impacts during construction. Table 13.6 of the EIS provides an assessment of the potential visual impacts of the Cintra Park tunnel and civil construction ancillary facility (C6) on Taylor Street residents (see assessment for Cintra Park tunnel site (C6)).

This assessment concluded that some activities within the site would be visible.

However, the view would be filtered by existing vegetation which would be retained. The hoarding around the site would further reduce the potential for light spill impacts. The hoarding and visible aspects of the site (e.g. acoustic sheds) would be designed and located to minimise visual impacts.

Issue description – visual impacts on 24 Wattle Street at Haberfield

Submissions raised concern that visual impacts on 24 Wattle Street at Haberfield would arise during construction and have not been adequately addressed as part of the EIS.

Response

Section 13.3 and Appendix L of the EIS consider the potential for visual impacts during construction. Table 13.6 of the EIS provides an assessment of the potential visual impacts of the Wattle Street and Walker Avenue civil construction ancillary facility (C9). The area was considered to have a high sensitivity to change, due to long viewing periods from the location of living areas and back yards (refer to Table 13.3 of the EIS).

The assessment concluded that residences around Wattle Street would have varying views to the construction ancillary facility from front yards, back yards and the sides of properties. The potential magnitude of the impact is assessed as high in an area of moderate sensitivity.

General and site specific management measures are identified in section 13.5 of the EIS and amended in **Chapter 8** (Revised environmental management measures) of this report. Measures include, but are not limited to:

- Retain existing vegetation around the perimeter of construction sites where feasible and reasonable

- Early implementation of noise barriers and landscape planting around ancillary facilities to provide visual screening and minimise noise impacts during construction
- Locate equipment on construction sites, including buildings that are two storeys (or equivalent) or greater in height, to minimise visual impacts as far as feasible and reasonable
- Acoustic shed, acoustic barrier and two storey site offices and amenities building design would aim to blend into the background where feasible and reasonable
- Design of site hoardings would consider the use of artwork or project information
- Maintain site hoardings and perimeter areas including the prompt removal of graffiti
- Revegetation and landscaping would be undertaken progressively.

Issue description – visual impact of the Walker Avenue civil site (C9)

Concern was raised that the Walker Avenue civil site (C9) would impact the local neighbourhood, and information on how the visual impact would be addressed was requested.

Response

Chapter 13 and Appendix L of the EIS have assessed the potential visual and landscape impacts that would result from the project. Residences on Walker Avenue would have varying views to the Wattle Street and Walker Avenue civil construction ancillary facility site (C9) from front yards, back yards and the sides of properties. There would be extensive work to reconfigure Wattle Street at this location. The magnitude of impacts is assessed as high at this locality, with low impacts from light spill. These impacts would be temporary for the duration of the construction phase.

General and site specific management measures are identified in section 13.5 of the EIS and amended in **Chapter 8** (Revised environmental management measures) of this report. These measures would be incorporated to minimise any impacts to visual amenity from the construction phase. These include but are not limited to:

- Retain existing vegetation around the perimeter of construction sites where feasible and reasonable
- Early implementation of noise barriers and landscape planting around ancillary facilities to provide visual screening and minimise noise impacts during construction
- Locate equipment on construction sites, including buildings that are two storeys (or equivalent) or greater in height, to minimise visual impacts as far as feasible and reasonable
- Acoustic shed, acoustic barrier and two storey site offices and amenities building design would aim to blend into the background where feasible and reasonable
- Design of site hoardings would consider the use of artwork or project information
- Maintain site hoardings and perimeter areas including the prompt removal of graffiti.

Issue description – impact of Powells Creek on-ramp

Concern was raised that the proposed new Powells Creek on-ramp would have a major adverse impact on the amenity and quality of the public open space and the surrounding residences, including visual impact during construction.

Response

Section 13.5.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) describes the management measures that would be incorporated to minimise any impacts to visual amenity from the construction phase. These measures include but are not limited to:

- Retain existing vegetation around the perimeter of construction sites where feasible and reasonable
- Early implementation of landscape planting around the ancillary facility at this location to provide visual screening and minimise noise impacts during construction

- Locate equipment on construction sites, including buildings that are two storeys (or equivalent) or greater in height, to minimise visual impacts as far as feasible and reasonable
- Acoustic shed, acoustic barrier and two storey site offices and amenities building design would aim to blend into the background where feasible and reasonable
- Design of site hoardings would consider the use of artwork or project information
- Maintain site hoardings and perimeter areas including the prompt removal of graffiti.

Issue description – visual impact of the Northcote Street tunnel site (c7)

Concern was raised that the Northcote Street tunnel site (C7) would severely affect the visual amenity of neighbouring properties. Impact would arise from boundary hoarding and the acoustic shed which would be 10 metres tall and 90 metres long. Request that the hoarding is not greater than 2.5 to 3.0 metres in height.

Response

The Northcote Street tunnel site (C7) would include an acoustic shed and a temporary acoustic hoarding along the north and west boundaries where the site is adjacent to residential areas. The detailed design of acoustic sheds and temporary acoustic hoardings would be considered during the construction planning and work area establishment phases of the project. The position of nearby sensitive receivers would be considered when planning the site layout and designing the acoustic enclosure and hoardings. These would be established on the site to minimise noise impacts on surrounding properties associated with out-of-hours tunnelling and spoil handling. Although there would be visual impact from these structures, this is considered preferable to the noise impacts that would result without mitigation.

Issue description – visual impact of the Underwood Road

Concern that the removal of the trees surrounding the Underwood Road civil and tunnel site (C3) would change the visual aspects of the street.

Response

Section 13.5.2 of the EIS describes the measures that would be considered to mitigate impacts arising from the Underwood Road civil and tunnel site (C3). These include the following:

- During pre-construction, consider a formal park design that incorporates measures (eg mounding/deeper soils areas) to facilitate a successful large tree planting program between Underwood Road and Ismay Avenue
- Explore opportunities with local councils to provide avenue planting down both sides of the street, and a linking canopy across the road
- Consider the use of a planting mix for the proposed park on the corner of Short Street East and Underwood Road that draws upon the suburban setting of cultural plantings, and which may include elements such as park seating, other park furniture, paving, signage and lighting.

Issue description – visual impact of Concord Road civil and tunnel site (C5)

Concern was raised that the Concord Road civil and tunnel site (C5) would result in visual impacts to 18 Franklyn Street at Concord and other local residences.)

Response

Section 13.3 of the EIS describes the visual impact resulting from the Concord Road civil and tunnel site (C5). Some buildings and equipment would be visible above noise barriers, fences and hoarding. Permanent noise barriers, where these are identified as being able to installed prior to the operation of the project, would also be a significant change from the existing condition.

Views from residential areas towards Concord Road currently consist of filtered views through street trees, which would be interrupted by the high walls associated with the construction ancillary facilities. The magnitude of the impact has been assessed as high. Management measures are detailed in section 13.5 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report). These include but are not limited to:

- Retain existing vegetation around the perimeter of construction sites where feasible and reasonable
- Early implementation of noise barriers and landscape planting around ancillary facilities to provide visual screening and minimise noise impacts during construction
- Locate equipment on construction sites, including buildings that are two storeys (or equivalent) or greater in height, to minimise visual impacts as far as feasible and reasonable
- Acoustic shed, acoustic barrier and two storey site offices and amenities building design would aim to blend into the background where feasible and reasonable
- Design of site hoardings would consider the use of artwork or project information
- Maintain site hoardings and perimeter areas including the prompt removal of graffiti
- Revegetation and landscaping would be undertaken progressively.

Issue description – visual impact of fencing at Concord Road civil and tunnel site (C6)

Concern was raised that a temporary 4.5 metre fence at the Concord Road civil and tunnel site (C6) would be erected close to and along the western boundary of properties on Edward Street. This would result in:

- Visual impacts
- The temporary fence would be located within a few metres of the side windows of the house completely destroying any view.

The submission raised concern that this would continue for up to three years.

Response

Temporary fences and acoustic hoardings would be established at the Concord Road civil and tunnel site (C6) to minimise noise and visual impacts on surrounding properties associated with out-of-hours tunnelling and spoil handling. The installation of such hoarding typically reduces noise levels between five dBA and 10 dBA. The installation of hoardings would reduce the number of highly noise affected receivers by more than 60 per cent. These reductions are based on hoarding heights varying between 2.1 and 4.5 metres.

Section 10.4.1 of the EIS considers the impact of temporary acoustic hoardings in more detail. The detailed design of the tunnelling enclosures would be considered during the construction planning and work area establishment phases of the project. The position of nearby sensitive receivers would be considered when planning the site layout and designing the acoustic enclosure to ensure sufficient noise mitigation is achieved for all surrounding receivers.

Although there would be visual impact from these structures, this is considered preferable to the noise impacts which would result without the mitigation. Temporary fences and acoustic hoardings would be removed as soon as possible following the completion of construction.

Issue description – resulting impacts from management measures

Concern was raised that mitigation strategies proposed to address one impact would create a different impact. For example, a noise barrier proposed to mitigate noise impacts would create a visual impact. This is not properly accounted for in the EIS and demonstrates a methodological failure.

Response

All impacts associated with structures and works described in Chapter 5 and Chapter 6 of the EIS were assessed in the environmental impact assessment. This includes visual impacts resulting from structures to mitigate other impacts, including noise walls (refer to sections 13.3 and 13.4 of the EIS).

Issue description – visual impact of construction ancillary facilities

Concerns were raised that the construction ancillary facilities would have visual impacts and block views to neighbouring areas. The construction period would be prolonged and impacts should not be trivialised. Decorated hoardings and temporary planting are not adequate mitigation.

Response

Section 13.3 and Appendix L of the EIS describes the potential visual impacts which may arise from the construction ancillary facilities. Depending on the location of receivers, the magnitude of potential impacts ranges from low to high. The construction schedule of the project has been optimised so as to limit, as far as practicable, the duration of the construction period and any associated amenity impacts on the local community. The primary way by which this would be achieved is via continuous tunnelling (24 hours per day and seven days per week).

Management measures are detailed in section 13.5 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report would assist in ameliorating visual amenity impacts. This would include judicious selection of the location of equipment on construction sites, consideration of project information or artwork for the design of site hoardings and management of lighting within ancillary facilities to reduce impacts on nearby receivers.

5.12.3 Operational landscape character impact

37 submissions raised issues regarding landscape character impacts during operation.

Issue description – conservation of the character of Haberfield

Submissions requested that the unique character and feel of Haberfield be protected.

Response

The Haberfield landscape character zone (LCZ 12) is one of 15 character zones considered by the urban design and visual amenity assessment summarised in Chapter 13 of the EIS. This landscape character zone is considered to have a high sensitivity to change (refer to Table 13.2 of the EIS).

Section 13.4 and Appendix L of the EIS consider the potential for landscape character and visual impacts during operation. Table 13.8 of the EIS provides an assessment of the potential landscape character impacts on the Haberfield landscape character zone. The assessment noted that the key visual features of the project in this character zone would be the:

- Ventilation outlet (around 25 metres high) at the Parramatta Road end of Walker Avenue
- Proposed boulevard planting of large eucalypts to Wattle Street and the end of Martin Street
- The proposed Wattle Street interchange.

The results of the assessment summarised in Table 13.8 of the EIS indicate that the project would impact on the landscape character of Walker Street, and the ends of Walker Avenue and Martin Street. The project would change the landscape character of Haberfield, introducing a number of road infrastructure-related structures within and visible from the existing setting. The potential magnitude of change is considered to be high in an area of high sensitivity.

As noted in section 13.4.4 of the EIS, operational facilities and buildings would be designed in accordance with the *WestConnex Motorway Urban Design Framework* (Roads and Maritime 2013a, WUDF) and landscaped to complement and blend with their surroundings. The urban design and landscape approach for the project would be developed during detailed design with the aim of integrating the project into the surrounding landscape and visual setting. Implementation of the intended public realm and landscape design at Wattle Street in Haberfield would ensure that the project is well integrated with the surrounding context.

In response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the project. The panel would review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist would also be included on the panel.

Management measures are identified in section 13.5 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report). Measures include the planting of mature vegetation in order to provide shade and to make an early visual impact. The planting of vegetation on the cut-and-cover structures would be required to achieve an integrated project outcome. Where mature street trees would be removed as part of construction of the project, these would be reinstated, where practicable, with appropriate species, in accordance with the Urban Design and Landscape Plan.

Further development of pedestrian paths and potential screening from the road would be considered during detailed design.

Issue description – protection of the heritage culture of Haberfield

Submissions expressed concern that the project objective 'protect natural and cultural resources and enhance the environment' would not be achieved as the project would destroy the natural and cultural resources in Haberfield and other areas. The homes and the suburb of Haberfield is a significant part of early Australian culture seen through the style of homes, gardens and parks along with the eclectic mix of people who live there. The loss of these significant period homes would impact Sydney's heritage culture and the heritage suburb.

Response

The full project objective is listed below and is provided in section 3.3 of the EIS, and the measures to achieve this are described in section 30.1.2 of the EIS.

- Protect natural and cultural resources and enhance the environment through the following key approaches:
  - Manage tunnel ventilation emissions to ensure local air quality meets EPA standards
  - Maintain regional air quality
  - Minimise adverse impacts at a local level on air and noise quality
  - Manage in-tunnel air quality to meet community visibility and health expectations
  - Minimise energy use during construction and operation
  - Manage noise impacts in accordance with the NSW Road Noise Policy and realise opportunities to reduce or mitigate noise
  - Provide for improvement of social and visual amenity
  - Minimise impacts on natural systems including biodiversity
  - Minimise impact on Aboriginal and non-Aboriginal cultural heritage
  - Minimal impact on surface and groundwater sources and water quality including management of contaminated areas
  - Reduce susceptibility to, and minimise impacts of, flooding
  - Integrate sustainability considerations throughout the design, construction and operation of the project, including consideration of the Infrastructure Sustainability Council of Australia (ISCA) Sustainability Rating tool scorecard.

Potential impacts on the environment have been assessed throughout the EIS and a range of management measures are proposed in order to achieve this objective. However some residual impacts would remain after mitigation is applied, including impacts to heritage and communities around the intersections.

In response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the project. The panel would review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist would also be included on the panel.

Issue description – modification of the landscape character of Haberfield and Ashfield

Concerns were raised that the landscape character of the streets in Haberfield and Ashfield, around Parramatta Road (Wattle Street, Alt Street, Bland Street, etc) would be permanently modified by the proposal through the proposed land acquisition, demolition of properties and construction of the eastern ventilation facility, Wattle Street widening, cut-and-cover tunnels, bridges, tunnel portals and noise walls. Concerns were raised that the project's hard edges are being masked by trees.

Response

As outlined in Chapter 13 and Appendix L of the EIS, the project would impact on the landscape character of Wattle Street and around the Parramatta Road interchange. The project would change the landscape character, introducing a number of visible road infrastructure-related structures into the existing setting.

The magnitude of the change around Wattle Street has been assessed as being high in an area of moderate sensitivity.

The ramps have been positioned to ensure that they do not commence their descent too close to the Wattle Street and Parramatta Road intersection. The topography of Wattle Street also played a role in the positioning of the ramps, as the change in gradient along Wattle Street towards the north means the tunnels and ramps are shorter if they travel with the gradient and essentially exit out of the side of the hill. If the ramps were to be located further to the south, vehicles would need to travel uphill before travelling downhill again.

Landscaping would be designed to be sympathetic to the local context. Section 13.5.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) describes management measures, which include:

- Where mature street trees have been removed as part of construction of the project, these would be reinstated, where practicable, with appropriate species, in accordance with the Urban Design and Landscape Plan
- Refine the size, numbers and densities of proposed trees, to foster robust, rapid growth and canopy closure for shade and screening
- Selection of appropriate species for mass plantings at project boundaries, and for sedimentation basin planting, to be undertaken as part of the Urban Design and Landscaping Plan by an appropriately qualified person.

The project, from an urban design viewpoint, aims to integrate any new infrastructure into the environment to which it is located. At the eastern ventilation facility site, the proposed buildings would be of similar scale and form to the commercial building on the southern side of Parramatta Road (Bunnings). This would assist in establishing a portal feature for this section of Parramatta Road. Retained and planted mature trees would assist in mediating the visual relationship between the project and residential buildings on Walker Avenue.

The magnitude of the change around Parramatta Road (east), which includes Alt Street and Bland Street, is considered to be high in an area of moderate sensitivity. However, the project would improve the character and appearance of this zone via the incorporation of a substantial soft-landscaping component. Integration of the project at this location with the surrounding context would be achieved via the implementation of the intended public realm and landscape design, including the inclusion of mature vegetation to make an early impact.

To ensure that the urban design objectives established for the project are met, further development of the design would be undertaken during detailed design.

Issue description – landscaping near aged care facility at 169-171 Parramatta Road

A submission requested that landscaping near the aged care facility at 169-171 Parramatta Road be managed and improved during operation and that visual impacts are minimised.

Response

The assessment of project effects for landscape character zone 11 – Parramatta Road (east) precinct identifies that the project would change the character of this LCZ beneficially, due to the prominent urban design and landscape initiatives that are proposed at this location.

Implementation of the intended public realm and landscape design at the Parramatta Road interchange would ensure that it is well integrated with the surrounding context. This would include substantial vegetation planting. The urban design and landscape objectives for this landscape character zone would continue to be considered during detailed design.

Issue description – destruction of parklands and vegetation

Concerns were raised that the project is destroying parkland and vegetation.

Response

As described in section 12.3.1 of the EIS, acquisition and temporary lease of public land would occur for the construction of the project. Following construction the majority of this public land would be reinstated and returned to the relevant local councils. The public land that would be affected includes:

- Bill Boyce Reserve at Homebush
- Part of the proposed future Arnotts Reserve at Homebush
- Cintra Park at Concord
- Part of Reg Coady Reserve at Haberfield.

Bill Boyce Reserve would be acquired for the establishment of Pomeroy Street civil site (C2) to support construction of the project. At the end of construction the land would be returned to Strathfield Council for reinstatement as public open space.

About 3220 m^2 of the proposed future Arnotts Reserve (about 19 per cent of the reserve), which is currently fenced off and not open to the public, would be leased during construction for the Powells Creek civil site (C4). About 1280 m^2 of Arnotts Reserve (about seven per cent of the reserve) would be acquired for permanent operational infrastructure associated with the Powells Creek on-ramp. The majority of Arnotts Reserve would be reinstated and returned to Strathfield Council for use as open space following construction.

The project would result in the partial acquisition of one property (about 43 per cent) which contains the Cintra Park hockey field and an unsealed car park at Concord Oval. Relocation of the hockey field has been approved and construction of the new hockey field at St Lukes Park has commenced. The new hockey field at St Lukes Park would be in operation before the existing hockey field is closed and construction commences. Following relocation of the hockey field, land at Cintra Park would change from active open space to a construction ancillary facility for the duration of construction. The majority of Cintra Park would be reinstated and returned to Canada Bay Council or the Crown (State of NSW) for use as open space following construction. The nature of this future open space would be determined in consultation with Canada Bay Council and other stakeholders.

About 18 per cent of Reg Coady Reserve would be leased during construction. 12 per cent of the reserve would be required for operation and the widening of Wattle Street. The area of Reg Coady Reserve to be leased would be reinstated and returned to Ashfield Council for use as open space following construction.

Chapter 20 and Appendix T of the EIS discuss the biodiversity impacts associated with the project. The project is located in a highly urbanised environment and much of the project would be tunnelled under existing roads and residential areas. No intact, remnant native vegetation communities are present in the project footprint or immediately adjacent to the study area. Construction of the project would result in the removal of about 15.7 hectares of vegetation, comprising about 12.9 hectares of planted trees and screening vegetation (mainly from alongside the existing M4) and about 2.8 hectares of grassland with scattered trees (such as from Cintra Park and Reg Coady Reserve).

The provision of green space and landscaping has been included within the design where possible. Further consideration would be made during detailed design for the final use of any residual land. This would be undertaken in collaboration with local councils to ensure that any residual land available for green space would be appropriate for the uses of landscaping, public open space or biodiversity habitat.

Issue description – landscaping along Parramatta Road (Haberfield side)

Concerns were raised that the EIS does not discuss the final plans for size and type of landscaping proposed to Parramatta Road (Haberfield side). Submissions requested that trees of a substantial size and type are provided in line with the artist's impression provided in the EIS, with adequate provision of 200 litre street trees consistent with the Parramatta Road Urban Transformation Program.

Response

Section 6.3.1 of the Urban Design, Landscape Character and Visual Impact Assessment in Appendix L of the EIS recommends that the design approach be consistent with the objectives of the *WestConnex Motorway Urban Design Framework* (Roads and Maritime 2013a) and Roads and Maritime design guidelines. The application of a planting palette and the suitability of the species mix would be further considered during detailed design.

Specific materials to be used as part of specific project elements in this section of the project would be determined during detailed design and would have regard to the specific characteristics of the Haberfield area. This would include consideration of the use of a planting palette which is more responsive to the particular landscape character of different precincts eg Federation-era precincts that use brush box avenue plantings, have detailed garden settings and extensive examples of well-presented Federation-era architecture, such as Edward Street in North Strathfield, and Walker Avenue and Martin Street in Haberfield. The design development process would consider these cultural integration issues within these types of areas.

In addition, as described in Chapter 19.4 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report), the urban design and landscape plan would ensure views to the front gates and landmark Moreton Bay figs within Yasmar's mature garden are not obscured, and significant trees in the vicinity of the project would be protected during construction works.

Issue description – impact of vehicle movements on character of suburbs

Concerns were raised that the project and the daily movement of large trucks would permanently change the character of affected suburbs.

Response

The project would introduce new operational elements and ancillary infrastructure into an existing built environment and would be located next to or within major transport corridors. It would remove some traffic, including heavy vehicles from the existing surface road network.

The key landscape character and visual amenity impact would be a change from a visually enclosed four-lane motorway with vegetated embankments, to a substantially wider corridor incorporating multiple lanes and the opening up of new view lines to the transport corridor. As noted in section 13.4.4 of the EIS, operational facilities and buildings would be designed in accordance with the *WestConnex Motorway Urban Design Framework* (Roads and Maritime 2013a) and landscaped to complement and blend with their surroundings. The urban design and landscape approach for the project would be developed during detailed design with the aim of integrating the project into the surrounding landscape and visual setting

Issue description – expansion of landscape character assessment zones

Submissions request that landscape character assessment zones are expanded to include broader areas.

Response

The assessment was undertaken in accordance with the *Environmental Impact Assessment Guidance Note – Guidelines for landscape character and visual impact assessment* (EIA-N04) (Roads and Maritime, 2013c). Reference has also been made to the UK *Guidelines for Landscape and Visual Impact Assessment Third edition* (known as GLVIA3) (Landscape Institute/IEMA, 2013).

For the purposes of the assessment, 15 landscape character zones were identified. These are areas with similar visual landscape and urban design characteristics, and were identified in those areas that have the potential to be impacted by the surface components of the project.

5.12.4 Operational visual impact

56 submissions raised issues regarding visual impacts during operation.

Issue description – visual impacts of the project

Submissions raised concerns regarding the visual aspects of the project. WestConnex would have adverse visual impacts on adjoining areas in Sydney through creating a large feature that separates the areas on either side.

Response

The majority of the project would be located within tunnels below the surface. Subsurface sections of the project would not have adverse visual impacts.

An assessment of the urban design, landscape and visual impacts of surface infrastructure, including the tunnel portals, interchanges and ancillary structures, is included in Chapter 13 and Appendix L of the EIS.

The project, from an urban design viewpoint, aims to integrate any new infrastructure into the environment to which it is located.

Issue description – visual impact of permanent facilities at Cintra Park tunnel site (C6)

Concerns were raised that the Cintra Park facilities (eg fresh air supply and water treatment facility) would result in major visual impacts to residents of Taylor Street at Five Dock, including 7 and 7A Taylor Street.

Response

The proposed positioning of facilities along the eastern boundary of Cintra Park would mean some views of the infrastructure would be available to residents in Taylor Street. However, the view would be filtered by existing vegetation along the boundary of the park which would be retained.

The exact location of operational infrastructure at Cintra Park would be confirmed during detailed design to minimise the potential for impacts on adjacent properties.

As noted in section 13.4.4 of the EIS, operational facilities and buildings would be designed in accordance with the *WestConnex Motorway Urban Design Framework* (Roads and Maritime 2013a) and landscaped to complement and blend with their surroundings.

In response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the project. The panel would review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist would also be included on the panel.

Issue description – visual impacts of the project on 24 Wattle Street at Haberfield

Concerns were raised by residents of 24 Wattle Street at Haberfield about the visual impact of the project on their property. The EIS does not adequately assess the impacts for properties along Wattle Street, west of Ash Lane.

Response

The Wattle Street landscape character zone (LCZ 10) is one of 15 character zones considered by the urban design and visual amenity assessment summarised in Chapter 13 of the EIS. The extent of the Wattle Street landscape character zone is shown in Figure 13.4 of the EIS. This landscape character zone is considered to have a moderate sensitivity to change (refer to Table 13.2 of the EIS).

Section 13.4 and Appendix L of the EIS consider the potential for landscape character and visual impacts during operation. Table 13.8 of the EIS provides an assessment of the potential landscape character impacts on the Wattle Street landscape character zone. The assessment noted that the key visual features of the project in this character zone would be the:

- Eastern ventilation facility and associated electrical substations on the corner of Wattle Street and Parramatta Road
- Widening of Wattle Street from about 20 metres to about 80 metres wide, with the addition of:
  - Two tunnel portals at Ramsey Street
  - Two portals midway between Ramsey Street and Parramatta Road
- Noise barrier to the eastern side of Wattle Street.

The results of the assessment summarised in Table 13.8 indicate that the project would impact on the landscape character of Wattle Street. The project would introduce a number of road infrastructure-related structures into the existing setting. The introduction of new infrastructure (on- and off-ramps) would result in a road corridor that is wider than the existing corridor. The potential magnitude of impacts was considered to be high.

General management measures are identified in section 13.5 of the EIS, as amended in **Chapter 8** (Revised environmental management measures) of this report. Site specific management measures relating to this area include considering an opportunity to extend the street tree planting along the western side of Wattle Street and Dobroyd Parade.

Issue description – visual impact of demolished properties

Concerns were raised that, after homes on Young Street at North Strathfield are acquired and demolished, the residents of Sydney Street would be visually impacted by the maze of freeway networks.

Response

As outlined in Chapter 13 and Appendix L of the EIS, the introduction of the project in this area (landscape character zone LCZ6) would change the character from residential, to a stronger road infrastructure character. The main impacts of the project within LCZ6 would be contained to Sydney Street west and the ends of Sydney Street east, Edward Street, and Alexandra Street, creating a new interchange landscape character including a large informal park. Impacts are assessed as high in an area of low sensitivity.

Residual land between the on-ramp and the houses on Sydney Street would comprise green spaces with a linking pathway. Implementation of management measures proposed in section 13.5 of the EIS would assist in the integration of the project with this area.

Issue description – management measures for loss of houses on Ramsay Street

Submissions asked what would replace the houses being acquired from 156 Ramsay Street at Haberfield south to the corner of Wattle Street, and what would be done to ameliorate the impact of the loss of these houses.

Response

The area of land from 156 Ramsay Street to the corner of the Wattle Street intersection (currently properties 156 to164 Ramsey Street) would be acquired to provide land contributing to three elements of the project:

- Part of the Wattle Street interchange dive structure
- New pedestrian footpath
- Part of the cut-and-cover tunnel.

Vegetation would be planted on the cut-and-cover structures. Further development of pedestrian paths and potential screening from the roadway would be considered during detailed design.

Issue description – visual impact of Powells Creek on-ramp

Concern that the proposed new Powells Creek on-ramp (Arnotts Reserve) would have a major adverse visual impact on the amenity and quality of the public open space and the surrounding residences, including 167-173 Parramatta Road.

Response

Traffic analysis proposed the closure of the existing on-ramp from Concord Road northbound to the M4 westbound (see section 4.4.3 of the EIS) in order to reduce the number of vehicles accessing the Parramatta Road/Concord Road/Leicester Avenue intersection. This intersection experiences significant delays, and reducing the number of vehicles using this intersection would assist with improving its performance. The project therefore includes the construction of a new on-ramp near Powells Creek to the west of George Street to replace the Concord Road on-ramp (refer to section 5.5.2 of the EIS).

Section 13.5 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) includes several recommendations for consideration with regards to the detailed design phase of the Powells Creek on-ramp, which include:

- During pre-construction of the M4 on-ramp at Powells Creek, consider incorporating design features that maximise the height of the opening, and facilitate views and pedestrian/cycle access under the structure to the northern end of the park
- On completion of construction, the portion of land comprising Arnotts Reserve utilised by the project, would be re-instated in sympathy with elements of Council's masterplan for the site
- Consider ways to increase the level of screening between the apartment block at the eastern end of Powell Street and the project.

The above recommendations seek to maximise visual and functional accessibility between the northern section of the reserve and the proposed on-ramp, and to create a carefully considered park space that provides significant levels of public benefit.

Detailed landscaping plans would be developed during detailed design in order to minimise visual impacts and improve user amenity. Landscape plans would be required to take into consideration the suitability of locations for such planting, ensuring that vegetation can be maintained and would not pose risks to the project.

Issue description – cumulative visual impacts

A submission requested confirmation that the cumulative visual impacts of the project have been considered with other motorways built since the 1950s.

Response

Other motorways and infrastructure which are already built are considered within the existing environment (section 13.2 of the EIS and section 4 of the Urban Design, Landscape Character and Visual Impact Assessment report provided in Appendix L of the EIS) and are therefore included within the assessment.

Issue description – visual impact of noise barrier

Submissions raised concerns that the noise barrier proposed in front of property at 67 Dobroyd Parade at Haberfield would block out views of Timbrell Park.

Response

The noise barrier proposed on Dobroyd Parade would obscure views to the north from certain properties located to the south of this barrier. The design of noise walls would be developed during detailed design, to ensure that the urban design and landscape objectives of the project are met. Walls would be designed to minimise visual impacts on adjacent properties and where possible to be consistent with the surrounding landscape. Opportunities to use vegetation to provide a visual screening in conjunction with noise walls would also be considered.

The noise barrier at this location would, however, provide positive impacts to receivers along Dobroyd Parade. Currently, vegetation acts as both visual and acoustic screening at this location. The noise barrier would ameliorate traffic noise and provide a more effective visual buffer between receivers and the City West Link.

Issue description – suitability of spatial tools in assessing environmental impacts

Concern was raised that unsuitable spatial tools have been used to assess the environmental impacts of the construction, instead of three dimensional spatial movie-type simulation which makes understanding the visual impacts details easier for citizens.

Response

The EIS provides a range of representative visual receiver locations which address the key elements of the project, and generally address key issues associated with that element of the project. The visibility of all project elements was determined using a three dimensional model of the project and existing development. Views were taken from all surrounding streets to determine the furthest locations from which project elements are likely to be readily visible, with this information combined to create a visual envelope map for the project.

The visual impact assessment has been undertaken in accordance with the SEARs, which do not require simulated 'fly-throughs'. The 'birds eye' views provided at the beginning of Appendix L of the EIS are artist's impressions that are designed to provide an overview of key project elements, illustrating them within an early mature landscape. Receiver location photomontages within Appendix L of the EIS provide a greater level of project detail, generally within a wide landscape setting, with the images taken from eye level at representative, readily publically accessible locations. The landscape planting in the photomontages is shown at 12 to 18 months following commencement of operation, and at 10 years post commencement of operation.

Issue description – visual impacts of eastern ventilation facility site (C9)

Concerns were raised that the eastern ventilation facility would have visual impacts on 13 Walker Avenue and other local residential properties.

Response

Table 13.9 of the EIS provides a summary of potential impacts to key visual features within the project area. The taller eastern ventilation facility buildings would be of a similar scale and form to the commercial building on the southern side of Parramatta Road (Bunnings). Having the ventilation facility and commercial property on either side of Parramatta Road would help create a 'portal' feature for this section of the road. The remaining buildings within the ventilation facility would be similar in height and scale to the adjacent residential typologies. The facility would be set back from adjacent residential properties, to provide a landscaped buffer area. The visual relationship between the ventilation facility and the surrounding residential area would be mediated by the retained and newly planted mature street trees. Landscaping would be considered further at detailed design.

In response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the project. The panel would review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist would also be included on the panel.

Issue description – visual impacts of noise barrier

Concern was raised about the visual impacts from a five metre high noise barrier in Haberfield on adjacent residential properties.

Response

As described in section 7.3.2 of the Noise and Vibration Impact Assessment at Appendix I of the EIS, a noise barrier optimisation process has been undertaken for the project to identify the optimised height of noise barriers. The recommended, or optimised, height of noise barriers at each location would be subject to further consideration during detailed design, and would include an assessment of construction limitations, overshadowing, urban design and community preference.

The design of noise barriers would be developed during detailed design to ensure that the urban design and landscape objectives of the project are met. Noise barriers would be designed to minimise visual impacts on adjacent properties and where possible to be consistent with the surrounding landscape. The use of vegetation to provide a visual screening to any noise barriers would also be considered.

5.12.5 Operational urban design and landscaping

83 submissions raised issues concerning urban design and landscaping during operation.

Issue description – visual screening on Wattle Street at Haberfield

Submissions from residents on Wattle Street (14 to 24) at Haberfield requested provision of a barrier to minimise visual impacts of the new roadway. Properties north of Ash Lane do have visual screening.

Response

The provision of a wall in the vicinity of 14 to 24 Wattle Street was not considered feasible due to the limited space available between these properties and Wattle Street.

Management measures are identified in section 13.5.2 of the EIS. During detailed design further consideration of landscaping along Wattle Street would be made to minimise the visual impacts on adjacent properties due to introduction of new road infrastructure. The provision of landscaping south of Ash Lane to the extent of that within the Wattle Street interchange to the north of Ash Lane would not be feasible due to the proposed layout of the roadways in this location.

Issue description – provision of open space

Submissions requested that open space be provided at the end of Sydney Street and at the Concord Road interchange, and confirmation of who would manage this open space. It was also requested that greenspaces at the Concord Road interchange be designed by landscape architects in consultation with the local community. Concerns were raised that these areas should be designed to discourage the dumping of rubbish, to provide an additional opportunity for preventing adverse noise and visual impacts from the road, to ensure that their ongoing maintenance is considered and adverse social behaviours prevented.

Response

As outlined in Chapter 12.3.1 of the EIS, residual land not required for the operation of the project would be considered for future use by Roads and Maritime. Potential future land uses could include open space or other community uses, or redevelopment in accordance with the land use zoning. A decision of its use would be made during detailed design and in collaboration with Council.

The design of any open space areas in the vicinity of the Concord Road interchange would seek to ensure that areas are highly visible and that there are opportunities for passive surveillance, to deter the dumping of rubbish and promote Crime Prevention Through Environmental Design (CPTED) outcomes.

Issue description – visually appealing treatment of proposed noise barriers

Submissions requested that noise walls be visually appealing for residents located in close proximity to the walls. This can include planting of vegetation in front of walls. Noise walls could consist of clear acrylic or similar panels similar to the noise wall that was constructed along the north side of Syd Einfeld Drive at Woollahra, in 2013-2014.

Response

The design of noise walls would be developed during detailed design, to ensure that the urban design and landscape objectives of the project are met. Walls would be designed to minimise visual impacts on adjacent properties and where possible to be consistent with the surrounding landscape. Opportunities to use vegetation to provide a visual screening in conjunction with noise walls would also be considered.

Issue description – increased provision of open spaces

Submissions requested provision of more open spaces which are valuable community assets (ie Cintra Park, Reg Coady Reserve) and are appropriately designed by landscape architects in consultation with local residents.

Response

The provision of open space has been included within the design of the project where possible. Further consideration would be made during detailed design for the final use of any residual land.

Existing public land areas temporarily acquired for construction including Bill Boyce Reserve, part of Arnotts Reserve, Cintra Park and part of Reg Coady Reserve would be returned to the relevant local councils at the end of construction for reinstatement.

The urban design and landscape objectives for the project would continue to be considered during detailed design development.

Issue description – visual impacts of the project on Iron Cove

Submission raised concerns that a beautiful bay with scenic views of the water would be much improved by removing traffic lanes from running alongside, instead of adding even more.

Response

The project's northern extent is located on Dobroyd Parade just north of Louden Avenue. The project would not result in any changes to Dobroyd Parade in the vicinity of Iron Cove and therefore would not impact upon the views from the edge of Iron Cove.

Issue description – visual screening around Concord Road interchange

Concerns were raised about the lack of visual screening around the Concord Road interchange. The project should provide aesthetic visual barriers and effective screen planting in the following locations:

- On both sides of the existing M4 bridge as it crosses the railway near Strathfield
- Back of the houses at the northern end of Carrington Street
- Southern side of Sydney street (between exit of M4 and concord Road)
- Along the sound walls in the loop out of the Concord Road interchange
- Above the entrance and exit of the tunnels
- Along the railway line along Queen Street between Parramatta Road and Wellbank Street

- On Carrington Lane to replace the temporary construction fence that will be pulled down once building has been completed.

Response

Detailed landscaping plans would be developed during detailed design. All locations outlined above (with the exception of along the railway line) would be considered for landscaping to minimise visual impacts. Landscape plans would be required to take into consideration the suitability of locations for such planting. This would include ensuring vegetation can be maintained and would not pose any risks to the infrastructure to be constructed.

Issue description – visual impacts of Concord Road interchange

Concerns and objections were raised that the Concord Road interchange and substation would result in visual impacts, and that this type of elevated overpass should not be built near residential areas. There is an opportunity for the project to be architecturally integrated in the local area, particularly relating to noise walls and landscaping. The motorway should integrate architecturally with the community in particular with reference to the rejuvenation of Parramatta Road associated with the Parramatta Road Transformation Program.

Response

Section 13.4.5 of the EIS describes the interaction between the project and the Parramatta Road urban transformation project. The desired future character of the area has been determined based on the strategic direction provided in local and regional planning documents (as outlined in Appendix L of the EIS). The key urban design elements of the project would be consistent with the objectives and design principles set by the WestConnex Urban Design Framework and Roads and Maritime Design Guidelines. The nature of the design process is iterative and would continue to evolve as various elements become realised in detail and better coordinated as part of the whole project.

The area around the interchange is not identified as a key site in the Parramatta Road Urban Transformation Program. As a result land use in this area would not be subject to significant changes.

As described in **Chapter 7** (Preferred infrastructure report) of this report, it is proposed to re-orient the substation at Sydney Street. The Sydney Street substation is a relatively minor supporting component of the project. The reorientation of the substation is not a significant change and the potential impacts of the substation would not differ substantially from those described in the EIS. The reoriented substation would be designed to be as unobtrusive as possible within the surrounding residential area. The architecturally detailed aspect of the substation would be reoriented to face the relatively public Sydney Street with a setback likely to match future development, while the utilitarian aspects of the substation would be reoriented to face a relatively less public and residential areas.

Issue description – residual lands to be used as parks and open spaces

Submissions requested that the residual land between Sydney Street and Carrington Lane be turned into a park with amenities for the local residents on completion of construction.

Response

As outlined in Chapter 12.3.1 of the EIS, the future use of residual land and associated rezoning does not form part of the project. These matters would be determined by Roads and Maritime in conjunction with the relevant authorities, including government agencies and local councils.

Issue description – visual screening at Wattle Street and Walker Avenue civil site (C9)

Submissions requested that the permanent buildings and open space at the western end of Walker Avenue and Wattle Street be of the highest design practice standards and be attractively screened with greenery from a very early stage.

Response

The visual relationship between the project and the residential buildings on Walker Avenue would be mediated by the retained and newly planted mature street trees. Landscaping would be considered further at detailed design.

The desired future character of the area has been determined based on the strategic direction provided in local and regional planning documents (as outlined in Appendix L of the EIS). The key urban design elements of the project would be consistent with the objectives and design principles set by the WestConnex Urban Design Framework and Roads and Maritime Design Guidelines. The nature of the design process is iterative and would continue to evolve as various elements become realised in detail and better coordinated as part of the whole project.

In response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the project. The panel would review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist would also be included on the panel.

Issue description – design of Eastern ventilation facility site (C8)

Concerns were raised that the eastern ventilation facility site would be an eyesore and should be as short as possible, so that it does not tower over surrounding residences and ruin the outlook. The facility significantly breaches the height limits set by the Ashfield LEP 2013, dominates the streetscape and would be inconsistent with the character of one and two storey residential dwellings along Wattle Street. The proposed vegetative screening of the ventilation facility would not be able to mitigate the visual impacts of facility due to its height.

Response

The eastern ventilation facility buildings would be of a similar scale and form to the commercial building on the southern side of Parramatta Road (Bunnings). Having the ventilation facility and commercial property on either side of Parramatta Road would help create a 'portal' feature for this section of the road. The remaining buildings within the ventilation facility would be similar in height and scale to the adjacent residential typologies.

The facility would be set back from adjacent residential properties, to provide a landscaped buffer area. The visual relationship between the ventilation facility and the surrounding residential area would be mediated by the retained and newly planted mature street trees. Landscaping would be considered further at detailed design.

Section 13.5.2 of the EIS provides the following management measures (as amended in **Chapter 8** (Revised environmental management measures) of this report):

- During pre-construction, refinements to the ventilation facilities' designs should be considered to further moderate their visual impact
- During pre-construction (if feasible), consider how the eastern ventilation facility addresses Walker Avenue. Explore whether the exterior of the ventilation facility can be oriented to mirror the Bunnings 'street-wall', with street trees providing scale mitigation and shade amenity.

Issue description – removal of vegetation

Concerns were raised that insufficient detail has been provided on what trees and vegetation would replace those which are removed and planted as screening or that appropriate species would be used.

Response

Section 6.3.2 in the Urban Design, Landscape Character and Visual Impact Assessment in Appendix L of the EIS describes the planting parameters for the project. A typical condition of consent requires an urban design and landscape plan to be provided to the Department of Planning and Environment prior to commencement of built works or landscaping.

The size, type, numbers and densities of proposed trees and landscape planting, would be refined during detailed design to foster robust, rapid growth and canopy closure for shade and screening. However the following design approaches would be followed:

- Integration with local setting - the design 'maintains and enhances existing landscape character and vegetation patterns'
- Ecologically sound - the design proposes to use local species from existing and adjoining plant communities and assists in protecting and recovering local biodiversity
- Add character and value - the design intends to draw upon the existing landscape patterns of the area.

The design approach is consistent with the objectives of the WestConnex Motorway Urban Design Framework and Roads and Maritime design guidelines. The application of a planting palette derived from Cumberland Plan Woodland species would be appropriate for those areas of natural plantings where it may be possible to re-establish endemic plant communities, but may not be appropriate in all areas, for example existing residential areas characterised by 'cultural plantings' in and around residential neighbourhoods. The suitability of the species mix would be further considered as part of detailed design.

Issue description – visual impact of Underwood Road civil and tunnel site (C3)

Concerns were raised that the western ventilation facility would be an imposing structure and would be located very close to residential properties.

Response

As described in section 13.5.2 of the EIS, the following mitigation relating to the western ventilation facility would considered:

- During pre-construction, refinements to the ventilation facilities' designs would be considered to further moderate their visual impact
- Refine substation designs during pre-construction to be integrated as far as possible within each landscape and urban context
- During detailed design, consider a formal park design that incorporates measures (eg mounding/deeper soils areas) to facilitate a successful large tree planting program between Underwood Road and Ismay Avenue
- Explore opportunities with local councils to provide avenue planting down both sides of Underwood Road, and a linking canopy across the road
- Consider the use of a planting mix for the proposed park on the corner of Short Street East and Underwood Road that draws upon the suburban setting of cultural plantings, and which may include elements such as park seating, other park furniture, paving, signage and lighting
- Consider at-receiver planting for residences at 65−71 and 73 Underwood Road and at the end of Short Street East
- Consider the use of street trees along both sides of Short Street East.

Issue description – design of noise barriers

Concern was raised about the closeness of developments and noise walls in Wattle Street to the rear boundary of 26 Walker Avenue which appears to be a distance of around 20 metres. The EIS indicates that a five metre noise barrier would be adjacent to the properties on Wattle Street but no reference to the style, colour or material that this barrier would consist of could be found.

Response

The design of noise walls would be further developed during detailed design, ensuring that the urban design and landscape objectives of the project are met. Walls would be designed to minimise visual impacts on adjacent properties and where possible to be consistent with the surrounding landscape. The use of vegetation to provide a visual screening to any noise walls would also be considered.

Issue description – provision of vegetation

Submissions requested that quotas be set for new trees and planting in the community, particularly in the most affected areas, and these should be approved by council.

Response

Provision would be made during detailed design to maximise opportunities for tree planting having regard to relevant road design requirements. In accordance with environmental management measure V43 in Table 8.1 of this report, an Urban Design and Landscaping Plan would be prepared prior to the commencement of construction and which would include selection of appropriate species for mass plantings at project boundaries, and for sedimentation basin planting.

Landscape detailed design would be undertaken in collaboration with local councils.

Issue description – consideration of visual impact of alternative route alignments

In accordance with the Environmental Impact Assessment Practice Note - Guidelines for Landscape Character and Visual Impact Assessment (Roads and Maritime, 2013), a submission requested information on what route alignment decisions were adjusted so that the project could avoid and minimise impacts on landscape character and visual amenity? It is unclear if landscape character and visual amenity were considered during the evaluation of alternative proposals.

Response

A summary of the assessment of options for the motorway is provided in section 4.3 of the EIS. The assessment, conducted in accordance with the SEARs for the project, considered all project elements and included the identification of environmental, social and economic advantages and disadvantages for each option.

Issue description – unsatisfactory urban design outcomes

Submissions raise dissatisfaction with the quality of urban design outcomes being depicted within the EIS. Many of the images shown in Appendix L of the EIS are considered to be deeply flawed and troubling from an urban design perspective. Key concerns are:

- Gaping tunnel holes (eg Figure 2.8)
- Inaccessible, useless green space (eg Figure 2.5)
- Blank sound walls (eg Figure 6.75)
- Nondescript grass verges with narrow footpaths alongside the carriageway (eg Figure 6.81)
- Imposing, bulky, bleak utilitarian services structures (eg Figure 6.84).

Response

The design of structures landscaping would be further developed during detailed design, ensuring that the urban design and landscape objectives of the project are met. Structures would be designed to minimise visual impacts on adjacent properties and where possible to be consistent with the surrounding landscape.

The images referred to in the submission are artist's impressions of various components of the proposal. Below is an explanation of each concern raised.

'Gaping tunnel holes'

This comment refers to the tunnel portals illustrated in the artists perspective of the Wattle Street twin dive structure. As described in **Chapter 7** (Preferred infrastructure report), this component of the project has since been amended to split the twin portals into two separate dive structures approximately 35 metres apart. This design amendment would reduce the visual impact of the proposed structure and provide additional opportunities for tall tree screen planting along each side of each dive structure.

'Inaccessible, useless green space'

The vacant space illustrated in Figure 2.5 of the EIS consists of two proposed pocket parks and two areas of residual land intended for future development. Issues of isolation, poor access and activation in the proposed parks are highlighted in the EIS as requiring consideration during detailed design.

The future use of residual land and associated rezoning does not form part of the project. These matters would be determined by Roads and Maritime in conjunction with the relevant authorities, including government agencies and local councils.

'Blank sound walls'

This issue has been noted in the EIS as requiring a landscape design response. Section 13.5.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) sets out the following management measures for LCZ 7 – Edward Street, which is shown in Figure 6.75:

- Refine the design of the end of Edward Street to minimise the visual prominence of the on-ramp wall and noise barrier. Facilitate a planting edge between the on-ramp wall and the footpath, and between the footpath and the Edward Street turning head, that reflects the Federation-era character of the streetscape
- Minimise the landscaping required between the carriageway and noise barrier (between Parramatta Road and the pedestrian bridge over the tunnel on- and off-ramps), which could be difficult to maintain. Instead, retain sufficient room to provide screen planting along the edge of the M4.

'Nondescript grass verges with narrow footpaths alongside the carriageway'

Figure 6.81 is an artist's impression of the view from Reg Coady Reserve towards the south. The issue raised has also been noted in the EIS as requiring a landscape design response. Section 13.5.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) sets out the following management measures for LCZ 9 – Dobroyd Parade:

- Consider the provision of a landscape design response to Reg Coady Reserve that re-integrates the new road edge with the landscape character of the park
- Consider a landscape response along the edge of Reg Coady Reserve edge which more closely reflects the existing, generally informal planting character of the reserve
- Where feasible, consider moving the footpath away from the busy road edge on both sides of Dobroyd Parade.

'Imposing, bulky, bleak utilitarian services structures'

This comment refers to the artist's impression of the ventilation facility on the corner of Frederick Street and Parramatta Road. This issue has been discussed in the EIS, which states that, notwithstanding the size of the proposed building infrastructure elements, these comprise an architecturally well-considered family of elements, which would replace the more haphazard, mixed development currently in place along this section of Parramatta Road. The road widening of Wattle Street would not be very visually different from what is currently in place.

The building elements would be sited within a landscaped setting that would help to reduce their visual prominence, while still revealing them as large urban building elements which are not uncommon along Parramatta Road streetscape. The landscape setting of the infrastructure group when seen from this receiver location would be integrated with a roadside avenue planting that would extend along the full length of the southern side of Wattle Street.

Issue description – maintenance and funding of greenspaces and landscaping

Concerns were raised about maintenance and funding of green spaces and landscaping. Concerns were raised that landscaping would not be undertaken as bare structures and walls will be easier to maintain.

Response

The project includes provision of landscaping as shown in Appendix A of the Urban Design, Landscape Character and Visual Impact Assessment in Appendix L of the EIS.

The ownership and maintenance of green space areas following completion of construction would be agreed between Road and Maritime Services and the relevant local council. In collaboration with council detailed design for park/residual area landscape treatments would be provided that reflect the cultural setting of the adjoining residential precincts.

Issue description – timing of restoration of reserves

Concerns were raised that Bill Boyce and Reg Coady reserves are listed as being restored to their 'pre-construction condition' with the timing given as 'pre-construction'. Request for confirmation of timing of works.

Response

As described in section 12.3.1 of the EIS, acquisition and temporary lease of public land would occur for the construction of the project. Following construction the majority of this public land would be reinstated and returned to the relevant local councils.

Issue description – integration of public artwork

A recommendation was made that public artwork suitably associated with the heritage status of the Haberfield area should be integrated with pedestrian and cycle paths in this location.

Response

In response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the project. The panel would review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist would also be included on the panel.

5.12.6 Operational light spill

Six submissions raised issues regarding light spill of the project during operation.

Issue description – light spill at Powells Creek on-ramp

Concerns were raised that the new Powells Creek on-ramp would impact the property at 167-173 Parramatta Road through an increase in light spill during the night.

Response

The urban design and visual amenity assessment (see Chapter 13 of the EIS) has assessed the impacts from on-ramp lighting, and existing M4 lighting, for residents within units on the eastern end of Powell Street as high. This is due to new lighting and the loss of existing tall screening alongside the M4, and the inability to reinstate screening vegetation within the project boundary between the western edge of the Powells Creek corridor and the eastern end of Powell Street.

The surface roadway lighting design would comply with AS/NZS 1158 *Lighting for roads and public spaces*, and would be designed to minimise light spill in accordance with AS 4282:1997 *Control of the obtrusive effects of outdoor lighting*.

Issue description – impact of vehicle headlights at Concord Road Interchange

Concerns were raised that vehicle headlights from traffic using the Concord Road interchange, together with additional street lighting, would impact the living space of properties on Edward Street.

Response

Properties on Edward Street would be protected from vehicle headlights directly shining through windows from the existing and new noise barriers that would be constructed around the interchange. A new noise barrier would be positioned at the western end of Edward Street. The design of noise barriers would be developed during detailed design, to ensure that the urban design and landscape objectives of the project are met. Walls would be designed to minimise visual impacts on adjacent properties and where possible to be consistent with the surrounding landscape. Opportunities to use vegetation to provide a visual screening in conjunction with noise walls would also be considered.

Issue description – location of street lighting

Submissions request the strategic location of new street lights to minimise illumination into the rear yards of 103 Chandos Street and 105 Chandos Street at Haberfield.

Response

The surface roadway lighting design would comply with AS/NZS 1158 *Lighting for roads and public spaces*, and would be designed to minimise light spill in accordance with AS 4282:1997 *Control of the obtrusive effects of outdoor lighting*.

Issue description – light spill resulting from the project

Concerns were raised that new lighting would result in light spill.

Response

The surface roadway lighting design would comply with AS/NZS 1158 *Lighting for roads and public spaces*, and would be designed to minimise light spill in accordance with AS 4282:1997 *Control of the obtrusive effects of outdoor lighting*.

5.13 Social and economic

5.13.1 Social and community impacts

2,425 submissions raised issues regarding social and community impacts resulting from the project.

Issue description – general impacts during project operation

Submissions raised issues regarding general social and amenity impacts to residents, local neighbourhoods and the community from operation of the project.

Response

In the Social Impact Assessment (SIA) in Appendix M of the EIS, permanent impacts associated with property acquisition (refer section 6.2 of the SIA) and the longer term operational impacts of the project (refer section 7 of the SIA) were considered. These included impacts to:

- Properties and households
- Social infrastructure
- Access and connectivity (including traffic, pedestrian, cyclist and public transport)
- Amenity (including noise/vibration, air quality, human health and visual)
- Business/economic.

Amenity impacts were considered in terms of the noise, air quality, human health and visual presence of operational traffic, as well as the provision of new surface infrastructure associated with the project.

The key social infrastructure facilities considered in the assessment are described in section 5.3 and Appendix C of the SIA. They include facilities in the categories of aged care, child care, community facilities, education, emergency services, health, religious services, open space and sport/recreation.

The permanent changes brought about by the project, and their impacts on local amenity, have been addressed in the EIS as detailed below:

- Changes to traffic access, pedestrian access and local connectivity – Chapters 5 and 8 of the EIS and the Traffic and Transport Assessment in Appendix G of the EIS.
- Air quality impacts – Chapter 9 of the EIS and the Air Quality Impact Assessment in Appendix H of the EIS.
- Noise impacts – Chapter 10 of the EIS and the Noise and Vibration Impact Assessment in Appendix I of the EIS.
- Human health impacts – Chapter 11 of the EIS and the Human Health Risk Assessment in Appendix J of the EIS.
- Property and land use impacts – section 5.11 and Chapter 12 of the EIS.
- Visual, urban design and landscape impacts – Chapter 13 of the EIS and the Urban Design, Landscape and Visual Impact Assessment in Appendix L of the EIS.

Permanent changes to social infrastructure, access and connectivity, and amenity as a result of the above impacts are addressed in Chapter 7 of the SIA (Appendix M of the EIS).

Impacts associated with severance and division of communities, loss of community connectedness and cohesion, and changes in local character are discussed in section 6.2 of Appendix M in relation to impacts associated with property acquisition. The focus of this discussion is on the Concord Road, Wattle Street and Parramatta Road precincts where the majority of property acquisition, demolition and new surface works would occur.

At Wattle Street and Parramatta Road in Ashfield impacts on access and community connectivity would include:

- An increase in physical and visual separation between the residential areas on either side of the proposed Wattle Street and Parramatta Road interchanges, and associated noise barriers along the east side of Wattle Street
- Overall pedestrian access via signalised intersections would not significantly change as a result of the project. However for a small number of crossing locations there will be an increase in the overall reservation width and the number of surface traffic lanes to be traversed, particularly at Wattle Street/Ramsay Street and to a lesser extent at Dobroyd Parade/Waratah Street. This is likely to result in pedestrian trips taking longer to cross than they would currently
- Crossing these arterial roads at mid-block locations is not currently a safe option given the traffic volumes, number of traffic lanes and the lack of any central median for pedestrian safety. Crossing at mid-block locations will be actively discouraged by the project given the width of the interchanges, the intervening tunnel dive and portal structures, raised barriers and landscaping areas which are proposed
- The proposed closure of Allum Street and the noise barriers proposed along the east side of Wattle Street would remove the existing pedestrian connectivity between these two streets. Alternative access routes would be available for pedestrians to the north (Ramsay Street) and south (Parramatta Road) that are reasonably convenient
- Pedestrian movements north/south along Wattle Street and east/west along Parramatta Road would not change. There will be some improvements in amenity for pedestrians using the southern side of Parramatta Road and the east side of Wattle Street due to the provision of new paths and landscaping, increased separation from main traffic lanes, a reduction in traffic volumes on some sections of the key surface roads and the removal of driveway crossings to a number of properties, which will improve both pedestrian and traffic safety
- In terms of traffic connectivity, the performance of some intersections will improve, while others will deteriorate and others will stay the same (refer to the summary table provided in **Chapter 4** of this report) Based on this assessment the key intersection of concern is Dobroyd Parade/ Timbrell Drive, while Wattle Street / Ramsay Street will benefit the most as a result of the project

- The following permanent road network changes are proposed in the Haberfield and Ashfield area: closure of Allum Street on the east side of Wattle Street, closure of Martin Street on the east side of Wattle Street, and modifying access to Martin Street on the west side of Wattle Street. A further proposed design change at this location is discussed in **Chapter 7** (Preferred Infrastructure Report) of this report
- There would also be changes to access for properties along the west side of Wattle Street. Right turns into these properties would not be possible when travelling south on Wattle Street however, alternative access routes are available. It is not unusual for properties fronting main roads to have restricted access arrangements. While these changes may result in some local inconvenience they would improve road safety and traffic flow on the main road network

Impacts on amenity as a result of the project would include:

- Road traffic noise impacts during operation would result in minor reductions in noise along the M4 and Parramatta Road corridors for 78 per cent of sensitive receivers due to traffic displacement into the new tunnels. These areas include the unmodified M4 to the east of the tunnel portals and Parramatta Road between Concord Road and Wattle Street. Traffic displacement from the M4 and along sections of Parramatta Road is expected to deliver traffic noise amenity benefits supportive of potential urban renewal opportunities in the corridor. A minor increase in noise levels of less than 2.0 dB (which is generally unnoticeable to the average person) is expected at approximately 18 per cent of sensitive receivers
- Some additional noise mitigation will be required to address noise exceedances for sensitive receivers located in the vicinity of surface roads where there is expected to be increases in traffic, such as adjacent to the new interchanges. Mitigation measures recommended include:- low noise pavements, new or increased height noise barriers or at property treatments
- Predicted noise levels from the in tunnel ventilations fans, ventilation facilities and other mechanical plant are unlikely to exceed the INP noise goals. These will be reviewed further during detailed design and should be controllable by common engineering methods
- The Human Health Risk Assessment found that the project is expected to result in a decrease in total pollutant levels in the community. The project is expected to result in a redistribution of impacts associated with vehicle emissions. For much of the community this will result in an improvement (or decreased concentrations and health impacts), however for a number of areas where traffic on the surface roads is expected to increase as a result of the project, a small increase in pollutant concentration may occur. Potential health impacts associated with changes in air quality (specifically nitrogen dioxide and particulates) are low and essentially negligible within the community.
- Visual amenity impacts would occur largely due to changes to streetscapes, loss of vegetation screening, new road infrastructure and its closer proximity, and ancillary operational facilities. Project design and landscaping plans aim to minimise visual intrusion of project elements and respect and respond to the existing and desired character of these areas. These impacts are expected to diminish over time as landscaping treatments mature.
- Heritage impacts would occur associated with the demolition of heritage items, changes to streetscapes and visual impacts associated with the new proposed infrastructure. These impacts predominantly impact on the Haberfield and Powells Estate Heritage Conservation Areas and have the potential to effect community cohesion and sense of place in these communities. While it is acknowledged that these impacts cannot be fully mitigated, a number of measures are proposed in **Chapter 8** (Revised environmental management measures) of this report to mitigate impacts to the extent possible.

The EIS has considered potential social impacts and demonstrates that these impacts can be managed within acceptable limits with the application of a suite of management measures. Management measures have been summarised in their relevant sections in **Chapter 8** (Revised environmental management measures) of this report.

By removing significant volumes of traffic from Parramatta Road the project would improve the speed, reliability and safety of travel in this corridor and create opportunities for urban revitalisation. It would also provide the opportunity for future potential improvements in public transport, cycling and pedestrian access along and across the corridor, improving community cohesion and connectivity. Overall the project is anticipated to improve social amenity in the Parramatta Road corridor, with positive effects on the community's wellbeing, identity and sense of place.

Issue description – general impacts during project construction

Submissions raised issues regarding general social and amenity impacts to the residents, local neighbourhoods and community during construction of the project.

Response

The Social Impact Assessment in Appendix M of the EIS assessed impacts to social infrastructure, access and connectivity, and changes in amenity during the construction phase of the project.

In undertaking this assessment the SIA also reviewed the impacts and proposed management measures identified in the following technical assessments:

- Changes to traffic access, pedestrian access and local connectivity – Chapter 8 of the EIS and the Traffic and Transport Assessment in Appendix G of the EIS
- Air quality impacts – Chapter 9 of the EIS and the Air Quality Impact Assessment in Appendix H of the EIS
- Noise impacts – Chapter 10 of the EIS and the Noise and Vibration Impact Assessment in Appendix I of the EIS
- Human health impacts – Chapter 11 of the EIS and the Human Health Risk Assessment in Appendix J of the EIS
- Property and land use impacts – Chapter 12 of the EIS
- Visual, urban design and landscape impacts – Chapter 13 of the EIS and the Urban Design, Landscape and Visual Impact Assessment in Appendix L of the EIS
- Non-Aboriginal heritage impacts – Chapter 19 and Non-Aboriginal Heritage Assessment in Appendix S of the EIS.

Some of the key impacts during the construction period include:

- Acquisition of properties and associated relocation of households
- Demolition of housing including impacts on heritage items and streetscapes within Heritage Conservation Areas
- Construction traffic impacts particularly associated with heavy vehicle movements
- Noise and vibration impacts associated with construction activities
- Air quality impacts associated with construction activities
- Changes to pedestrian routes, cycleway routes and bus stops during construction.

The project would require the full acquisition of 167 residential properties, partial acquisition of 15 and resumption of 98 properties currently owned by Roads and Maritime.

Allowing for the fact that some of these properties are vacant, it is estimated that the project would require the relocation of approximately 168 residential dwellings or households (approximately 460 people).

Impacts on access and community connectivity during construction would include:

- Major construction works would be primarily accessed from Parramatta Road and the M4. Access to construction ancillary facilities would be located to and from arterial roads to provide the most direct access for heavy vehicles. It is estimated construction traffic would represent only two per cent of total daily traffic on Parramatta Road. The construction workforce is expected to increase the volume of light vehicles on the surrounding road network, generating only minor impacts, except in Underwood Road and Short Street East. Localised detours, temporary traffic signals and construction traffic delays are expected to have minor impacts on motorists
- The existing cycleway along the M4 between Hill Road and Concord Road would be unavailable during construction, with a detour route proposed to the north of the M4 corridor. During construction, traffic delays due to increased waiting times at intersections may potentially impact motorists, bus passengers, cyclists and pedestrians. This may reduce the reliability of buses in making connections to other transport modes
- The short term relocation of the westbound Orpington Street bus stop in the Parramatta Road precinct would increase walking distances for visitors to the Willows Private Nursing Home. The closure of Chandos Street and relocation of the westbound bus stop could reduce accessibility and increase travel distances to public transport for residents in the area. Reduced access to public transport is particularly important, as this area recorded higher levels of relative socio-economic disadvantage and lower vehicle ownership
- Similarly, the relocation of the southbound bus stop on Concord Road, together with large footprint of the proposed interchange, would increase walking distances and potentially discourage people to walk to this bus stop or within the local area across Concord Road
- Pedestrian safety at the Bland Street exit of the Parramatta Road eastern civil site would be considered in developing construction environmental management plans.

Consultation in accordance with the project Community Consultation Framework would provide the opportunity to mitigate these impacts, with specific considerations including:

- Consult with key local social infrastructure providers in developing construction traffic management plans, including notification to local emergency services about changes to local road networks, particularly road closures
- Relocate Orpington Street bus stop in consultation with the Willows Private Nursing Home to minimise walking distance between the relocated bus stop and the nursing home
- Explore options to increase pedestrian and cyclist connectivity along the M4 alignment particularly in the vicinity of Underwood Road and Allen Street to increase opportunities for active lifestyles and contribute to offsetting the amenity impact of the project corridor
- Develop a construction car parking strategy that promotes public transport use and minimises impacts on on-street car parking
- Consider (in consultation with Haberfield Public School and Ashfield Council) pedestrian safety at the egress point for the Parramatta Road civil site at Bland Street, as part of the TMSP.

The EIS has considered potential social impacts and demonstrates that these impacts can be managed within acceptable limits with the application of a suite of management measures. Management measures have been summarised in their relevant sections in **Chapter 8** (Revised environmental management measures) of this report.

Issue description – impacts to community infrastructure and services

Submissions raised issues regarding social impacts from the introduction of construction and operational infrastructure into local neighbourhoods.

In summary, the issues raised included:

- Concern regarding impacts to community infrastructure and services, including green space
- Impacts to local schools and the students and families that access these facilities
- Impacts to child care, aged care and health care facilities.

Response

Design of the project has been optimised to reduce impacts on social infrastructure. After initial consultation with Ashfield Council and the local community in relation to the preliminary concept design during late 2013 and 2014, there have been some modifications to the project which will deliver improved outcomes in the Haberfield and Ashfield areas. This includes redesign of the Parramatta Road interchange to avoid the need to acquire Haberfield Aged Care, Peek-A-Boo Early Learning Centre, the heritage listed Yasmar Training Facility, and the heritage listed and socially important Ashfield Park.

Social infrastructure facilities and open spaces that would be acquired by the project include:

- Strathfield Girl Guides Hall (Strathfield Council)
- Arnotts Reserve (Strathfield Council)
- Zongde Buddhist Temple
- Sydney Cheil Uniting Church (partial acquisition along its Concord Road frontage).

The SIA assesses potential impacts on social infrastructure and services during construction of the project (refer to section 6.3 of Appendix M of the EIS).

The leasing of four parcels of land would result in loss of public access to the following open spaces during construction:

- Bill Boyce Reserve at Pomeroy Street (managed by Strathfield Council)
- Parts of Reg Coady Reserve at Wattle Street (managed by Ashfield Council)
- Vacant land located west of Powells Creek (locally referred to as Arnotts Reserve) adjacent to the northern side of Parramatta Road. This land is managed by Strathfield Council who intend to develop it for open space in the future
- Cintra Park Hockey Field with this facility being reinstated on the nearby St Lukes Park.

Leased public reserves would be restored and returned to their owners at the end of construction.

A number of other social facilities are in close proximity to project surface works and would likely be affected by construction traffic and amenity impacts (eg noise, vibration and visual amenity). These include:

- Our Lady of the Assumption Catholic Church on Underwood Street at Homebush
- Arnotts Reserve on Allen Street at Homebush
- Concord Oval on Parramatta Road at Concord
- Jehovah's Witness Church on Wattle Street at Haberfield
- Willows Private Nursing Home on Orpington Street at Ashfield
- Haberfield Aged Care on Parramatta Road at Haberfield
- Peek-A-Boo Early Learning Centre on Parramatta Road at Haberfield
- Yasmar Training Facility on Parramatta Road at Haberfield.

Other social infrastructure directly and indirectly affected by proximity to the project construction works, is identified in section 6.3 of Appendix M of the EIS.

Consultation in accordance with the project Community Consultation Framework would mitigate these impacts, with specific considerations including:

- Consult with Strathfield Council and Strathfield Girl Guides to assist in identifying and accessing temporary premises for relocation of these facilities
- Continue to support the Zongde Temple in planning for relocation in the short and long term

- Liaise with the property owners and the congregation of users at the Sydney Cheil Uniting Church to provide alternate land for car parking
- Consult with users of Concord Oval and St Luke's Park facilities for development of the CEMP for the Cintra Park tunnel site
- Consult with social infrastructure (specifically schools, aged care and child care facilities) affected by the project in regard to any respite periods (where reasonable and feasible) when the most intrusive construction activities are undertaken during the day.

The SIA assesses potential impacts on social infrastructure and services during operation of the project (refer to section 7.2 of Appendix M of the EIS). Potential impacts include:

- Landscaping treatments and noise walls would mitigate amenity impacts for most social infrastructure
- Strathfield Council would undertake consultation with the operators of the Strathfield Girl Guides to ensure the needs of the organisation and other users of the hall are met in the long term
- Operational impacts to the Sydney Cheil Uniting Church would largely be related to a reduced visual amenity from provision of a noise wall and increased noise due to its proximity to the new tunnel and ramps. Appropriate landscaping treatments could significantly reduce these impacts for key outdoor areas. Reduced parking is the key concern for the church. WDA is working with the church to explore opportunities for increasing access to green space and parking
- The Zongde Temple would need to be relocated to a location which can deliver financial advantage similar to its existing property (i.e. passive income from advertising, mobile phone tower hosting and other tenants)
- Operational social impacts of the project on the adjacent and nearby Haberfield Aged Care, Peek-A-Boo Early Learning Centre, Willows Private Nursing Home, Yasmar, Ashfield Park and Ashfield Bowling Club are expected to be minor to moderate due to traffic noise and amenity changes, in the context of the existing low amenity and high noise environment. The integrated introduction of landscape planting elements would assist in moderating visual impacts
- Impacts on the Jehovah's Witness Church during operation would be related to a change in noise and visual amenity due to the adjacent expanded road infrastructure
- Operational social impacts of the project on The Infants Home and Haberfield Public School are expected to be minor due to minor noise and amenity changes
- Other education, child care and aged care facilities are located further from the works and the project is anticipated to have minor to negligible impacts on their amenity
- The proposed operational infrastructure at Cintra Park would have only minor impacts for park users as the area to be occupied is relatively limited and the bulk of the site would be rehabilitated, landscaped and returned to Canada Bay Council for use as public open space. The upgraded car park would also be made available to sports facility users
- Permanent acquisition of 1,312 square metres of the Reg Coady Reserve would be required for the realignment of Wattle Street, however this is not considered to be a significant impact on the availability of local open space
- Other parks and green space would be rehabilitated to their original condition and returned for public use at the conclusion of the construction works.

Issue description – impacts to communities and homes from tunnelling

Submissions raised concerns regarding impacts to communities from tunnels underneath their houses.

Response

An assessment of vibration from tunnelling works is provided in Section 10.4.4 and Appendix I of the EIS, which presents an assessment for vibration above human comfort vibration goals. Such impacts will be site specific, occur intermittently and would be scheduled to minimise impacts on residents and communities.

In relation to human comfort, the assessment identified a low risk of annoyance from the proposed tunnelling works using a roadheader and rock anchor drill, with all receivers being located outside of the nominated safe working distance for human comfort, except for three receivers in noise catchment area (NCA) 02 near the tunnel dives at the western end of the project.

Ground borne noise associated with excavation of the tunnels would occur for a short period of time (ie several days for each roadheader) while the tunnelling works are below a particular receiver. At some locations where the tunnel depth is less than 40 metres (in the vicinity of Concord Road, Burwood Road and Wattle Street) there is potential for ground based noise exceedances to some receivers during the evening and night time periods.

Construction noise and vibration management plans would aim to mitigate noise and vibration impacts at the source, consider the timing and duration of works, especially those with the greatest impacts, consider potential respite periods and include consultation and communication with potentially affected stakeholders.

The Noise and Vibration Impact Assessment at Appendix I of the EIS also suggests further construction noise modelling during detailed design to assess impacts adjacent to tunnelling and ventilation sites, with atproperty treatments or alternate accommodation considered potentially feasible options if night-time noise impacts justify.

The potential for ground movement associated with proposed tunnelling activities has been addressed in section 18.3.3 of the EIS. For the majority of properties the risk category for potential settlement has been assessed as ‘negligible’ to ‘very slight’ except for:

- At the mainline tunnels in the vicinity of Dobroyd Canal (Iron Cove Creek) and the eastern ventilation facility where the assessed risk category is ‘slight’ to ‘moderate’
- In the vicinity of the Concord Road interchange cut-and-cover tunnel structure where the assessed risk category is ‘slight’.

Further assessments will be undertaken during detailed design to determine the level of potential impact on structures and mitigation measures required to minimise potential ground movement impacts and make good identified impacts.

Prior to commencing tunnelling works, existing condition surveys will 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) and within 50 metres of surface works.

Concerns regarding noise and vibration impacts from tunnelling are addressed in further detail in **section 5.9** of this report. Proposed management measures are summarised in **Chapter 8** (Revised environmental management measures) of this report.

Issue description – impacts from night lighting during construction and operation

Submissions raised concerns around night lighting as part of the project and impacts on the privacy, safety and wellbeing of the community.

Response

The urban design and visual amenity assessment (refer to section 13.3 of the EIS) considers the potential for light spill impacts during construction. With respect to privacy and lighting impacts, all construction works would be planned and executed to minimise potential issues with adjacent and surrounding receivers where feasible and reasonable. In general light spill would be managed to minimise impacts on adjoining properties by the use of cut-off and directed lighting. Lighting within ancillary facilities will be turned off or reduced to a level which maintains site safety, whenever the facility is not in use.

The urban design and visual amenity assessment (refer to Chapter 13.4 of the EIS) has also assessed the impacts associated with operational lighting. Lighting would be designed in accordance with relevant standards and be designed to minimise light spill. In addition, implementation of lighting for bridges, undercrofts and pedestrian paths would be considered to improve pedestrian and shared path safety and amenity.

Concerns regarding light spill are addressed in further detail in **section 5.12** of this report and measures to manage potential lighting impacts are provided in **Chapter 8** (Revised environmental management measures) of this report.

Issue description – potential community severance and access impacts

Submissions raised concerns that project infrastructure would physically divide communities, impacting community cohesion and access to amenities.

Response

WestConnex has been designed to improve connectivity by removing traffic from the surface road network, reducing congestion and delivering travel time savings.

A number of local communities within the project area are already divided by main roads such as the M4, Parramatta Road, Concord Road and Wattle Street/City West Link. These roads have multiple lanes, and in some cases carriageways, and carry significant traffic volumes. Similar situations occur throughout much of the Sydney metropolitan area where communities are separated by major linear transport infrastructure.

The project is a tunnel which runs underground for much of its length and as a result there would be no impact on connectivity within these local communities. By transferring traffic to the tunnel the project would also reduce traffic along sections of Parramatta Road which in turn would reduce congestion and improve the amenity of this corridor. Many of the existing vehicle trips on Parramatta Road are local trips involving relatively short distances. These trips currently face significant delays during peak periods which are only likely to worsen as traffic growth continues.

The project would involve realignment and alterations to a number of roads, and adjustments to existing pedestrian and cycle facilities would also be required. Existing access routes would be maintained during construction and operation where reasonable and feasible or alternative access routes would be provided.

Removing traffic from Parramatta Road provides opportunities to improve vehicle, pedestrian and cyclist movement along and across the corridor. These opportunities are being further investigated as part of the Parramatta Road Urban Transformation Program.

Where the tunnel emerges to connect with the surface road network there would be some widening of main roads associated with the introduction of additional lanes and tunnel on- and off-ramps. This would occur in the vicinity of the four main interchanges at Homebush Bay Drive, Concord Road, Wattle Street and Parramatta Road. While there would be some adjustments to the local road network in the vicinity of these interchanges, the key locations for vehicles and pedestrians to cross these roads will remain unchanged.

The ‘do nothing’ alternative would see continued traffic growth and congestion on these main roads which would further hinder local connectivity.

Issue description – concerns regarding community safety

Submissions raised concerns regarding community safety during construction and operation of the project. Issues raised included:

- Concerns that the design of project will result in environments that promote anti-social behaviour (eg loitering, drug offences, illegal dumping, graffiti)
- Concerns that the introduction of project infrastructure and the presence of construction personnel would decrease privacy for residents
- Concerns that the presence of construction personnel, a large number of non-residents, would increase resident anxiety about property safety and attract disreputable or illegal activity.

Response

The project would reduce through traffic on surface arterial roads, which would facilitate urban renewal in precincts along the Parramatta Road corridor and contribute to improved liveability in these areas. The level of amenity along the corridor has progressively declined over time as a result of the growth in traffic and increase in congestion.

By removing traffic flows from surface roads and reducing through traffic the project would improve road safety and free up space to facilitate local movement by more space efficient and sustainable modes – walking, cycling and public transport. The project also has the potential to facilitate social inclusion, by providing better access to employment locations and connecting people to social and cultural hubs.

The reduction in traffic, particularly trucks, would also assist in improving public transport and urban amenity, both of which would support future growth along the corridor, in particular commercial and residential development. This should create additional activity and surveillance of public spaces.

The Urban Design Landscape and Visual Impact assessment in Appendix L of the EIS assessed the project against the design principles contained in the WestConnex Urban Design Framework (WUDF). The assessment found that the project was generally consistent with the objectives and design principles set by the WUDF and the Roads and Maritime design guidelines. A number of management measures are outlined in **Chapter 8** (Revised environmental management measures) of this report to guide refinement of the design during the detailed design phase. For these reasons, it is considered unlikely that the project would result in environments that promote anti-social, disreputable or illegal behaviours.

Construction of a transport infrastructure project of this scale in an established urban area will inevitably generate a range of localised impacts. The amenity related impacts associated with the construction phase of the project such as traffic, noise and vibration, air quality, heritage and visual are comprehensively assessed in the EIS and associated technical reports and management measures are recommended to minimise impacts where possible.

The majority of construction sites would include provision of car parking for some of the construction personnel based at those sites. A TMSP will be prepared to guide traffic management during construction and would include a detailed traffic management plan for construction staff at the various worksites. This will include the promotion of public transport and car-pooling to reduce work site related vehicle movements. The area is well serviced by public transport and there are a number of railway stations and bus routes within walking distance of the construction sites.

With respect to privacy and lighting impacts, all construction works would be planned and executed to minimise potential issues with adjacent and surrounding receivers where feasible and reasonable.

The contractor would be responsible for the conduct of the construction workforce. A CEMP will be prepared to outline the environmental management measures which are proposed during the construction phase of the project to minimise impacts on the environment and the local community. Monitoring of potential amenity impacts would occur during the construction period and complaints would be recorded, investigated and actioned promptly.

Section 6.5.1 of the EIS outlines a number of amenity criteria that would be considered in refining the layout and access arrangements for the construction ancillary facilities during detailed design. The layouts would have regard to a range of amenity criteria including noise, overlooking, overshadowing, lighting, dust, traffic and access.

During construction, the contractor 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 F of the EIS provides information on the key consultation activities and processes that would be undertaken during construction.

In addition, a number of management measures as summarised in **Chapter 8** (Revised environmental management measures) of this report regarding further community consultation.

Issue description – validity and independence of the social impact assessment

Submissions questioned the methodology, validity and independence of the social impact assessment. Issues raised include:

- Material and information used as a basis for the SIA was collected and supplied by WestConnex Delivery Authority
- Research material was not collected independently
- Superficial and flawed methodology used in the SIA
- Level of assessment chosen using the Roads and Maritime Environmental Impact Assessment Practice Note: Socio-economic assessment ("moderate" investigation) implies a moderate level of impact from traffic delays
- The SIA work was done when the 'baseline' work was completed and before the preferred route was announced
- Limited knowledge or information about social infrastructure
- Omission of social impacts from proposed traffic changes and restrictions at the intersection of City West Link with Timbrell Avenue and Mortley Avenue at Haberfield because they were considered outside the project area required to be considered by the SIA
- The SIA failed to undertake direct research on the impact of forced acquisitions on residents
- The maximum spatial scope of the assessment "inner western region of Sydney" is not broad enough.

Response

The Social Impact Assessment at Appendix M has been prepared in accordance with Secretary's Environmental Assessment Requirements, or SEARs, prepared by the Secretary of DP&E and the relevant provisions of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (NSW).

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 impact assessments are carried out consistently, to a high standard, and are properly integrated with other environmental assessments, design development and management processes. Section 3 of Appendix M of the EIS details the methodology used for the Social Impact Assesment.

Appendix A of the Social Impact Assessment contains a summary of the methodology, social impacts and benefits identified for communities, and recommended mitigation measures for social impact assessments that have been prepared for other similar projects in Australia. This analysis was completed to develop the range of categories of potential impacts and associated concepts relevant to assessing the social impacts of transport infrastructure. The purpose of this appendix was not to compare the M4 East project to these other listed projects, nor comment on the success or otherwise of those projects.

A combination of desktop investigations, site visits, social research, review of other EIS technical assessments, consultation with local service providers and the outcomes of community consultation were used to inform the assessment. The level of assessment chosen (moderate) is considered appropriate having regard to the range of potential impacts associated with the project, the duration of impacts and the number of people likely to be impacted.

The study area is defined in section 1.5 of the Social Impact Assessment (Appendix M of the EIS) and includes the intersection of City West Link with Timbrell Drive and Mortley Avenue at Haberfield. Social impacts are identified in terms of access for pedestrians and cyclists at this location (refer to section 2.3.5 of Appendix M of the EIS).

The proposed network upgrades to be investigated at the Timbrell Drive / Mortley Avenue / Dobroyd Parade intersection are recommended as a management measure to minimise potential congestion issues at this intersection (refer to the Traffic and Transport Assessment in Appendix G of EIS). These upgrades are to be investigated in consultation with relevant local councils, Roads and Maritime and affected communities.

Development and analysis of a local community profile to inform the social impact assessment was undertaken from desktop sources, including use of the Australian Bureau of Statistics (ABS) 2011 Census data.

Community consultation undertaken for the project was used to inform the Social Impact Assessment (refer to Section 5.5 of Appendix M of the EIS). The consultation activities were undertaken by WDA during the period 2014 and 2015. Consultation activities would continue as the project progresses through the assessment/approval and design development phase and into the construction phase.

The EIS and the social impact assessment were prepared on the basis of the preferred design that was announced in June 2015.

The Social Impact Assessment considered permanent impacts associated with property acquisition (refer to section 6.2 of Appendix M of the EIS).

Environmental management measures have been recommended in **Chapter 8** (Revised environmental management measures) of this report to manage impacts associated with the project.

Issue description – social impacts adequately addressed

Submissions raised concerns that the EIS does not adequately address a number of social impacts associated with the project including:

- Impacts on residents living in Burwood, Croydon and Concord
- Impacts on students and families at nearby educational facilities
- Short term and long term impacts to residents and the community
- The social impacts of acquisition
- Loss of community due to the destruction of local property, and the impact on children's health and learning environment with the proposed construction in Haberfield.

Response

Section 1.5 of the Social Impact Assessment (Appendix M of the EIS) defines the study area. The study area is comprised ofthe five LGAs (Ashfield, Auburn, Burwood, Canada Bay and Strathfield) within which the project is located and this includes the suburbs of Burwood, Croydon and Concord. The assessment also examines in further detail five local precincts to consider potential social changes for communities in close proximity to the proposed surface works.

Social impacts associated with property acquisition are discussed in Section 6.2 of Appendix M of the EIS. The focus of this discussion is on the Concord Road, Wattle Street and Parramatta Road precincts where the majority of property acquisition and demolition would occur. The impacts would include 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.

Section 6 of the Social Impact Assessment at Appendix M of the EIS considered the short term construction related impacts associated with property acquisition, impacts to social infrastructure, changes to access and connectivity, amenity impacts and business/economic impacts. Section 7 of the Social Impact Assessment considered the longer term operational impacts of the project using the same issues.

The social impact assessment assesses impacts to social infrastructure facilities including schools, guides hall, infant centre, early learning centre, churches and areas of open space, which would be used by children and their families. The majority of these impacts were considered to be temporary or short term on the basis that they would occur during the construction phase of the project. However, longer term operational impacts such as operational traffic, air quality, noise and vibration and human health were also considered.

In addition Chapter 11 of the EIS assesses the human health related impacts associated with the project including the impacts on a list of sensitive community receptors which are likely to be used by children and their families such as schools, early learning centres and child care centres (refer to Table 11.2 of the EIS).

The project would result in improved air quality within much of the local community. An increase in pollutants at some locations would occur, such as interchanges where surface traffic is redistributed. However, the risks to human health posed by these changes range from negligible to tolerable/acceptable.

Issue description – acquisition and demolition of properties

Submissions raising issues regarding compulsory acquisition and demolition of properties.

Issues raised in submissions included:

- Object to 'forcing people from their homes
- Impacts to elderly residents from compulsory acquisition
- Object to demolishing properties to make way for the project
- Concerns that the impact to evicted residents has been underestimated or not properly assessed
- Concerns that residents who's properties are acquired will not be able to find equivalent replacement homes in the community
- Acquisition and demolition of apartment buildings that house a number of residents
- Acquisition will impact on lifestyles, families, children and social cohesion
- Physical and psychological effects due to stress and anxiety associated with knowing or not knowing whether acquisition will be required.

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 is undertaken in consultation with the affected landowners in accordance with the *Roads and Maritime Services Land acquisition information guide* (Roads and Maritime 2014e) and the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).

The services available to support residents 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.

Residents who are having their properties acquired or are relocating due the M4 East project (eg tenants) have been advised to contact WestConnex directly to discuss available support services.

Section 6.2 of Appendix M of the EIS discusses the various social impacts associated with the property acquisition and household relocation process. This section acknowledges the social risks involved in relocating to other areas, 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 family/social networks.

Issue description – inequitable impacts on communities

Submissions raised concerns that the project would have an inequitable impact on the suburbs of Haberfield and Ashfield and result in the loss of social capital, community and access to services.

Response

Construction of a transport infrastructure project of this scale in an established urban area would inevitably generate a range of localised impacts and these impacts will affect different areas in different ways. For this project the impacts on Haberfield and Ashfield would include:

- The demolition of heritage listed and contributory items and streetscape impacts within a Heritage Conservation Area
- Noise, traffic and air quality impacts associated with construction activity at a number of site compounds
- Impacts associated with proposed new road infrastructure at the Wattle Street and Parramatta Road interchanges and the permanent operational infrastructure such as the ventilation facilities.

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 and mitigate impacts where possible.

Sections 4.4.4 and 4.4.5 of the EIS discuss the various options considered for the Wattle Street (City West Link) and Parramatta Road interchanges including their location and configuration. Further detail regarding the development of options and the rationale behind the preferred location and alignment of interchanges is provided in **section 5.3.2** of this report.

The heavily trafficked Wattle Street and Parramatta Road already separate the communities of Ashfield and Haberfield to some extent and this is exacerbated by some of the commercial development located along this section Parramatta Road. Pedestrian and traffic access across Wattle Street and Parramatta Road would not be significantly affected by the project.

The EIS has considered potential social impacts and demonstrates that these impacts can be managed within acceptable limits.. Recommended environmental management measures have been summarised in **Chapter 8** (Revised environmental management measures) of this report.

Issue description – impacts to sensitive and disadvantaged community members

Submissions raised concerns that construction of an additional motorway would:

- Have a cumulative effect on minimising the independence of children
- Result in social isolation for non-drivers
- To contribute to an increased burden for parents and carers to chauffer people around
- Result in a loss of social housing, including housing for people with mild to moderate disabilities.

Response

The Social Impact Assessment (Appendix M of the EIS) assesses potential impacts to social infrastructure, access and connectivity, and changes in amenity and public safety. Social infrastructure facilities assessed included schools, guides hall, infant centre, early learning centre, churches and areas of open space, which would be used by children and their families. These impacts were considered to be temporary or short term on the basis that these were impacts that would occur during the construction phase of the project.

The Parramatta Road corridor is one of Sydney's busiest corridors for public transport. By removing traffic from sections of Parramatta Road the project would create an opportunity to provide for potential improvements in public transport such as dedicated bus lanes or light rail. It would also create opportunities to provide for improved cycling and pedestrian access along and across the corridor. These opportunities are being considered further as part of the Parramatta Road Urban Transformation Program. Travel time savings (or transport efficiency) as a result of the project would provide significant social benefits, freeing more time for recreation and social interaction, which contribute to the physical and mental health of the community.

With reduced congestion on Parramatta Road, local mobility would also be enhanced. High traffic volumes on Parramatta Road currently create a barrier to movement along and across the corridor. The project would remove significant traffic volumes from Parramatta Road allowing improved local connectivity and enhancing access to local social infrastructure such as schools, medical facilities and open space and regional facilities such as Sydney Olympic Park. .

The project would require the acquisition of two public housing estates to facilitate the construction of the project. Roads and Maritime and SMC are in negotiations with NSW Land and Housing who are actively seeking alternative accommodation for the existing tenants of these two properties. NSW Land and Housing are supporting these affected tenants during this process.

Issue description – potential health risks to communities

Submissions object to the diminishing of social capital of communities due to potential health risks during construction and operation of the project.

Response

The project eases congestion, reducing travel times and improving travel safety, all of which are positive outcomes for the health of the community and the built environment.

Chapter 11 of the EIS assesses the human health related impacts associated with the project including the impacts on a list of sensitive community receptors such as schools, early learning centres and child care centres (refer Table 11.2 of the EIS).

The Human Health Risk Assessment found that the project is expected to result in a decrease in total pollutant levels in the community. The project is expected to result in a redistribution of impacts associated with vehicle emissions. For much of the community this would result in an improvement (or decreased concentrations and health impacts), however for a number of areas where traffic on the surface roads is expected to increase as a result of the project, a small increase in pollutant concentration may occur. Potential health impacts associated with changes in air quality (specifically nitrogen dioxide and particulates) are low and essentially negligible within the community.

Issue description – employment of locals and Indigenous people

Submissions relating to social and community impacts raised question around the number of jobs for locals / apprentices and indigenous people and requested that specific objectives around employment of locals are included in the EIS.

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.

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 27.2 of the EIS, the WestConnex Sustainability Strategy has set a target for the project to employ the equivalent of 115 apprentices/trainees during design and construction, and maximise employment and training opportunities for young people, Aboriginal and Torres Strait Islanders, disadvantaged groups, long term unemployed and people who live in greater Western Sydney and along the project alignment.

Issue description – unsatisfactory support services offered

Submissions suggesting the counselling service that will be offered to those impacted by the project is unsatisfactory and that legal, social and financial support should be provided.

Response

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 2014e) and the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW). The services available to support residents who are being relocated as a result of property acquisition are detailed in Section 6.2 of Appendix M of the EIS (Social Impact Assessment) 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.

Issue description – financial burden on the public

The creation of toll roads imposes a crippling, financial burden on the public. The proposal will have a long-term, cumulative impact on the public to fund the proposal through a user-pays approach. This is not in the public or community interest.

Response

Information regarding the proposed tolling regime, traffic forecasts, economic evaluation, and financing and delivery strategy for the WestConnex project is detailed in the *WestConnex Updated Strategic Business Case* dated November 2015 which has recently been released to the public and is available at http://www.westconnex.com.au/library/key_documents_and_maps.html.

Issue description – cumulative social impacts

Submissions raise concerns regarding the cumulative impacts to communities from the various stages of WestConnex.

Response

Cumulative impacts are assessed in Chapter 26 of the EIS. This included an assessment of the impacts associated with the individual components of WestConnex and other major developments in the vicinity of the project, including the Parramatta Road Urban Transformation Program. The key cumulative impact issues assessed related to traffic and transport, air quality, noise and vibration, social and economic, heritage and biodiversity.

In addition, the technical assessments for the EIS relating to traffic and transport, air quality, noise and vibration and human health all included modelling of a cumulative scenario whereby it was assumed that all stages of WestConnex were completed. Based on current government policy commitments all stages of WestConnex will be completed in 2023.

Separate EISs have and will be prepared to assess the impacts associated with each stage of WestConnex.

5.13.2 Construction amenity and traffic

304 submissions raised issues relating to amenity in the vicinity of the project during construction.

Issue description – amenity impacts during project construction

Construction will expose residents to disruption and loss of amenity and the EIS does not adequately address quality of life impacts from construction activities (eg excessive truck movements, night works).

Response

Construction of a transport infrastructure project of this scale in an established urban area would inevitably generate a range of localised impacts and these impacts would affect different areas in different ways. 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 to within acceptable limits.

Construction related amenity impacts are discussed in some detail in the following sections of the EIS:

- Traffic impacts – Chapter 8 of the EIS and the Traffic and Transport Assessment in Appendix G of the EIS
- Air quality impacts – Chapter 9 of the EIS and the Air Quality Impact Assessment in Appendix H of the EIS
- Noise and vibration impacts – Chapter 10 of the EIS and the Noise and Vibration Impact Assessment in Appendix I of the EIS
- Human health impacts – Chapter 11 of the EIS and the Human Health Risk Assessment in Appendix J of the EIS
- Property and land use impacts – Chapter 12 of the EIS
- Visual, urban design and landscape impacts – Chapter 13 of the EIS and the Urban Design, Landscape and Visual Impact Assessment in Appendix L of the EIS
- Non-Aboriginal heritage impacts – Chapter 19 and Non-Aboriginal Heritage Assessment in Appendix S of the EIS.

Issue description – traffic impacts during project construction

Submission relating to impacts on residents in Ashfield and Haberfield caused by trucks exiting into Bland Street from the construction site which is in a densely populated area.

Response

A TMSP will be prepared in addition to the construction environmental management plan (CEMP). The TMSP will include the guidelines, general requirements and principles of traffic management to be implemented during construction.

The heavy vehicle route to Bland Street is necessary due to the internal site layouts of the construction compound which would include a large construction zone in the area of the proposed tunnel cut-and-cover and tunnel dive structure (refer to Figure 6.18 of EIS). This construction zone would preclude direct access to Parramatta Road in this area. The intersection of Parramatta Road and Bland Street is signalised which would assist in controlling heavy vehicle movements as they enter back onto the main road network.

In addition to development of a TMSP, management strategies would be adopted to manage and control traffic during construction. This would include a spoil management plan which outlines subsequent monitoring of heavy vehicle and haul routes to ensure compliance and minimise the impact on Bland Street and the wider local road network.

Issue description – pedestrian impacts during project construction

Disruption of pedestrian access and impacts on residential amenity due to the partial loss of Reg Coady Reserve.

Response

As described in section 6.6.2 of the EIS and further clarified in **section 6.3** (Clarifications) of this report, 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. In most cases, this would involve maintaining pedestrian access on one side of the road, with suitable crossing points and signage provided.

A small area of Reg Coady Reserve would be acquired for construction activities associated with the realignment of Wattle Street. The loss of this area of the reserve is considered a minor impact and there are no existing formal pedestrian paths along the west side of Wattle Street in this location. Alternative pedestrian routes would be provided to maintain access. These include provision of a pedestrian route via Reg Coady Reserve and Timbrell Park, or footpath on western side of Dobroyd Parade, with pedestrian crossings located at Ramsay Street, Waratah Street, and Timbrell Drive/Mortley Avenue.

There would be additional traffic, noise and visual amenity issues associated with use of part of the reserve during the construction phase of the project. These impacts would be of limited duration and ultimately the reserve will be reinstated to its original condition and a new pedestrian path would be developed along the west side of Wattle Street. .

5.13.3 Operational amenity and traffic

47 submissions raised issues relating to amenity in the vicinity of the project during operation, changes to access and impacts to community facilities as a result of the project.

Issue description – amenity impacts during project operation

Submissions raised concerns that traffic movements, access changes, parking and congestion, and visual impacts associated with operation of the project would result in significant amenity impacts to adjacent neighbourhoods, residences and community facilities and diminish the attractiveness and quality of life in the vicinity of the project.

Response

Amenity impacts influence the way residents and workers experience their environment. They affect how and where they choose to travel and relax, both at home and outside the home, how they enjoy outdoor areas, and how much they identify with their environment. This relationship to environment therefore has strong links to physical and psychological wellbeing. Measures to avoid, mitigate and manage amenity impacts are therefore important for community health.

By removing significant volumes of traffic from Parramatta Road the project would improve the speed, reliability and safety of travel in this corridor. It would also provide the opportunity for future potential improvements in public transport, cycling and pedestrian access along and across the corridor.

With much of the project underground, traffic displacement from the surface M4 and Parramatta Road are expected to deliver visual amenity benefits, facilitating the urban renewal proposed for the corridor. Where surface works have been undertaken, some visual amenity and heritage impacts would remain, largely due to:

- Loss of vegetation screening
- New road infrastructure − interchanges, tunnel ramps, bridges/flyovers and new noise walls
- Closer proximity to new road infrastructure for some properties
- Changes to access and parking in some areas
- Ancillary operational facilities such as ventilation facilities, the motorway control centre, electricity sub-stations and the water treatment facility
- Loss of heritage items and changes to streetscapes.

A number of measures to avoid, mitigate and manage amenity impacts have been proposed in the EIS, including:

- Support will be given to local beautification of operational facilities and spaces through public art and landscaping to assist in reducing visual impacts associated with these facilities. Consultation will be undertaken with the community in planning and implementing these approaches to contribute to sustaining community cohesion and identity following the construction period
- Support will be provided for local community development activities such as community events to assist with restoring and increasing community cohesion post construction

- Consideration will be given to the creation of legacy projects that deliver social benefit, such as developing residual land as open space areas. Legacy projects will be identified and developed in consultation with local councils
- Tree planting will be maximised in those areas within the project corridor where this is feasible and appropriate within an overall design framework.

The EIS has considered potential impacts on amenity and demonstrates that these impacts can be managed within acceptable limits with the application of management measures.

Issue description – traffic impacts on amenity

Submissions raised concerns that the EIS has not appropriately considered the amenity impacts of increased traffic on local roads for neighbourhoods, schools, churches, parks, clubs, shopping areas and the general amenity of local areas.

Response

In the Social Impact Assessment in Appendix M of the EIS, longer term operational impacts of the project (refer to section 7 of the SIA) were considered, including traffic and transport impacts on access and connectivity and the amenity of residents, businesses and social infrastructure. Amenity impacts were considered in terms of the noise, air quality/human health and visual presence of operational traffic, as well as the provision of new surface infrastructure associated with the project.

The key social infrastructure facilities considered in the assessment are described in section 5.3 and Appendix C of the SIA. They include facilities in the categories of aged care, child care, community facilities, education, emergency services, health, religious services, open space and sport/recreation.

The permanent changes brought about by the project, and their impacts on local amenity, have been addressed in the EIS as detailed below:

- Changes to traffic access, pedestrian access and local connectivity – Chapters 5, 6 and 8 of the EIS and the Traffic and Transport Assessment in Appendix G of the EIS
- Air quality impacts – Chapter 9 of the EIS and the Air Quality Impact Assessment in Appendix H of the EIS
- Human health impacts – Chapter 11 of the EIS and the Human Health Risk Assessment in Appendix J of the EIS
- Noise impacts – Chapter 10 of the EIS and the Noise and Vibration Impact Assessment in Appendix I of the EIS
- Property and land use impacts – section 5.11 and Chapter 12 of the EIS
- Visual, urban design and landscape impacts – Chapter 13 of the EIS and the Urban Design, Landscape and Visual Impact Assessment in Appendix L of the EIS.

Changes to social infrastructure and amenity as a result of these impacts are addressed in Chapter 7 of the Social Impact Assessment (Appendix M of the EIS). Impacts on amenity as a result of operational traffic would include:

- Road traffic noise impacts during operation would result in minor reductions in noise along the M4 and Parramatta Road corridors for 78 per cent of sensitive receivers due to traffic displacement into the new tunnels. These areas include the unmodified M4 to the east of the tunnel portals and Parramatta Road between Concord Road and Wattle Street
- A minor increase in noise levels of less than 2.0 dB (which is generally unnoticeable to the average person) is expected at approximately 18 per cent of sensitive receivers
- Traffic displacement from the M4 and along sections of Parramatta Road is expected to deliver traffic noise amenity benefits supportive of potential urban renewal opportunities in the corridor

- The Human Health Risk Assessment found that the project is expected to result in a decrease in total pollutant levels in the community. The project is expected to result in a redistribution of impacts associated with vehicle emissions. For much of the community this will result in an improvement (or decreased concentrations and health impacts), however for a number of areas where traffic on the surface roads is expected to increase as a result of the project, a small increase in pollutant concentration may occur. Potential health impacts associated with changes in air quality (specifically nitrogen dioxide and particulates) are low and essentially negligible within the community
- Visual amenity and heritage impacts would occur largely due to a loss of vegetation screening, new road infrastructure, closer proximity to new road infrastructure (including the presence of operational traffic using new infrastructure), ancillary operational facilities and the loss of heritage items and changes to streetscapes. Project design and landscaping plans aim to minimise visual intrusion of project elements and respect and respond to the existing and desired character of these areas. These impacts, and the consequent impacts to community cohesion and sense of place, are expected to diminish over time as landscaping treatments mature.

The EIS has considered potential impacts on amenity and demonstrates that these impacts can be managed within acceptable limits with the application of management measures.

By removing significant volumes of traffic from Parramatta Road the project would improve the speed, reliability and safety of travel in this corridor. It would also provide the opportunity for future potential improvements in public transport, cycling and pedestrian access along and across the corridor, improving community cohesion and connectivity. Overall the project is anticipated to improve amenity in the Parramatta Road corridor, with positive effects on the community's wellbeing, identity and sense of place.

Issue description – impacts to community facilities during project operation

Section 5.3.3 in the Social Impact Assessment at Appendix M of the EIS does not acknowledge that there is before, after school and vacation care facilities at Haberfield Public School. Similarly, Table C4 in Appendix C to Appendix M.

Response

It is acknowledged that the EIS did not discuss the presence of before school, after school and vacation care facilities at Haberfield Public School. This has been addressed in **Chapter 6** (Clarifications).

The omission of this information in the EIS is not considered to have a material effect on the assessment of impacts to the Haberfield Public School.

Issue description – changes to access

Submissions raised issues with regard to changes to access for residences and community facilities, including parks and greenspace.

Response

As discussed in **section 5.13.1** of this report, permanent changes to access points would be planned in consultation with affected property owners, and are expected to have minor social impact.

There would be changes to access for properties along the west side of Wattle Street. Right turns into these properties would not be possible when travelling south on Wattle Street however, alternative access routes are available. It is not unusual for properties fronting main roads to have restricted access arrangements. Subsequent alterations to the design of the project and implications for access in the vicinity of the Ramsay Street and Wattle Street are discussed further in **Chapter 7** of this report.

While these changes may result in some local inconvenience they would improve road safety and traffic flow on the main road network.

The existing M4 entrance would be removed for the project and access to the residential apartment building at 167-173 Parramatta Road at North Strathfield would be maintained from its existing access point Parramatta Road. Vehicles would be able to turn left onto Concord Road, and utilise local roads such as Princess Avenue, Napier Street and/or Nelson Street to be able to travel southbound on Concord Road and use the proposed M4 westbound on-ramp. This type of movement is not uncommon for properties fronting directly onto arterial roads where it is not possible to turn right.

The existing access to the property at 154 Ramsay Street at Haberfield would not be impacted and therefore alternate access, including a turning circle, would not be necessary to maintain access.

The submission from The Infants' Home incorrectly states that the Bunnings building would be acquired for the project. The project would involve subsurface acquisition only beneath the Bunnings site. Given this, there would be no impact or need to provide alternative access to The Infants' Home.

The project would require the acquisition of the Cintra Park site which is currently occupied by a hockey field. The existing hockey field is being relocated to the north side of Gipps Street in St Lukes Park, under a separate environmental assessment process. Use of the Cintra Park hockey field site for provision of a fresh air supply facility as part of the project would remove direct rear access to the field from residential properties on Taylor Street. Access for residents to Cintra Park and the relocated hockey field would remain via Gipps Street.

Ongoing consultation with affected property owners would take place during detailed design and through to construction. Future consultation arrangements are discussed in **section 5.6** of this report.

Issue description – use of residual landscape as greenspace

Submissions raised issues with the use of residual landscape as greenspace, stating that return or provision of greenspace will not meaningfully contribute to the liveability of the suburbs impacted.

Response

Community values and concerns explored as part of the social impact assessment identified the provision and use of open space as a key community value contributing to the amenity and character of the local area (refer to section 5.5 of Appendix M of the EIS).

As discussed in Chapter 7 of Appendix M of the EIS, residual land not required for the ongoing operation or maintenance of the project would potentially become available for redevelopment. The future use of residual land and associated rezoning does not form part of the project. These matters would be determined by Roads and Maritime in conjunction with the relevant authorities, including government agencies and local councils.

Existing public land areas temporarily acquired for construction including Bill Boyce Reserve, part of Arnotts Reserve, Cintra Park and part of Reg Coady Reserve would be reinstated to their pre-construction condition at the end of construction and returned to the relevant local councils. The acquisition and temporary use of these areas is discussed in **section 5.12.1** of this report.

The footprint of proposed operational infrastructure at Cintra Park is limited and would only result in minor amenity impacts and visual changes for park users. The remainder of the site would be rehabilitated and landscaped and available for return to the Crown for use as a public reserve, resulting in a net gain in public open space. This gain in open space is considered a minor regional benefit due to the potential for the area to be developed into active open space, augmenting existing uses of Concord Oval and the redeveloped St Lukes Park. The upgraded car park built on the northern side of Concord Oval for construction purposes (providing about 250 car parking spaces) would be wholly available to users of the adjacent sporting fields at the conclusion of construction.

5.13.4 Impacts to economic output

882 submissions raised regarding impacts to economic output.

Issue description – Long term employment opportunities

More long term jobs would be created with public transport than with building WestConnex.

Response

The project would generate long term employment through a number of pathways. These include, employment opportunities directly and indirectly related to the operation of the motorway and those generated through a range of transport solutions with which WestConnex is integrated.

The project is intended to be delivered as an integrated package of transport improvements across Sydney, with complementary enhancements to the existing road network (including associated surface street changes, bus priority measures, heavy vehicle access improvements), redesign of bus services and facilities, improved access to rail stations and upgrades to cyclist and pedestrian facilities.

Integrated land use and transport planning initiatives are key factors in developing a future where 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 NSW *Long Term Transport Master Plan* (Transport for NSW 2012a). Ultimately, it is the combination of these initiatives that will best address global Sydney's needs.

WestConnex supports the needs of Sydney in terms of growth, and improving productivity and liveability through provision of a transport solution. The project would act as a catalyst for urban renewal and improvements to public transport along Parramatta Road by reducing surface traffic.

Improvements facilitated by the construction of WestConnex would result in the creation of jobs in addition to those generated directly by WestConnex.

As outlined in the economic impact assessment in Appendix N of the EIS, the operation of WestConnex would result in an average total increase of 110 full-time equivalent (FTE) employment positions for each year of operation.

Issue description – Financial risk and economic impacts of the project

WestConnex will negatively affect the economy and potentially expose NSW ratepayers to high levels of financial risk.

Response

The Economic Impact Assessment in Appendix N of the EIS estimated through economic multipliers that construction expenditure would contribute a total of $1.8 billion of output, $420 million of household income, around 4,120 FTE jobs and $690 million value added to the NSW economy, per average year of construction. Operational expenditure was estimated to contribute a total of $39 million in output, around $9 million in household income, 110 FTE jobs and $18 million in value added, per year of operation of the project.

The project would provide immediate benefits in relieving congestion along the M4 / Parramatta Road corridor, reducing travel times and improving road safety. The project would support NSW's key economic generators and provide a strategic response to the currently inadequate and highly congested transport routes. WestConnex will provide the missing link in the motorway network that supports freight movement and the development of Sydney's global economic corridor.

The WestConnex Updated Strategic Business Case (2015) has been recently released to the public. It reports that an assessment of the economic viability of WestConnex has been undertaken using cost benefit analysis and wider economic impact analysis. The analysis indicates that WestConnex is economically viable and will return $1.71 for every dollar invested, and this increases to $1.88 for every dollar with wider economic benefits included. The Business Case also outlines the financing and delivery strategy for the project.

Issue description – Impacts to existing businesses and employment

Submissions raised concerns that the project is going to result in loss of or impacts to businesses and jobs.

Response

The Economic Impact Assessment in Appendix N of the EIS lists the number and types of businesses that are to be impacted by property acquisition (section 6.2), the businesses on Parramatta Road that potentially may be impacted by changes in passing trade, both positive and negative (section 7.3) and changes to access and amenity of businesses during construction and operation of the project (sections 6.3, 6.4, 7.4 and 7.5).

The Economic Impact Assessment (Appendix N of the EIS) assesses impacts to economic expenditure and employment as a result of the project in section 6.1 (construction) and section 7.1 (operation).

During construction, employment opportunities would grow in the region through the potential increase in business customers and through the increase in demand for construction workers. The increase in demand for labour may increase wages in the region, particularly for construction workers, who would be in high demand. It is estimated that construction expenditure would directly and indirectly contribute an estimated $1.8 billion of output, $410 million of household income, around 4,120 FTE jobs and $690 million value added to the NSW economy per average year of construction.

During operation of the project operational expenditure is estimated to contribute a total of $39 million in output, around $9 million in household income, 110 FTE jobs and $18 million in value added per year of operation of the project.

As a significant volume of traffic currently using Parramatta Road would be diverted into the tunnel, businesses that are reliant on passing trade would be affected by the project. It has been estimated that there could be an annual reduction of around $7.3 million in output and around 33 FTE jobs due to loss in passing trade. This equates to a loss of 19 per cent of total output and FTE employment of the businesses reliant on passing trade. Reductions in passing trade would potentially be offset to some degree by improved amenity and accessibility for the businesses affected.

This assessment does not take into account the potential increase in passing trade for businesses located along Parramatta Road, west of Concord Road, from an increase in traffic volumes associated with drivers choosing to avoid the motorway tolls. A total of five businesses were identified as potentially benefitting from an increase in passing trade, comprising of services stations, a car wash and cafes/restaurants.

Issue description – economic impacts on The Infants' Home

Economic impacts on Infants' Home (Henry Street at Ashfield) during construction and commissioning of the tunnel junction.

Response

The Infants' Home is located to the south of the Northcote Street tunnel site (C7) and the eastern ventilation facility site (C8), separated by the Parramatta Road and the Bunnings property. It is also located to the south west of the Parramatta Road civil site (C10) separated by Bland Street and residential housing.

A pre-construction assessment of the construction noise and vibration impacts of the project has been completed and is presented in Section 10.4 Appendix I of the EIS. The Infants' Home is located within noise catchment area (NCA) 13 and is identified as a child care centre.

The assessment found that The Infants' Home would experience predicted day time exceedances of the NML of up to 15 dBA for all construction scenarios. Temporary hoarding around the construction sites near NCA 13 would assist in ameliorating noise impacts from the operation. The eastern ventilation facility site (C8) is about 120 metres from the closest buildings associated with The Infants' Home and would be shielded to some degree by existing buildings, in particular Bunnings.

The EIS includes a commitment to, when working adjacent to schools, schedule particularly noisy activities outside normal school hours, where practicable.

A CNVMP will be prepared which will provide detail of the mechanisms proposed for the management and mitigation of potential noise during the construction period. In **Chapter 8** (Revised environmental management measures) of this report, a comprehensive range of management measures have been identified to manage noise impacts during the construction period.

A Construction Air Quality Management Plan will be prepared to cover all construction phases of the project. In addition a range of management measures are proposed in **Chapter 8** (Revised environmental management measures) of his report in relation to issues such as community communication, dust management, stockpile management, tracking of material on roads, emissions management, demolition and earthworks. This also includes regular inspections of work sites to monitor dust emissions and to respond to any issues or complaints should they arise.

Representatives from SMC, Roads and Maritime and the contractor have met with The Infants' Home on two occasions to provide project information and further discuss the environmental assessments contained in the EIS. At both meetings, SMC reaffirmed their commitment to continuing to work with the Infants' Home to reduce impacts and contributing to help the not-for-profit organisation.

Issue description

Reduced traffic on Parramatta Road will reduce advertising potential and visibility of businesses on Parramatta Road.

Response

Section 7.3 of the Economic Impact Assessment at Appendix N of the EIS states that 18 businesses are identified as potentially being impacted by a reduction in passing trade along sections of Parramatta Road associated with the operation of the project. Five businesses are also identified as potentially benefiting from an increase in passing trade along sections of Parramatta Road, such as between Concord Road and Homebush Bay Drive/Centenary Drive.

Impacts on businesses from changes in passing trade may be offset by the potential increase in customers frequenting local businesses along some sections of Parramatta Road due to improved amenity. There are also opportunities for new commercial businesses to be established when any residual land located along Parramatta Road is developed in the future.

As outlined in Chapter 3 of the EIS the project would create opportunities for urban revitalisation, improved liveability and public transport along Parramatta Road. This urban revitalisation has the potential to attract new residents and visitors to the area providing opportunities for advertising and increased visibility.

Issue description

Submissions raised concerns that power outages during construction of the project would impact the ability to work from home.

Response

Potential interruptions to power supply during construction could result from insufficient network capacity, accidental disturbance of existing services and planned outages during connections.

The provision of power to construction sites is discussed in section 6.10.2 of the EIS. Tunnel sites would require direct high voltage feeds from local substations. Additional power requirements would be met through the use of generators. It is anticipated that the local network would have sufficient capacity to supply the power required for the project.

Construction works have the potential to cause accidental disturbance of underground services.

Consultation with service infrastructure providers would commence during the detailed design, and would continue throughout construction to mitigate the risk of unplanned or unexpected disturbance of utilities.

Planned outages during construction would occur in consultation with relevant service providers.

Issue description – Economic implications of potential health risks from the project

Submissions raised concerns that health impacts from air quality changes as a result of the project will be a long term cost to the NSW economy.

Response

The environmental impact statement provides a Human Health Risk Assessment in Chapter 11 and Appendix J of the EIS. The assessment found that the theoretical health risks from changes to air quality as a result of the project are considered to be low.

Issue description – Cumulative impacts

The project will add to the cumulative costs of additional urban motorways.

Response

The assessment of potential impacts of the project with consideration to the existing urban environment (eg motorways, residences, existing amenity) has been presented in the EIS prepared for the project.

Detailed assessment of cumulative impacts is included in Chapter 26 of the EIS. This focuses on impacts associated with:

- Related WestConnex component projects
- Other major developments located nearby.

The key issues considered in the cumulative impact assessment include traffic and transport, air quality, noise and vibration, social, economic, non-Aboriginal heritage and biodiversity.

It is acknowledge that the project would result in some cumulative impacts on the community however there would also be a number of economic and social benefits from the project such as improved connectivity, reductions in traffic congestion and travel times, removal of traffic from Parramatta Road and facilitation of public transport and urban revitalisation opportunities.

WestConnex will provide the missing link in the motorway network that supports freight movement and the development of Sydney's global economic corridor. The full benefits of WestConnex will be realised when all stages of the project are completed.

Issue description

The project will add to the cumulative economic impacts from traffic crashes from the construction of additional urban motorways.

Response

Information regarding the change in numbers of traffic crashes as a result of the project is provided in Chapter 8 of the EIS. A key benefit of the project is the expected improvement in road safety following the transfer of traffic from arterial roads to the M4 East project. Analysis of historic crash data indicates that crash rates on motorways and tunnels are generally lower than on the arterial road network.

With the construction of the project (do something scenario), there is a clear overall road safety benefit on the corridor with a 32 per cent reduction in crash costs in 2021 from $14.95 million to $10.2 million annually. This reduction in crash costs is less pronounced in 2031, but a reduction of approximately 25 per cent is observed with costs falling from $16.31 million to $12.22 million per annum. Traffic crash analysis is discussed in section 10.4 of Appendix G of the EIS.

5.13.5 Compensation

80 submissions raised issues regarding compensation as a result of the project.

Issue description – Compensation for acquisition

Properties to be acquired should be undertaken in line with the *Land Acquisition (Just Terms Compensation) Act 1991*. All other costs and fees associated with renting and moving should be compensated for those required to move.

Response

The property acquisition process for the project has been undertaken in accordance with the relevant statutory requirements under *Land Acquisition (Just Terms Compensation) Act 1991* (NSW). Further information regarding the acquisition process is contained in the *Roads and Maritime land acquisition information guide* (Roads and Maritime 2014e).

As outlined in section 6.2 of the Social Impact Assessment in Appendix M of the EIS, 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 and disturbance costs which include legal costs, valuation fees, relocation costs, stamp duty costs, mortgage discharge and execution fees or other financial costs reasonably incurred.

Roads and Maritime aims to negotiate with property owners to establish a mutually agreeable market value of the property.

Issue description – Compensation requested for various impacts

Submissions raised issues relating to compensation requesting that compensation is provided for a variety of reasons, including:

- Loss in income from rent
- Impacts to lifestyle
- Impacts to the amenity of Haberfield public school (air quality, traffic and noise)
- Loss of business to shopkeepers and restauranteurs
- Impacts on noise and visual amenity
- Cumulative impacts of the project
- Cost of installing air conditioning to offset air and noise impacts during construction
- Decrease in property values
- Assist with rental affordability in Haberfield to allow families to continue sending their children to Haberfield Public School
- Relocation during the demolition of buildings and construction of tunnelling sheds
- Compensation of buildings beyond a 50 metres radius of zones of work impact.

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.

An owner is entitled to compensation for their land being acquired including the market value of the property. All properties required for the construction of the project would be subject to acquisition in accordance with the Roads and Maritime's *Land acquisition information guide* (Roads and Maritime Services 2014e) and the *Land Acquisition (Just Terms Compensation) Act 1991*.

A range of services will be made available to support residents who are being relocated as a result of property acquisition (detailed in Section 6.2 of the Social Impact Assessment at Appendix M of the EIS), including provision of an independent service to vulnerable households to assist with their relocation and community relations support to respond to community issues, concerns and requests.

Issue description – Request for community fund

Submissions object to the project and suggest a "community fund" be set up to fund projects to address impacts on Ashfield and Haberfield communities.

Response

Recommendations relating to conditions of approval are a matter for the NSW Department of Planning and Environment to consider during its assessment of the critical State significant infrastructure application.

Issue description – Valuation of properties

Submissions raised concerns that compensation value for property acquisition would be inadequate or have undervalued property prices and that compulsorily acquired properties should be properly compensated.

Response

The property acquisition process is undertaken in accordance with the relevant statutory requirements under *Land Acquisition (Just Terms Compensation) Act* NSW 1991 and further information regarding the acquisition process is contained in the *Land acquisition information guide* (Roads and Maritime 2014e).

As outlined in section 6.2 of Appendix M, the *Land Acquisition (Just Terms Compensation Act) NSW 1991* states that an owner is entitled to compensation for their land being acquired including the market value of the property.

Beyond the issue of financial compensation, the social impacts of the property acquisition process on property owners and tenants have been acknowledged as including:

- Inaccessibility of housing at a comparable cost
- Relocation health risks
- Altered access to social infrastructure
- The rapid pace of the project development
- Increase in local market competition from affected property owners looking to purchase homes in the same area.

Issue description – Compensation for damages

Submissions raised concerns regarding the provision and level of compensation for damage to the property caused by the project.

Response

The potential for ground movement associated with proposed tunnelling activities has been addressed in Section 18.3.3 of the EIS. For the majority of properties the risk category for potential settlement has been assessed as 'negligible' to 'very slight' except for:

- At the mainline tunnels in the vicinity of Dobroyd Canal (Iron Cove Creek) and the eastern ventilation facility where the assessed risk category is 'slight' to 'moderate'
- In the vicinity of the Concord Road interchange cut-and-cover tunnel structure where the assessed risk category is 'slight'.

Recommended environmental management measures in **Chapter 8** (Revised environmental management measures) of this report and include:

- Further assessments will be undertaken during detailed design to determine the level of potential impact on structures and to identify feasible and reasonable mitigation and management measures
- Existing condition surveys will 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) and within 50 metres of surface works.

Issue description – Compensation for businesses

Request discussion regarding compensation should the enrolments at The Infants' Home (Henry Street, Ashfield) decline as a result of construction impacts.

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.

Representatives from SMC, Roads and Maritime and the contractor have met with The Infants' Home on two occasions to provide project information and further discuss the environmental assessments contained in the EIS. At both meetings, SMC reaffirmed their commitment to continuing to work with the Infants' Home to reduce impacts and continuing to help the not-for-profit organisation.

Issue description

Submissions relating to businesses along Parramatta Rd at Haberfield that are unlikely to receive adequate compensation for business losses that occurred during the post concept and preferred route phase and would continue to have losses in the next phases of the project.

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.

The assessment of indirect impacts to businesses as a result of the project is included in the EIS. This includes assessment of impacts associated with changes in passing trade, impacts to business turnover and employment, impacts to access and amenity impacts.

The EIA also provided estimates of the additional (direct and indirect) expenditure and employment to be generated during the construction and operational phases of the project. It included an assessment of impacts associated with property acquisition and relocation of businesses, and impacts on passing trade of businesses arising from changes in traffic volumes on Parramatta Road.

During consultation as part of the property acquisition process, most of the affected business owners indicated that they planned to re-open at another nearby location. Some residual land along Parramatta Road would become available for future commercial development at the completion of the project which would provide opportunities for new businesses to relocate and service the area.

5.14 Soil and water quality

5.14.1 Construction erosion and sedimentation

Three submissions raised issues regarding construction erosion and sedimentation

Issue description – potential soil erosion

Concerns were raised that the catchment area of 1,553 hectares would potentially experience significant surface water quality impacts, including soil erosion. What would mitigate these issues?

Response

Chapter 15 and Appendix P of the EIS describe in detail the potential impacts to local waterways. During construction, the highest risk of impacts on soils and water quality would be associated with exposure of soils resulting in off-site movement of eroded sediments by wind and/or stormwater to receiving waterways. Section 15.5 of the EIS (as amended by **Chapter 8** (Revised environmental management measures) of this report) describes the measures that would be implemented to manage surface water quality impacts and soil erosion. These include:

- A soil and water quality management plan would be prepared in consultation with the New South Wales Environment Protection Agency and NSW Office of Water and in accordance with:
  - Blue Book requirements
  - RTA Code of Practice for Water Management (RTA 1999).

- Work method statements would be prepared for waterway works with particular emphasis on the early implementation of erosion and scour protection requirements
- A qualified soil conservationist would develop the initial project erosion and sediment control plans and advise on appropriate controls, implementation and monitoring and management processes
- Measures would be implemented to minimise the risk of erosion and sedimentation. These measures may include:
  - Disturbed areas would be minimised and revegetated or stabilised as soon as practical.
  - Erosion control measures such as sediment fences, check dams, temporary ground stabilising, diversion berm or site regrading would be installed as appropriate
  - Where practical, clean water would be diverted away from works or disturbed areas
  - Measures would be employed to control ground stability and limit run-off lengths and velocities within the construction ancillary facilities
  - Wheel wash or rumble grid systems would be installed, where practical, at compound heavy vehicle exit points to minimise the transfer of soil from construction areas to roadways
  - Erosion and sedimentation controls would be regularly inspected to maintain performance to the design criteria and design specifications. Controls would be upgraded or altered if these objectives are found to not be satisfied
- Disturbed areas, including riparian environments, would be rehabilitated as soon as practical. Measures would include revegetation (using native species from the relevant local vegetation communities) and stabilisation.

Issue description – implementation of sediment control measures

A submission requested that sediment control measures be implemented to ensure there are no impacts from sediment generated from construction activities including vehicle movements, tunnelling and general construction works. These measures should be implemented at the following sites:

- Wentworth Road South, Pomeroy Street, Underwood Road, Ismay Avenue and Allen Street at Homebush
- Concord Road interchange
- Cintra Park tunnel site and St Lukes Park
- Frederick Street at Ashfield and the eastern ventilation facility.

Response

Section 15.5 of the EIS (as amended by **Chapter 8** (Revised environmental management measures) of this report) describes the proposed management measures to manage potential construction impacts. During construction, the highest risk of impacts on soils and water quality would be associated with exposure of soils resulting in off-site movement of eroded sediments by wind and/or stormwater to receiving waterways. These impacts would be managed through the implementation of management measures including:

- A soil and water quality management plan will be prepared in consultation with the New South Wales Environment Protection Agency and NSW Office of Water and in accordance with:
  - Blue Book requirements
  - RTA Code of Practice for Water Management (RTA 1999)
- Measures will be implemented to minimise the risk of erosion and sedimentation. These measures may include:
  - Disturbed areas will be minimised and revegetated or stabilised as soon as practical
  - Erosion control measures such as sediment fences, check dams, temporary ground stabilising, diversion berm or site regrading will be installed as appropriate
  - Where practical, clean water will be diverted away from works or disturbed areas

  - Measures will be employed to control ground stability and limit run-off lengths and velocities within the construction ancillary facilities
  - Wheel wash or rumble grid systems will be installed, where practical, at compound heavy vehicle exit points to minimise the transfer of soil from construction areas to roadways
  - Erosion and sedimentation controls will be regularly inspected to maintain performance to the design criteria and design specifications. Controls are to be upgraded or altered if these objectives are found to not be satisfied
- Where passive dewatering of the aquifer system is required, additional contamination sampling (of groundwater and seepage quality) will be completed to assess the potential management and disposal options. A pre-construction baseline groundwater monitoring plan has been implemented to gather water quality data to inform management and disposal options of groundwater seepage during construction.

5.14.2 Construction water quality and discharge

254 submissions raised issues regarding construction water quality and discharge.

Issue description – concern local waterways may be contaminated

Concerns were raised that local waterways may be contaminated. Large, permanent sediment basins would have to be located at the Homebush Bay Drive interchange to accommodate contaminated runoff in storm events. Construction work would cause:

- Pollution of groundwater, potential asbestos contamination in soils and stormwater runoff
- Contamination of downstream waterways and groundwater, impacting on aquatic and riparian habitats
- Accidental leaks or spills of chemicals, fuels, oils and/or greases from construction plant and machinery may result in pollution of local waterways and groundwater sources
- Discharge of treated groundwater, stormwater runoff during rainfall events and direct deposition of airborne particles risk causing acute or chronic contamination of water quality in downstream waterways.

Response

Chapter 15 and Appendix P of the EIS describe in detail the potential impacts to local waterways. During construction, the highest risk of impacts on soils and water quality would be associated with exposure of soils resulting in off-site movement of eroded sediments. In addition, potential accidental leaks or spills of chemicals, fuels, oils and/or greases from construction plant and machinery, may pollute receiving waterways.

The project would include the installation and commission of construction water treatment plants (WTPs) to treat tunnel groundwater and dirty construction water at the sites identified in section 2.3 of Appendix O of the EIS. Monitoring of the discharged water from these systems would be required throughout construction to confirm that the discharged water quality meets the required standards of the receiving environment and the project EPL.

Impacts would be managed through the implementation of management measures described in section 15.5 of the EIS (as amended by **Chapter 8** (Revised environmental management measures) of this report) and would include the following:

- Procedures to manage unexpected contamination finds and hazardous materials identified during site preparation and/or construction works will be prepared. The procedures will include details for the management of the following identified contaminants:
  - PAHs and benzo(a)pyrene TEQ
  - Asbestos.
- A soil and water quality management plan will be prepared in consultation with the New South Wales Environment Protection Agency and NSW Office of Water and in accordance with:

  - Blue Book requirements
  - RTA Code of Practice for Water Management (RTA 1999).
- Measures will be implemented to minimise the risk of erosion and sedimentation. These measures may include:
  - Disturbed areas will be minimised and revegetated or stabilised as soon as practical
  - Erosion control measures such as sediment fences, check dams, temporary ground stabilising, diversion berm or site regrading will be installed as appropriate
  - Where practical, clean water will be diverted away from works or disturbed areas
  - Measures will be employed to control ground stability and limit run-off lengths and velocities within the construction ancillary facilities
  - Wheel wash or rumble grid systems will be installed, where practical, at compound heavy vehicle exit points to minimise the transfer of soil from construction areas to roadways
  - Erosion and sedimentation controls will be regularly inspected to maintain performance to the design criteria and design specifications. Controls are to be upgraded or altered if these objectives are found to not be satisfied
- Where passive dewatering of the aquifer system is required, additional contamination sampling (of groundwater and seepage quality) will be completed to assess the potential management and disposal options. A pre-construction baseline groundwater monitoring plan has been implemented to gather water quality data to inform management and disposal options of groundwater seepage during construction
- Measures would be implemented to minimise the risk of spills. These measures may include:
  - Spill containment would be included at locations where there is direct discharge of stormwater to receiving waterways
  - Appropriately bunded areas would be provided for storage of hazardous materials such as oils, chemicals and fuels
  - Adequate controls around stockpile areas and excavation works would be installed to minimise the risk of contaminants being washed into waterways or stormwater systems
  - Maintenance of containment/spill infrastructure and clean-up procedures for on-site spills would be undertaken
  - Spilt materials and/or any contaminated materials would be disposed of appropriately

The handling of asbestos waste is discussed in the resource use and waste section in **section 5.22** of this report.

5.14.3 Operational drainage infrastructure

No submissions raised issues on Operational drainage infrastructure.

5.14.4 Operational water quality, treatment and discharge

592 submissions raised issues regarding operational water quality, treatment and discharge.

Issue description – operation of project would cause contamination

Concerns were raised that the discharge of stormwater runoff and direct deposition of airborne particles during operation would be likely to cause acute or chronic contamination of soil and water quality in downstream waterways and groundwater systems. Waterway pollution during operation remains a significant risk. The proposed mitigation is inadequate for the scale and scope of the project and the significant risks involved.

The project will result in increased VKT, and therefore more contaminants (brake and clutch dust, hydrocarbon particulates etc) being deposited on roadways and washed into local waterways.

Given the strong support of communities in the Cooks River watershed to improving water quality in their environment, concern was raised that the impact of the project is unacceptable.

Response

The operational water quality impacts from the above ground permanent infrastructure associated with the project are assessed in section 15.4.2 of the EIS. These impacts would be predominantly due to an increase in runoff from a small increase of impervious area and the related mobilisation of pollutants from the carriageway. Although the project would result in a minor increase in impervious area, the project would also change traffic volumes on surface roads and would result in a reduction in the number of heavy vehicles on some of the surface roadways. The additional operational impacts of the project on stormwater runoff pollutants would be marginal.

Section 15.5 of the EIS (as amended by **Chapter 8** (Revised environmental management measures) of this report) outlines the measures to mitigate potential water quality risks to the waterways during operation. The interchanges and connections to existing roads including Homebush Bay Drive, Concord Road, Wattle Street and Parramatta Road east of Wattle Street would require the management of additional runoff from the widened carriageways in these areas. The following management measures are proposed:

- The water quality basin at Saleyards Creek would be designed to minimise impacts on the creek corridor and the setback area along this boundary should be appropriately landscaped
- A surface water quality monitoring program for the pre-construction, construction and operation of the project would be undertaken in accordance with the ANZECC Guidelines and RTA Guideline. The program would be periodically reviewed so that it provides appropriate information relevant to the project implementation phase.

Water discharged from the tunnel during operation would require collection and treatment prior to discharge to any receiving environment. Relevant measures to treat this water would be identified and could include, for example, a treatment basin with appropriate settling and flocculation employed, and proprietary or mechanical treatment devices as relevant.

During operation, the proposed operational water quality treatment plant at the Cintra Park site would be configured to manage and treat tunnel water, to meet discharge objectives and criteria. Monitoring of discharge water quality and quantity would be undertaken during operation, the frequency and scope of which would be determined in consultation with the regulators and in accordance with operational licences and approval conditions.

The proposed management measures are recommended to address any potential increase in contaminants. Any comment on the increase of potential contaminants reaching the waterways needs to be considered in light of the baseline water quality monitoring and the ongoing construction and operational monitoring programme.

The project is in the Parramatta River catchment, and does not affect the Cooks River catchment.

5.15 Contamination

Contamination as discussed in Chapter 16 of the EIS concerns the presence of contaminants of potential concern in the project footprint. No submissions received during the public exhibition of the EIS were considered to concern contamination specifically. Submissions about handling of asbestos waste are discussed in the discussion of resource use and waste in **chapter 5.22** of this report.

5.16 Flooding

5.16.1 Construction hydrology and flooding

Five submissions raised issues regarding construction hydrology and flooding.

Issue description – exacerbation of flooding conditions during construction

Concern was raised that, during construction, there is the potential for local catchment runoff to enter project excavations and potentially exacerbate flooding conditions in adjacent developments. The public needs full independent advice on the safety of the tunnels which is not possible in the short period allowed for consultation.

Response

Section 17.5.2 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) describes the management measures that would be followed to minimise impacts resulting from flooding and drainage. Measures to prevent impacts from flooding on adjacent properties include:

- A flood management strategy (FMS) would be prepared to manage flooding and stormwater related issues
- A detailed hydrologic and hydraulic assessment into flooding behaviour and mitigation measures would be undertaken 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 also be made of impacts during flooding in excess of the 100 year ARI event up to the PMF, in the context of impacts on critical infrastructure and flood hazards
- Floor level survey would be carried out at all properties at risk (where there is a potential increase in flood levels) to confirm whether construction activities will increase flood damages. Where flooding potential is confirmed, management measures for construction works and operational design will be incorporated
- Temporary flood protection would be provided for properties identified as being at risk of adverse flood impacts during any stage of construction of the project.

5.16.2 Operational hydrology and flooding

Six submissions raised issues regarding operational hydrology and flooding.

Issue description – reference to Council flood documentation

Submissions raised concern that, as flooding and drainage is a significant issue, reference should be made to Ashfield Council's recently completed 'Flood Zone' review. Recent extreme storms have tested the storm water system which has in some circumstances been stretched.

Response

Reference to recent reviews undertaken by Ashfield Council is noted. The project and associated drainage arrangements would be designed to limit increases in peak discharges into Council's stormwater drainage systems that would otherwise impact on the performance of the receiving drainage system and exacerbate flooding in existing development.

Issue description – minimise impacts to flooding during operation

Submissions raised concerns that there would be unacceptable proposed increases in flooding to downstream properties and requested that impacts to flooding be minimised during operation of the project. There are potential increases in stormwater volumes within the local council (Ashfield Council's) stormwater pit and pipe network.

Response

Chapter 17 of the EIS outlines the potential flooding and drainage impacts associated with the project. A detailed flooding assessment has been undertaken for the project and is included in Appendix Q of the EIS.

During operation of the project, floodwater inundation has the potential to cause damage to infrastructure, impact on the safe operation of the motorway tunnels and pose a safety risk to road users and motorway operations staff. As such, the preferred design includes measures that would achieve the hydrologic standard requirements and manage the impact the project would have on the flooding characteristics of adjacent development under post-construction conditions. The tunnel portals and ancillary facilities such as substations, ventilation buildings and emergency response facilities would be located above the flood risk level.

The investigation found that changes in the characteristics of flooding associated with future climate change would not lead to a significant increase in the flood risk to the project.

Section 17.5 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) summarises the management measures included within the project to minimise impacts relating to flooding, including:

- A flood management strategy (FMS) would be prepared to manage flooding and stormwater related issues and will include:
  - The layout of construction ancillary facilities
  - Location of amenities buildings and equipment outside high flood hazard areas
  - Controlled diversion of overland flow either through or around work areas
  - Staging construction to limit the extent and duration of temporary works on the floodplain
  - Monitoring weather conditions
  - Ensuring construction equipment and materials are removed from floodplain areas at the completion of each work activity, or upon issuing of a weather warning of impending flood producing rain
  - Provision of temporary flood protection for properties identified as being at risk of adverse flood impacts during any stage of construction of the project
  - Development of flood emergency response procedures to remove temporary works during periods of heavy rainfall and staff evacuation plans
  - For site facilities located within the floodplain, the FMS would identify how risks to personal safety and damage to construction facilities will be managed
- Adverse flood impacts on existing development would be managed through the FMS. This may include:
  - A detailed hydrologic and hydraulic assessment into flooding behaviour and mitigation 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 also be made of impacts during flooding in excess of the 100 year ARI event up to the PMF, in the context of impacts on critical infrastructure and flood hazards.

Floor level survey would be carried out at all properties at risk (where there is a potential increase in flood levels) to confirm whether construction activities would increase flood damages. Where flooding potential is confirmed, management measures for construction works and operational design would be incorporated.

Issue description – increased stormwater flows to existing infrastructure

A submission raised concerns regarding the potential increases in stormwater volumes within the local council (Ashfield Council's) 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 existing downstream stormwater system.

Response

The assessment of operational flood risks and impacts associated with the proposed works and the associated concept stormwater drainage arrangements that have been assessed as part of the flooding and drainage investigation is presented in section 6.2 of Appendix Q of the EIS. The assessment was based on concept road and drainage designs for the M4 East.

Sections 6.2.7 and 6.2.8 of Appendix Q of the EIS present the findings of an assessment into the operational flood risks and impacts of the proposed works within the Ashfield Council local Government area at Parramatta Road interchange and Wattle Street (City West Link) interchange, respectively. The assessment shows that impacts on flooding downstream of the project is of a minor nature.

The concept drainage arrangement at the Parramatta Road interchange is shown on Figure 6.17 of Appendix Q of the EIS and includes a stormwater detention tank on the south-east corner of Bland Street and Parramatta Road, which would attenuate peak flows in the downstream drainage system. Runoff from the tunnel dive structure would be controlled by the tunnel drainage system and therefore would not contribute to runoff to the surface drainage system under post-construction conditions.

The concept drainage arrangement at the Wattle Street (City West Link) interchange is shown on Figure 6.21 of Appendix Q of the EIS and includes the upgrade to the stormwater drainage system along a section of City West Link Road (Wattle Street and Dobroyd Parade), with new drainage outlets into Iron Cove Creek in the vicinity of Loudon Avenue and Waratah Street. These new drainage outlets would offset an increase in peak flows into Ashfield Council's existing stormwater pit and pipe network.

The methodology adopted to assess flooding and drainage impacts is described in section 3.1 of Appendix Q of the EIS and included the development of detailed hydrologic and hydraulic models which were used to define flood behaviour under pre-project conditions, assess the flood related risks and impacts associated with the construction and operation of the project, and identify measures aimed at mitigating the identified flood risks and impacts.

Operational flood risks and impacts of the proposed works are described in sections 6.2.2 to 6.2.8 of Appendix Q of the EIS, which also includes a description of the key elements of the concept design and associated concept stormwater drainage arrangements. Concept stormwater drainage arrangements are also shown on Figures 6.1, 6.5, 6.9, 6.13, 6.17 and 6.21 of Appendix Q of the EIS. These figures include concept layouts of proposed upgrades to the existing drainage networks.

As stated in section 6.1 of Appendix Q of the EIS, it is recognised that the assessment is based on a concept design for the M4 East, which would need to be refined during the detailed design stage. For this reason **Chapter 8** (Revised environmental management measures) of this report sets out the requirements of a Flood Management Strategy that will be prepared to manage flooding and stormwater related issues. The Flood Management Strategy will be prepared in consultation with relevant stakeholders.

The Flood Management Strategy will address residual flood impacts identified in the EIS, as well as any flood impacts identified following further design development and assessment. As identified in **Chapter 8** (Revised environmental management measures) of this report, the Flood Management Strategy also commits to the provision of local stormwater measures (where required).

- Appropriate local stormwater measures will be provided, where required.

5.16.3 Incomplete specialist report during exhibition

No submissions raised issues regarding incomplete specialist reports during exhibition.

5.17 Groundwater

5.17.1 Construction groundwater impacts

Six submissions raised issues regarding groundwater impacts during construction.

Issue description – potential contamination of groundwater from construction

Concerns were raised regarding potential contamination of groundwater from construction activities.

Response

Section 18.3.2 of the EIS describes the potential impacts on groundwater quality from contamination during the construction phase. Groundwater encountered during construction would be collected and treated before discharge.

As described in section 6.10 of the EIS, the project would include construction water treatment plants to treat tunnel groundwater at the five tunnelling sites. The water treatment plants would be designed to treat groundwater to water quality guidelines within the environment protection licence and may consist of:

- Primary settling tanks/pond to remove sand and silt sediment fractions and oil and grease
- pH balance/metals oxidation tank, with primary flocculation
- Secondary flocculation tank
- Clarifiers to remove sediment and residual oil
- Sediment dewatering processes
- Inline process and discharge turbidity and pH monitoring with diversion valves to divert out-of-specification water for retreatment.

The volume of wastewater generated during construction would vary according to construction activities taking place, the amount of groundwater infiltrating into the tunnel, and the length of the tunnel that has been excavated.

5.17.2 Settlement

76 submissions raised issues regarding settlement resulting from the construction of the tunnel.

Issue description – impacts to property as a result of tunnel settlement

Concerns were raised about impacts on properties due to the settlement of the tunnel and tunnel collapse (eg Lane Cove Tunnel Collapse) and prevention of sink holes. A submission requested monitoring of surface conditions throughout construction of the tunnel.

Concerns were raised as to how the property at 24 Walker Avenue would be protected from subsidence.

Response

The risk to individual structures would be dependent on the geotechnical conditions, the depth of the tunnel, the number of storeys of the building, and the position, condition, and masonry of the structure itself.

Preliminary ground movement investigations indicate that there may be potential settlement of up to 50 millimetres at the mainline tunnels in the vicinity of Dobroyd Canal (Iron Cove Creek) and the eastern ventilation facility, and the risk category has been assessed as slight to moderate. In the vicinity of the Concord Road interchange cut-and-cover tunnel structure, there may be potential settlement of up to 25 millimetres, and the risk category has been assessed as slight. Elsewhere, the risk category has been assessed as negligible to very slight.

This indicates that ground movement is generally likely to result in cosmetic damage only. For the majority of properties, the anticipated impacts are negligible, typically resulting in hairline cracking only. For a limited number of properties, ground movement may result in cracking of up to 15 millimetres.

These results are preliminary and do not take into account the specifics of individual buildings or heritage buildings. Further assessments would be undertaken during detailed design to determine the level of potential impact on structures and to identify feasible and reasonable management measures required to minimise potential ground movement impacts.

Community members would be aware of the tunnel collapse in Sydney during the construction of the Lane Cove tunnel.

A number of major design and construction method reviews have been undertaken to better understand the Lane Cove incident and other incidents overseas. Consequently the risks of a similar incident occurring during a Sydney tunnelling project have been virtually eliminated. The reasons for this include:

- Vastly improved geotechnical assessment and modelling
- Improved predictive two dimensional and three dimensional modelling of geology, excavation spans, temporary and permanent loads
- Fit for purpose design to develop the appropriate type of 'support' to match the ground conditions as the excavation progresses on a day to day basis
- Continuous independent review of the temporary and permanent works design and construction methods by experts
- Continual construction verification that tunnel support is installed and performing as per design
- Robust change management processes for conditions that are out of the ordinary or unexpected, including probe drilling and ground treatment through suspected poor ground zones
- Continuous assessment of likely excavation and groundwater conditions
- Detailed survey monitoring of surface roads, buildings and structures in the tunnel vicinity
- Tunnelling program milestones have been set with allowance for the works to proceed safely.

The features that relate to tunnelling operating methodology are brought together in the 'permit to tunnel' process as described in section 25.1.4 of the EIS. This is a process where all of the relevant information is reviewed by the contractor's tunnelling staff and independent verifiers. The approval to proceed with tunnelling is only issued when all checks and activities have been completed.

Issue description – concerns relating to land subsidence

Property owner at 35 Lang Street, Croydon, objects to the tunnel route underneath homes being approved. Concerns about land subsidence, sink holes and other damages including cracking and instability resulting to our home. Key concerns are:

- There is no supporting evidence to inform how safe it would be to live above a tunnel
- Tunnel collapse is a possibility.
- Geotechnical testing has not been completed
- The EIS indicates that construction is mainly through the Hawkesbury Sandstone. Ashfield Shale is the main rock structure in the inner west area of Sydney
- Bore hole results are not provided showing results of testing along the preferred route but the EIS does reveal that bore hole testing was carried out along Parramatta Road. Request to see evidence of the bore hole results and the depth to the Hawkesbury Sandstone.

Response

Preliminary ground movement investigations (see Table 18.4 section 18.3.3 and Appendix R of the EIS) indicate that there may be impacts to some buildings between Croydon Road and Earle Avenue assessed as very slight to slight. This area is over 300 metres from 35 Lang Street.

These results are preliminary and do not take into account the specifics of individual buildings. Further assessments would be undertaken during detailed design to determine the level of potential impact on structures and to identify feasible and reasonable management measures required to minimise potential ground movement impacts. Potentially affected property owners would be consulted with directly.

Geotechnical investigations are ongoing and will continue until construction is completed. Available geological data was used for the groundwater model provided in Appendix R of the EIS. This indicated the top of the Hawkesbury Sandstone is at around -1.0 metres Australian Height Datum (AHD) or 11 metres below ground surface at this property. The proposed tunnel base would be at about -36 metres AHD or 46 metres below the surface at the site, which is about 35 metres below the top of the Hawkesbury Sandstone.

5.17.3 Operational groundwater impacts

70 submissions raised issues regarding operational groundwater impacts.

Issue description – impacts of potential salinity damage

Concerns were raised about the potential for salinity damage affecting infrastructure, buildings, parks and gardens.

Concerns were raised about possible changes to the salinity levels of the soil at 35 Lang Street, Croydon. The EIS states that "Urban salinity becomes a problem when the natural hydrogeological balance is disturbed by human interaction through changes to the water balance. Small changes in sensitive areas can result in the balance being altered and salinisation occurring". The submission objects to their property being affected by soil salinity issues, and does not want water levels to be changed which may affect their gardens. The Tallowwood tree on this property is a protected tree under the council's Tree Preservation Order and stands in the path of the tunnel.

Response

Section 18.4.6 of the EIS describes the potential impacts to groundwater from an increase in salinity. Groundwater modelling indicates that saline groundwater is likely to underlie fresh groundwater throughout the project footprint.

Shallow groundwater and soil salinity can be increased by raising the water table to the point where groundwater can be evaporated, concentrating the natural salts in the evaporation zone until the pore water becomes saline. The water table is typically raised by increasing recharge due to:

- Clearing vegetation so that evapotranspiration decreases and hence groundwater recharge increases (dryland salinity)
- Increasing recharge through excessive irrigation (irrigation salinity).

The tunnel would cause neither of these and drainage would lower the water table, reducing the risk of soil salinity.

Shallow water table elevation can also occur where structures, such as wall foundations or backfilled trenches, block off shallow aquifers and 'dam' groundwater flow. As there are no such structures near this property, this is not a significant risk.

Deep groundwater salinity increase can occur through drawing in seawater (seawater intrusion). Although this has been identified as a risk in the Hawkesbury Sandstone aquifer in near-coastal areas to the north and east, this cannot occur in this case as the property is not between the tunnel and any shoreline sources of saline water. The nearest area likely to be impacted is about 400 metres to the east.

Water levels in the uppermost formations below the site are modelled to drop about 30 metres over the life of the tunnel, with the greatest drop occurring after approximately 2050. This would only affect vegetation relying on groundwater rather than soil moisture. It is highly unlikely to affect general garden vegetation but could affect large trees such as the tallowwood tree, if it relies on groundwater (typically only during periods of drought). During detailed design, the contractor would assess if the tree would be impacted by the project.

5.18 Non-Aboriginal heritage

5.18.1 Direct impacts to heritage items

466 submissions raised issues regarding direct impacts to heritage items.

Issue description – concern for permanent impacts to heritage items

Concerns were raised that the project would result in permanent impacts to heritage items; in some case they would be demolished. How can such impacts be justified? Once they are gone the history is lost. The project will remove valuable cultural resources including heritage buildings, and construct infrastructure through Australia's 19th and 20th century history. These are architecturally significant and unique. The heritage impacts of the WestConnex Motorway are severe, and involve the demolition of places which have been removed from Heritage Lists on non-heritage-based grounds. Those items and buildings that have been identified and are registered as heritage listed items at any level of government (whether it be local, state or national) must be preserved in their entirety.

Response

Section 19.3 and Appendix S of the EIS consider the potential for heritage impacts including the demolition of some heritage items. The project would directly impact 22 locally listed heritage items, including:

- The complete demolition of 16 houses
- Partial demolition of one house (reduction curtilage only)
- Partial demolition of one church (part of garden, boundary fence and gates)
- Removal of street trees from two listed groups.

A number of properties that would be impacted are located within the Powell's Estate Heritage Conservation Area (Powell's Creek HCA) or Haberfield Heritage Conservation Areas (Haberfield HCA). This includes items that are not listed in their own right but contribute to the values of the Conservation Areas. Powell's Estate HCA and Haberfield HCA therefore comprise two of the 22 locally listed heritage items that would be directly impacted.

An additional ten items would be directly impacted that are not listed but are considered to have heritage significance. The project may also have more generalised impacts to other heritage items that would not be directly impacted but may otherwise be affected due to changes in setting and amenity during the construction and operation of the project.

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 the 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.

During the development of the design one of the key objectives was to minimise impacts on heritage items. Impacts to built heritage, heritage landscapes and historical archaeological sites, would to the greatest extent practicable, be avoided and minimised. This has been achieved in a number of locations where the preferred design was amended to avoid impacts to heritage features. For example during project development, options were considered that would have resulted in direct impacts on Ashfield Park, which is locally listed, and Yasmar, a State listed heritage item. Due to these potential impacts, these options were not selected as the preferred option. The preferred design assessed in the EIS would not directly impact on Ashfield Park or Yasmar, with no works proposed within the boundaries of these items.

In terms of the Haberfield HCA, impacts would be clustered around the already affected margins of Wattle Street. Despite this incremental direct impact, by concentrating development in this way the project avoids intruding into other largely unaffected parts of Haberfield HCA.

The EIS recognises that the project would impact on heritage. The potential significance of the impacts were assessed, and a range of management measures are proposed to minimise the impacts. When considered as part of WestConnex, the project would support NSW's key economic generators and provide a strategic response to the currently inadequate, and highly congested, transport routes. Critically, this includes providing the missing link in the motorway network. Improvements to the transport network, including this project, support the global economic corridor by enabling domestic and international trade and therefore underpin a sustainable NSW economy and Sydney's role as a global city.

The detailed design, documentation and construction of the M4 East 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 19.4 of EIS (and amended in **Chapter 8** (Revised environmental management measures) of this report) and include:

- Where practical, heritage specialists (built and landscape heritage and historical archaeology) and urban designers would provide input into the detailed design and documentation phase to assist in identifying opportunities to enhance the conservation options for heritage items and archaeological sites and ensure adverse impacts are avoided or minimised. This would include, but not be limited to, the alignment and design of noise barriers to avoid or minimise impacts on heritage items
- Photographic recording would be undertaken of listed and contributory heritage items and affected sections of the Heritage Conservation Areas – contributory streetscapes and houses where a major adverse impact will be caused by the project, as identified in the Construction Heritage Management Plan in the Powells Estate HCA, Thornleigh House gates and driveway, and the Haberfield HCA. The recording methodology would be generally in accordance with the NSW Heritage Office guidelines Photographic Recording of Heritage Items Using Film or Digital Capture (2006b), but the detail of the recording required would be determined by the significance of the items/groups/streetscapes
- During demolition, where practical and as advised by a qualified heritage consultant, recycle elements of heritage fabric from listed heritage items and affected sections of the Heritage Conservation Areas – contributory streetscapes and houses where a major adverse impact would be caused by the project, as identified in the Construction Heritage Management Plan in the Powells Estate HCA, Thornleigh House gates and driveway, and the Haberfield HCA.

In response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the M4 East project. The panel will review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. For heritage input into the refinement of the design, an experienced, reputable and independent heritage specialist will also be included on the panel.

As described in section 6.9 in the Non-Aboriginal Heritage Impact Assessment in Appendix S of the EIS, the tunnel stubs, ramps, ventilation outlet and ancillary facilities for the western end of the M4-M5 Link are being developed as part of the M4 East project to minimise the need to undertake further works in the Haberfield HCA in association with key M4-M5 Link infrastructure.

Issue description – preservation of 9 Wattle Street at Haberfield

Section 12.32 of the EIS states that the house at 9 Wattle Street at Haberfield would be demolished for use as a construction ancillary facility for the duration of construction. Concerns were raised as to why this property, which is listed as of significant heritage importance, cannot be preserved.

Response

The house at 9 Wattle Street at Haberfield (Item 177 in Appendix D of the Non-Aboriginal Heritage Impact Assessment in Appendix S of the EIS) would be demolished to accommodate the new Wattle Street interchange and realignment of Wattle Street. It would not be impacted solely for a construction ancillary facility.

Section 19.3 and Appendix S of the EIS provides an assessment of the impacts on heritage resulting from the project on 9 Wattle Street.

Issue description – impact on Yasmar Estate

Submissions pointed out that Yasmar Estate is a nationally significant heritage item. Concerns were raised that, after construction, there would be up to 10 lanes of traffic right outside its front gates. The blasting and tunnelling which would be required on Parramatta Road to construct the WestConnex tunnel could have devastating impacts on this property. Concerns were raised that this has not been adequately considered in the EIS.

Response

As outlined in section 19.2.2 of the EIS, Yasmar Estate at 185 Parramatta Road at Haberfield is listed on the State heritage register and is of State heritage significance.

Table 19.25 in the EIS describes the impacts to Yasmar and acknowledges that, during project development, options were considered that would have resulted in major adverse impacts on Yasmar. Due to these impacts, these options were not selected as the preferred option. Under the preferred option the significance of the State-heritage listed house and garden, as a rare, intact villa estate along Parramatta Road, and its historically significant access way would not be affected by the project. This would be a result of the preferred option not directly impacting on Yasmar itself or its grounds.

However, tunnel dives proposed in front of Yasmar would increase the separation of Yasmar from the historical road it once faced. The widening of Parramatta Road to accomodate additional traffic lanes and the dive sections of the tunnel, and the addition of new landscaping proposed in association with these works, has the potential to obscure views of the Yasmar property. This would include views of Yasmar's gardens, front fence and entrance gates. These are currently visually prominent landmark elements in the streetscape.

Section 19.4 of the EIS (and amended in **Chapter 8** (Revised environmental management measures) of this report) lists the management measures which would be implemented to minimise potential impacts to Yasmar. These include:

- The urban design and landscape plan would ensure views to the front gates and landmark Moreton Bay figs within Yasmar's mature garden are not obscured
- If required, the front entrance gates and mature trees along Yasmar's front (Parramatta Road) boundary would be protected during construction works
- If impacted by construction works, the access way from Parramatta Road into Yasmar will be re-instated
- Significant trees in the vicinity of the project would be protected during construction works.

All of these management measures were rated as being highly effective, and would completely mitigate the impact on the heritage significance of Yasmar.

In response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the project. The panel would review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist would also be included on the panel.

It would consider the integration of the project within the heritage fabric of the immediate area, including Yasmar, with the aim of achieving the best possible design and heritage outcomes for the project.

Issue description – removal of heritage listed trees

Concerns were raised regarding the heritage listed trees being removed as part of the project. Submissions recommended that if these trees cannot be relocated, they should not be removed.

Response

As assessed in the non-Aboriginal Heritage Impact Assessment in Appendix S of the EIS, the project would potentially involve the removal of 16 to 18 street trees on Sydney Street and Edward Street listed under the *Canada Bay Local Environmental Plan 2013*.

The project also has the potential to impact five mature fig trees near St Lukes Park that are also listed under the *Canada Bay Local Environmental Plan 2013*, however removal would be avoided if feasible and in accordance with the advice of a suitable qualified arborist.

The project would maximise the number of trees to be retained and new trees would be planted using similar species. Management measures listed in section 19.4 of the EIS (and amended in **Chapter 8** (Revised environmental management measures) of this report) also include:

- Where feasible and reasonable, the detailed design and construction stages would seek to maximise the number of trees retained
- Significant trees in the vicinity of the project along Sydney Street and Edward Street would be protected during construction works, on the advice of a suitably qualified and experienced arborist
- New trees planted at the western end of Sydney Street would be brush box or a similar, sympathetic species.

All of these management measures were rated as being highly effective, and would completely mitigate the impact on the heritage significance of the trees.

Issue description – cumulative cost from destruction of heritage

Concerns were raised 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 cumulative costs resulting from destruction of heritage are considerable.

Response

Other motorways and infrastructure which are already built are considered as being part of the existing environment (section 19.2 of the EIS) and are therefore included within the assessment.

As described in section 6.9 of the Non-Aboriginal Heritage Impact Assessment in Appendix S of the EIS, the tunnel stubs, ramps, ventilation outlet and ancillary facilities for the western end of the M4-M5 Link are being developed as part of the M4 East project to minimise the need to undertake further works in the Haberfield HCA in association with key M4-M5 Link infrastructure.

Given the major adverse impacts on the Haberfield HCA resulting from the project, any additional impacts on the HCA from the M4–M5 Link would potentially result in further cumulative impacts. The work being undertaken as part of this project to deliver the tunnel stubs, ramps and ventilation outlet facilities for the future M4-M5 link would help to mitigate against any cumulative impacts from WestConnex on individual heritage items beyond the impacts on the Haberfield HCA, since no items are likely to be affected by multiple WestConnex projects.

Issue description – concern regarding the demolition of 142 Alt Street at Haberfield

Concern was raised regarding the demolition of 142 Alt Street at Haberfield. This property is known as 'Louisa Cottage' and was built in 1888. It is the oldest house in Alt Street and one of the oldest houses in Haberfield, and predates Richard Stanton's Garden Suburb of Haberfield.

Response

The project would not result in demolition of the building at 142 Alt Street at Haberfield. The stub tunnel for the future M4–M5 Link would be partially located under this property. Part of the property would be subject to subsurface acquisition only. Impacts associated with subsurface acquisition are discussed in **section 5.18.3** of this report.

Issue description – heritage buildings which are not shown in the EIS

Concerns were raised that there are heritage buildings in Haberfield that do not appear on the EIS map of affected properties. This includes the 1888 built 'Louisa Cottage' located 142 Alt Street at Haberfield.

Response

Heritage items located within the project footprint and listed in the following registers are included within the Non-Aboriginal Heritage Impact Assessment (refer to Appendix S of the EIS):

- State Heritage Register
- NSW State Heritage Inventory database
- Ashfield Local Environmental Plan 2013 (Ashfield LEP 2013)
- Strathfield Local Environmental Plan 2012 (Strathfield LEP 2012)
- Canada Bay Local Environmental Plan 2013 (Canada Bay LEP 2013)
- Burwood Local Environmental Plan 2012 (Burwood LEP 2012)
- Section 170 Heritage and Conservation Registers for Sydney Water, Roads and Maritime, RailCorp and Ausgrid.

Louisa Cottage, located at 142 Alt Street at Haberfield, is not recorded as a listed heritage item on any of these registers.

5.18.2 Impacts to Heritage Conservation Areas

2,404 submissions raised issues regarding Heritage Conservation Areas to be impacted upon by the project.

Issue description – impact of the project on Sydney's heritage

Concerns were raised that the project would impact upon Sydney's heritage, in particular, the heritage of the Haberfield and Ashfield areas, including having a detrimental effect on the Haberfield Conservation Area through demolition, and impacts of the M4 East's additional traffic, roadways, ventilation outlets and more on the area's heritage value. These features, including historic federation houses, should be preserved.

Response

Section 19.3 and Appendix S of the EIS provide an assessment of the impacts on heritage resulting from the project including the demolition of some heritage items.

As noted in Section 19.1.3 of the EIS, the study area for the heritage assessment was split into four broad areas and each area contains a number of historical archaeological management units (HAMUs) which correspond to the areas of potential archaeological significance. Area 4 includes Haberfield and Ashfield.

Section 19.3.2 of the EIS states that, in Area 4, heritage impacts in Haberfield would be related to the demolition of buildings and gardens. Visual impacts would arise from new motorway infrastructure and the loss or reduction of significant streetscapes. Temporary visual impacts would also result from the establishment of the construction ancillary facility sites. The EIS concluded that the impact of the project on the heritage significance of the Haberfield HCA and individual heritage items within it would be major and could not be effectively mitigated.

The EIS states that in Ashfield, the potential for heritage impacts would arise from the demolition of heritage items and construction of new motorway infrastructure, including dive structures, cut-and-cover tunnels, driven tunnels, noise barriers and construction ancillary facility sites in the vicinity of heritage items. There would also be possible damage from the effects of construction vibration.

Management measures to minimise the impacts of the project on non-Aboriginal heritage are outlined in section 19.4 of EIS (and amended in **Chapter 8** (Revised environmental management measures) of this report). The measures proposed include:

- Where practical, heritage specialists (built and landscape heritage and historical archaeology) and urban designers will provide input into the detailed design and documentation phase to assist in identifying opportunities to enhance the conservation options for heritage items and archaeological sites and ensure adverse impacts are avoided or minimised.
- Impacts to built heritage, heritage landscapes and historical archaeological sites, will to the greatest extent practicable, be avoided and minimised
- Photographic recording will be undertaken of listed and contributory heritage items and affected sections of the Heritage Conservation Areas
- The vents and motorway facilities would be sited as close as possible to Parramatta Road to minimise their intrusion into the Haberfield HCA
- The urban design and landscape plan will include planting strategies for the impacted area of the Haberfield HCA.

Issue description – impact on unique heritage values and the legibility of Haberfield

Concern and objections were raised that the project and WestConnex would have a major impact on the unique heritage values of the Haberfield HCA and result in the demolition of contributory items. This would affect the legibility of the original 'garden suburb' layout through fragmentation and installation of new structures that are out of character with the conservation area.

Response

Section 19.3 and Appendix S of the EIS provide an assessment of the impacts on heritage resulting from the project including the demolition of some heritage items and impacts on the Haberfield HCA.

The project would require the demolition of 53 dwellings within the Haberfield HCA. Of these, 11 are heritage listed properties and a further 29 have been identified as contributory to the heritage significance of the HCA. The remaining 13 properties are considered either neutral or intrusive (conflicting) with the HCA. Two of the suburb's intact tree-lined streets would also be affected. All of these elements contribute to the heritage values of the HCA. These impacts would be localised around Wattle Street. As noted above, the EIS concludes that the impact of the project on the heritage significance of the Haberfield HCA and individual heritage items within it would be major, and could not be effectively mitigated.

The future use of residual land and associated rezoning do not form part of the project. These matters would be determined by Roads and Maritime in conjunction with the relevant authorities, including government agencies and local councils.

The fragmentation may have an impact on the social significance of the Haberfield HCA, particularly for residents who live west of Wattle Street who would be visually and spatially separated from the remainder of the suburb.

The increased acquisition and demolition of properties around Wattle Street would consolidate the separation of the two halves of the HCA that has already taken place. It would encroach from one margin, rather than impacting other areas within the two parts of the HCA.

As described in section 6.9 of Appendix S of the EIS, the tunnel stubs, ramps, ventilation outlet and ancillary facilities for the western end of the M4-M5 Link are being developed as part of the M4 East project, to minimise the need to undertake further works in the Haberfield HCA in association with M4-M5 Link infrastructure.

Section 19.4 of the EIS (and amended in **Chapter 8** (Revised environmental management measures) of this report) sets out the environmental management measures that would be implemented during construction and operation to minimise heritage impacts to the extent possible. The anticipated effectiveness of the management measures is also summarised in this section. Specific measures to minimise impacts to the Haberfield HCA include:

- The vents and motorway facilities would be sited as close as possible to Parramatta Road to minimise their intrusion into the HCA. An orientation that is more consistent with the Haberfield built form and subdivision would also be investigated. Where feasible, the proposed ventilation outlet and motorway facilities would be as recessive as feasible and reasonable to reduce permanent visual impacts on the Haberfield HCA. They would be of high-quality design and materials
- The urban design and landscape plan would include planting strategies for the impacted area of the Haberfield HCA to guide the landscaping along the project, around the ventilation facility and motorway facilities and along streets. The planting strategies would be developed with a view to complementing the existing historic streetscape plantings where relevant, with particular focus on Martin Street, Walker Avenue and Northcote Streets
- The photographic archival recording of the affected areas of the Haberfield HCA would include the streetscapes affected by the demolition of individual buildings.

In response to issues raised by the NSW Heritage Council and other stakeholders in relation to heritage and urban design, an independent urban design review panel would be established for the detailed design phase of the project. The panel would review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist would also be included on the panel.

Issue description – project disregards heritage laws held by council

Submissions object to the project demolishing heritage items and buildings within the conservation area when residents have so little flexibility when it comes to making external changes to their properties. Council has previously discussed the desirability of heritage buildings, how can this project disregard heritage laws?

Response

The approval process for works undertaken by private landowners to locally listed heritage items is defined by the relevant local environmental plans (LEP).

The project is critical State significant infrastructure. As noted in section 2.2.2 of the EIS (and in accordance with Section 115ZF(2) of the EP&A Act), environmental planning instruments do not apply to or in respect of State significant infrastructure. However, the NSW Minister for Planning may take into account the provisions of relevant local environment plans when deciding whether to approve a project. Locally significant heritage items and HCAs are listed through the local council's local environmental plan. The project does not impact on any listed State heritage items or areas.

Haberfield HCA area is listed as a local heritage item under the Ashfield LEP 2013. In Appendix S Non Aboriginal Heritage Assessment of the EIS, the Haberfield HCA is noted as an area that has been previously considered for listing on the State Heritage Register and as having potential state significance.

Potential adverse impacts associated with the project have been fully assessed and strategies to avoid, minimise and mitigate those impacts have been an integral part of the project development process. These impacts would be minimised through the development and implementation of construction environmental management plans and planning of the construction schedule and methodologies.

Issue description – degradation of important heritage sites

Submissions raised concern that the impacts to heritage are enormous and the project would negatively impact on and degrade some of Sydney's most important heritage sites. Heritage areas should be retained.

Response

Impacts to built heritage, heritage landscapes and historical archaeological sites would, to the greatest extent practicable, be avoided and minimised. During the development of the project design, one of the key objectives was to minimise impacts on heritage items. This has been achieved in a number of locations where the preferred design was amended to avoid impacts. For example, during project development, options were considered that would have resulted in major adverse impacts on Ashfield Park. Due to these impacts, these project options were not selected as the preferred project.

Where impacts are unavoidable, works would be undertaken in accordance with the strategy outlined in the construction heritage management plan. 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.

Issue description – impact of noise barrier design on heritage

Concerns were raised that information on the design (height, width, materials) of the noise barrier located south of Wattle Street (between Parramatta Road and Waratah Street) has not been included in the EIS. This information is required in order to assess how the noise barriers would impact on the Haberfield HCA.

Response

Section 19.3 and Appendix S of the EIS provide an assessment of the impacts on heritage resulting from the project including the installation of noise walls within the Haberfield area.

The EIS recognises that the project would impact on heritage. Potential impacts on HCAs in Area 4 (Haberfield and Ashfield) are summarised in Table 19.26 of the EIS. The assessment notes that noise barriers (up to five metres high along the south eastern side of Wattle Street) would be visible over the back fences of the retained properties along Walker Street and would have an adverse impact on their setting.

As specified by the management measures, the design of noise walls would be further developed during detailed design, to ensure that the urban design and landscape objectives of the project are met. Walls would be designed to minimise visual impacts on adjacent properties and where possible to be consistent with the surrounding landscape. The use of vegetation to provide a visual screening to any noise walls would also be considered. The project, from an urban design viewpoint, aims to integrate any new infrastructure into the environment to which it is located.

Issue description – demolition of properties listed with the National Trust

Submissions raised concerns that the following properties that are part of four semi-detached properties built in 1916 would be impacted. These properties are listed with the National Trust:

- 148 Ramsay Street
- 152 Ramsay Street.

Response

As outlined in Table 19.25 in section 19.3.2 of the EIS, demolition of neighbouring dwellings at 156 to 164 Ramsay Street would disturb the existing rhythm of the semi-detached and freestanding bungalows on the south western side of Ramsay Street, including 148 and 152 Ramsay Street. However, 148 and 152 Ramsay Street would not be demolished. The assessment notes that the project would have a moderate adverse effect on the setting of these buildings, and there would be potential vibration impacts.

Section 19.4 of the EIS outlines management measures that would be implemented to mitigate heritage impacts, including:

- Where practical, heritage specialists (built and landscape heritage and historical archaeology) and urban designers would provide input into the detailed design and documentation phase to assist in identifying opportunities to enhance the conservation options for heritage items and archaeological sites and ensure adverse impacts are avoided or minimised. This would include, but not be limited to, the alignment and design of noise barriers to avoid or minimise impacts on heritage items
- New structures would be of a high quality, sympathetic design to minimise visual impacts on the setting of heritage buildings and landscapes taking into account a range of design considerations.

5.18.3 Potential indirect impacts

14 submissions raised issues regarding potential indirect impacts.

Issue description – proposed tunnels are located beneath fragile homes

Submissions objected to the tunnels being located underneath homes. Many buildings in the inner west areas of Burwood and Croydon comprise older style federation homes and are fragile. These houses are being put at risk of damage to their stability if a tunnel is constructed underneath.

Concerns were raised regarding potential damage to the condition, appearance and structural integrity of non-acquired homes within the Haberfield HCA due to vibration, settlement and noise impacts.

Concern was raised regarding the construction of a tunnel beneath 142 Alt Street at Haberfield. This property is known as 'Louisa Cottage' and was built in 1888. It is the oldest house in Alt Street and one of the oldest houses in Haberfield, and predates Richard Stanton's Garden Suburb of Haberfield.

Response

A preliminary ground movement investigation has been undertaken and is summarised in Chapter 18 and Appendix R of the EIS. The investigation indicates that there may be potential settlement of up to 50 millimetres at the mainline tunnels in the vicinity of Dobroyd Canal (Iron Cove Creek) and the eastern ventilation facility, and the risk category has been assessed as slight to moderate. In the vicinity of the Concord Road interchange cut-and-cover tunnel structure, there may be potential settlement of up to 25 millimetres, and the risk category has been assessed as slight. Elsewhere, the risk category has been assessed as negligible to very slight.

This indicates that ground movement is generally likely to result in cosmetic damage only. For the majority of properties, the anticipated impacts are negligible, typically resulting in hairline cracking only. For a limited number of properties, as described in Table 18.4 of the EIS, ground movement may result in cracking of up to 15 millimetres.

These results are preliminary and do not take into account the specifics of individual buildings or heritage buildings. Further assessments would be undertaken during detailed design to determine the level of potential impact on structures and to identify feasible and reasonable management measures required to minimise potential ground movement impacts and make good identified impacts.

An assessment of noise and vibration effects on heritage buildings was provided in Chapter 10 of the EIS. This assessment concluded that 11 heritage listed buildings would be located within the safe working distance for structurally unsound buildings. Of these, ten are masonry constructions which are not likely to be structurally unsound; however, one timber building could be potentially structurally unsound.

The construction type and structural integrity of all the listed heritage buildings would be investigated during detailed design by a suitably qualified structural engineer. This information would be used to verify the applicable vibration criteria and associated impacts. At locations where the predicted and/or measured vibration levels are greater than the nominated screening levels, a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be required to determine the applicable safe vibration level.

Issue description – concern residual land will be over-developed

Concerns were raised that following construction, residual land in Haberfield would be transferred to UrbanGrowth NSW for development such as high-rise or densification as permitted along a motorway. There would be no protection against inappropriate development further impacting the conservation area.

Response

As outlined in section 12.3.1 of the EIS, all residual land would remain in the ownership of Roads and Maritime, until a decision is made about the future use of this land. Roads and Maritime would consult with the relevant councils about the future development potential of residual land. Once the future use is determined, land would be sold to allow development for its future land use.

The artist impressions shown within the EIS are indicative and were based on the preferred design on which the EIS was based. The green areas shown in these impressions are the residual areas discussed in Table 12.9 in the EIS. For the purposes of the impressions, these areas have been shown as green areas, however as outlined in section 12.3.1 of the EIS, Roads and Maritime would investigate the use of any residual land. Use of this land could include redevelopment in line with the local planning provisions or return of land to the local council for open space.

Roads and Maritime and SMC would consider the future use of residual land during detailed design and construction, in consultation with the relevant councils.

Issue description – large truck movements through heritage precincts

A submission opposed motorway proposals which promote increased large truck movements through urban precincts, particularly those with heritage significance.

Response

Table 6.19 in Chapter 6 of the EIS describes indicative access routes to and from construction ancillary facilities and Figures 6.9 to 6.18 of the EIS show the location of access points. **Section 6.1** (Clarifications) of this report provides further clarification on the construction ancillary facilities, and describes some minor refinements to the layout and access points at these facilities.

With the exception of Underwood Road, Short Street East and Powell Street at Homebush, part of Walker Avenue at Haberfield, and part of Bland Street at Ashfield, heavy vehicles would only use main, arterial roads such as the existing M4, Parramatta Road and Wattle Street. It is not intended that heavy vehicles would use the streets identified in the submissions during operation of the construction ancillary facility sites. Notwithstanding this, during initial demolition and site establishment for all ten construction ancillary facilities, construction vehicles (both light and heavy vehicles) may potentially use all existing and proposed site entries and exits, and may use local roads to access these entries and exits. This would be temporary only, and once the construction ancillary facilities are operating, vehicle access points would be as shown on **Figure 6.1** to **Figure 6.9** in **Chapter 6** (Clarifications) of this report.

As outlined in section 6.10 of Appendix S of the EIS, heritage items and Heritage Conservation Areas above the proposed tunnels and in the vicinity of construction works may be subject to vibration impacts. Vibration could affect the condition of heritage fabric through cracking and settlement; and in the worst case scenario compromise a heritage item's structural integrity.

Potential vibration impacts would be managed in accordance with the management measures in **Chapter 8** (Revised environmental management measures) of this report.

5.19 Biodiversity

5.19.1 Vegetation clearing

762 submissions raised issues regarding vegetation clearing.

Issue description – vegetation clearing

Concerns were raised regarding the adequacy of the biodiversity impact assessment, including a number of matters related to vegetation clearing. Submissions noted that the project would result in the loss of some of the last bushland remnants in inner west and south west Sydney, including many well established and old trees. Vegetation clearing in parkland including Reg Coady Reserve and Cintra Park was also highlighted as a concern.

It was argued that clearing of street and garden trees was not adequately valued as habitat, accounted for in clearing calculations or mapped in the EIS. Submissions argued that the identification of 83 flora species indicated that this work was completed and should have been presented in the EIS. It was argued the proposed clearing conflicted with project objectives and was not presented in the context of clearing and loss of open space for the whole of WestConnex.

Response

Roads and Maritime is seeking approval for the project under Part 5.1 of the EP&A Act. The EIS, including the biodiversity impact assessment in Appendix T, has been prepared in accordance with Secretary's Environmental Assessment Requirements, or SEARs, prepared by the Secretary of DP&E and under the relevant provisions of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (NSW). The EIS was reviewed by the NSW Department of Planning and Environment for adequacy with regard to the SEARs prior to public exhibition.

Chapter 20 and Appendix T of the EIS discuss the biodiversity impacts associated with the project. The project is located in a highly urbanised environment and much of the project would be tunnelled under existing roads and residential areas. No intact, remnant native vegetation communities are present in the project footprint or immediately adjacent to the study area.

Section 6.3 of the Biodiversity Impact Assessment in Appendix T of the EIS acknowledges that the WestConnex projects and other developments would result in the further loss of habitat, including removal of mainly planted vegetation and associated fauna habitats. The project is unlikely to have any significant cumulative impact on these species given the above and proposed replanting that will create similar stepping stone habitat and foraging opportunity to what is there now.

Section 26.4.7 considers the cumulative biodiversity impacts of WestConnex. Cumulative impacts of the M4 East and M4 Widening projects are described as these projects directly adjoin each other. The M4 Widening EIS identifies that the project would impact up to 9.32 hectares of planted and remnant vegetation in various condition states. This includes impacts on up to 0.52 hectares of threatened ecological communities (remnant vegetation) and 8.55 hectares of planted vegetation and 0.39 hectares of drainage lines. For the M4 East project, a total of 12.9 hectares of planted and screening vegetation and 2.8 hectares of grassland with scattered trees would be removed. No native vegetation communities would be impacted. The two projects combined would impact about 24.77 hectares of vegetation, the majority of which (around 21.45 hectares) is planted. While the two projects would remove vegetation that is habitat for fauna, this would be a small proportion of the available habitat in the locality of both projects (as defined by a 10 kilometre radius).

Cumulative impacts would increase the impacts on common fauna and flora species, as well as threatened species such as the Grey-headed Flying-fox and the Eastern Bentwing Bat. As described above, large areas of foraging habitat for these species would remain in the locality, and thus the cumulative impacts are not likely to be substantial.

WestConnex projects such as the King Georges Road Interchange Upgrade, New M5 and the future M4-M5 Link would result in removal of planted vegetation and fauna habitats. The New M5 EIS identifies that the project would impact on around 10.76 hectares of vegetation, including 3.31 hectares of native vegetation and 7.45 hectares of urban native and exotic vegetation. The project would impact on Cooks River Castlereagh Ironbark Forest and Green and Golden Bell Frog habitat. Neither of these are issues for the M4 East 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 limited natural biodiversity value. Cumulative impacts to biodiversity are therefore unlikely to be significant.

Assessment of cumulative impacts with the M4-M5 Link project is not possible at this stage, as the project is still in the early preliminary design phase and an EIS has not yet been prepared. As described in the M4 East EIS, the tunnel stubs, ramps, ventilation outlet and ancillary facilities for the western end of the M4-M5 Link would be constructed as part of the M4 East project, which would minimise the need to undertake further works in the Haberfield Heritage Conservation Area.

As stated in section 20.3.1 of the EIS, these totals and maps did reflect scattered trees located in private gardens and some street trees that would also be cleared. As stated in section 20.2.2 of the EIS, the 83 identified flora species was not reflective of all vegetation on private properties due to limited access – aside from some visual classification undertaken from public viewpoints. However, the key finding of the biodiversity assessment with regard to all clearing was that the project would only impact on highly modified areas that provide limited habitat for biodiversity values.

Given the above considerations, there are likely to be only minor residual impacts on the natural environment and a formal biodiversity offset is not necessary. On the basis of the assessments undertaken, the project is not likely to result in a significant impact on any matter of national environmental significance.

It was identified in the assessment that screening vegetation, vacant land, urban parks and gardens within the project footprint contain planted trees and shrubs, garden beds and mown lawns that provide some habitat resources for native fauna. Planted trees and shrubs are present as street plantings and screening along the existing M4 and associated on and off ramps. Planted trees include a range of locally endemic, native Australian and exotic trees. Planted and screening vegetation and parks provide limited connectivity for fauna. Mobile species such as birds and bats would use patches of vegetation as ‘stepping stones’ for movement across the urban landscape.

Habitats in the study area are already highly fragmented and these fragments provide stepping stones for highly mobile species. Vegetation is planted and does not have the structural or floristic complexity to provide refuge for most species. Riparian linkages would remain and proposed landscaping within the project area provides an opportunity to replace fauna habitat and provide for fauna movement.

There was no access to private property and only dominant species visible from public land were identified in residential areas. The full number of species that occur within the study area is therefore likely to be greater than the number presented within this assessment. Notwithstanding, the assessment acknowledged that residential gardens in the study area provide limited habitat for fauna species.

Areas that were surveyed as part of the assessment (eg parks and publicly accessible land) are likely to have increased biodiversity values that what would be contained in residential gardens given their location in a highly urbanised environment. The project would not significantly affect the persistence of common species or their existing use of the area with respect to movement or habitat loss given the points discussed above. The vegetation to be removed was planted and would be replaced with similar planted vegetation.

Issue description – replacement planting

Submissions raised concerns regarding the protection of the environmental landscape, particularly the selection of vegetation to replace mature trees proposed to be cleared. Submissions requested consultation with the local community regarding protection of the environmental landscape during construction and its return after construction (0514, 2435).

Response

Section 6.3.2 of the Urban Design, Landscape Character and Visual Impact Assessment in Appendix L of the EIS describes the planting parameters for the project. The size, type, numbers and densities of proposed trees and landscape planting would be refined during detailed design to foster robust, rapid growth and canopy closure for shade and screening. The approach to planting would consider:

- Integration with local setting – the design maintains and enhances existing landscape character and vegetation patterns
- Ecologically sound – the design proposes to use local species from existing and adjoining plant communities and assists in protecting and recovering local biodiversity
- Add character and value – the design intends to draw upon the existing landscape patterns.

The design approach is consistent with the objectives of the *Draft WestConnex Motorway Urban Design Framework* (Roads and Maritime 2013a) and Roads and Maritime design guidelines. The application of a planting palette derived from Cumberland Plain Woodland species would be appropriate for those areas of natural plantings where it may be possible to re-establish endemic plant communities, but may not be appropriate in all areas, for example existing residential areas characterised by 'cultural plantings' in and around residential neighbourhoods. The suitability of the species mix would be further considered as part of detailed design.

As identified in the EIS and management measures in **Chapter 8** (Revised environmental management measures) of this report, an urban design and landscape plan would be prepared for the project to present an integrated landscape and design. This plan would be prepared in consultation with relevant councils and the community.

5.19.2 Impacts to endangered ecological species and communities

667 submissions raised issued regarding impacts to endangered ecological species and communities.

Issue description – threatened species

Concerns were raised regarding the adequacy the biodiversity impact assessment, including a number of matters related to endangered species and communities. Particular matters included:

- Lack of detail in site surveys including duration and seasonality to identify all relevant species
- Potential impacts to the Grey-headed Flying fox
- Potential impacts to microbats such as the Eastern Bentwing Bat and Large-footed Myotis
- Potential impacts to Cooks River Castlereagh Ironbark Forest
- Potential impacts to Cooks River Clay Plain Scrub Forest
- Potential impacts to the Green and Golden Bell Frog.

Response

Chapter 20 and Appendix T of the EIS discuss the biodiversity impacts associated with the project, while survey effort specifically is discussed in section 4.2.4 of Appendix T of the EIS.

Field surveys were conducted with reference to the *Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities* (DEC 2004). The surveys were undertaken during February and May 2014 and March 2015. Given the short duration of the survey period, it is likely that some species that utilise the study area (permanently, seasonally or transiently) were not detected. These species may include flora species that flower after rainfall as well as annual, ephemeral or cryptic species; and fauna species that are mobile and transient in their use of resources. The habitat assessment conducted for the site allows for identification of habitat resources for such species. The survey was not designed to detect all species, rather to provide an overall assessment of the ecological values in the study area in order to predict potential impacts of the project, with particular emphasis on threatened biota and their habitats.

Survey effort was appropriate for the nature and context of the habitats that would be affected (planted vegetation, cleared and grassed parks and gardens). Dedicated and targeted surveys such as trapping were not warranted. Instead, the fauna surveys focused on habitat assessment to identify specific resources of potential value for more mobile threatened biota species (such as the Grey-headed Flying-fox and microchiropteran bats) capable of accessing and using small, isolated patches of vegetation within urban landscapes.

The project site is located within a highly modified, urban landscape and there are no stands of intact native vegetation within the study area. Vegetation is limited to small stands of planted roadside vegetation, and within parks and gardens which provide habitat for mobile, common fauna typical of urban environments. The study area does not contain habitat of relevance to the vast majority of threatened biota previously recorded or predicted to occur in the locality.

Vegetation to be removed comprises foraging habitat for two threatened fauna species (Grey-headed Flying-Fox and Eastern Bentwing-bat). However, the assessment concluded that no threatened flora or fauna are likely to be significantly impacted by the project. As stated in section 5.5.3 in the Biodiversity Impact Assessment in Appendix T of the EIS, this habitat represented only a very small proportion of foraging resources in the locality.

The M4 East project would not impact on Cooks River Castlereagh Ironbark Forest, Cooks River Clay Plain Scrub Forest or Green and Golden Bell Frog habitat at Kogarah Golf Club in Arncliffe, as these areas are located well beyond the project footprint.

Biodiversity management measures are summarised in section 20.6 of the EIS (and **Chapter 8** (Revised environmental management measures) of this report). Measures include:

- A pre-clearing survey would be carried out to identify any habitat trees or other features that require the presence of an appropriately qualified fauna handler during clearing
- An appropriately qualified fauna handler would be present during removal of habitat trees identified during pre-clearing surveys to guide clearing activities and undertake rescue and relocation of fauna
- Landscaping should incorporate planting of Grey-headed Flying-fox feed trees where feasible.

On the basis of the assessments undertaken, the project is not likely to result in a significant impact on any matter of national environmental significance, including threatened species.

As identified in section 2.3.2 of the EIS, under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act), proposed 'actions' that have the potential to have a significant impact on matters of national environmental significance or on the environment of Commonwealth land, or that are being carried out by a Commonwealth agency, must be referred to the Australian Government. If the Australian Government Minister for the Environment determines that a referred project is a 'controlled action', the approval of that Minister would be required for the project, in addition to the approval of the NSW Minister for Planning.

As discussed in Chapter 20 (Biodiversity) of the EIS, the project is not likely to result in a significant impact on any matter of national environmental significance under the EPBC Act, including threatened and migratory species, or Commonwealth land. Accordingly, the project has not been referred to the Australian Government Department of the Environment for further assessment or approval under the EPBC Act.

None of the issues raised in the submissions received change this assessment.

Issue description – habitat critical to the survival of Grey-headed Flying fox

Concerns were raised regarding the use of the category of habitat critical to the survival of Grey-headed Flying fox with regard to clearing proposed for the project. Submissions argued that this category of habitat had not yet been defined or officially endorsed for this species.

Response

Habitat critical to the survival of the Grey-headed Flying-fox is defined in the draft recovery plan for the species (DECCW 2009) as natural foraging habitat that is:

- Productive during winter and spring, when food bottlenecks have been identified
- Known to support populations of more than 30,000 individuals within a 50 kilometre radius
- Productive during the weeks of birth, lactation and conception and final weeks of gestation
- Productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes

- Known to be continuously occupied as a camp site.

Critical habitat is discussed in detail in the assessments of significance prepared for this species against the provisions of the *Threatened Species Conservation Act 1995* (NSW) and *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) in Appendix D and E of the Biodiversity Impact Assessment in Appendix T of the EIS.

No intact native vegetation communities are present in the project footprint. Planted trees are likely to contribute to the available foraging habitat for the Grey-headed Flying fox but comprise only a very small component of foraging resources in the locality, including that within 50 kilometres of the nearest camp and would therefore not constitute habitat critical to the survival of a local population of the species.

Issue description – migratory birds

Concerns were raised regarding the potential impacts of the project on migratory birds and habitat.

Response

Construction of the project would occur about 500 metres from the Mason Park Wetlands. Migratory birds need to cross the large Sydney metropolitan area to access these wetlands. Construction activity at some distance from the occupied habitat is unlikely to affect their use of the area. Indirect impacts on migratory birds were discussed in sections 6.1.2 and 6.7.3 of the biodiversity impact assessment in Appendix T of the EIS. The project is unlikely to have a significant impact on migratory wetland birds as:

- No important habitat for migratory birds would be directly impacted
- There would be no direct mortality of birds as a result of the project
- Indirect impacts on wetland habitat are unlikely, given the distance of the wetland from the project, and the limited hydrological interaction between the wetland and Powells Creek
- The project is unlikely to disrupt the breeding cycle of an ecologically significant proportion of the population of any migratory species
- The project is unlikely to lead to degradation or increased disturbance of habitat at Mason Park Wetland such that there would be a substantial reduction in migratory shorebirds using the wetland.

5.19.3 Impacts on aquatic environment and groundwater dependent ecosystems

261 submissions raised issues regarding potential impacts on the aquatic environment and groundwater dependent ecosystems.

Issue description – aquatic and groundwater dependent ecosystems

Submissions raised concerns regarding the adequacy of the biodiversity impact assessment, including a number of matters related to aquatic environment and groundwater dependent ecosystems. Concerns were raised regarding the potential for surface water or groundwater contamination in the event of leaks, spills, discharge of treated groundwater, release of water from sediment basins and settlement of airborne particles.

Response

No natural creek lines occur in the study area; all creeks occur as concrete canals. Sydney Water Corporation proposes to naturalise the banks of Powells Creek in the future, although this is unlikely to occur prior to the construction of the project. Any construction works in the vicinity of canals would involve the construction of culverts or bridges similar to those currently present. No canals would be realigned. There would be no impact on fish passage or large woody debris.

Some limited planted riparian vegetation is present above the concrete-sided canals. This planted vegetation does not contribute to the health of the canals as it is located above the concrete edges.

Some planted vegetation would be removed from adjacent to Saleyards Creek where it is crossed by the existing M4 and from the Powells Creek civil site adjacent to Powells Creek. There would be very limited clearing of planted trees from the Cintra Park civil site adjacent to St Lukes Park canal and from Reg Coady Reserve adjacent to Dobroyd Canal (Iron Cove Creek). There would be no direct impact as a result of the project at or near Barnwell Park Canal.

The limited removal of planted vegetation at these locations would have a negligible impact on the ecological value of riparian corridors, given that this vegetation is planted above the concrete sides of the canals and does not contribute to the health of water quality of the creeks. The loss of small areas of vegetation at Saleyards Creek and Powells Creek would not impact the movement of mobile fauna along the riparian corridor.

Impacts on groundwater dependent ecosystems are described in section 20.3.2 of the EIS. No groundwater dependent ecosystems are present within or immediately adjacent to the project footprint. Coastal Saltmarsh located in the Mason Park wetland is mainly reliant on seawater, but is also likely to be reliant on groundwater for ecological processes. Mason Park wetland is located about 500 metres north of the project footprint. There would be no tunnelling under or in the immediate vicinity of the wetland. As such, the project is unlikely to impact any groundwater dependent ecosystems.

Appropriate management measures would be implemented during construction and operation to minimise the potential for surface water or groundwater contamination. These are discussed in **sections 5.14** and **5.17** of this report.

Issue description – cumulative impacts on wetlands

Concerns were also raised regarding potential cumulative impacts of WestConnex on wetlands. The Gateway to the South project was also raised as potentially adding to these impacts.

Response

The project would not directly impact wetland ecosystems. As stated in section 15.2.3 of the EIS, the nearest wetlands to the project are the Mason Park wetland and Homebush Bay wetland, including the Badu Mangrove area. The project has the potential to indirectly impact these wetlands through surface water contamination and/or groundwater drawdown. The main channels for surface water flows between the project and these wetlands are Powells Creek and Saleyards Creek. Both creeks have highly modified and urbanised riparian areas.

Section 15.5 of the EIS identifies that potential impacts to surface water quality would be managed with a range of standard controls and project design features, including a surface water quality monitoring program.

Sydney Water are in the process of designing naturalising works in Powells Creek that would likely improve water surface water quality. These wetlands are not considered groundwater dependent (refer to section 18.2.4 of the EIS). The potential impacts of the project on wetland ecosystems are therefore considered to be limited. Potential for cumulative impacts is likewise limited; however the potential impacts of WestConnex and Gateway to the South would be subject to separate assessment and approval processes.

5.19.4 Indirect and other impacts

Five submissions raised issues regarding indirect and other impacts.

Issue description – indirect impacts to vegetation

Concerns were raised regarding groundwater level, soil salinity and associated impacts to vegetation.

Response

Section 18.4.6 of the EIS describes the potential impacts to groundwater from an increase in salinity. Groundwater modelling indicates that saline groundwater is likely to underlie fresh groundwater throughout the project footprint.

Shallow groundwater and soil salinity can be increased by raising the water table to the point where groundwater can be evaporated, concentrating the natural salts in the evaporation zone until the pore water becomes saline. The water table is typically raised by increasing recharge due to:

- Clearing vegetation so that evapotranspiration decreases and hence groundwater recharge increases (dryland salinity)
- Increasing recharge through excessive irrigation (irrigation salinity).

The tunnel would not cause either of these and drainage would lower the water table, reducing the risk of soil salinity. Shallow water table elevation can also occur where structures, such as wall foundations or backfilled trenches, block off shallow aquifers and 'dam' groundwater flow. Deep groundwater salinity increase can occur through drawing in seawater (seawater intrusion). This has been identified as a risk in the Hawkesbury Sandstone aquifer in near-coastal areas.

Water levels in the uppermost formations below the site are modelled to drop about 30 metres over the life of the tunnel, with the greatest drop occurring after approximately 2050. This would only affect vegetation relying on groundwater rather than soil moisture. It is highly unlikely to affect general garden vegetation but could affect large trees, if they rely on groundwater. During detailed design, the contractor would assess trees that would be impacted by the project.

Issue description – assessment of WestConnex

Concerns were raised that the Biodiversity Impact Assessment did not consider the cumulative impacts of the project in combination with other WestConnex projects.

Response

Section 26.4 of the EIS considered cumulative impacts with other WestConnex projects. The cumulative impact assessment found that potential biodiversity impacts would be limited in extent due to the highly modified and fragmented nature of potentially affected ecosystems. Further discussion on the cumulative impacts of WestConnex on biodiversity is in **section 5.19.1**.

The assessment of WestConnex within the EIS broadly is discussed in **section 5.1** of this report, while the cumulative impacts of the project in combination with other major projects is discussed in **section 5.25** of this report.

5.19.5 Biodiversity management

16 submissions raised issues regarding management of potential biodiversity impacts.

Issue description – requirement for a formal offset package

Concerns were raised that a formal offset package would not be required.

Response

As outlined in section 20.1.5 of the EIS and section 4.1.2 of the biodiversity impact assessment in Appendix T of the EIS, no intact native remnant vegetation is present in the project footprint and the project would not remove any habitat for 'species' credit species. Therefore the *Framework for Biodiversity Assessment* (Office of Environment and Heritage 2014) is not applicable to this project and offsets cannot be calculated.

As described in section 7.3 of the Biodiversity Impact Assessment in Appendix T of the EIS, impacts on biodiversity would generally be avoided as no native vegetation communities would be removed and impacts would be restricted to the removal of planted vegetation. Landscaping would include planting of trees and shrubs where possible, including along the proposed on- and off-ramps, the Concord Road interchange, and the Parramatta Road interchange. This would create new stepping stone habitats along the project footprint. Landscaping would also incorporate the planting of tree species to provide foraging habitat for birds and in particular for the Grey-headed Flying-fox.

Open space utilised by the project during both construction and operation would include:

- Bill Boyce Reserve for the establishment of Pomeroy Street civil site (C2)

- Part of Arnotts Reserve near the corner of Station Street and Parramatta Road for the establishment of Powells Creek civil site (C4) and permanent operational infrastructure associated with Powells Creek on-ramp
- Cintra Park hockey field for the establishment of Cintra Park tunnel site (C6) and permanent operational infrastructure including a water treatment facility and electrical substation
- Part of Reg Coady Reserve for the establishment of Wattle Street and Walker Avenue Civil Site (C9) and the widening of Wattle Street.

Bill Boyce Reserve, the majority of Arnotts Reserve, the majority of Cintra Park and part of Reg Coady Reserve would be returned to the relevant councils for use as open space following construction. The acquisition or lease of public land is discussed further in **section 5.11.1** of this report.

5.20 Greenhouse gas

5.20.1 Construction greenhouse gas emissions

9 submissions raised issues concerning construction greenhouse gas (GHG) emissions.

Issue description – emissions resulting from construction of the project

Concern was raised regarding the greenhouse emissions resulting from construction of the project and in particular the large concrete requirement.

Response

As stated in section 23.3.1 of the EIS, significant quantities of materials (including concrete) would be required for the construction of the project. Construction resource requirements for the project are typical for a tunnelling project of this scale. Unnecessary resource consumption would be avoided by making realistic predictions on the required quantities of resources, such as construction materials.

Section 21.3 of the EIS provides an assessment of the construction activities resulting in potential GHG. The use of concrete would contribute significantly to emissions. The high proportions of emissions associated with this material is attributed not only to the quantity required for the construction of the project, but also the emissions-intensive processes involved in the extraction and production of these materials. Table 21.2 of the EIS summarises the emission results from construction materials. Findings estimate concrete being the source of 39.5 per cent of the total construction emissions.

5.20.2 Operational greenhouse gas emissions

271 submissions raised issues concerning operational GHG emissions.

Issue description – operational emissions

Concerns were raised about the volume of GHG emissions caused or facilitated by the project. The submissions argued that development should be geared toward minimising or reducing GHG emissions, and raised concerns that the project would accelerate global warming.

Response

An assessment of greenhouse gas emissions as a result of the project is included in Chapter 21 and Appendix U of the EIS. The project would result in the generation of GHG emissions during construction, operation and use of the project, however, the assessment identified that project emissions would be less than those for the 'do minimum' (without project) scenario of the existing roads under future conditions.

The Australian Government recently announced it is committed to a target of reducing GHG emissions by 26 to 28 per cent below 2005 levels by 2030, building on its previous target of five per cent below 2000 emission levels by 2020, irrespective of what other countries do. The Government has submitted this new target to the UNFCC as its intended nationally determined contribution to the proposed new agreement to be negotiated at United Nations Climate Change Summit in Paris in December 2015.

The *NSW Long Term Transport Master Plan* (Transport for NSW 2012) (Transport Master Plan) includes an objective to:

> *'Improve sustainability – by maintaining and optimizing the use of the transport network, easing congestion, growing the proportion of travel by sustainable modes such as public transport, walking and cycling, and becoming more energy efficient.'*

An action of the Transport Master Plan is also to:

> *'continue to explore opportunities to reduce vehicle emissions, improve air quality and lower GHG emissions from the NSW transport sector.'*

The results of the GHG assessment demonstrate the benefits of road tunnel usage in urban areas, where travel along a more direct route at a higher average speed results in fewer GHG emissions being generated by road users, as reduced congestion and stop-start driving reduces the fuel used by vehicles. The assessment results indicate the project would reduce annual GHG emissions by around 56,800 t CO2-e in 2021 and around 45,400 t CO2-e in 2031. The predicted reduction in GHG emissions as a result of the project is due to an improvement in vehicle fuel efficiency for most sections of Parramatta Road as well as the operational efficiency of the project tunnels.

This project would also enable improvements to public transport on Parramatta Road, including provision of kerbside bus lanes between Burwood Road at Burwood/Concord and Chandos Street at Ashfield/Haberfield at project opening, and the possible future provision of rapid public transport services along Parramatta Road. Any public transport improvements would be subject to separate assessment and approval as required.

In addition, as described in **Chapter 8** (Revised environmental management measures) of this report, the following management measures would apply to the project:

- The preparation of an energy efficiency and GHG emissions strategy for the project
- A minimum of six per cent of the project's estimated electricity consumption will be sourced from a renewable energy source or GreenPower
- The tunnel will 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
- A life cycle assessment will 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
- Low carbon energy generation options will be investigated as part of the design process in order to reduce the demand on mains electricity and generate renewable energy onsite, where feasible.

Issue description – fuel efficiency

Submissions criticised the assertion in the EIS that improvements to traffic flow would improve fuel efficiency of trips and thereby reduce emissions. Submissions argue that emissions are affected by vehicle kilometres travelled. It was therefore argued that the project could not decrease GHG emissions while increasing vehicle kilometres travelled.

Response

The methodology for the GHG assessment in the Appendix U of the EIS was based on relevant GHG reporting legislation and international reporting guidelines, as described in section 21.1 of the assessment.

Table 21.4 in Chapter 21 of the EIS provides results for the total operational emissions, including those for the 'do something/with project' 2031 scenario, which includes completion of all sections of WestConnex as identified in Section 21.4.2 of the EIS:

Higher fuel consumption and higher GHG emissions are produced through the frequent acceleration and deceleration associated with stop/start movements on existing roads, which are compounded by issues of congestion. Higher average speeds maintained on a motorway, with less acceleration and deceleration, results in reduced fuel consumption and therefore reduced emissions.

The influence of average speed, as a contributing factor of vehicle fuel consumption, is recognised by both national and international transport authorities. The methodology used to calculate fuel consumption is sourced from Austroads *Guide to Project Evaluation Part 4*, 3rd edition (2008). Austroads is the association of road transport and traffic agencies and guideline documents published by Austroads are used to inform the design, construction, maintenance and operation of the road network in Australia and New Zealand. The fuel consumption relationship and model coefficients provided by Austroads are a factor of average vehicle speed.

One of the key findings of the Organisation for Economic Co-operation and Development and International Transport Forum Working Group on Transport GHG Emissions Reduction Strategies (Reducing Transport Greenhouse Gas Emissions: Opportunities and Costs, 2009) is that:

> *"Better traffic management has the potential to deliver significant CO2 reductions, reducing the incidence of stop-go traffic and discouraging excessive speed. Freeing capacity through traffic management will induce additional traffic in many circumstances, but even when overall travel increases, emissions may still be less than before if operating speeds are more efficient."*

Efficiencies included in the design of the project, such as straightening of the alignment to reduce the length of the tunnel (kilometres travelled) and large radius curves within the tunnel in order to allow consistent vehicle speeds to be maintained and reduce the need for vehicles to slow down on the approach to corners, would allow for reductions in fuel consumption of vehicles. These efficiencies result in lower GHG emissions compared with the 'do minimum/without project' scenario of existing roads under future traffic conditions.

Issue description – traffic model

Concerns were raised that, as the traffic data is questionable, how can assessments based on the traffic modelling, such as GHG emissions be relied upon.

Response

Section 5.5.7 of this report provides a response to adequacy of the methodology for the traffic forecasts and modelling. The traffic and transport assessment for the project utilised an industry standard strategic transport model administered by Roads and Maritime. An integral part of the traffic modelling process was the involvement of independent expert peer reviewers to examine model development, traffic forecasts and associated methodologies. It is therefore considered that the traffic model comprised the best available input for calculating GHG emissions from vehicles.

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 urban heat island effect is considered to result from the replacement of natural surfaces, including the vegetation canopy, by hard surfaces and the narrow arrangement of buildings in urban areas which absorbs radiation and inhibits atmospheric cooling. It is considered to have negative effects on human health, plants, and animals in particular with regard to increased temperatures.

The majority of the project is subterranean or involves replacing existing hard surfaces with new hard surfaces. While the project would remove 12.9 hectares of planted trees and screening vegetation (mainly along the M4), and about 2.8 hectares of grassland with scattered trees (eg Cintra Park and Reg Coady Reserve), 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 scattered planted trees and landscaped gardens and would provide only a very localised benefit to residents directly adjacent to the vegetation. Proposed landscaping would replace some of the planted vegetation that would be lost, which would help to offset any impact.

Issue description – inadequate mitigation

Concerns were raised that the project did not include sufficient mitigation. The Intergenerational Panel on Climate Change (2010) was cited, noting that aggressive and sustained mitigation would be required to control increases in transport emissions.

Response

The project includes a number of initiatives to reduce construction and operational GHG emissions, such as:

- The contractor would prepare an Energy Efficiency and GHG Emissions Strategy during detailed design
- The project would seek to minimise operational energy demand through ventilation and lighting strategies. This could include the use of low maintenance, high efficiency LED lighting
- The project aims to source six per cent of its energy from renewable energy generated onsite and/or accredited GreenPower
- 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 has been provided in in the Chapter 21 of the EIS
- The mainline tunnels would be designed to minimise vehicle fuel use in operation
- The mainline tunnel alignment has been optimised to reduce the tunnel length.

While rail and public transport do 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 area and not easily accessed by public transport. In addition, public transport alone cannot provide sufficient point-to-point access to the diverse range of employment and educational hubs, shopping centres or recreational centres, nor can it provide for the safe and efficient delivery of goods and services to Sydney's growing population.

The Parramatta Road corridor is one of Sydney's busiest corridors for public transport. It has one of the highest numbers of bus passengers during the morning peak of any major bus route in Metropolitan Sydney. Congestion on Parramatta Road has led to bus services using the road being delayed and unreliable. The project would enable improvements to public transport on Parramatta Road, including provision of kerbside bus lanes between Burwood Road at Burwood/Concord and Chandos Street at Ashfield/Haberfield at project opening, and the possible future provision of rapid public transport services along Parramatta Road. In addition, the project would provide improved access and travel along and across Parramatta Road for active transport (e.g. walking).

The connection of modal strategies (including public transport options) to the project and WestConnex are discussed in further detail in section 3.1.3 of the EIS.

Chapter 21 of the EIS recognises the contribution of emissions from road transport to Australia's total GHG emissions (refer to section 21.2.2 of the EIS). Reference to the Intergenerational Panel on Climate Change in the submission refers to the transport sector as a whole, including emissions from road, rail, aviation and marine transport on a global scale.

5.21 Aboriginal heritage

5.21.1 Potential impacts to Aboriginal heritage items

Two submissions raised potential impacts to Aboriginal heritage items

Issue description – concerns with impacts on Aboriginal culture

Matters of Aboriginal culture are not all addressed because they have been forgotten. In respect of that it is mindfully requested herein WestConnex address its Aboriginality. The M4 Motorway corridor traverses old Darug Country and M4 East is inside Metropolitan Local Aboriginal Land Council (MLALC). The whole corridor is considered a sacred landscape and common travelling passage. This has implications for landscape development and dimensional layers of meanings. In a broad context, the whole travelling public can benefit from a transcendent corridor.

Response

The Aboriginal Heritage Assessment (Appendix V of the EIS) was prepared in accordance with the SEARs issued for the project. As noted in section 4.1 of the Aboriginal Heritage Assessment, the consultation process identified the MLALC as the relevant Local Aboriginal Land Council (LALC) for this project. A representative from MLALC participated in the archaeological survey.

Following the archaeological survey key observations were made:

- Areas of grossly disturbed terrain are unlikely to retain Aboriginal archaeological materials in surface or subsurface contexts
- No surface expressions of Aboriginal objects or places were identified
- Aboriginal Heritage Information Management System (AHIMS) registered site #45-6-2339, located at Phillips Park in Lidcombe, 1.6 kilometres to the west of the project corridor, was re-identified during the current survey. The site card for #45-6-2339 lists 10 artefacts and shell fragments. Shell fragments in a disturbed context were present but no artefacts were identified during this inspection
- Two areas of potential Aboriginal heritage sensitivity were identified:
  - Mason Park, off Underwood Road, Homebush
  - Queen Elizabeth Park, between Broughton Street and Addison Avenue, Concord
- Neither of the potential areas of sensitivity would be impacted either directly or indirectly by the construction or operation of the project.

MLALC also prepared a cultural heritage survey report for the project, which is contained in Appendix B of the Aboriginal Heritage Assessment. In its report, MLALC concluded that because:

> "no features of Aboriginal cultural heritage were identified during this assessment, MLALC has no objection to the project proceeding".

Issue description - Landscape garden area along the edge of the M4 at Homebush

Aboriginality is layered into landscape design of a Sacred Gymea Lilies garden. There is a message for the World that is self-evident for perennial observations. The original landscape garden was designed and built for the Sydney Olympics. It was ephemerally placed on the motorway reservation for a laneway widening. Key Aboriginal cultural motifs are the Flame Lilies and wavy, serpentine margin. It is a Garden of Recovery for Ancient Ones to find Lost Souls below a Waveline.

It should not be disturbed without the consent of its Aboriginal Traditional Elders. Its landscape architect has tapped into Sydney's Dharawal Gymea Lily Dreaming. Ref: Kai'mia. http://www.glalc.org.au/Aboutus.aspx. It is conceived as part of the whole M4 Motorway corridor and ought to be replaced. Aboriginal Elders consider another favourable location be identified along the M4. It is forgotten as first in a sequence of Aboriginal cultural art and stories along M4. Aboriginal Elders accept this both sacred and common corridor is for All Tradition.

Hopefully NSWG, as part of a greater whole of WestConnex, will recommence the real opportunity for Aboriginal engagement and nurturing of a whole M4 corridor. Rebeautification of all "M4—Zones" and its Aboriginal places must be maintained. Aboriginal Elders, Leaders, Community are highly capable to help Getting it Right.

Response

This comment refers to a landscape garden area that was designed and built at the time of the Sydney Olympics along the northern edge of the M4, to the east of Homebush Bay Drive and to the south of Olympic Park. It was designed in the form of waves and contained plantings of native vegetation. The design was intended to refer to Aboriginal cultural motifs (see images below).

Figure 5.27 Landscape garden area along the northern edge of the M4 at Homebush

The garden is not a listed or identified heritage item, but rather a modern feature that refers to the Aboriginal past in its design elements. The heritage assessment was undertaken in consultation with MLALC, who stated "no features of Aboriginal cultural heritage were identified during this assessment, MLALC has no objection to the project proceeding". The garden was designed to be ephemeral, located in the reservation identified for future widening of the motorway. The motorway widening reservation is now proposed to accommodate additional traffic lanes as part of the M4 East project.

5.22 Resource use and waste

5.22.1 Construction spoil management and waste

No submissions specifically concerned construction spoil management and waste.

5.22.2 Other construction waste

11 submissions concerned other construction waste.

Issue description – handling and transport of asbestos waste

Concerns were raised regarding the handling and transport of asbestos waste. Submissions suggested that measures be implemented to minimise the risk associated with transporting asbestos waste, including sprinkler systems, truck wash-downs and load covering.

Response

As stated in section 23.3.2 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.

Removal of asbestos containing material would generally involve the following:

- Development of an asbestos management plan (as identified in **section 5.10.7** above)
- Establishing asbestos removal boundaries with appropriate security signage and barriers
- Preparation of the work area
- Use of the wet removal method where feasible and reasonable
- Removal of asbestos containing material in sections and placement in suitably labelled and properly sealed asbestos waste containers
- Decontamination of the workplace, tools and personal protective equipment
- Disposal of asbestos waste at an appropriately licensed facility.

As stated in section 28.4 of the EIS (and **Chapter 8** (Revised environmental management measures) of this report) asbestos handling and management would be undertaken in accordance with an Asbestos Management Plan, relevant State legislation, government policies and Australian Standards. The plan 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.

5.22.3 Construction resource use

No submissions specifically concerned construction resource use.

5.22.4 Operational resource use

No submissions specifically concerned operational resource use.

5.22.5 Peak oil

Eight submissions concerned the project and its relationship to peak oil.

Issue description – exacerbation of peak oil constraints

Concerns were raised regarding the exacerbation of peak oil constraints.

Response

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 on Parramatta Road. 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 WestConnex. With or without the project, the population of Western Sydney will require transport to locations that are dispersed through the Sydney metropolitan area and not necessarily serviced by public transport. Furthermore, the development of the project or WestConnex does not preclude use of electric vehicles, the ongoing development of public transport or other energy efficient transport options.

5.23 Climate change

5.23.1 Climate change risk assessment and impacts

Climate change and risk adaptation concerns the project and its capacity to adapt to climate change over its 100 year design life, as discussed in Chapter 24 of the EIS. No submissions received during the public exhibition of the EIS were considered to concern climate change risk and adaptation. Submissions about the contribution of the project to climate change are included in the discussion of greenhouse gas emissions in **section 5.20** of this report.

5.24 Hazard and risk

5.24.1 Construction tunnelling risks

No submissions specifically raised construction tunnelling risks. The potential for tunnel collapse with regard to associated settlement impacts is discussed in **section 5.17.2** of this report.

5.24.2 Electric and magnetic fields

Two submissions raised issues regarding electric and magnetic fields.

Issue description – electromagnetic fields

Concerns were received about the possibility of electromagnetic fields from electrical substations impacting residents. Submissions specifically concerned proposed substations at the Concord Road interchange (Sydney Street) and Cintra Park.

Response

The electrical capacity of the proposed substations would be no bigger than a standard utility kiosk substation, examples of which can be found on numerous street corners and frontages. The high voltage equipment would be enclosed within a substantial building with a low operating load and medium voltage.

All electrical substations would be designed and sited in accordance with all industry standards and guidance, including the principle of prudent avoidance adopted by the Australian Energy Networks Association and most Australian power utilities in the design of electric power infrastructure. Where this is the case, levels at substation boundaries are expected to be low and similar to levels commonly reported inside homes.

Guidelines on safe levels of electromagnetic field in workplaces and residential areas are provided in the draft guidelines from the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA 2006), the body currently responsible for managing health risks of electromagnetic fields. The ARPANSA guidelines are based on the protection of adverse health effects following review of the available data on health effects associated with exposure. It is noted that there are a number of studies available that show associations between electromagnetic field exposure and a wide range of adverse health effects. All available studies were reviewed by ARPANSA to develop the guidelines, with only robust and sound studies used. This approach is appropriate and consistent with the approach adopted for the development of all other guidelines in Australia.

The exposure limit adopted by ARPANSA for residential areas is 2000 milligauss. This limit is consistent with the findings of the International Commission on Non-Ionising Radiation Protection (ICNIRP 2010). Reviews conducted by the World Health Organisation (WHO 2007) have identified uncertainties in the available information on long-term exposures to electromagnetic fields and advise adopting a precautionary approach.

Work undertaken by International Agency for Research on Cancer (IARC) indicates that outdoor substations normally do not increase residential exposure to electric and magnetic fields. Substations inside buildings may result in exposure to magnetic fields at distances less than five to ten metres from the stations (IARC 2002), however the levels reported near substations drop rapidly from the substation walls.

Electromagnetic fields have been measured to be one to six milligauss at a major substation fence, five to 14 milligauss close or adjacent to some substation buildings, and 0.5 to three milligauss at a modular substation fence. For context, the levels of electromagnetic field measured within a residential home, from a number of different appliances, range from 0.2 to 70 milligauss (Energex 2015; ARPANSA 2015; WHO 2008; Greenhalgh 1998).

5.24.3 Incidents in the tunnel

One submission raised incidents in the tunnel

Issue description – vehicles carrying dangerous goods using local roads

Concerns were raised regarding vehicles carrying dangerous goods using local roads if prohibited from using the proposed tunnels.

Response

As stated in section 25.2.3 of the EIS, the transport of dangerous goods would be prohibited through the mainline tunnels and ramps due to safety considerations.

It is not considered 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.

5.25 Cumulative impacts

5.25.1 Impacts of non WestConnex projects

Five submissions concerned cumulative impacts with non-WestConnex projects.

Issue description – major infrastructure projects

Concerns were raised that the EIS does not adequately consider the cumulative impacts of the project and other major infrastructure projects.

Response

The cumulative impact assessment is included in Chapter 26 of the EIS. Section 26.4 considered cumulative impacts with other WestConnex projects, while section 26.5 considered cumulative impacts with other major projects in the vicinity. These major projects were identified through a review of the NSW DP&E development assessment tracking system for major projects as well as a review of strategic projects, such as the Parramatta Road Urban Transformation Program.

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 were the Haberfield Heritage Conservation Area due to the construction of the M4–M5 Link and areas of Homebush north of the M4, which may be subject to construction fatigue in combination with the Parramatta Road Urban Transformation Strategy.

Some potential for cumulative biodiversity impacts with the M4–M5 Link was also identified but would be limited in extent due to the highly modified and fragmented nature of potentially affected ecosystems.

Roads and Maritime and SMC would continue to consult with proponents of surrounding projects to minimise the potential for cumulative impacts.

Issue description – Parramatta Road Urban Transformation Program

Concerns were raised that the combined impacts of the project and the Parramatta Road Urban Transformation Program would lead to a cumulative reduction in green space amenity.

Response

There is limited potential for significant cumulative impacts on green space amenity resulting from the project and the Parramatta Road Urban Transformation Program (which is a separate project).

As described in **section 5.11** of this report, the acquisition of public open space for the project would mainly occur in support of construction and would therefore be temporary. Open space utilised by the project during both construction and operation would include:

- Bill Boyce Reserve for the establishment of Pomeroy Street civil site (C2)
- Part of Arnotts Reserve near the corner of Station Street and Parramatta Road for the establishment of Powells Creek civil site (C4) and permanent operational infrastructure associated with Powells Creek on-ramp
- Cintra Park hockey field for the establishment of Cintra Park tunnel site (C6) and permanent operational infrastructure including a water treatment facility and electrical substation
- Part of Reg Coady Reserve for the establishment of Wattle Street and Walker Avenue Civil Site (C9) and the widening of Wattle Street.

Bill Boyce Reserve, the majority of Arnotts Reserve, the majority of Cintra Park and part of Reg Coady Reserve would be returned to the relevant councils for use as open space following construction. The acquisition or lease of public land is discussed further in **section 5.11.1** of this report.

The *Draft Parramatta Road Urban Transformation Strategy* (UrbanGrowth NSW, 2015) states that a key objective of the program is to make the Parramatta Road corridor 'greener' with more street trees, landscaped areas, parks and open spaces. Any future works under the Parramatta Road Urban Transformation Program would be subject to separate assessment and approval.

5.26 Sustainability

124 submissions raised issues relating to sustainability.

Issue description – sustainability of the project

Concerns were raised that the project was not environmentally sustainable and would lead to a dependency on motor vehicle transportation with consequent impacts to fuel security, fuel cost and safety. Sustainable alternatives were suggested including improved active and public transport.

Response

Section 27.2 of the EIS describes the *WestConnex Sustainability Strategy* (WDA 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* (Transport for NSW 2013f), *Transport Environment and Sustainability Policy Framework* (Transport for NSW 2013e), 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 on Parramatta Road. 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 WestConnex. With or without the project, the population of Western Sydney will 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 WestConnex does not preclude the use of electric vehicles, the ongoing development of public transport, or other energy efficient transport options.

Issue description – use energy from sustainable sources

Submission requests a commitment is made to source 100 per cent of energy from sustainable sources, instead of six per cent as described in the EIS.

Response

The project will source at least six per cent of its energy from renewable energy generated onsite and/or accredited GreenPower providers. The following management measures (summarised in **Chapter 8** (Revised environmental management measures) of this report) would also be implemented:

- The preparation of an energy efficiency and greenhouse gas emissions strategy for the project. The project would seek to minimise operational energy demand through ventilation and lighting strategies. This could include the use of low maintenance, high efficiency LED lighting
- Low carbon energy generation options would be investigated as part of the design process in order to reduce the demand on mains electricity and generate renewable energy onsite, where feasible. Additional detail regarding energy efficiency is provided in Chapter 21 of the EIS.
- The mainline tunnels would be designed to minimise vehicle fuel use in operation for example through the provision of a vertical alignment that allows consistent vehicle speeds to be maintained.

5.27 Issues outside the scope of the project

5.27.1 Voluntary (wanted) additional acquisition

392 submissions raised issues regarding voluntary acquisition of properties.

Issue description – voluntary acquisition

Submissions suggested that voluntary acquisition should occur due to impacts on property and hardship. Properties located adjacent to the construction sites and construction areas should be eligible for voluntary acquisition.

Submissions also suggested voluntary acquisition due to proximity to unfiltered exhaust stack, noise impacts and loss of property value.

Response

Under the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), 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 which has resulted in them needing to sell their property and 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 that Roads and Maritime becomes the buyer of the property that the owner cannot find in the market place. In such exceptional matters, the consideration for the purchase would be based on the market value of the property with each party being responsible for their own costs of sale. The owner's personal circumstances which Roads and Maritime may be willing to consider, does 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 SMC WestConnex M4 East property team.

5.27.2 Issues which are not part of the scope of the project

87 submissions raised issues regarding items which are not within scope for the project.

Issue description – public private partnerships

Submissions suggested public private partnership agreements for urban motorways should be made public and such agreements must not contain penalty provisions for compensation payments to a motorway operator if a public transport system competes effectively with the motorway.

Response

The detail of commercial arrangements is not a relevant consideration as part of the EIS and planning approval process.

Detailed procurement strategies were developed for going to market prior to commencing competitive tender processes. The strategies were developed with the primary objective of maximising competition during the procurement to drive value for money. These strategies were complemented with draft contracts adopting public private partnership market standard risk allocations.

Public private partnerships are a common and successful approach to infrastructure delivery. This approach can deliver much needed infrastructure in advance of when delivery would otherwise be possible with solely Government funding.

The WestConnex M4 Project Deed between Roads and Maritime and WCX M4 Pty Limited has been published on the Roads and Maritime website. See http://www.rms.nsw.gov.au/business-industry/partners-suppliers/tenders-contracts/contracts-awarded/class-3-contract-documents.html.

Issue description – tree planting at North Strathfield

Submissions requested tree planting adjacent to the railway line along Queen Street at North Strathfield between Parramatta Road and Wellbank Street.

Response

Queen Street between Parramatta Road and Wellbank Street is outside the project footprint.

Issue description – restriction on vehicles entering the city

It was suggested that the volume of car traffic entering the city should be restricted and should be supplemented by park and ride areas to encourage the use of public transport.

Response

Restrictions on car traffic entering the city do not form part of this project. Such restrictions would need to be considered as part of broader transport policy reform.

Issue description – impact of redevelopment on heritage

A submission acknowledged the relationship between urban motorway development and the redevelopment of urban areas, and noted that development would be opposed where the development would impact on Heritage Conservation Areas and/or listed heritage items.

Response

The potential impact of other development on Heritage Conservation Areas and/or listed heritage items is beyond the scope of the M4 East project, and would be subject to separate assessment and approval as required.

Issue description – Parramatta Road Transformation Program

Submissions raised concerns regarding the Parramatta Road Transformation Program, including:

- Concern with the number of new dwellings to be constructed along Parramatta Road
- Concerns with where community facilities required to service the population growth, such as schools and hospitals, would be located
- Concerns with the associated growth of population and how the impacts of the additional numbers of people would be managed
- Concerns with regards the potential environmental and human health impacts which would be generated as a result of the program
- Concerns with the height of new buildings along Parramatta Road
- The location of public transport space and footpath widening, tree planting etc that would make Parramatta Road an attractive residential environment
- Concerns that the traffic noise from the project has not been modelled for potential future receivers associated with the planned development for Parramatta Road under the draft Parramatta Road Urban Transformation Strategy
- Potential vibrations and property damage as a result of tunnelling associated with the NorthConnex project
- Concerns regarding tunnelling under Balmain for the Western Harbour Tunnel project due to the apparent presence of old coal mine tunnels
- Concern with land use zoning in Burwood North.

Response

The Parramatta Road Transformation Program does not form part of the project. The project is however considered one of the key drivers for the program as it would reduce traffic volumes on Parramatta Road, which in turn would enable the improvement of public transport and urban amenity to support growth.

The *Draft Parramatta Road Urban Transformation Strategy* was released in September 2015 for public comment. This strategy considers the Parramatta Road corridor as a single strategic area or region while also recognising it as a place of many individual neighbourhoods and suburbs. This draft builds on a preliminary draft which was released in November 2014.

The purpose of the draft strategy is to outline how the Parramatta Road corridor can support employment and housing growth over the next 30 years and is focused on eight key precincts where this growth is expected to occur. The draft strategy includes an objective to reshape the transport system, via the optimisation of road space for all users, the delivery of new public transport services and improvements to safety for pedestrians and cyclists.

The Parramatta Road Transformation Program is in its early stages and therefore currently does not include any detailed planning of these precincts. The provision of community infrastructure to support the growth of employment and housing in the precincts would be considered during future stages of the program. UrbanGrowth NSW would continue to work on this program.

The project does not include any works along Parramatta Road associated with the Parramatta Road Transformation Program. Such works would be subject to separate assessment and approval as required.

At the Parramatta Road interchange, the project includes provision for a future mass transit corridor that would run down the centre of Parramatta Road.

Modelling of traffic noise along Parramatta Road considered sensitive receivers along the full extent of Parramatta Road within the project area. As described in section 10.5.1 of the EIS, the project is predicted to result in an overall reduction in the number of receivers where exceedances of the noise criteria are experienced during both the daytime and night-time periods. This reduction is a result of reductions in the numbers of vehicles using some surface roads such as the existing M4 (east of the tunnel portals), Parramatta Road east of Concord Road, and Wattle Street north of Ramsay Street. These reduced noise levels would also apply to any new developments built as a result of the Parramatta Road Transformation Program.

Further, under clause 102 of *State Environmental Planning Policy (Infrastructure) 2007*, for residential developments adjacent to road corridor for a freeway, a tollway, or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (ie the M4 and Parramatta Road), the responsibility for ensuring new developments have appropriate acoustic amenity is with local councils, developers and builders.

Issue description – impacts from construction and operation but no benefit from urban transformation

Submissions raised concerns that the Parramatta Road Transformation Program does not suggest any planned improvements between Kings Bay and Taverners Hill precincts. So while residents of The Ranch are being asked to endure enormous disruption during three years of construction, as well as increased traffic congestion and the real possibility of poorer air quality, the only benefit before 2030 is a six minute decrease in travel time if residents of this area travel west to Homebush or beyond.

Response

While the area in the vicinity of The Ranch Heritage Conservation Area (which is generally defined as being all the properties addressing Page Avenue and Earle Avenue at Ashfield zoned Residential 2, nine houses in Henry Street at Ashfield and the residential properties facing Frederick Street between Henry Street and Parramatta Road at Ashfield) has not been identified as a key growth area within the Parramatta Road Transformation Program, the section of Parramatta Road in this area would benefit from a reduction in traffic, which would enable revitalisation of the corridor in line with current planning controls.

Issue description – road network changes

Submissions suggested works on the following roads should be undertaken:

- Access along Homebush Bay Drive (Concord Road) should be improved at Ryde Bridge
- Concord Road and Homebush Bay Drive intersection
- The intersection of Tideswell Street and Liverpool Road at Ashfield
- Do not re-open Lilyfield Road

- Old Canterbury Road at Lewisham.

Response

The above intersections or road sections are beyond the extent of the project. Modifications to these intersections or upgrades to these roads would need to be considered by Roads and Maritime or the relevant local council depending on the ownership of the road in question.

Issues description – traffic congestion and disruption in the CBD

Submissions raised concern with the traffic disruptions (including buses) in the Central Business District (CBD).

Response

Existing traffic congestion and changes to bus routes and bus stops in the Sydney CBD are beyond the scope of the project.

Issue description – Western Sydney airport

Submissions suggested the WestConnex Scheme should be assessed in the context of the commitment to deliver the Western Sydney Airport. The investment into WestConnex could result in omission of funding for the Western Sydney Airport and other imperatives in western Sydney.

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 will be accessible via road links from the M7, M4 and M5, 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.

Issue description – transport policies of other political parties

A submission questioned the State Labor party's solution to increased traffic when they have not undertaken any road upgrades during their time in power.

Response

Considerations regarding previous commitments relating to the planning or funding of roads do not form part of the scope of the environmental impact statement.

Chapter 3 of the EIS describes in detail the strategic context and project need for the M4 East project.

Issue description – issues unrelated to the project

The following issues and requests were made in submissions:

- Request for properties for residents aged over 60 with reasonable rent
- Major cities have not been designed to accommodate increasing numbers of people. Central Australia should be used to accommodate people
- Concerned about the overdevelopment of Sydney and in the inner west
- Wants scripture taken out of schools
- Impacts relating to the North Strathfield Rail Underpass Project including the removal of vegetation along Queen Street adjacent to the rail corridor
- Development and/or construction not related to the project
- Commitments to providing new community facilities including child care, schools, hospitals and aged care facilities
- Opposition to the sale of NSW's State owned electricity assets
- Political affiliation or declaration of donation status for residents

- Objection to council amalgamations
- Request for better access to public transport in the Northern Rivers
- Concern for the traffic impacts on the suburb of White Bay
- Concerns relating to the Bankstown line stopping at St Peters
- Impacts relating to the closure of George Street in the CBD
- Submissions relating to development in and around Sydney Airport
- Concern about congestion in White Bay
- Concerns about soil contamination and asbestos at Erskine Park
- Request that diesel vehicles be phased out
- Impacts on the Rockdale wetlands
- Request for changes to legislation which control the amount of noise that cars can emit.

Response

The issues and requests listed above are beyond the scope of this project.

5.28 Issues not related specifically to the M4 East project but which form part of WestConnex

877 submissions raised issues regarding other WestConnex projects.

Issue description – M4 Widening

The following comments were raised in relation to the M4 Widening project:

- Opposition to the widening of the M4 Motorway
- Support for the M4 widening
- Concern that the M4 widening would result in increased traffic congestion.

Response

The M4 Widening 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 21 December 2014. The M4 Widening project is currently under construction.

Issue description – King Georges Road interchange upgrade

The following comments were raised in relation to the King Georges Road Interchange upgrade project:

- The EIS for King Georges Road M5 Interchange does not honestly discuss cost, economic benefits, social and effects nor alternatives
- Submissions expressed concern about peak hour travel times for the King Georges Road M5 Interchange.

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 EPA by the NSW Minister for Planning on 3 March 2015. The King Georges Road project is currently under construction.

Issue description – New M5

The following comments were raised by submissions in relation to the New M5:

- Impacts on King Street at Newtown (and the broader Newtown area), including:
  - Traffic congestion in Newtown

  - Parking
  - Consideration of clearways for King Street
  - Socio-economic impacts
  - Impacts on amenity
- A noise wall or park should be provided for properties on Campbell Road, Alexandria
- Objection to the potential impacts on Sydney Park, including impacts on amenity and access
- Objection to increases in traffic in St Peters and associated impacts on community facilities including schools and amenity
- Objection to potential heritage impacts associated with the St Peters interchange
- Objection to potential air quality impacts
- Objection to the number of lanes proposed for the Tempe interchange
- Impacts on amenity in suburbs including Newtown, Erskineville, Enmore and Alexandria
- Submissions raised a number of concerns about the New M5 project not meeting its objectives
- Objection to the ventilation stack in Arncliffe and the negative impacts human health impacts
- Concerns about the mutations caused to mushrooms around the existing M5 East Turrella ventilation facility
- Incorrect information of the location of the ventilation stack
- The number of lanes and options for future expansion of the New M5 tunnel
- Support for the project
- Impacts on the Green and Golden Bell Frog
- Objections to property acquisition at St Peters
- Objection to potential impacts on the Alexandria Canal
- Concerns with potential traffic impacts on Euston Road
- Destruction of rare patches of bushland along Wolli Creek.

Response

Specific impacts associated with construction and operation of the New M5 are beyond the scope of the M4 East project. The size and scale of WestConnex requires the program of works to be delivered in stages. The project is naturally aligned to fit into three construction stages. This is primarily due to natural 'break points' where the project can be cost effectively integrated into the surrounding road network. As such the New M5 is being developed as a separate project and is subject to separate assessment and approval under Part 5.1 of the EP&A Act.

The New M5 has been considered as part of this EIS only in how it relates to the project in terms of the broader strategic objectives of WestConnex and in relation to cumulative impacts associated with the project. Cumulative impacts of the New M5 and the M4 East have been assessed in Chapter 26 of the EIS.

The EIS for the New M5 is currently on public exhibition between 27 November 2015 and 29 January 2016. Further information on the New M5, the status of the EIS, and details on how to make a submission can be found on the WestConnex website www.westconnex.com.au. Submissions can be made on the DP&E website:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6788

Issues raised in submissions relating to the New M5 will be provided to the New M5 team for information.

Issue description – M4–M5 Link

The following comments were raised in relation to the M4 – M5 Link:

- Has council been consulted about the ventilation outlet within the Rozelle Yard
- Concerns related to pollution from Stage three of WestConnex
- Concerns about potential impacts on the suburb of Lilyfield
- Concerns about the potential impacts on the suburb of Leichardt
- Objection to potential heritage impacts
- Concerns regarding the location of a ventilation outlet in Rozelle.

Response

Specific impacts associated with construction and operation of the M4–M5 Link are beyond the scope of this EIS. The size and scale of WestConnex requires the program of works to be delivered in stages. The project is naturally aligned to fit into three construction stages. This is primarily due to natural 'break points' where the project can be cost effectively integrated into the surrounding road network. As such the M4–M5 Link is being developed as a separate project and will be subject to separate assessment and approval.

The M4–M5 Link has been considered as part of this EIS in how it relates to the project in terms of the broader strategic objectives of WestConnex and in relation to cumulative impacts associated with the project. Cumulative impacts of the M4–M5 Link and the M4 East projects have been assessed in Chapter 26 of the EIS.

In addition, to enable connection of the M4 East project to the M4-M5 Link, the M4 East mainline tunnels would extend beyond the on- and off-ramp connections to Wattle Street and Parramatta Road, to a point between Walker Street and Alt Street at Haberfield. The eastbound stub tunnel would be about 550 metres long, while the westbound stub tunnel would be about 350 metres long. Ventilation shafts from the stub tunnels to the eastern ventilation facility would also be built as part of the project, so as to minimise cumulative construction impacts on the community, and the location of these shafts has determined the length of the stub tunnels.

The construction of the M4–M5 Link would be subject to a separate planning and approvals process. The assessment of infrastructure location options and consultation activities for the M4–M5 Link would take place as part of the environmental assessment process for that project.

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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 preparation and exhibition of the EIS.

The clarifications and refinements detailed in this chapter are:

- Refinements to the layout of and access to construction ancillary facilities (refer to **section 6.1**)
- Additional refinements to local roads during construction (refer to **section 6.2**)
- Additional refinements to pedestrian access during construction (refer to **section 6.3**)
- Refinements to construction workforce car parking (refer to **section 6.4**).

Section 6.5 provides a number of corrections to the EIS.

6.1 Refinements to construction ancillary facilities

Chapter 6 of the EIS anticipated that further refinement of the construction methodology and layout and access arrangements for the construction ancillary facilities would be undertaken during detailed design. Accordingly, **sections 6.1 to 6.4** of this report describe refinements to the construction work set out in the EIS following further construction planning and design development undertaken.

The construction ancillary facilities and construction methodology in the EIS and this Submissions Report are subject to further refinement as the detailed design phase continues.

6.1.1 Overview

Section 6.5 of the EIS provided an outline of the 10 construction ancillary facilities that would be required as part of the project.

Since the exhibition of the EIS, further construction planning has been undertaken by the contractor, which has resulted in refinements to the internal layout and access arrangements of the construction ancillary facilities described in the EIS.

The layout of all 10 construction ancillary facilities are proposed to be refined, however they would be contained within the same area of land as described in the EIS, with the exception of the following:

- At the Homebush Bay Drive civil site (C1), the size of the facility would increase. The expansion and refinements to the internal layout of this facility are discussed in the Preferred Infrastructure Report in **section 7.2** of this report
- At the Walker Avenue and Wattle Street civil site (C9), one additional property would be included within the construction ancillary facility due to a proposed refinement in the design of the Wattle Street interchange. This additional property is discussed in **section 7.6** (of the Preferred Infrastructure Report), while the refinement of the layout is discussed in this section.

The following sections outline the proposed refinements to the construction ancillary facilities (except for C1), including refinements to internal layout and access.

In terms of vehicle access to the construction ancillary facilities, it should be noted that the vehicle entry and exit details shown on the figures in this section (including details of the type of vehicles proposed to use each entry and exit) relate to the ongoing operation of the ancillary facilities during the three year construction period. During initial demolition and site establishment for all 10 construction ancillary facilities, construction vehicles (both light and heavy vehicles) would use all existing and proposed site entries and exits, including local roads, in order to facilitate the construction of the entries and exits that would be used during the operation of these construction ancillary facilities. The site entries and exits would be constructed early in the construction program to ensure the use of local roads is minimised as far as possible.

In addition to these refinements, it should also be noted that spoil material may be stockpiled at all 10 construction ancillary facilities; however, tunnel spoil material would generally only be stockpiled at the Underwood Road civil and tunnel site (C3), Concord Road civil and tunnel site (C5), Cintra Park tunnel site (C6), Northcote Street tunnel site (C7) and eastern ventilation facility site (C8).

6.1.2 Pomeroy Street civil site (C2)

The Pomeroy Street civil site (C2) was described in section 6.5.3 of the EIS. The revised internal layout for this site is shown on **Figure 6.1**. Refinements to the facility are outlined below.

Internal layout

The internal layout of this facility would largely be unchanged in terms of circulation and the location of site amenities and laydown areas. The following refinements are proposed:

- Car parking would be relocated to the south-western part of the site near the light vehicle entry and exit at Pomeroy Street
- Storage buildings would be relocated further west along the northern boundary
- The area of existing vegetation located adjacent to Pomeroy Street would be maintained
- A sedimentation pond would be provided in the south-eastern corner of the site.

Access refinements

Light vehicle access to this facility would remain from Pomeroy Street; however, a single entry and exit point would be provided as opposed to separate entry and exit points. As described in the EIS, heavy vehicles would not be permitted to use this entry and exit.

6.1.3 Underwood Road civil and tunnel site (C3)

The Underwood Road civil and tunnel site (C3) was described in section 6.5.4 of the EIS. The revised internal layout for this site is shown on **Figure 6.2**. Refinements to the facility are outlined below.

Internal layout

The internal layout of this facility would largely be unchanged in terms of circulation and the location of site amenities, laydown areas and the location of stockpile areas. The following refinements are proposed:

- Eastern civil site:
  - Site amenities buildings would be two storey, if required, subject to assessment as described in **section 6.1.11** of this report
  - The existing concrete open stormwater channel on Ismay Avenue would be partially retained. As this channel would be affected by the cut-and-cover tunnel, and a replacement covered drainage channel would be constructed to continue this channel south through the eastern civil site, where it would connect with existing pipes that drain to Powells Creek
  - A sedimentation pond would be provided adjacent to the open channel
  - The water treatment plant would be relocated to the Underwood Road tunnel site

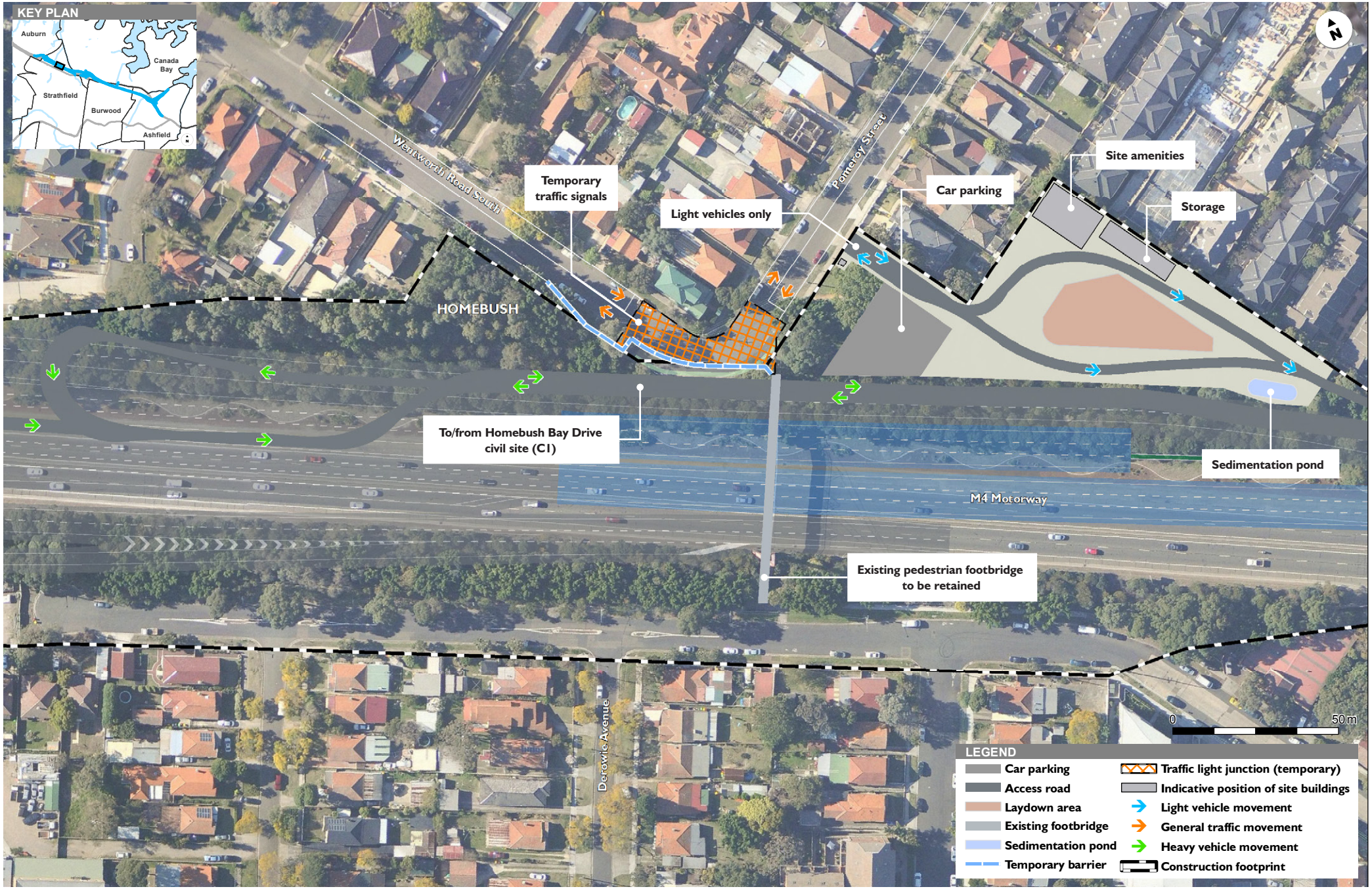

Figure 6.1 Revised Pomeroy Street civil site (C2)

Figure 6.2 Revised Underwood Road civil and tunnel site (C3)

- Tunnel site:
  - Acoustic shed would be moved to the eastern boundary of the site adjacent to Allen Street and Arnotts Reserve
  - Laydown areas would be limited to an area in the south-western corner of the site
  - Electrical substation and store room would be located to the north of the laydown area on the western side of the site
  - Workshops and site buildings would be rearranged and concentrated in the south-eastern corner of the tunnel site. These buildings would be two storey, with workshops at ground level and offices and site amenities on the first floor
  - Compressor station relocated to adjacent to the acoustic shed
  - Water treatment plant relocated from eastern civil site to the south-western side of the acoustic shed, with a sedimentation pond adjacent.

There would be no change to the layout of the Underwood Road west civil site.

Access refinements

Access to all three sites making up this facility (western civil site, eastern civil site and tunnel site) would be as per the EIS.

6.1.4 Powells Creek civil site (C4)

The Powells Creek civil site (C4) was described in section 6.5.5 of the EIS. The layout for this site is shown on **Figure 6.3**. Refinements to the facility are outlined below.

Internal layout

The internal layout of this facility would be largely unchanged in terms of location of site buildings and car parking. The following changes are proposed:

- The laydown area adjacent to the existing M4 would be extended further to the east
- An additional internal one-way circulation road would be provided
- A sedimentation pond would be provided in the western corner.

Access refinements

The location of entries and exits to this facility would not be altered from that shown in the EIS. The only refinements relate to the vehicle type and direction of access:

- Heavy vehicles would enter the site at the western driveway on Powell Street, as well as the western driveway on Parramatta Road, and would exit via the driveway located at the 90 degree bend on Powell Street
- Light vehicles would only enter the site at the western driveway on Parramatta Road, and would exit via the driveway located at the 90 degree bend on Powell Street.

6.1.5 Concord Road civil and tunnel site (C5)

The Concord Road civil and tunnel site (C5) was described in section 6.5.6 of the EIS. The revised internal layout for this site is shown on **Figure 6.4**. Refinements to the facility are outlined below.

Internal layout

The layout of the western and southern civil sites would be unchanged.

While the construction footprint of the tunnel site would not change compared to that shown in the EIS, facilities on the site would extend to the construction footprint boundary.

Figure 6.3 Revised Powells Creek civil site (C4)

Figure 6.4 Revised Concord Road civil and tunnel site (C5)

The internal layout of the tunnel site would largely be unchanged in terms of circulation, location of site amenities, laydown areas and the location of stockpile areas. The following changes are proposed:

- The acoustic shed would be reduced in size, so that the decline to the tunnels would be located outside the acoustic shed but would be covered
- Workshops would be relocated to the eastern boundary of the site between Sydney Street (east) and Edward Street
- Additional storage would be provided on the western boundary of the tunnel site adjacent to the laydown area
- The substation would be relocated to the western boundary adjacent to Concord Road
- A new internal circulation road would connect the tunnel site and the south civil site, which would allow vehicles from the western and southern civil sites to exit on to Concord Road
- Sedimentation ponds would be provided in the north-eastern corner of the site, adjacent to the water treatment plant, and the south-eastern corner of the site near the Ada Street light vehicle entry and exit.

Access refinements

Access to the Concord Road tunnel site would be altered to have separate ingress and egress points on Concord Road. Heavy vehicles would enter the site via the Sydney Street and Concord Road intersection, where the traffic signals would be reconfigured. Heavy vehicles would exit the site at a new free flow exit point located about 60 metres south of the Sydney Street intersection. Vehicles would be required to exit from this location to Concord Road southbound.

Access to the western and southern civil sites would be as described in the EIS.

6.1.6 Cintra Park tunnel site (C6)

The Cintra Park tunnel site (C6) was described in section 6.5.7 of the EIS. The revised internal layout for this site is shown on **Figure 6.5**. Refinements to the facility are outlined below.

In addition to the changes to layout and access, a crawler crane would also be used at this site during site establishment, in addition to the other plant and equipment items listed in Table 6.23 in section 6.8 of the EIS.

Internal layout

The internal layout of this facility would largely be unchanged in terms of circulation, location of site amenities and the location of the acoustic shed and associated covered decline to the tunnels. The following changes are proposed:

- Change in heavy vehicle access into acoustic shed from the eastern side to northern side
- Workshop on the eastern boundary would be relocated to the centre of the site (south of acoustic shed) adjacent to existing water treatment facility
- Storage building on the eastern boundary would be moved to the south, closer to Parramatta Road
- Site offices would be in the location shown in the EIS, adjacent to the car park and Gipps Street, but would be two storey
- The existing clubhouse would be retained
- Other support buildings would be located to the west of the decline or in the vicinity of the existing clubhouse
- A sedimentation pond would be provided in the centre of the site, adjacent to the water treatment plant.

Figure 6.5 Revised Cintra Park tunnel site (C6)

Access refinements

Access to the tunnel site would be as per the EIS, with the exception of provision of a new slip lane on Parramatta Road. Access to the upgraded car park would be via the existing driveways on Gipps Street, at the eastern end of the car park adjacent to the tunnel site, and Loftus Street. The existing pedestrian footbridge over Gipps Street would be retained and would remain open at all times during construction. Two trees located in the car park that may have otherwise been removed would now be retained.

6.1.7 Northcote Street tunnel site (C7)

The Northcote Street tunnel site (C7) was described in section 6.5.8 of the EIS. The revised internal layout for this site is shown on **Figure 6.6**. Refinements to the facility are outlined below.

Internal layout

While the construction footprint of the site would not change compared to that shown in the EIS, facilities on the site would extend to the construction footprint boundary.

The layout of the site in terms of circulation and the location of the acoustic shed and associated covered dive would generally be as shown in the EIS. The following refinements are proposed:

- Change in dimensions and siting of the acoustic shed which is now proposed to be square rather than rectangular
- Relocation of the laydown area and store areas to the eastern part of the site adjacent to the vehicular access on Parramatta Road
- Additional site amenities located above the covered dive
- Relocation of water treatment plant to the western side of the acoustic shed, with a sedimentation pond adjacent
- Workshops relocated to the northern boundary of the site east of the acoustic shed
- Positioning of other support buildings and storage along the eastern side of the acoustic shed.

Access refinements

There would be no change to access to this facility, with access from Parramatta Road and egress to Wattle Street, as shown in the EIS.

6.1.8 Eastern ventilation facility site (C8)

The eastern ventilation facility site (C8) was described in section 6.5.9 of the EIS. The revised internal layout for this site is shown on **Figure 6.7**. Refinements to the facility are outlined below.

Internal layout

The internal layout of this facility would largely be unchanged in terms of the location of the tunnel shaft and the ventilation building construction area. The following changes are proposed:

- Instead of two stockpiles in the northern and southern parts of the ventilation building construction area, there would be one stockpile toward the centre of the site
- There would be three shafts excavated to access the ventilation tunnels
- Site offices and store buildings would be located in the north-eastern corner of the site, and would include two storey site offices along Walker Street, if required
- The workshop would be located adjacent to Wattle Street near the heavy vehicle egress point
- The water treatment plant and substation relocated, but remaining on the Parramatta Road frontage

Figure 6.6 Revised Northcote Street tunnel site (C7)

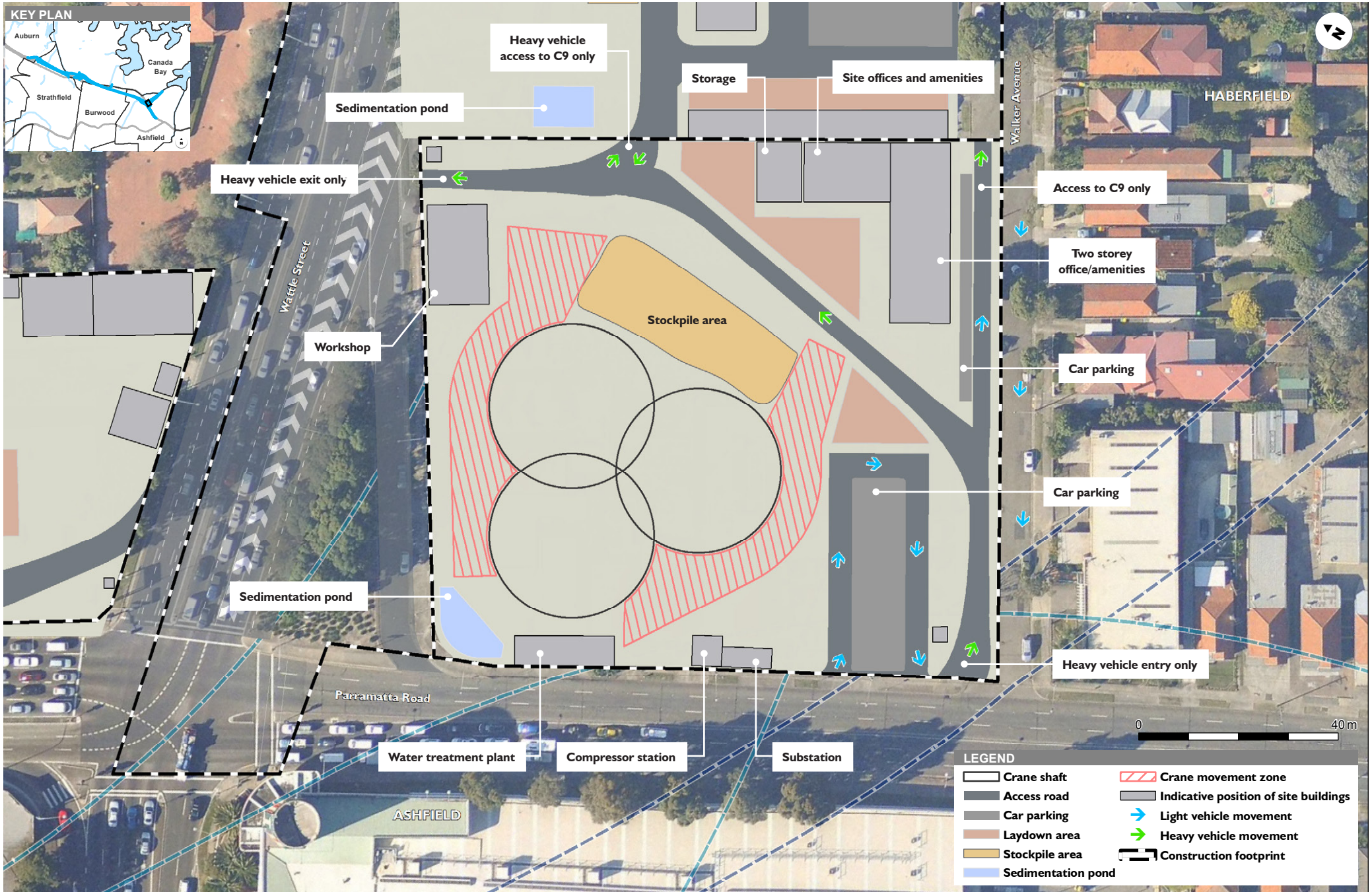

Figure 6.7 Revised eastern ventilation facility site (C8)

- A new car park for light vehicles would be provided off Parramatta Road, with additional parking provided along part of the section of Walker Avenue to be closed during construction
- Laydown areas would be provided north of the car park and adjacent to the site offices and stores
- A sedimentation pond would be provided in the south-western corner, adjacent to the water treatment plant.

Access refinements

Access to the site would change in the following ways:

- Entry and exit for light vehicles would be provided on Parramatta Road, to access the car parking area
- Heavy vehicles would enter the site via a left turn from Parramatta Road into the eastbound lane of Walker Avenue that would be closed to the public during the construction period and form part of the eastern ventilation facility site. Heavy vehicles would also be able to continue along the closed part of Walker Avenue to the Wattle Street and Walker Avenue civil site (C9).

Access between this facility and the Wattle Street and Walker Avenue civil site (C9) from within the site would remain.

The heavy vehicle egress point from both the eastern ventilation facility site (C8) and the Wattle Street and Walker Avenue civil site (C9) would remain on Wattle Street.

6.1.9 Wattle Street and Walker Avenue civil site (C9)

The Wattle Street and Walker Avenue civil site (C9) was described in section 6.5.10 of the EIS. The revised internal layout for this site is shown on **Figure 6.8**. Refinements to the facility are outlined below.

Internal layout

The internal layout of this facility would largely be unchanged in terms of circulation and general location of site buildings. The following refinements are proposed:

- Expansion of the construction area to include one additional Roads and Maritime owned property on Martin Street (refer to **section 7.6** (Preferred infrastructure report) where this increase in construction and operational footprint is described and assessed)
- Amenities buildings and site offices may be two storey, if required, subject to assessment as described in **section 6.1.11** of this report
- Minor localised shift in the internal circulation road on the northern side of Ramsay Street closer to the eastern boundary, and provision of an internal circulation road along the full length of the eastern side of the site, extending to the eastern ventilation facility site (C8)
- A laydown area would be provided on the western side of Wattle Street adjacent to the heavy vehicle turning lane
- Stockpile areas would be provided within the laydown areas identified in the EIS
- A sedimentation basin would be provided on the southern boundary with the eastern ventilation facility site (C8).

Access refinements

Access to and from this site would generally be the same as outlined in the EIS. Entry to the site would continue to be provided at two locations on Wattle Street and via the eastern ventilation facility site (C8). The construction vehicle turning lane on the western side of Wattle Street would remain and allow vehicles travelling eastbound to turn around and enter the site via a left turn.

Figure 6.8 Revised Wattle Stteet and Walker Avenue civil site (C9)

Light vehicle access would continue to be provided via Walker Avenue; however, non-construction vehicles (private staff and visitor vehicles) would enter the site via Walker Avenue westbound. The access from Parramatta Road via the closed part of Walker Avenue would be for authorised construction light and heavy vehicles only. Light vehicles would also exit to Walker Avenue and travel either eastbound or westbound along Walker Avenue.

6.1.10 Parramatta Road civil site (C10)

The Parramatta Road civil site (C10) was described in section 6.5.11 of the EIS. The revised internal layout for this site is shown on **Figure 6.9**. Changes to the facility are outlined below.

Internal layout

The internal layout of this facility would largely be unchanged in terms of circulation, location of site buildings, location of car parking and location of laydown and stockpile areas. A sedimentation basin would be provided in the south-western corner of the site.

In addition, the construction layout has been amended to clarify that there would be construction work on the northern side of Parramatta Road (on the corner of Bland Street), at the site of the proposed detention tank. This area is within the construction footprint as shown in the EIS.

Access refinements

Access to the site would be as described in the EIS, with the following refinements:

- Heavy vehicles would also be able to exit the site via a left turn at the new signalised intersection near Rogers Avenue
- An interim entry and exit would be provided from Parramatta Road via the section of Chandos Street that would be closed during construction. This would be used for about three months during site establishment, demolition and ground preparation at the start of the construction period, then closed once on- and off-ramp excavation commences.

The construction area on the northern side of Parramatta Road would only be accessed by light vehicles, with access and egress points on both Bland Street and Parramatta Road.

6.1.11 Environmental assessment

The following sections describe the potential impacts associated with the changes at each of the construction ancillary facilities.

Traffic and transport

Table 6.20 in the EIS presents indicative construction vehicle routes and vehicle numbers per day and per hour. The refinements to the layout and location of access and egress points at the construction ancillary facilities do not result in any change to the construction traffic volumes presented in this table. Therefore there is no change to the construction traffic impact assessment presented in section 8.3 of the EIS.

The most significant refinements to construction vehicle access and egress points are at:

- Concord Road tunnel site (C5), where the heavy vehicle exit would be directly onto Concord Road, south of the signalised intersection with Sydney Street
- Parramatta Road civil site (C10), where, for the initial three months of the construction period, heavy vehicle entry and exit would be directly onto Parramatta Road, via the section of Chandos Street to be closed during construction.

These refinements would not significantly alter the impacts of construction traffic on Concord Road and Parramatta Road, and would generally be as described in Table 8.7 of the EIS.

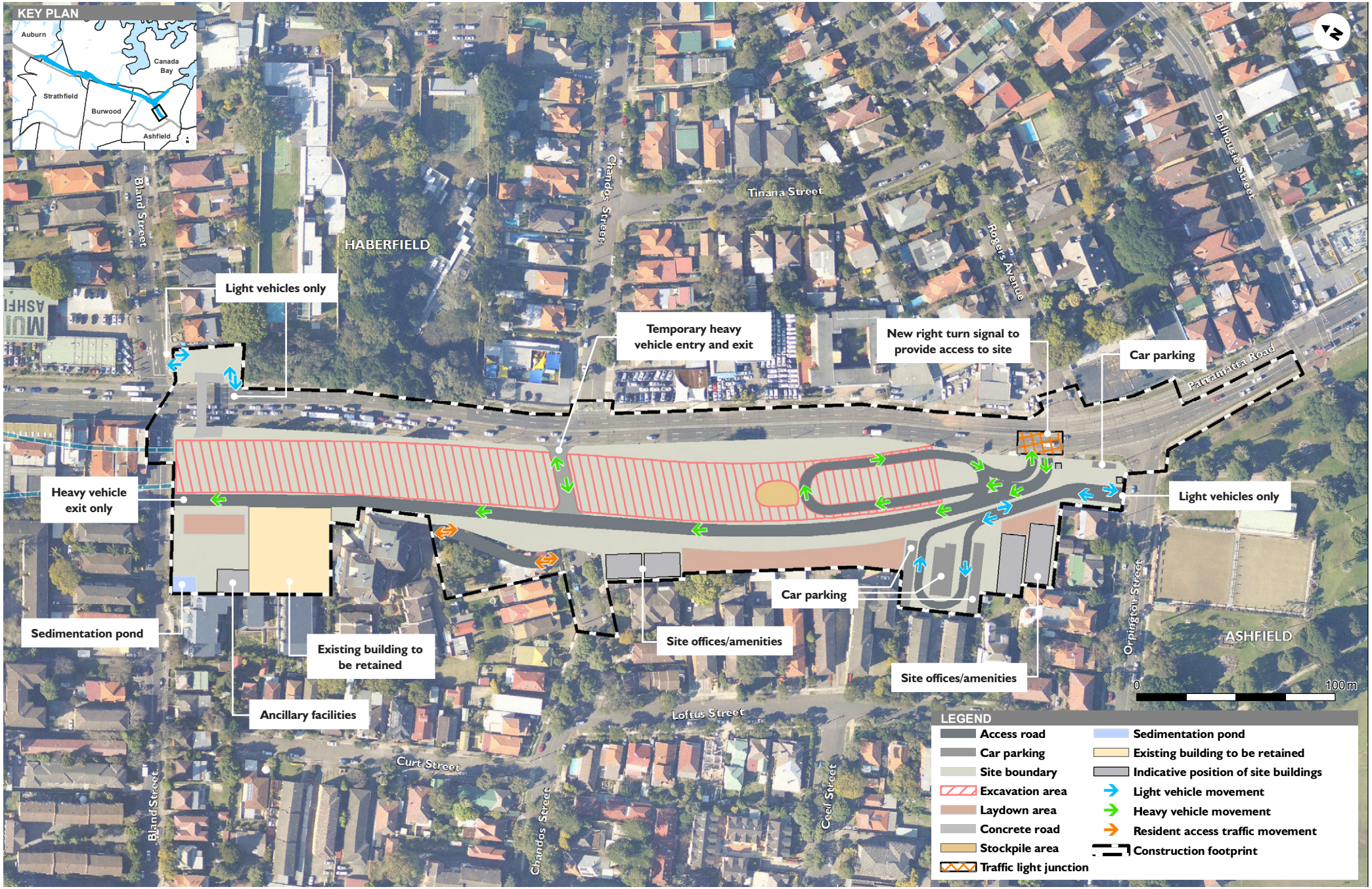

Figure 6.9 Revised Parramatta Road civil site (C10)

Noise and vibration

Apart from the Homebush Bay Drive civil site (C1), which is assessed in **section 7.2** (Preferred Infrastructure Report), the size of the construction ancillary facilities is generally unchanged.

The modified site layouts would potentially reduce impacts, as in many cases, site buildings have been moved to the edges of the site, and would act as a noise barrier. This is consistent with the management measures described in section 10.4.1 of the EIS, under the heading of 'Considerations to reduce construction noise levels'.

Furthermore, the construction noise impact assessment presented in section 10.4 of the EIS, and section 10.6 of the Noise and Vibration Impact Assessment in Appendix I of the EIS, is based on the simultaneous operation of noise intensive construction plant in proximity to adjacent receivers, and is therefore a worst case assessment. On this basis, the minor rearrangement of activities on the various construction sites would not result in a significant change in predicted noise levels.

In relation to the addition of a crawler crane to the plant and equipment to be used at the Cintra Park tunnel site (C6), given the relatively high worst-case sound power levels of the plant and equipment used in the tunnel scenario in the construction noise assessment, it is unlikely that adding a crane to the equipment list would affect the worst-case predicted impacts.

In relation to the two storey buildings proposed at a number of the construction ancillary facilities, these are proposed to be used for site offices and amenities only. Should the second storey of these buildings be proposed to be used for any other purpose and particularly where plant and equipment would be used, this would be subject to further noise assessment. An additional management measure has been included to reflect this requirement (see **Chapter 8** (Revised environmental management measures) of this report).

Therefore, construction noise and vibration impacts would generally be as described in Chapter 10 and Appendix I of the EIS. Should there be any further revisions to the layout of construction ancillary facilities, further noise assessment would be undertaken to confirm impacts.

Land use and property (including overshadowing)

Land use and property impacts

The proposed refinements outlined in **sections 6.1.2** to **6.1.10**, with the exception of refinements to the area of the Wattle Street and Walker Avenue (C9) civil site, would not result in any change to the land required for these facilities and therefore impacts would remain as discussed in the EIS. Indirect impacts (ie amenity) on adjacent properties would potentially change as a result of the other impacts discussed in this section.

Land use impacts at the Wattle Street and Walker Avenue (C9) civil site are discussed in detail in **Chapter 7** (Preferred Infrastructure Report).

Overshadowing

The layout of a number of construction ancillary facilities has been refined so that site buildings are located on the edge of these sites. In most cases these would be single storey structures that would be a similar height to adjacent residential buildings and therefore any shadows cast on to neighbouring properties are not considered to differ from those experienced for any adjacent single storey residential dwellings.

It is, however, proposed at the Underwood Road civil and tunnel site (C3), Cintra Park tunnel site (C6), eastern ventilation facility site (C8), and Wattle Street and Walker Avenue civil site (C9) that some structures (mainly site offices and amenities) are proposed to be two storey structures. In addition, the acoustic sheds at the Underwood Road civil and tunnel site (C3) and Northcote Street tunnel site (C7) would be relocated to be closer to adjacent properties. Therefore a preliminary analysis of potential overshadowing impacts has been undertaken. This however, has not involved preparation of shadow diagrams.

At the Cintra Park tunnel site (C6) and eastern ventilation facility site (C8), two storey structures would not be adjacent to residential properties. Therefore shadows would likely fall within the site or onto adjacent roadways or perimeter fencing or hoardings.

At the Underwood Road east civil site (C3), two storey structures would be located to the south-east and west of adjacent residential properties. At 3.00 pm in mid-winter, some shadow may fall onto the rear yards of adjacent residential properties on Ismay Avenue. At the Underwood Road tunnel site (C3), two storey structures would be positioned to the west of Arnotts Reserve. At 3.00 pm in mid-winter, some shadow would likely fall onto Arnotts Reserve; however, the extent of shadow would be similar to that of a two storey dwelling and not affect any private residences.

At the Northcote Street tunnel site (C7), the acoustic shed would be on the south-western side of the adjacent residential properties, and shadows would likely be largely contained within the site or would fall onto adjacent roadways, perimeter fencing or hoardings. At 3.00 pm in mid-winter, some shadow would likely fall onto the adjacent dwellings on both sides of Northcote Street; however, the extent of shadow would be similar to that of a two storey dwelling.

At the Wattle Street and Walker Avenue civil site (C9), two storey structures would be located to the west of adjoining residential properties. At 3.00 pm in mid-winter, some shadow would likely fall onto the adjacent dwellings; however, the extent of shadow would be similar to that of a two storey dwelling.

As noted above, this assessment is preliminary only, and further assessment would be undertaken during detailed design, including preparation of shadow diagrams where the location of these two storey structures immediately adjoins residential properties and have the potential to result in overshadowing of these properties. The additional management measure (PL8) has been included to reflect this requirement (see **Chapter 8** (Revised environmental management measures) of this report):

"A Solar Access and Overshadowing report will be developed during construction planning to assess the impacts of overshadowing as a result of buildings at construction ancillary facilities that are two storeys (or equivalent) or greater in height, where they are immediately adjacent to residential properties".

Urban design and visual amenity

The proposed refinements in **sections 6.1.2** to **6.1.10** would not result in any significant refinements to the visual impacts from the ancillary facilities. At a number of sites, the proposed acoustic sheds have been reduced in size which would reduce their visual prominence within their respective landscapes.

There would be some visual impacts resulting from the positioning of two storey structures along the edge of some sites. These impacts would be short term (ie during the construction period only) and where possible the structures would be designed and installed to minimise visual impacts. This would be further considered during detailed design. A number of management measures have been amended to reflect this requirement (see **Chapter 8** (Revised environmental management measures) of this report).

Flooding and drainage

The existing concrete open stormwater channel at the Underwood Road civil and tunnel site (C3) is identified as XD02 in the Surface Water: Flooding and Drainage assessment in Appendix Q of the EIS. The proposed refinement to this channel, which is required for the operational phase of the project, was assessed in Table 17.6 in section 17.4.1 of the EIS.

The assessment identified:

- An increase in peak 100 year ARI flood levels by a maximum of 0.02 metres within two residential properties in Ismay Avenue, immediately north of the project corridor
- An increase in peak probably maximum flood (PMF) levels upstream and downstream of the existing M4 by a maximum of 0.03 metres.

As outlined in section 17.5.2 of the EIS (as amended by **Chapter 8** (Revised environmental management measures) of this report), a flood management strategy would be prepared to manage flooding and stormwater related issues. Adverse flood impacts on existing development would be managed through the flood management strategy. This may include:

- 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 average recurrence interval (ARI) event. Assessment would also be made of impacts during flooding in excess of the 100 year ARI event up to the PMF, in the context of impacts on critical infrastructure and flood hazards
- Floor level survey would be carried out at all properties at risk (where there is a potential increase in flood levels) to confirm whether construction activities would increase flood damages. Where flooding potential is confirmed, management measures for construction works and operational design would be incorporated.

Non-Aboriginal heritage

Apart from the Homebush Bay Drive civil site (C1) and Wattle Street and Walker Avenue civil site (C9), which are assessed in **Chapter 7** (Preferred Infrastructure Report), the size of the construction ancillary facilities is unchanged. Therefore the non-Aboriginal heritage impacts would be as described in Chapter 19 of the EIS.

6.2 Changes to existing roads during construction

6.2.1 Description

Table 6.16 of the EIS describes indicative temporary road closures and diversions during construction. Following further design development, a number of additional road closures have been identified, as described below.

Closure of lanes on the existing M4 east of Sydney Street

One lane would be closed in each direction, leaving two lanes available in each direction on the existing M4, east of Sydney Street. Two lanes would remain open in each direction through the construction phase.

As per Table 6.16 of the EIS, the estimated duration of this closure would be two years to allow for construction works to occur in the vicinity of the Concord Road Bridge where it crosses the existing M4 Motorway.

Closure of lanes on Parramatta Road

During construction it is proposed that the available lane capacity on Parramatta Road between Bland Street and Dalhousie Street would be reduced from three lanes to two lanes. This would impact on both the eastbound and westbound carriageways as they pass the Parramatta Road civil site (C10).

Section 8.3.3 of the EIS (Table 8.8) shows the impact of construction vehicles on the operation of key roads in 2017, the peak construction year for the project. For the section of Parramatta Road between Bland Street and Dalhousie Street it was assumed that all three traffic lanes in each direction would be open during construction.

The Traffic and Transport Assessment in Appendix G of the EIS assessed construction impacts on the roadway level of service (LoS) along this section of Parramatta Road assuming that three traffic lanes would be available (refer section 7.4.2 and Table 7.15 of the Traffic and Transport Assessment in Appendix G of the EIS).

Loss of car parking on Northcote Street

At Northcote Street at Haberfield, about eight parking spaces on both sides of the street adjacent to the construction ancillary facility would be removed during the construction period. This would enable cars and garbage trucks to turn around at the end of Northcote Street, which is to be closed at Parramatta Road, as described in Table 6.16 of the EIS.

Temporary closure of Ramsay Street

Temporary closure of Ramsay Street (south of Wattle Street within the construction footprint) may be required, as an alternative construction method to accommodate the construction of the cut and cover section of the dive structure associated with the Wattle Street interchange. The contractor has identified the following three potential Ramsay Street closure options:

1. Ramsay Street full temporary closure seven days a week for around four months
2. Ramsay Street full temporary closure during a combination of weekends (Friday night to Monday morning), long weekends (ie Friday night to Tuesday morning) and school holiday (for the full two weeks of holiday period). The road would re-open Monday morning to Friday night. However, this option would still require the full temporary closure of Ramsay Street (option 1) during sporadic periods of major construction works
3. As per option 2, but night-time closures only during Sunday to Thursday night (generally no Friday or Saturday nights) and re-opening of Ramsay Street each morning.

During the period of the Ramsay Street closure, the following diversions would be put in place:

- For traffic heading eastbound on Ramsay Street, a new right turn onto Wattle Street would be provided. Traffic would then turn left onto Parramatta Road and then left into Dalhousie Street
- For traffic heading westbound on Ramsay Street, traffic would turn left onto Dalhousie Street, right onto Parramatta Road, and then right onto Great North Road
- For traffic heading eastbound on Wattle Street, no detour is proposed as there is currently no right turn into Ramsay Street
- For traffic heading westbound on Wattle Street, traffic would turn left onto Waratah Street, right onto Alt Street and then left onto Ramsay Street.

6.2.2 Environmental assessment

Closure of lanes on the existing M4 east of Sydney Street

Closure of one lane in each direction on the existing M4 would reduce storage capacity in the eastbound direction and merging lane length in the eastbound direction. Closure of these lanes would be subject to further assessment and approval by Roads and Maritime and the Traffic Management Centre.

Closure of traffic lanes on Parramatta Road

Table 6.1 and **Table 6.2** show the LoS for a mid-block location on Parramatta Road between Bland Street and Dalhousie Street. The tables directly compare the midblock performance under two construction scenarios:

- Assuming three available traffic lanes in both directions on Parramatta Road (EIS)
- Assuming two available traffic lanes in both directions on Parramatta Road (revised scenario).

Table 6.1 Construction year (2017) mid-block operational performance summary (EIS)

Location and direction		No. lanes	AM peak hour (veh/hr)			PM peak hour (veh/hr)		
			Flow	V/C	LoS	Flow	V/C	LoS
Parramatta Road between Bland Street and Dalhousie Street – Haberfield	EB	3	2099	0.78	D	2185	0.81	D
	WB	3	1840	0.68	D	1668	0.62	D

Table 6.2 Construction year (2017) mid-block operational performance summary (revised)

Location and direction		No. lanes	AM peak hour (veh/hr)			PM peak hour (veh/hr)		
			Flow	V/C	LoS	Flow	V/C	LoS
Parramatta Road between Bland Street and Dalhousie Street – Haberfield	EB	2	2099	1.17	F	2185	1.21	F
	WB	2	1840	1.02	F	1668	0.93	E

The above tables demonstrate that the temporary lane reduction would reduce capacity, and the operational performance of vehicles travelling on this section of Parramatta Road is predicted to deteriorate from LoS D to LoS E and F. This demonstrates that the theoretical roadway capacity would be exceeded. The LoS would be similar to other sections of Parramatta Road near Strathfield, which are also expected to operate at LoS E and F levels during construction.

On major arterial routes with closely spaced signalised intersections, mid-block capacities and level of service are often a secondary performance measure as the key constraint is the performance of the signalised intersections. There are numerous arterial roads in Sydney, including other sections of Parramatta Road, which would operate at similar levels of performance.

As such, it is recommended that:

- A review of the operation of signalised intersections on the approach to and departure from the Parramatta Road lane closures would be undertaken to ensure that this section of the network continues to operate at maximum efficiency
- In consultation with Traffic Management Centre, an assessment would be undertaken to determine the optimum extent of the proposed lane closure and also the timing of these works in relation to other temporary road closures proposed during construction.

Loss of car parking on Northcote Street

The loss of about eight car parking spaces on Northcote Street is not expected to have significant impacts, owing to the availability of other on-street car parking. As Northcote Street would be closed at Parramatta Road, the demand for on-street car parking on Northcote Street would be expected to reduce, as vehicles and pedestrians would not be able to access Parramatta Road.

Temporary closure of Ramsay Street

Three potential closure options for the temporary closure of Ramsay Street have been identified by the contractor. For the purposes of this assessment a full temporary closure seven days a week over a period of up to four months has been assumed as the most conservative traffic scenario.

Traffic modelling for the construction impact assessment has been updated to determine the predicted performance of key signalised intersections during this specific period. The impacts have been assessed as an alternative construction scenario, and the assessment has only been undertaken for cluster 6 where the local redistribution of traffic would be concentrated; as shown in **Figure 6.10**.

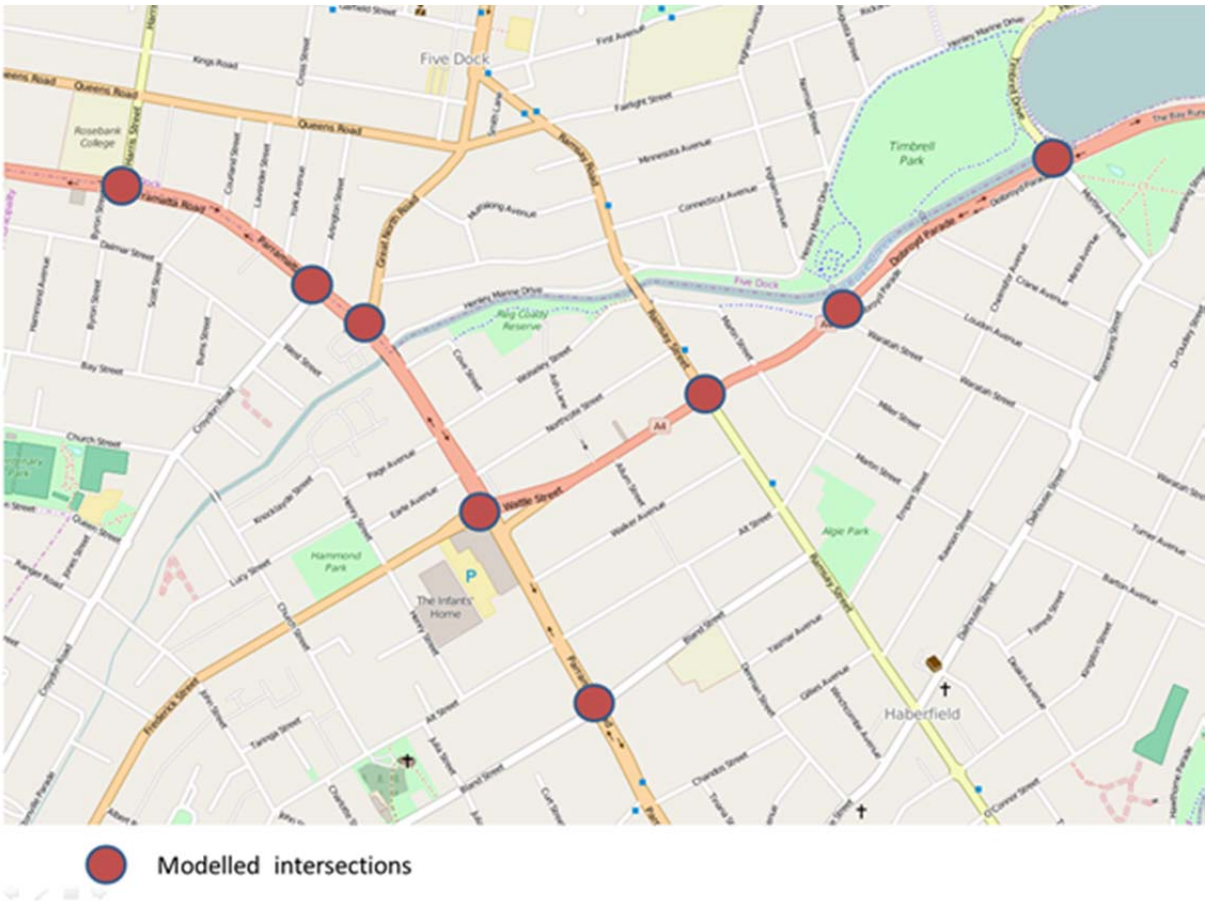

Figure 6.10 Modelled intersections (cluster 6)

The traffic modelling assumes that the temporary closure of Ramsay Street has resulted in the through lane on Ramsay Street eastbound being allocated to a new right turn movement to Wattle Street, to accommodate diverting traffic during the period of the closure. Traffic modelling of the road closure and surrounding road network during construction of the project indicates:

- During morning peak traffic:
  - Reduced delays at the intersection of Parramatta Road and Wattle Street, due to a reduction in right turns
  - Increased delays at the intersection of Parramatta Road and Great North Road
  - Increased delays at the intersection of Timbrell Drive and Dobroyd Parade
  - Minor increases in delays at the intersection of Parramatta Road with Harris Road, Arlington Street and Bland Street
- During the afternoon peak traffic:
  - Reduced delays at the intersection of Parramatta Road and Wattle Street due to upstream congestion at Great North Road and a reduction in right turns
  - Increased delays at the intersection of Parramatta Road and Great North Road
  - Increased delays at the Waratah Street intersection, primarily caused by an increase in right turns from the shared northbound through lane on Wattle Street
  - Minor increases in delays at the intersection of Timbrell Drive and Dobroyd Parade
  - Minor increases in delays at the intersection of Parramatta Road with Arlington Street.

Overall, the temporary closure of Ramsay Street would result in a number of impacts to intersections in the Haberfield area beyond those identified in the EIS, for the duration of the closure. The following management measures (as amended by **Chapter 8** (Revised environmental management measures) of this report) are proposed to mitigate the impacts:

- A traffic management and safety plan (TMSP) will be prepared in addition to the construction environmental management plan (CEMP). The TMSP will include the guidelines, general requirements and principles of traffic management to be implemented during the proposed Ramsay Street closure
- In addition to development of a TMSP, the following mitigation strategies would be implemented to manage and control traffic operation and access during the closure period:
  - The contractor will further review and develop the three proposed Ramsay Street closure options to establish an optimum construction strategy that would aim to have the minimum amount of disruption to affected residents
  - Manage and maintain adequate property access by providing reasonable and practical alternate traffic routes; which will be effectively communicated to the community. This would be undertaken in consultation with Roads and Maritime, local councils and property owners likely to be impacted.

Management measures have been added to **Chapter 8** (Revised environmental management measures) to reflect these commitments.

6.3 Refinements to pedestrian access during construction

6.3.1 Description

Table 6.17 of the EIS describes indicative temporary pedestrian and cyclist diversions during construction. Following further design development, a number of additional diversions have been identified, as follows:

- Concord Road civil and tunnel site (C5) – closure of footpath on the eastern side of Concord Road. A detour would be provided via Sydney Street, Inverary Street, Alexandra Street and Franklyn Street. Note that, as described in section 5.9.2 of the EIS, the footpath on the western side of Concord Road would be permanently closed between Sydney Street and Parramatta Road
- Cintra Park tunnel site (C6) – closure of the footpath on the northern side of Parramatta Road in the vicinity of Cintra Park, due to the proposed slip lane entry to the tunnel site. A detour would be provided via the southern side of Parramatta Road (cross at Shaftesbury Road and Cheltenham Road)
- Northcote Street tunnel site (C7) – closure of footpath on the northern side of Parramatta Road. A detour would be provided via the southern side of Parramatta Road (cross at Great North Road and Wattle Street), or via Wolseley Street and Ash Lane.

6.3.2 Environmental assessment

Section 8.3.7 of the EIS describes the impacts of temporary pedestrian and cyclist diversions. The impacts of the additional diversions would be as described in this section.

6.4 Refinements to construction workforce car parking

6.4.1 Description

Following further design of the construction ancillary facilities as described in **section 6.1**, the layout of the upgraded car park to the north of Concord Oval has also been amended. The amended layout takes into account the existing trees along Loftus Street and the existing pedestrian bridge over Gipps Street that would be retained. As a result, the number of parking spaces to be provided in the upgraded car park has been reduced from about 250, as described in section 6.6.5 of the EIS, to 210.

Despite this change, this car park would remain available for use by the public on weekends and on weeknights. The following spaces would be allocated to construction workers and the public:

- 145 public parking spaces on Saturdays (leaving 65 for the construction workforce)
- 195 public parking spaces on Sundays (leaving 15 for the construction workforce)
- 145 public parking spaces on weeknights after 6.30 pm (leaving 65 for the construction workforce).

As described in section 6.6.5 of the EIS, this allocation would be further refined following consultation with Canada Bay Council and Concord Oval user groups.

6.4.2 Environmental assessment

The number of car parking spaces to be made available to the public on weekends and weeknights would not change. There would be a reduction (by 35) in the number of car parking spaces available for use by the construction workforce. The contractor has reviewed the workforce numbers for the adjacent Cintra Park tunnel site (C6) and believes that sufficient capacity is provided for the construction workforce.

There would be no change to management measures.

6.5 Correction of minor errors and discrepancies

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 change to the environmental impacts described in the EIS.

6.5.1 Closure of Bland Street pedestrian footbridge

Table 6.17 of the EIS states that the footbridge over Parramatta Road at Bland Street would be subject to 'short-term' closure. While not an error, further detail of this closure, including specific likely duration, is provided below.

The pedestrian footbridge work would be limited to relocating the southern stair access from the eastern side of the lift shaft to the western side, so the new westbound lanes of Parramatta Road can be accommodated to the east of the pedestrian bridge.

Stair construction work would generally be undertaken whilst maintaining access to the existing stairs and lift. Once the new stairs are complete, the existing stairs would be demolished. There would be interim closures of the adjacent footpaths and footbridge for safety reasons during periods of high risk activities eg crane lifts, concrete pours and demolition of the existing stairs.

Whilst the work program would involve about two months of work in this area, the footbridge would only be closed when high risk work activities are occurring. Traffic control plans and procedures would be implemented to ensure the safe access of both pedestrians and cars adjacent to the work areas, and provision of alternate pedestrian routes via the existing signalised crossing as described in the EIS. The footbridge is not anticipated to be closed full time over the duration of the two months.

It is intended to undertake the work on the footbridge stairs as part of 'early works' so that the work would be complete prior to the start of road construction work. This would ensure the safest, most efficient option for construction can be undertaken, and reduce the duration of footbridge closure and impacts on pedestrians and the local community.

6.5.2 Project description

Due to a transcribing error, the anticipated operational power requirements for the western ventilation facility and the eastern ventilation facility were incorrectly assigned to the wrong facility. The correct anticipated operational power requirements for these two facilities are shown in **Table 6.3**. The total power requirement (megawatt hours a year) has not changed and there is therefore no requirement for any additional environmental assessment.

Table 6.3 Corrected anticipated operational power requirements

Location	Power requirement (megawatt hours a year)
Western ventilation facility	4,325
Eastern ventilation facility	10,700

6.5.3 Construction work

Construction vehicle volumes on Parramatta Road (west of Underwood Road) are forecast to be extremely low with a maximum two way hourly total of 30 vehicles. As reported in Section 7.4 of the Traffic and Transport Assessment in Appendix G of the EIS, modelled intersections west of Underwood Road all operate well within capacity at Level of Service C or better. Ample capacity is therefore available to accommodate the small number of light vehicles associated with construction. Furthermore, it is noted that the Preferred Infrastructure Report (PIR) includes updated construction vehicle forecasts which reduce the forecast volume of vehicles using the Pomeroy Street civil site, and accordingly Underwood Road. **Appendix C** of this report provides updated modelling of other parts of the network impacted by the change.

6.5.4 Traffic and transport

Figure amendments

Figure 7.6 of the Traffic and Transport Assessment (in Appendix G of the EIS) is intended to show the construction site layouts for C7, C8 and C9. Due to a technical error the incorrect figure was shown. Amended figures reflecting refinements to the site layouts are shown in **Figure 6.6**, **Figure 6.7** and **Figure 6.8** of this report respectively.

Figure 7.7 of the Traffic and Transport Assessment (in Appendix G of the EIS) is supposed to show the construction site layout for site C10. Due to a technical error the incorrect figure has been shown. An amended figure reflecting refinements to the site layout is shown on **Figure 6.9** of this report.

Traffic lane numbers – Parramatta Road

Due to a transcription error, Table 7.15 in section 7.4.2 of the EIS shows the assumed number of available lanes for Parramatta Road between Bland and Dalhousie Street during construction as three lanes. The correct number is two lanes as shown in Table 6.16 in the EIS.

Tables 7.16 and 7.17 in the Traffic and Transport Assessment in Appendix G of the EIS shows 2017 construction traffic intersection performance. These tables contained errors in the passenger car unit (PCU) column at two intersections were the volumes had been incorrectly transposed. The volumes in the table should read as follows:

- Table 7.16 – Underwood/Pomeroy – AM peak PCU figure in ‘with construction’ column should read 2169 not 3101
- Table 7.16 – Parramatta/Knight – AM peak PCU figure in ‘without construction’ column should read 3101 not 2169
- Table 7.17 – Underwood/Pomeroy – PM peak PCU figure in ‘with construction’ column should read 2282 not 3241
- Table 7.17 – Parramatta/Knight – PM peak PCU figure in ‘without construction’ column should read 3241 not 2282.

There are no other changes to these tables. The conclusions drawn from these tables in relation to intersection performance during the construction period remain valid.

6.5.5 Air quality

Table of contents

During finalisation of the air quality assessment the decision was made to keep the reporting of the in tunnel air quality assessment solely in Appendix L of the Air Quality Assessment Report (in Appendix H of the EIS) rather than also provide a summary within the main Air Quality Assessment Report. The table of contents was not subsequently updated and therefore incorrectly references section 8.3 of the Air Quality Assessment Report. As the assessment of in-tunnel air quality is provided in Appendix L of the Air Quality Assessment Report (in Appendix H of the EIS), there is no need for any further environmental assessment.

Units in Figure 9.22

Figure 9.22 in the EIS incorrectly states mg/m^3 as the unit of measurement – the correct unit of measurement is $\mu g/m^3$. Figure 9.22 is otherwise correct and correctly shows that the maximum rolling eight-hour mean for carbon monoxide is well below the NSW impact assessment criterion of 10 $\mu g/m^3$.

Incorrect figure

The incorrect figure was inserted in for Figure 9.61 in Chapter 9 of the EIS. The correct figure is provided as Figure K-96 in Appendix K of the Air Quality Assessment Report, in Appendix H of the EIS. The incorrect figure overstated the change to annual mean $PM_{2.5}$ levels.

6.5.6 Noise and vibration

Background noise monitoring results presented in the EIS

Due to a transcription error, the background noise monitoring results in Table 10.2 of the EIS for noise monitoring locations L18, L19, L20, L21, L22 and L23 were incorrectly stated. The correct results were presented in Tables 7 and 8 of the Noise and Vibration Impact Assessment in Appendix I of the EIS.

A revised version of Table 10.2 of the EIS is provided in Table 6.4 and presents the correct background noise monitoring results for these locations. The results that have changed are shown in **bold**.

While the incorrect results were presented in Table 10.2 of the EIS, the noise management levels that were derived from the background noise monitoring results and presented in Table 10.4 and Tables 10.13 to 10.19 of the EIS were based on the correct background noise levels. Therefore the assessment of impacts presented in the EIS is correct, and there is no need for further environmental assessment.

Table 6.4 Background noise monitoring results

Noise monitoring location	Noise level (dBA)									
	Unattended monitoring results							Attended monitoring results		
	Rating background level (RBL) during ICNG defined time periods [1]			Rating background level (RBL) during RNP defined time periods [2]				Measured noise levels		
	Day RBL	Evening RBL	Night RBL	Day $L_{Aeq(15hr)}$	Night $L_{Aeq(9hr)}$	Daytime $L_{Aeq(1hr)}$	Night-time $L_{Aeq(1hr)}$	L_{A90}	L_{Aeq}	L_{Amax}
L1	53	52	46	58	55	61	59	53	58	80
L2	50	50	46	57	54	61	58	53	57	69
L3	50	49	43	55	52	59	56	52	59	79
L4	56	56	48	63	59	65	63	56	62	89
L5	53	52	46	66	62	68	67	54	65	82
L6	48	47	42	56	51	59	56	50	57	73
L7	41	41[4]	38	56	49	61	55	41	61	79
L8	55	54	47	64	62	66	65	58	67	80
L9	41	41[4]	40	57	50	59	55	42	54	70
L10	50	50	46	59	57	62	60	52	59	73
L11	58	58[4]	52	67	64	69	68	59	64	78
L12	46	46[4]	43	59	56	62	61	49	59	80
L13	46	46	38	60	56	64	61	51	60	73
L14	56	54	44	68	65	69	70	60	69	83
L15	54	52	41	66	63	67	68	53	66	79
L16	58	55	45	73	70	75	75	61	73	84
L18 [3]	**49**	**49**	**41**	**63**	**60**	**66**	**64**	**50**	**61**	**74**
L19	**58**	**55**	44	**71**	**69**	**74**	**72**	60	**72**	**98**
L20 [3]	**60**	**58**	**44**	**70**	**67**	**72**	**71**	**60**	**68**	**89**
L21	**56**	**53**	**43**	**67**	**64**	**69**	**68**	**57**	**66**	**85**
L22	**61**	**57**	**42**	**71**	**67**	**73**	**72**	**62**	**71**	**86**
L23	53	52	**49**	**59**	**57**	**62**	**60**	**54**	58	**79**

Note 1: ICNG governing periods – Day: 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening: 6.00 pm to 10.00 pm; Night: 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday.

Note 2: RNP assessment time periods – Day: 7.00 am to 10.00 pm; Night: 10.00 pm to 7.00 am (weekly data).

Note 3: Monitoring location near to building facade. Measured noise levels considered to represent facade affected noise levels which are up to 2.5 dBA higher than the equivalent free-field condition.

Note 4: Evening RBL reduced to equal daytime RBL in accordance with INP application notes.

Reduction of highly noise affected receivers

Due to a transcribing error, the heading for the second column in Table 10.21 of the EIS was incorrectly stated. The correct heading should read 'Reduction of highly noise affected receivers through implementation of acoustic hoarding', as was presented in the corresponding Table 47 of the Noise and Vibration Impact Assessment in Appendix I of the EIS.

Table 6.5 presents the correct column heading for this table. The word 'Residual' has also been added to the adjacent column heading for additional clarification.

While the incorrect column heading was presented in Table 10.21 of the EIS, the number which corresponds with the reduction of highly noise affected receivers and the number of highly noise affected receivers (with hoarding) were based on the correct reduction numbers and residual numbers as presented in Table 47 of the Noise and Vibration Impact Assessment in Appendix I of the EIS. As these are correct, there is no need for any further environmental assessment.

Table 6.5 Reduction in highly noise affected receivers with acoustic hoarding

NCA	Reduction of highly noise affected receivers through implementation of acoustic hoarding	Residual highly noise affected receivers (with hoarding)
1	1	1
2	7	2
3	-	-
4	6	1
5	-	1
6	5	1
7	-	-
8	5	1
9	-	-
10	-	-
11	-	1
12	3	-
13	-	4
14	3	-
15	8	3
16	5	1
17	4	1
18	4	-
19	-	-
20	-	-
21	5	15
Receivers east of works limit	-	-
Total	**88**	**32**

Receivers considered for additional noise mitigation

Section 8.1.2 of the Noise and Vibration Impact Assessment in Appendix I of the EIS describes the receivers that would be considered for additional noise mitigation. The third paragraph in this sentence contains a typographical error, and refers to 400 receivers/floors being considered for additional noise mitigation. This sentence should read (amended text in bold):

*A total of **392** receivers/floors (306 lots) are considered for additional noise mitigation on the basis of the following triggers:*

It should be noted that section 10.5.1 of the EIS, under the heading 'Without mitigation', presents the correct figure of 392.

Legend for full assessment table for all assessed receivers

Appendix N to the Noise and Vibration Impact Assessment in Appendix I of the EIS (provided as an electronic spreadsheet file only) included a table outlining predicted noise levels for all assessed receivers. For space reasons, the column labels were abbreviated. The legend for these labels is presented in **Table 6.6**.

Table 6.6 Legend for full assessment table for all assessed receivers

Code in spreadsheet	Description
wkt_geom	Points used to map the data in GIS if required
Name	Code assigned in the noise model
NCA	Noise catchment area
Floor	Floor level assessed
Property_Name	Name of property, if available
StreetNo	House or building number
Street	Street name
Suburb	Suburb name
Easting and northing	Coordinates used to map the location, if required
RecType	OCB = Other (Cafe/bar) OCC = Other (Childcare centre) OED = Other (Educational facility) OHO = Other (Hotel) OME = Other (Medical) OOA = Other (Outdoor active) OOP = Other (Outdoor passive) OPW = Other (Place of worship) RES = Residential
Period_Type	Assessment period type P = Period (ie L_{Aeq}15hour / L_{Aeq}9hour) H = Hourly (ie L_{Aeq}1hour)
Day_Criteria	Project-specific criteria during the day (7.00 am to 10.00 pm)
Night_Criteria	Project-specific criteria during the night (10.00 pm to 7.00 am)
T1_NB_D_RND	Predicted L_{Aeq} Noise Level in 2021, 'No build' scenario, day
T1_NB_N_RND	Predicted L_{Aeq} Noise Level in 2021, 'No build' scenario, night
T1_BB_D_RND	Predicted L_{Aeq} Noise Level in 2021, 'Build' scenario without additional mitigation, day
T1_BB_N_RND	Predicted L_{Aeq} Noise Level in 2021, 'Build' scenario without additional mitigation, night
T2_NB_D_RND	Predicted L_{Aeq} Noise Level in 2031, 'No build' scenario, day
T2_NB_N_RND	Predicted L_{Aeq} Noise Level in 2031, 'No build' scenario, night
T2_BB_D_RND	Predicted L_{Aeq} Noise Level in 2031, 'Build' scenario without additional mitigation, day
T2_BB_N_RND	Predicted L_{Aeq} Noise Level in 2031, 'Build' scenario without additional mitigation, night
T1_FB_D_RND	Predicted L_{Aeq} Noise Level in 2021, 'Build' scenario with additional mitigation, day
T1_FB_N_RND	Predicted L_{Aeq} Noise Level in 2021, 'Build' scenario with additional mitigation, night
T2_FB_D_RND	Predicted L_{Aeq} Noise Level in 2031, 'Build' scenario with additional mitigation, day
T2_FB_N_RND	Predicted L_{Aeq} Noise Level in 2031, 'Build' scenario with additional mitigation, night
Max_BNB	Maximum change in noise level (Build without mitigation minus No Build)
Qualify_for_Treatment_Build	Property qualifies for treatment in the 'Build' scenario without additional mitigation

Code in spreadsheet	Description
Qualify_for_Residual_ Architectural_Treatment	Property qualifies for residual architectural treatment
Exceed_Cumulative_Limit _Build	Property exceeds the cumulative limit in the 'Build' scenario without additional mitigation
Max_BB_PRT_ACUTE	Property is in the acute category in the 'Build' scenario without additional mitigation 1 = yes 0 = no

6.5.7 Human health

Two tables (Table 6.6. and Table 6.8) in the Human Health Risk Assessment in Appendix J of the EIS and Table 11.4 of Chapter 11 of the EIS have been based on an incorrect value.

The acetaldehyde value has been checked and the correct value of 9 µg/m^3 should have been listed in Table 6.6 of the Human Health Risk Assessment and used in the calculation of chronic health risks. As the threshold for impact is higher than that listed, the calculation presented in Table 6.8 of the Human Health Risk Assessment overestimates the hazard index (HI) for acetaldehyde.

The anthracene value has been checked and the correct value of 1,000 µg/m^3 (rounded) should have been listed in Table 6.6 of the Human Health Risk Assessment and used in the calculation of chronic health risks. Again, the calculation presented in Table 6.8 of the Human Health Risk Assessment overestimates the health impacts for anthracene. Corrected Table 6.8 is presented in **Table 6.7** below.

Table 6.7 Assessment of chronic exposures to VOCs and PAHs – maximum impacts in community associated with project (corrected)

Key VOCs and PAHs	Maximum predicted annual average concentration associated with project and calculated HI					
	2021		2031		Cumulative - 2031	
	Max concentration (µg/m^3)	HI	Max concentration (µg/m^3)	HI	Max concentration (µg/m^3)	HI
Total VOCs	**2.8**		**1.6**		**1.2**	
Toluene	0.17	0.000035	0.095	0.000019	0.075	0.000015
Xylenes	0.14	0.00065	0.079	0.00036	0.062	0.00028
1,3-Butadiene	0.027	0.090	0.015	0.050	0.012	0.039
Formaldehyde	0.12	0.036	0.073	0.022	0.052	0.016
Acetaldehyde	0.051	0.0057	0.030	0.0033	0.022	0.0025
Total PAHs	**0.00084**		**0.00050**		**0.00038**	
Naphthalene	0.00055	2×10^{-4}	0.00033	1×10^{-4}	0.00025	8×10^{-5}
Acenaphthylene	0.000045	2×10^{-7}	0.000027	1×10^{-7}	0.000020	1×10^{-7}
Acenaphthene	0.000012	6×10^{-8}	0.0000069	3×10^{-8}	0.0000053	3×10^{-8}
Fluorene	0.000058	4×10^{-7}	0.000034	2×10^{-7}	0.000026	2×10^{-7}
Phenanthrene	0.000012	8×10^{-7}	0.000068	5×10^{-7}	0.000052	4×10^{-7}
Anthracene	0.0000093	9×10^{-9}	0.0000055	5×10^{-9}	0.0000041	4×10^{-9}
Fluoranthene	0.0000067	4×10^{-8}	0.0000040	3×10^{-8}	0.0000030	2×10^{-8}
Pyrene	0.000012	1×10^{-7}	0.0000069	7×10^{-8}	0.0000053	5×10^{-8}
Total HI		**0.1**		**0.08**		**0.06**

6.5.8 Social and economic

Haberfield Public School

Section 5.3.3 in the Social Impact Assessment in Appendix M of the EIS, and Table C4 in Appendix C of the Social Impact Assessment does not acknowledge that there is before, after school and vacation care facilities at Haberfield Public School.

The text should read:

- Haberfield Public School (also provides before school, after school and vacation care facilities).

In addition, in section 6.3.4 of the Social Impact Assessment in Appendix M of the EIS, Haberfield Public School was discussed under the wrong precinct. It should be discussed under the Parramatta Road Precinct (in section 6.3.5 of the Social Impact Assessment) not the Wattle Street Precinct (section 6.3.4 of the Social Impact Assessment).

Dobroyd Point Public School

Section 6.3.4 of the Social Impact Assessment (in Appendix M of the EIS) should have included an assessment of the indirect impacts of the project on the Dobroyd Point Public School which is located in Waratah Street. Discussion is included below:

The Dobroyd Point Public School is located on the north side of Waratah Street about 200 metres to the east of Dobroyd Parade. A signalised pedestrian crossing is located at the intersection of Waratah Street and Dobroyd Parade which connects to Reg Coady Reserve and Timbrell Park to the west.

The project would result in localised widening of Dobroyd Parade at Waratah Street to accommodate the merging of surface and tunnel traffic lanes. During construction, the Wattle Street and Walker Avenue civil site (C9) would extend to near the intersection of Waratah Street and would utilise a portion of Reg Coady Reserve to accommodate a heavy vehicle turn around area. The Waratah Street intersection would be upgraded to accommodate these additional movements during construction.

The indirect impacts on Dobroyd Point Public School may include reduced amenity from traffic, noise, air quality and visual impacts during construction. During operation the indirect impacts may include noise and traffic.

As a result of the proposed local road modifications associated with the project there is some potential that additional local traffic may be diverted to Waratah Street from the catchment area on the east side of Wattle Street. However it is unlikely that there would be significant additional traffic using the street.

Overall construction noise impacts are expected to be limited due to the distance of the school from Dobroyd Parade and construction activities. During the daytime, it is expected that construction activities would result in no, or very minor exceedances of noise management levels for the school due to the distance from the construction activities. A range of mitigation measures are proposed to minimise construction noise impacts.

It is also expected that traffic noise during construction would be unlikely for the school given the distance of the school from Wattle Street. All heavy vehicles would be restricted to using Wattle Street and no access would be permitted to the local residential streets. Pedestrian connectivity at the signalised Waratah Street intersection with Dobroyd Parade would be maintained although it is noted that this crossing would be widened to accommodate one to two additional traffic lanes. Heavy vehicles would also use this intersection as a turn-around area during the construction phase.

Ground based noise during tunnelling is not expected to be an issue for the school given that the cut and cover tunnel and dive structures commence to the south of Martin Street, which is some distance removed from the school.

During operation, it is expected that noise impacts at the school from increased traffic on Wattle Street would not be an issue given the separation distance and the buffer provided by intervening structures.

There may be a minor impact for traffic using Waratah Street if movements are affected by congestion and queuing back from the intersection of Dobroyd Parade and Timbrell Drive. Options are being investigated to improve the operation of the Dobroyd Parade/Timbrell Drive intersection. Any proposal would be subject to consultation with local councils, the school and the local community.

Impacts to bus stops

Section 6.6.3 of the EIS describes the indicative changes to bus stops as a result of the project. As stated in this section, ongoing design refinements have allowed for further refinement of the number of affected bus stops.

A total of nine bus stops at four locations would be impacted during construction and one bus stop would be permanently relocated. The nine bus stops impacted include:

- Two bus stops at Underwood Road – both relocated
- Two bus stops at Concord Road – one relocated (northbound) and one closed (southbound)
- One bus stop at Parramatta Road Cintra Park (eastbound) – relocated
- Two bus stops on Parramatta Road Ashfield (westbound) – one closed and one relocated and two bus stops on Parramatta Road Ashfield (eastbound) – both temporarily relocated (short term).

Only one bus stop would be permanently relocated at Concord Road North Strathfield (northbound).

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 any bus stops or access arrangements.

Figure labels

Due to an error, four social infrastructure facilities in Figures 5.11, 5.12, 5.14 and 5.15 of the Social Impact Assessment in Appendix M of the EIS were incorrectly labelled. **Table 6.8** presents the EIS label and the corrected label. The facilities were numbered and labelled correctly in Table C3 in Appendix C to the Social Impact Assessment.

Table 6.8 Corrected figure labels

Facility	EIS label	Correct label
Strathfield Guide Hall	35	34
Strathfield Mens' Shed	34	33
Yasmar Training Facility	38	37
Haberfield Library	32	38

6.5.9 Contamination

The certificates of analysis in Appendix C of the Soil and Land Contamination Assessment in Appendix P of the EIS contained some blank columns. The blank columns are intentionally omitted as they contain data that is not relevant to the project.

6.5.10 Groundwater

Figure 18.4 in Chapter 18 of the EIS is missing due to a printing error. The figure that should have been included is shown as Figure 6.35 in the Groundwater Impact Assessment in Appendix R of the EIS.

6.5.11 Non-Aboriginal Heritage

Heritage impact classifications

Inconsistencies or errors have been identified in respect to the classification of heritage impacts to four buildings as detailed in Chapter 19 of the EIS and in the Non-Aboriginal Heritage Impact Assessment in Appendix S of the EIS.

Table 6.9 presents the section of the EIS in which these errors have been identified and the corresponding section in the Non-Aboriginal Heritage Impact Assessment (HIA). It also includes the heritage impact type and classification as per the EIS as well as the revised heritage impact type and classification.

Table 6.9 Changes to heritage impact classifications

Section of EIS and/or HIA	Heritage item	EIS heritage impact type and classification	Revised heritage impact type and classification
EIS Table 19.20 and HIA section 6.4.3	74 Underwood Road	Setting – neutral	Setting – minor adverse
EIS Table 19.22	Wesley Uniting Church and Hall at 81 Concord Road	Partial demolition (gates and grounds) – major adverse	Partial demolition (gates and grounds) – moderate adverse
EIS Table 19.25 and HIA section 6.7.3	19 Wattle Street	Demolition – adverse	Demolition – major adverse
EIS Table 19.25 and HIA section 6.7.3	21 Wattle Street	Demolition – adverse	Demolition – major adverse

Summary of heritage impacts

Section 30.3 of the EIS incorrectly states that the number of heritage items to be demolished would be 22. The correct numbers should be 16 heritage items fully demolished, four partially demolished and two heritage conservation areas (Powells Estate and Haberfield) would be impacted. In addition a total of 10 potential heritage items would be demolished.

6.5.12 Flooding and drainage

Spoil stockpiles

Section 17.3.1 of the EIS, under 'Construction ancillary facilities', describes stockpiling of spoil material, and the potential for stockpiles to obstruct floodwater and alter flooding patterns. The third sentence in the second paragraph should be amended to include 'Tunnel' and read (additional word in bold):

Tunnel *spoil material is proposed to be stockpiled at five sites (C1, C3a, C3b, C5 and C10).*

Powells Creek on-ramp

At a number of locations in Chapter 6 of the Surface Water: Flooding and Drainage assessment in Appendix Q of the EIS, the Powells Creek on-ramp is incorrectly referred to as the 'Powells Creek off-ramp'. All references to the Powells Creek off-ramp in this chapter should be read as the 'Powells Creek on-ramp'. This error does not affect the assessment of flooding and drainage impacts.

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7 Preferred infrastructure report

This chapter has been prepared to outline and assess the impact of alternative design options that have been identified since the exhibition of the environmental impact statement (EIS). As outlined in section 5.1 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 are to minimise environmental impacts, to deal with issues raised during exhibition, or which result from detailed design undertaken as contemplated by the EIS. The EIS notes that the final design of the M4 East project that is built could vary from the description in the EIS.

7.1 Homebush Bay Drive civil site (C1) expansion

7.1.1 Description of change

It is proposed to expand the construction footprint at the Homebush Bay Drive civil site (C1) to the north, beyond that shown in Figure 5.29 of the EIS. The affected land is owned by Ausgrid and is currently used for the following:

- Transmission line easement to the Mason Park Substation
- Hardstand car park area which is currently disused but has been previously used by the adjacent Direct Factory Outlet as an overflow car park.

The change to the construction footprint is shown in **Figure 7.1**. This land (or part thereof) would be leased from Ausgrid for the duration of construction.

The expansion of the Homebush Bay Drive civil site (C1) would allow for:

- Utilisation of existing car parking spaces for around 300 light vehicles
- Reconfiguration of site office, amenities and workshop facilities
- Reorientation of sedimentation basin and relocation of mulch and topsoil stockpile.

The sedimentation basin and mulch and topsoil stockpile would remain within the original extent of the Homebush Bay Drive civil site (C1). The existing transmission line easement, below the high voltage transmission lines, would be an exclusion zone, with the exception of internal roads and a footpath to enable movements across the easement.

The expansion of the construction footprint would allow for changes to the layout of the Homebush Bay Drive civil site (C1), as shown in **Figure 7.1**.

7.1.2 Consultation

Consultation between the contractor and Ausgrid regarding the leasing of additional land commenced in July 2015 and weekly meetings have been held with Ausgrid since.

7.1.3 Environmental overview of change

The expansion of Homebush Bay Drive civil site would increase its footprint considerably; however the civil site would expand into an already disturbed area comprised of a transmission line easement and car park. The expansion would therefore not result in significant impacts to the environment, while any increase in impact would be readily controlled with the management measures in the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report).

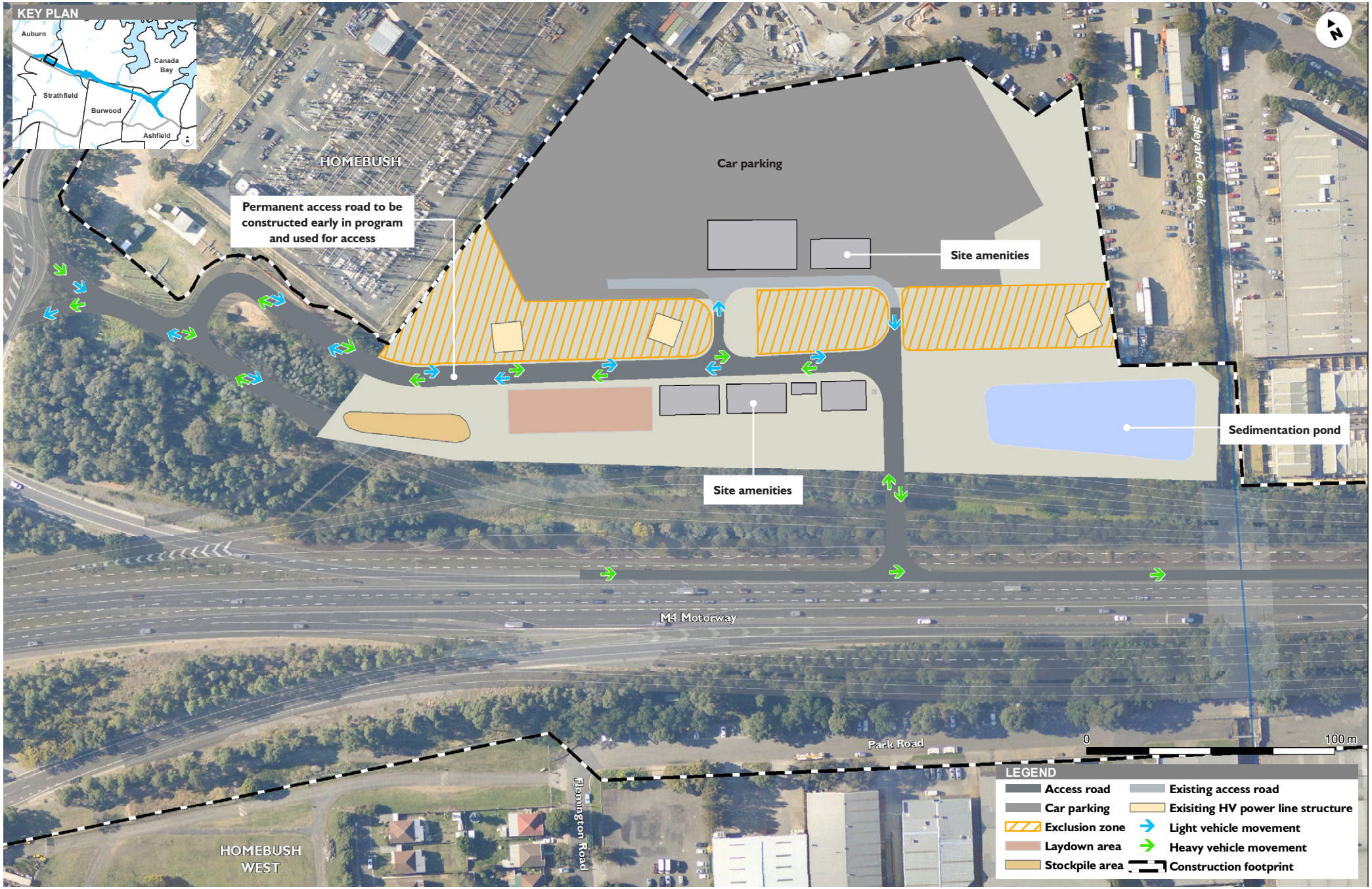

Figure 7.1 Revised Homebush Bay Drive civil site (C1)

7.1.4 Traffic and transport

The activities and effort involved in the establishment of the expanded Homebush Bay Drive civil site would not differ substantially from those described in the EIS, however it would enable utilisation of around 300 existing car parking spaces by the project workforce. Consistent with the previous site layout, light vehicle access to and egress from the car park would be via the Homebush Bay Drive on-ramp. Traffic modelling of the expanded civil site and surrounding road network during construction of the project indicates that morning and afternoon peak traffic conditions would be very similar to those reported in section 8.3 of the EIS.

Overall, the expansion of the expanded civil site would have minor traffic and transport impacts with some benefits to local streets. A traffic and transport report for the expanded civil site is provided in **Appendix C**.

7.1.5 Air quality

The expansion of the Homebush Bay Drive civil site is not considered to result in any changes to air quality during construction. The site would expand into existing hardstand area eliminating the need for additional earthworks and associated dust emissions, aside from minimal earthworks potentially necessary to provide access through the existing transmission line easement. The activities and effort involved in the construction of the expanded civil site would not differ substantially from those described in the EIS. The assessment of potential air quality impacts in sections 9.3 of the EIS therefore remains applicable.

7.1.6 Noise and vibration

The establishment of the civil site is unlikely to result in any significant exceedances of the applicable noise management level. Minor exceedances of around two decibels are predicted during the establishment of perimeter fencing; however this would be a temporary activity. The general day to day uses in the new expanded area are considered to be low noise activities such as car parking and site office activities and therefore are not considered to result in adverse impacts. A noise and vibration report for the expanded Homebush Bay Drive civil site is provided in **Appendix D**.

7.1.7 Human health

As detailed in **sections 7.1.5 and 7.1.6** of this report, the change at this site is not considered to result in any significant changes to impacts on the surrounding community due to air and noise impacts. It is therefore considered that human health impacts would also remain as per the EIS.

7.1.8 Property and land use

The expansion and adjustment of the Homebush Bay Drive civil site would result in an increase of land required for the construction site. The expansion of the site to the north would involve the leasing of land located north of the permanent acquisition outlined shown in Figure 5.29 of the EIS. This land would be leased from Ausgrid. The land is currently disused, however has been previously used as car parking for the outlet centre located to the north. The use of this land during construction is not considered to result in any property or land use impacts as the site is disused, and would be returned to Ausgrid in its original condition to meet the requirements of any agreement with Ausgrid, following completion of construction.

7.1.9 Urban design and visual amenity

The use of the existing car park area is not considered to result in any additional impacts on visual amenity. The proposed use is consistent with the previous use of the site. The establishment of some site offices in this location would potentially impact upon views from nearby properties; however the industrial nature of adjacent properties means impacts are considered to be minimal.

7.1.10 Social and economic

The use of this additional land is not expected to impact upon the community or result in any changed economic impacts. The adjacent outlet centre does not currently utilise this car park, and therefore use of these spaces for the construction workforce is not expected to result in any economic impacts at the outlet centre.

7.1.11 Soil and water quality

The potential soil and water quality impacts of the expanded Homebush Bay Drive civil site would not differ substantially from those described in the EIS. The civil site would be expanded onto an existing hardstand area and would therefore require minimal earthworks. The expansion of the civil site would not increase its frontage to Saleyards Creek. Construction and operation of the civil site would be subject to the same soil and water quality management plans and design standards as described in the EIS.

7.1.12 Contamination

As shown on Figure 16.1 of the EIS, the car park area proposed to be used during construction is considered to have a low potential of contamination due to past land uses. Figure 16.1 also highlights that part of the site is mapped as disturbed terrain and therefore there is potential for acid sulfate soils.

Regardless of the above the expansion of the construction site to the north is not considered to impact on any potentially contaminated land or acid sulfate soils. There would be minimal earthworks required as the existing hard stand would remain in place with all parking and site offices to be sited within these areas. It is not proposed to store any materials that could potentially contaminate soils within the expanded area of the site and therefore contamination is considered unlikely to result from the operation of the compound during construction. All potentially contaminating materials would be stored within the area of the compound assessed as part of the EIS (albeit with a slightly different layout as shown in **Figure 7.1**).

7.1.13 Flooding and drainage

As described in section 17.3 of the EIS, flows in Saleyards Creek during events exceeding a five year average recurrence interval (ARI) inundate the eastern side of the civil site. The EIS noted that the stockpile at the east of the civil site would be affected by flooding. This stockpile has been relocated to the west of the site as part of the expansion. This represents a reduction in environmental risk as the western side of the civil site would be less prone to flooding from Saleyards Creek.

Should a 100 year ARI event occur during construction, flood modelling shows that floodwater that surcharges the main arm of Saleyards Creek would extend into the expanded site area over a width of about two to 14 metres along its eastern boundary and reach a maximum depth of about 0.6 metres.

The proposed construction activities and facilities within the expanded site area would be located outside the 100 year ARI extent. As a result, no additional flood risks at the Homebush Bay Drive civil site (C1) are anticipated beyond those described in the EIS. Similarly, no additional impacts on mainstream flooding or major overland flow are anticipated during a 100 year ARI event.

A flooding and drainage report for the expanded Homebush Bay Drive civil site is provided in **Appendix E**.

7.1.14 Groundwater

The potential groundwater impacts of the expanded Homebush Bay Drive civil site would not differ substantially from those described in the EIS. The civil site would expand into an already disturbed area comprised of a transmission line easement and car park and would involve minimal additional earthworks. Significant impacts to groundwater are therefore unlikely. The assessment of potential groundwater impacts in section 18.3 of the EIS therefore remains applicable.

7.1.15 Non-Aboriginal heritage

The potential non-Aboriginal heritage impacts of the expanded Homebush Bay Drive civil site would not differ from those described in the EIS. The civil site would expand into an already disturbed area comprised of a transmission line easement and car park, with no listed heritage items and generally low potential for archaeological evidence to be present. The expanded civil site would be subject to the same detailed design processes and heritage management plans as described in the EIS. The assessment of potential non-Aboriginal heritage impacts in section 19.3 of the EIS therefore remains applicable.

7.1.16 Biodiversity

The car park on the Ausgrid land contains scattered planted trees. As the layout of the car park would not be amended, these scattered trees throughout the car park would generally not be affected.

There may be a need to remove some of these planted trees to install site offices and amenities, and/or to provide access from southern part of the civil site to the northern part of the civil site. Should this be required, the biodiversity value of any vegetation to be removed would be assessed.

7.1.17 Greenhouse gas

Greenhouse gas emissions due to the construction and operation of the expanded Homebush Bay Drive civil site would not differ substantially from those described in the EIS. The activities involved in its construction would be as described in the EIS and any additional clearing would be minor and would have a negligible effect on the associated greenhouse gas emissions. The greenhouse gas assessment in sections 21.3 of the EIS therefore remains applicable.

7.1.18 Aboriginal heritage

The potential Aboriginal heritage impacts of the expanded Homebush Bay Drive civil site would not differ from those described in the EIS. The civil site would expand into an already disturbed area comprised of a transmission line easement and car park. The land in this area is highly disturbed and unlikely to contain unidentified Aboriginal heritage objects. There are no registered Aboriginal heritage sites or areas of potential Aboriginal archaeological sensitivity at the expanded civil site, as defined in section 22.3.5 of the EIS. The assessment of potential Aboriginal heritage in section 22.4 of the EIS therefore remains applicable and unexpected finds procedures would apply during construction as per the Heritage Management Plan, a sub plan to the CEMP.

7.1.19 Resource use and waste minimisation

The establishment and utilisation of the expanded Homebush Bay Drive civil site would require construction materials, water resources and power as described in section 23.3 of the EIS. The measures to minimise waste generated by the project described in section 23.5 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) would apply equally to the expanded construction site. As such, the assessment of resource use and waste minimisation in the EIS remains applicable.

7.1.20 Hazards and risk

The use of the car park area to the north of the construction ancillary facilities described in the EIS results in the requirement to cross the Ausgrid transmission line easement in this location. There is a risk of construction activities in this area resulting in damage to the power network and also potential safety issues to workers. For this reason an exclusion zone would be established along the easement to ensure construction works do not occur in this area.

Two vehicle crossings and one pedestrian crossing would be provided for access across the easement. The risk of these vehicle movements resulting in impacts is considered to be low; however, some restrictions on the height of vehicles that may use the vehicle crossings may be required. These restrictions would be outlined in health and safety procedures that would be implemented at the Homebush Bay Drive civil site.

The establishment and utilisation of the expanded Homebush Bay Drive civil site would otherwise present the same environmental risks as described in section 25.2 of the EIS. The measures to control the level of risk described in section 25.3 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) would apply equally to the expanded construction site, including compliance with relevant standards for transport and storage of dangerous goods. As such, the assessment of hazards and risk in Chapter 25 of the EIS remains applicable.

7.1.21 Cumulative impacts

The cumulative impacts of the expanded Homebush Bay Drive civil site would not differ substantially from those described in the EIS. The expanded civil site would occupy the same general area described in the EIS and would not result in a material increase in potential impacts. As such, the assessment of cumulative impacts in Chapter 26 of the EIS remains applicable.

7.1.22 Sustainability

The expanded Homebush Bay Drive civil site would be constructed and operated in line with the WestConnex Sustainability Strategy as described in section 27.3 of the EIS.

7.2 Homebush Bay Drive interchange

7.2.1 Description of change

In the EIS, the Homebush Bay Drive interchange included two major bridge structures near Saleyards Creek to carry surface M4 traffic over traffic entering and exiting the M4 East mainline tunnels. The layout of the traffic lanes could be considered counter-intuitive, with traffic lanes to and from the new mainline tunnels provided on the outside of traffic lanes to and from the surface M4. This arrangement had the potential for the layout of the on- and off-ramps to be confusing for motorists.

Eastbound motorists wanting to enter the tunnel would have needed to use the northern (kerbside) lane, whereas drivers wanting to access the existing M4 (to the north of the tunnel) would have needed to use the southern lane. Westbound motorists wanting to continue on the M4 would have needed to go up and over a bridge and then back down onto the motorway rather than driving straight through at-grade. The proposed change would resolve these issues.

To maintain eastbound access to the existing M4 from Homebush Bay Drive, the design described in the EIS incorporated the construction of an elevated bridge up to eight metres in height adjacent to apartments on Verley Drive. The interchange as described in the EIS is depicted in **Figure 7.2** as an oblique elevation.

As a result of ongoing design development, the configuration of ramps and connections between the M4 and M4 East at the Homebush Bay Drive interchange is proposed to be modified. The purpose of these changes is to reduce the size of bridge structures, follow more direct grade lines and provide a more intuitive alignment for drivers entering and exiting at the Homebush Bay Drive interchange. The reconfiguration would also reduce potential visual and noise impacts on residents of Verley Drive.

The below sections outline the proposed changes to the configuration of this interchange. The new arrangement is shown in **Figure 7.3** as an oblique elevation and **Figure 7.4** in plan view. An indicative view of the revised interchange is shown in **Figure 7.5**.

M4 Motorway surface realignment

There would be no change to the western connection to the M4 Widening project as described in section 5.5.1 of the EIS. Traffic lanes on the M4 would continue to be realigned so that the dominant traffic flow would be to and from the new mainline tunnels.

In the eastbound direction, the lane for M4 surface traffic would be realigned to the north of the existing traffic lanes, and would travel under a short bridge structure carrying the M4 East entry ramp from Homebush Bay Drive. This short bridge structure would replace the long bridge structure further to the east as described in the EIS. The M4 surface traffic lane would widen to two lanes as it joins with a lane from the Homebush Bay Drive on-ramp for M4 surface traffic.

In the westbound direction, the two traffic lanes for M4 surface traffic would be realigned to the south of the existing traffic lanes. These lanes would continue at grade (instead of on a large bridge structure, as described in the EIS) before merging with the existing M4 to the east of Homebush Bay Drive.

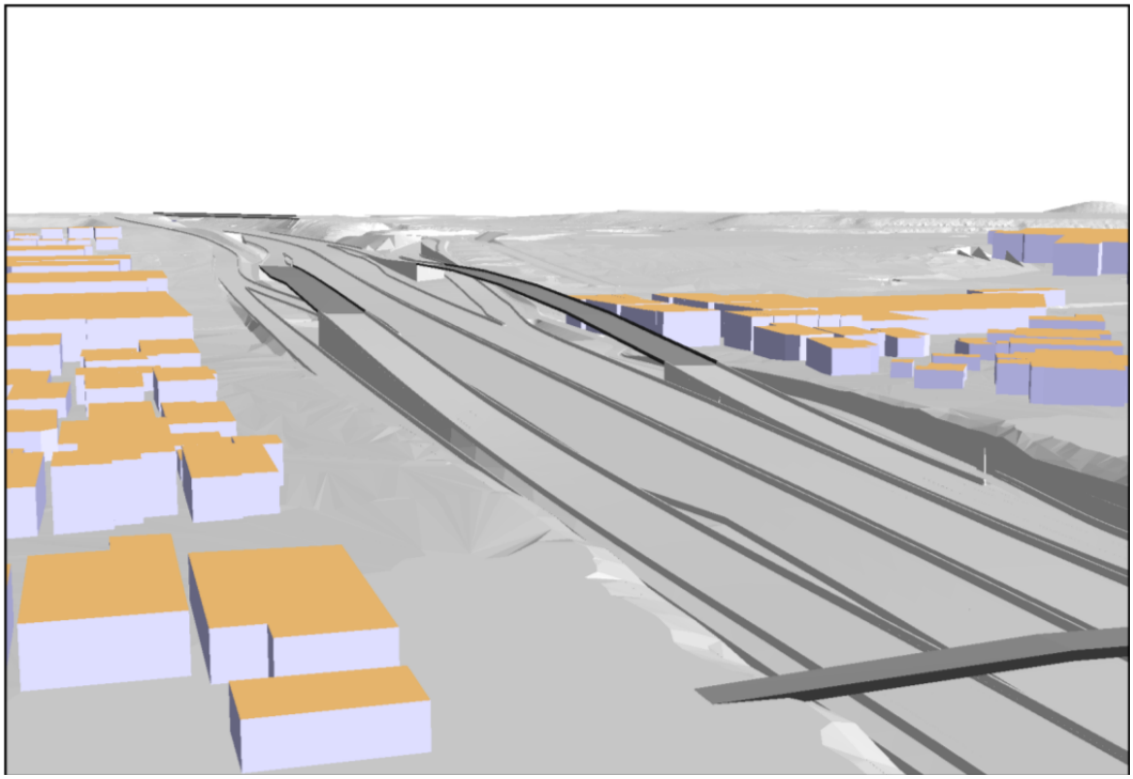

Figure 7.2 EIS Homebush Bay Drive interchange (oblique elevation, facing west)

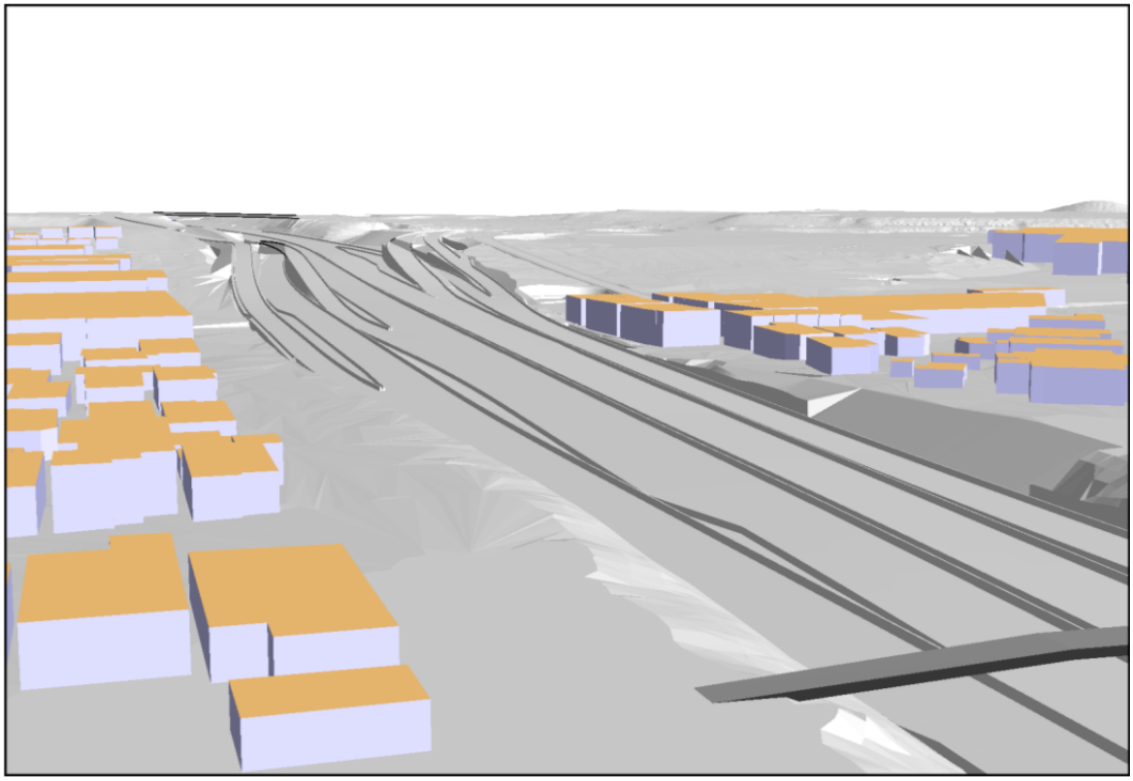

Figure 7.3 Reconfigured Homebush Bay Drive interchange (oblique elevation, facing west)

Figure 7.4 Reconfigured Homebush Bay Drive interchange

Figure 7.5 **Indicative view of the revised Homebush Bay Drive interchange, looking east from Homebush Bay Drive. This image is conceptual and is included for illustration purposes only**

Homebush Bay Drive eastbound on-ramp

As described in the EIS, the existing eastbound on-ramp from Homebush Bay Drive to the M4 would be realigned to the north.

At Homebush Bay Drive, the on-ramp would consist of one traffic lane which would provide access to the eastbound mainline tunnel. A lane on the northern side would provide access to the surface M4 eastbound. Both lanes would include a small bridge structure over the proposed re-routed eastbound cycleway, which would travel through an underpass under the on-ramp (instead of on a bridge over the on-ramp, as described in the EIS).

Traffic from the Homebush Bay Drive on-ramp choosing to use the eastbound mainline tunnel would travel in the southern-most (inside) lane, over the cycleway underpass, then on the short bridge described above (over eastbound surface M4 traffic) to merge with traffic travelling from the existing M4 east of Saleyards Creek. The design of the on-ramp widens to two lanes for managed motorway storage, before tapering back to one lane prior to merging with traffic travelling from the existing M4.

Traffic from the Homebush Bay Drive on-ramp choosing to use the surface M4 would travel in the northern-most (outside) lane, over the cycleway underpass. It would then join with the lane from the existing M4 described above, and would travel at grade before connecting to the existing M4 just west of Underwood Road.

Homebush Bay Drive westbound off-ramp

The westbound off-ramp to Homebush Bay Drive would be realigned to the south and would diverge from the surface M4 just east of Derowie Avenue, which is further to the west than the EIS configuration.

Traffic coming out of the westbound mainline tunnel and choosing to exit at Homebush Bay Drive would use a new exit lane just west of Derowie Avenue, which would travel over Saleyards Creek and a second small bridge structure near Flemington Road, after which it would join the surface M4 to Homebush Bay Drive off-ramp. The two off-ramps would tie into the existing off-ramp about 250 metres east of the signalised intersection with Homebush Bay Drive.

M4 East tunnel entrance and exit

There would be no changes to the M4 East tunnel entrance and exit portals and the M4 East surface configuration leading to the portals.

Re-routed eastbound cycleway

The proposed re-routed cycleway would travel under the Homebush Bay Drive on-ramp via an underpass, rather than an overpass as described in the EIS. The off-road section of the re-routed eastbound cycleway has been shortened, and would connect back into the M4 shoulder on the eastbound Homebush Bay Drive on-ramp connection to the surface M4 about 150 metres east of the underpass. The cycleway underpass would be developed further during detailed design.

7.2.2 Environmental overview of change

Although the reconfiguration of Homebush Bay Drive interchange is substantial, the reconfiguration would not significantly alter the footprint of the interchange. It is noted that the Homebush Bay Drive and east bound on ramp merge point would move north-west by about 20 metres. The reconfiguration would not result in significant additional impacts to the environment.

7.2.3 Traffic and transport

The reconfiguration of Homebush Bay Drive interchange would provide a more intuitive alignment for drivers entering and exiting. The potential traffic and transport impacts of the reconfigured interchange would not differ substantially from those described in the EIS. The activities and effort involved in the construction of Homebush Bay Drive interchange would not differ significantly from those described in the EIS and as such the assessment of construction traffic in section 8.3 of the EIS remains applicable. As the immediate approach lanes to the relevant intersections have not been redesigned, traffic flows during operation would be as described in section 8.4 of the EIS. A traffic and transport report for the reconfigured Homebush Bay Drive interchange is provided in **Appendix C**.

7.2.4 Air quality

The potential air quality impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS. The activities involved in the construction of Homebush Bay Drive interchange would not differ significantly from those described in the EIS. Construction dust impacts are therefore not expected to be significant – as described in section 9.6 of the EIS. The operation of Homebush Bay Drive interchange would not be materially affected by the reconfiguration, in terms of volumes of traffic or typical level of service. Emissions of nitrogen oxide, particulate matter and air toxics from surface roads would therefore be negligible and undetectable in ambient air quality – as described in section 9.7.2 of the EIS.

7.2.5 Noise and vibration

The potential noise and vibration impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfiguration generally reduces predicted noise at receivers adjacent to main areas of change, particularly adjacent to Verley Drive due to the removal of the elevated bridge. The reconfigured interchange produces noise levels comparable to those described in the EIS at remaining receptors. Predicted maximum noise levels at any receiver are similar to those described in the EIS.

The reconfiguration and associated noise barriers would lessen maximum noise levels in some noise catchment areas (NCA) by about five to seven decibels – namely the predominantly commercial NCA01 (north) and predominantly residential NCA02 and NCA03. The reconfiguration would also increase maximum noise levels in other areas by about nine decibels – namely the predominantly commercial NCA01 (south). Some receivers in these areas would be eligible for mitigation through treatment at their properties and may benefit from further optimisation of noise barriers during detailed design. Predicted maximum noise levels at receivers further away from the main areas of change – namely NCA04 and NCA05 – would not change materially.

The precise location and design of noise barriers (and hence predicted noise levels) would be subject to further considerations during detailed design including community preference. A noise and vibration report for the reconfigured Homebush Bay Drive interchange is provided in **Appendix D**.

7.2.6 Human health

The potential air quality and noise and vibration impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. In the predominantly residential areas where predicted maximum noise levels decrease (NCA02 and NCA03), there may be lower potential for health impacts to occur. However, the assessment of potential health impacts in sections 11.3 and 11.4 of the EIS remains generally applicable.

7.2.7 Property and land use

The potential property and land use impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS. Acquisition of additional land would be required adjacent to Verley Drive. This land was previously to be acquired as air space, but would now require partial acquisition of this property. In addition, there would be adjustment to the extent of permanent acquisition of Ausgrid land; however, the area to be acquired would remain the same. These changes would not represent a material change in the proposed use of the land from that described in the EIS. The assessment of potential property and land use impacts in sections 12.3 and 12.4 of the EIS therefore remains applicable.

7.2.8 Urban design and visual amenity

The reconfigured Homebush Bay Drive interchange offers a significant improvement in visual amenity compared to the configuration presented in the EIS.

The overall visual effect of the reconfiguration is to change Homebush Bay Drive interchange from a complex and elevated structure to one with less complexity and little or no appearance of elevation. This is particularly due to the removal of a 300 metre elevated bridge between Saleyards Creek and Verley Drive and its replacement with a much shorter bridge effectively at grade level, and also by the reconfiguration of the cycleway as an underpass.

The relocation of the Homebush Bay Drive east bound on ramp merge point would provide additional space that could enable planting of screening vegetation closer to the project, however the addition of batter slopes instead of retaining walls in the vicinity of the motorway control centre, westbound off-ramp and a vegetated area between Wentworth Road South and the M4 would reduce the area available for planting.

The urban design of the Homebush Bay Drive interchange would be subject to further considerations during detailed design, including review of opportunities for the use of retaining walls to maximise the area available for planting.

The overall impact of the reconfigured interchange on the landscape character would be consistent with the description provided in section 13.4 of the EIS. An urban design and visual amenity assessment for the reconfigured Wattle Street interchange is provided in **Appendix F**.

7.2.9 Social and economic

The potential social and economic impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. Economic stimulus from the construction of the reconfigured interchange, as a component of the project, would remain in the order of that described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS and would therefore not require the acquisition of additional properties, while changes in amenity and accessibility be as described in the EIS. The assessment of potential social and economic impacts in sections 14.3 and 14.4 of the EIS therefore remains applicable.

7.2.10 Soil and water quality

The potential soil and water quality impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS, would not involve significant additional ground disturbance and would retain the proposed bridge over Saleyards Creek. Construction and operation of the interchange would be subject to the same soil and water quality management plans and design standards as described in the EIS. The assessment of potential soil and water quality impacts in sections 15.3 and 15.4 of the EIS therefore remains applicable.

7.2.11 Contamination

The potential contamination impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS with low to moderate contamination potential. As identified in the EIS, the main area of concern is in the vicinity of Saleyards Creek where asbestos has been detected within fill materials and there is potential for acid sulfate soils. Excavation of asbestos containing material, acid sulfate soil or other harmful material would be undertaken following further investigation and would be managed in accordance with relevant legislation, policies and guidelines. The assessment of contamination impacts in sections 16.4 and 16.5 of the EIS remains applicable.

7.2.12 Flooding and drainage

The potential flooding and drainage impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area within the Powells Creek catchment as described in the EIS and would retain the proposed bridges over Saleyards Creek.

Flood modelling of the revised design shows that there would be a minor reduction in peak 100 year ARI flood levels upstream of the Saleyards Creek bridges of 0.02 metres or less, which is largely consistent with the post-construction impacts presented in the EIS. Similarly, the peak 100 year ARI flood upstream of the southern-most bridge (carrying westbound Homebush Bay Drive off-ramp traffic from the surface M4) is consistent with the EIS.

The modelling shows that there would be an increase in probable maximum flood (PMF) levels upstream of the project corridor, to a maximum of 0.4 metres. This is 0.1 metres higher than the PMF level identified in the EIS under post-construction conditions and is due to the increase in elevation of the barrier wall along the southern side of the project. However, the relative increase in the depth and extent of flooding is minor and no additional properties would be affected in comparison to the post-construction impacts presented in the EIS.

A flooding and drainage report for the reconfigured Homebush Bay Drive interchange is provided in **Appendix E**.

7.2.13 Groundwater

The potential groundwater impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area as described in the EIS and would not involve significant additional ground disturbance or excavation. The assessment of potential groundwater impacts in sections 18.3 and 18.4 of the EIS therefore remains applicable.

7.2.14 Non-Aboriginal heritage

The potential non-Aboriginal heritage impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area as described in the EIS, with no listed heritage items to be directly impacted and generally low potential for archaeological evidence to be present. The reconfigured interchange would be subject to the same detailed design processes and heritage management plans as described in the EIS. The assessment of potential non-Aboriginal heritage impacts in section 19.3 of the EIS therefore remains applicable.

7.2.15 Biodiversity

The potential biodiversity impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area as described in the EIS but would involve some additional clearing. As this area is highly urbanised and does not contain remnant vegetation, the value of the vegetation to be cleared is considered to be relatively low. The assessment of potential biodiversity impacts in sections 20.3 and 20.4 of the EIS therefore remains applicable.

7.2.16 Greenhouse gas

Greenhouse gas emissions due to the construction and operation of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area as described in the EIS and would involve a relatively minor volume of additional clearing while the activities involved in its construction would be as described in the EIS. The operation of Homebush Bay Drive interchange would not be affected in terms of traffic. The greenhouse gas assessment in sections 21.3 and 21.4 of the EIS therefore remains applicable.

7.2.17 Aboriginal heritage

The potential Aboriginal heritage impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area as described in the EIS and would not directly disturb any registered Aboriginal heritage sites. The land in this area is highly disturbed and unlikely to contain unidentified Aboriginal heritage objects. The assessment of potential Aboriginal heritage in section 22.4 of the EIS therefore remains applicable and unexpected finds procedures would apply during construction as per the Heritage Management Plan, a sub plan to the CEMP.

7.2.18 Resource use and waste minimisation

The construction and operation of the reconfigured Homebush Bay Drive interchange would require construction materials, water resources and power as described in section 23.3 and 23.4 of the EIS. The measures to minimise waste generated by the project described in section 23.5 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) would apply equally to the reconfigured interchange. As such, the assessment of resource use and waste minimisation remains applicable.

7.2.19 Hazards and risk

The construction and operation of the reconfigured Homebush Bay Drive interchange would present the same environmental risks as described in section 25.2 of the EIS. The measures to control the level of risk described in section 25.3 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) would apply equally to the reconfigured interchange, including compliance with relevant standards for transport and storage of dangerous goods. As such, the assessment of hazards and risk remains applicable.

7.2.20 Cumulative impacts

The cumulative impacts of the reconfigured Homebush Bay Drive interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS and would not result in a material increase in potential impacts. As such, the assessment of cumulative impacts in Chapter 26 of the EIS remains applicable.

7.2.21 Sustainability

The reconfigured Homebush Bay Drive interchange would be constructed and operated in line with the WestConnex Sustainability Strategy as described in section 27.3 of the EIS.

7.3 Sydney Street substation re-orientation

7.3.1 Description of change

As described in the EIS, the substation at the Concord Road interchange was proposed to be located above the cut-and-cover tunnel on the north-eastern corner of the Concord Lane and Sydney Street intersection, orientated perpendicular to Sydney Street with a frontage along Concord Lane.

Following further design development and in response to issues raised by the community, it is proposed to reorient the substation to run parallel to Sydney Street. The substation would have frontage to Sydney Street, Concord Road and Concord Lane.

An indicative view of the re-oriented substation is provided in **Figure 7.6** and the proposed orientation of the substation is shown in **Figure 7.7**.

Figure 7.6 **Indicative view of the re-oriented Sydney Street substation, looking east. This image is conceptual and is included for illustration purposes only**

7.3.2 Environmental impacts of change

The Sydney Street substation is a relatively minor supporting component of the project. The reorientation of the substation is not a significant change and the potential impacts of the substation would not differ substantially from those described in the EIS. As stated in the EIS, the specific equipment making up the substation would be subject to a selection process during detailed design.

Figure 7.7 Change in orientation of Sydney Street substation

The substation would operate within an enclosure that would minimise potential impacts – particularly noise. If necessary, noise could be further limited with the introduction of engineering controls such as barriers, silencers and acoustic lining.

The substation would be located within Powell's Estate heritage conservation area, where demolition of a number of heritage buildings is required for other components of the project. The reorientation of the substation would not require any additional demolition. From a non-Aboriginal heritage perspective, the re-orientation of the substation would be an improvement on the previously proposed orientation because it would:

- Be consistent with the orthogonal orientation of the existing residences along Concord Road including the existing residences proposed to be demolished to make way for the substation
- Create the opportunity for future infill development on the site to address and complement the built form and streetscape character of Concord Road
- Create the opportunity for future landscaping opportunities.

The reoriented substation would be designed to be as unobtrusive as possible within the surrounding residential area. The architecturally detailed aspect of the substation would be reoriented to face the relatively public Sydney Street with a setback likely to match future development, while the utilitarian aspects of the substation would be reoriented to face relatively less public and residential areas.

The substation would also be situated so as not to be affected by flooding or overland flow, as described in section 17.4 of the EIS. The reorientation of the substation would have negligible implications for other environmental aspects including traffic and transport, air quality and biodiversity.

The reoriented Sydney Street substation would be constructed and operated in line with the management measures described in the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) and the WestConnex Sustainability Strategy.

7.4 Construction access tunnel at Concord Road interchange

7.4.1 Description of change

To provide access between the tunnel on- and off-ramps and the mainline tunnel during construction, a construction access tunnel would be required beneath properties in Edward Street and Sydney Street at Concord, near the Concord Road interchange. Additional subsurface property acquisition would be required. This additional acquisition is shown in **Figure 7.8**.

Following completion of construction, the construction access tunnel would be backfilled.

7.4.2 Environmental impacts of change

The construction access tunnel would not result in any impacts at or above the ground surface. The works would be wholly contained underground.

Section 12.3.1 of the EIS describes the impacts of subsurface acquisition. The impacts of the additional subsurface acquisition would be as described in the EIS. In most cases, subsurface acquisition would not affect the future use of property at the surface. Subject to Council regulations and approvals, property owners would generally be able to:

- Carry out improvement such as installing a swimming pool
- Dig deeper foundations for a new building, second storey additions, etc
- Undertake property development.

The assessment of potential property impacts in section 12.3 of the EIS therefore remains applicable.

Figure 7.8 Additional subsurface acquisition at Concord Road interchange

7.5 Emergency smoke exhaust at Cintra Park

7.5.1 Description of change

The fresh air supply facility at Cintra Park, as described in section 5.6.2 of the EIS, is now proposed to also operate as an emergency smoke exhaust facility. This modification would not change the building described in the EIS. Instead, reversible fans would be installed so that the facility would have two functions – fresh air supply and emergency smoke exhaust.

The emergency smoke exhaust would only operate in emergencies, such as the outbreak of fire, which are expected to occur very rarely. The exhaust would also be infrequently tested for maintenance; however, testing would not result in smoke exhaust. The emergency smoke exhaust would be essential to providing a safe environment for tunnel users.

7.5.2 Environmental impacts of change

The repurposing of the fresh air supply facility at Cintra Park to also provide emergency smoke exhaust is not a material addition to the project. The repurposing would therefore have negligible implications for the majority of environmental values including noise and vibration, property and land use, flooding and drainage and non-Aboriginal heritage. In the very rare event of an emergency that requires use of the emergency smoke exhaust, there would be potential for air quality impacts to occur in the vicinity of Cintra Park.

The fresh air supply facility at Cintra Park would be constructed and operated in line with the mitigation measures described in the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report).

7.6 Wattle Street (City West Link) interchange

7.6.1 Description of change

In the EIS, the Wattle Street (City West Link) interchange included separate cut and cover tunnel structures. The interchange as described in the EIS is depicted in **Figure 7.9** as an oblique elevation.

As a result of ongoing design development, the configuration of the Wattle Street interchange is proposed to be modified. The purpose of these changes is to combine the dive and cut and cover structures for both the M4 East ramps and the M4–M5 Link ramps.

The below sections outline the proposed changes to the configuration of the interchange. The new arrangement is shown in **Figure 7.10** as an oblique elevation and **Figure 7.11** in plan view.

There would also be changes to subsurface property acquisition, as shown in **Figure 7.12**.

An indicative view of the revised interchange is shown in **Figure 7.13**.

M4 East tunnel exit to Wattle Street

The M4 East tunnel exit to Wattle Street would not be altered significantly. The tunnel portal would remain on the northern side of Ramsay Street.

The dedicated right turn bay at the Waratah Street signalised intersection would remain for traffic exiting the eastbound mainline tunnel only.

M4 East tunnel entrance from Wattle Street

The M4 East tunnel entry from Wattle Street would be relocated further to the east, so that the on-ramp would be the eastern-most (kerbside) lane while the surface Wattle Street lanes would continue as the centre lanes. The dive structure for this on-ramp would start on the southern side of Martin Street. The tunnel portal would remain on the northern side of Ramsay Street.

There would be no other change to the on-ramp.

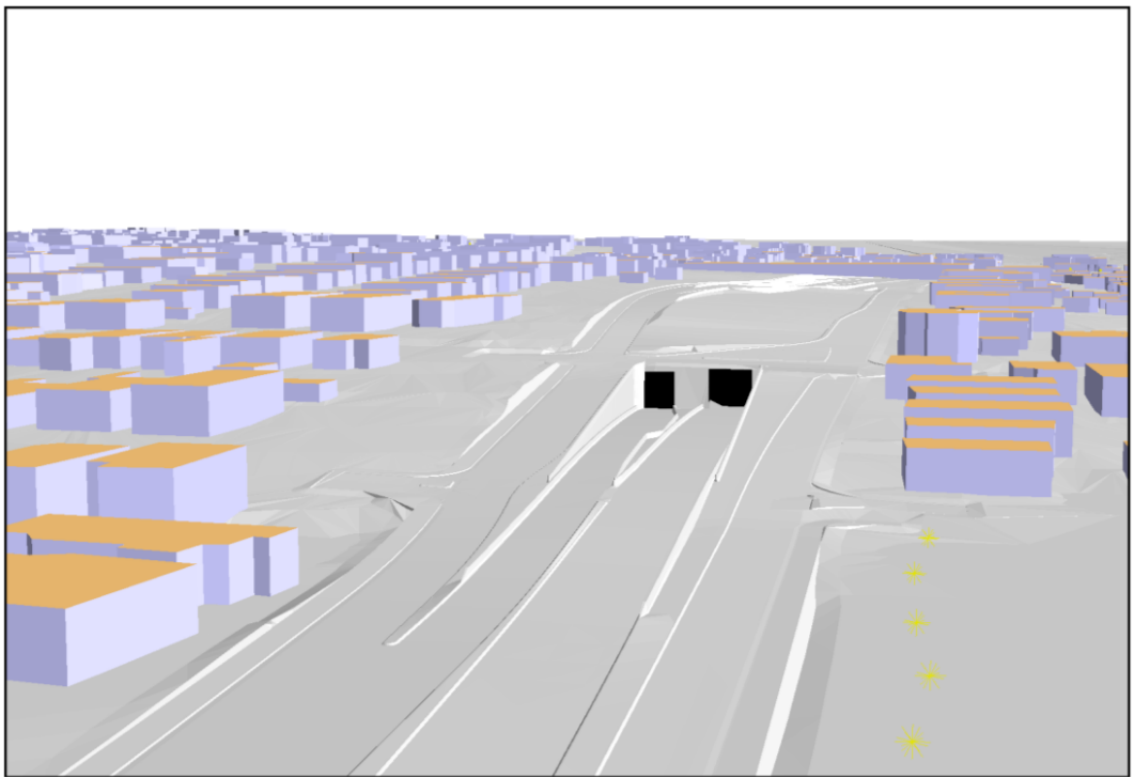

Figure 7.9 EIS Wattle Street interchange (oblique elevation, facing south)

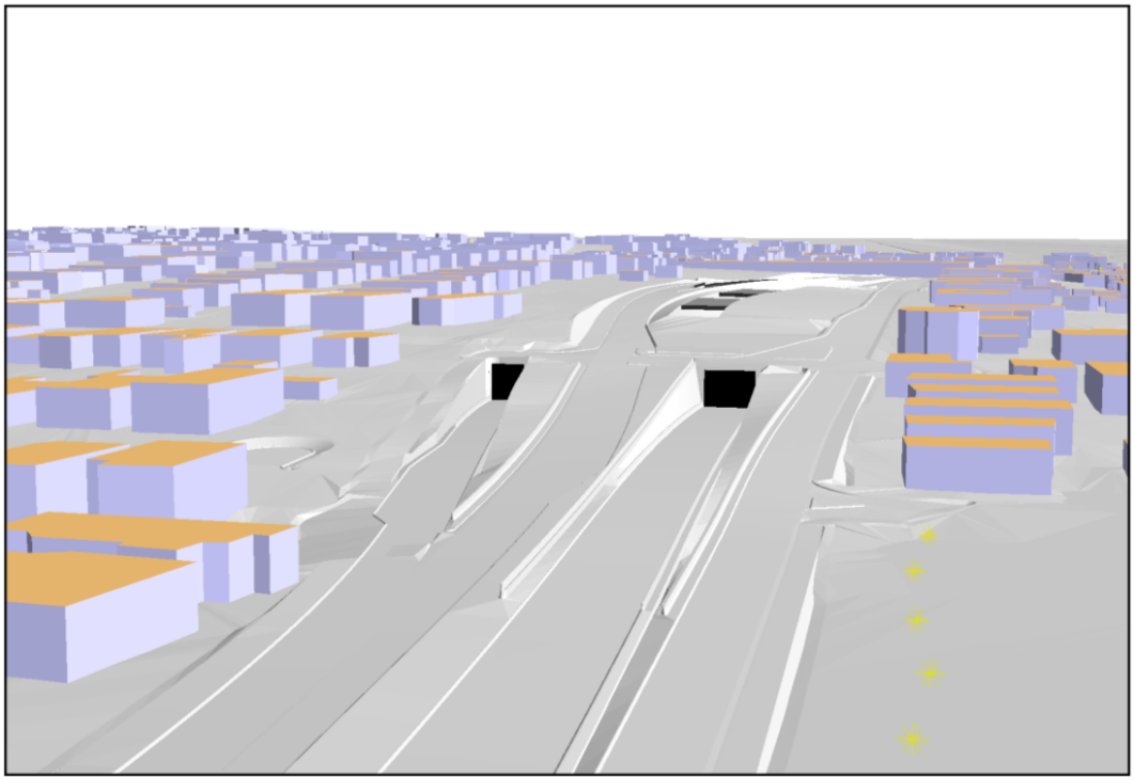

Figure 7.10 Reconfigured Wattle Street interchange (oblique elevation, facing south)

Figure 7.11 Reconfigured Wattle Street (City West Link) interchange

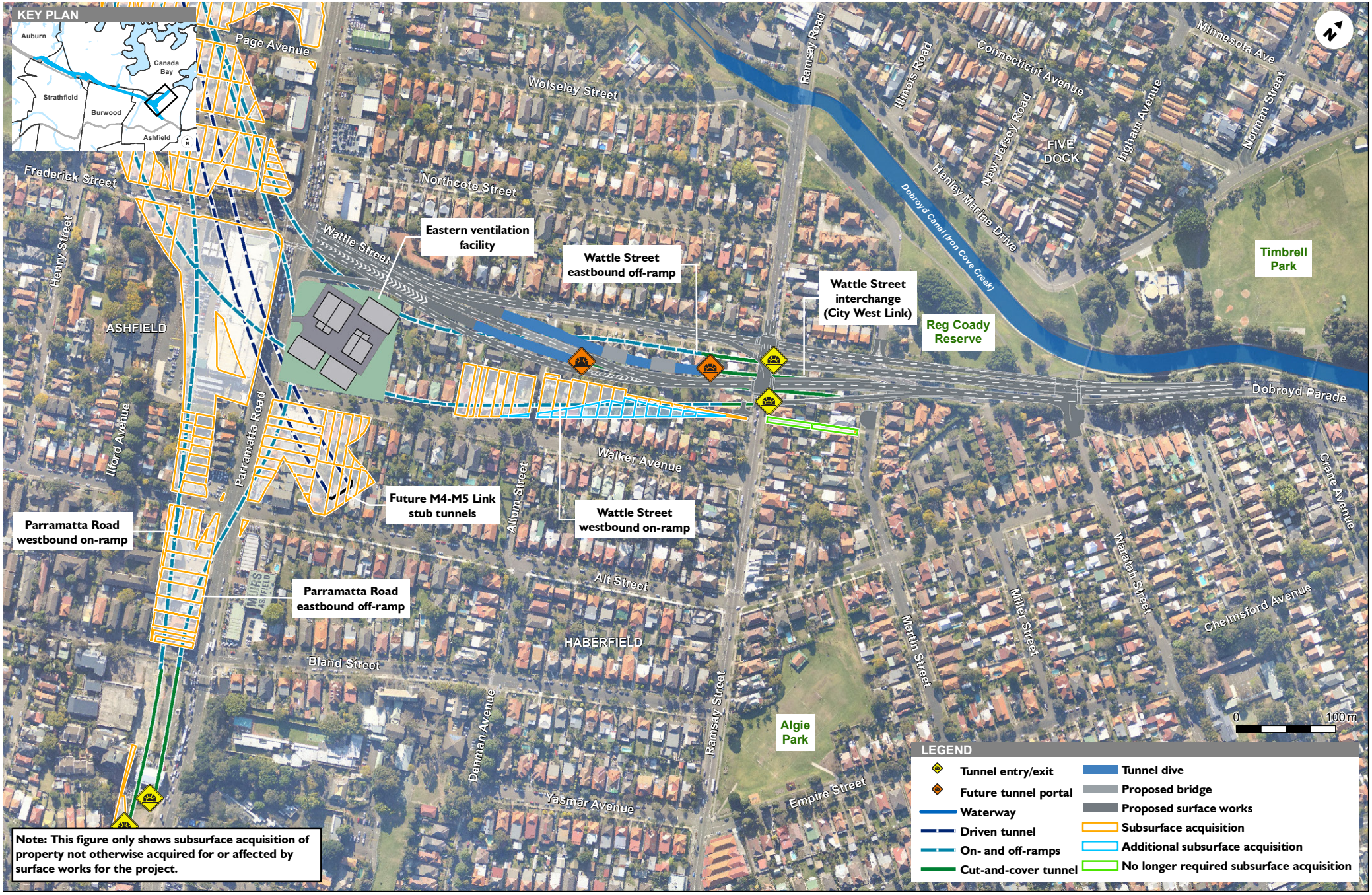

Figure 7.12 Changes to subsurface acquisition at the Wattle Street interchange

Figure 7.13 **Indicative view of the revised Wattle Street interchange, looking south along Wattle Street from near Reg Coady Reserve. This image is conceptual and is included for illustration purposes only**

Wattle Street surface adjustments

The surface Wattle Street eastbound lanes would not change as part of the modification of the interchange.

The surface Wattle Street westbound lanes would be realigned to the east of its existing alignment; however, it would continue in the centre lanes (instead of the kerbside lanes as described in the EIS). To do this, the surface lanes would travel over the cut and cover sections of the M4–M5 Link on- and off-ramps.

South of Ramsay Street, the westbound surface Wattle Street lanes would still split as described in the EIS, two separate sets of lanes providing access to Parramatta Road westbound, and Parramatta Road eastbound or Frederick Street southbound.

North of Waratah Street, the surface works would remain on the same general alignment.

M4–M5 Link on- and off-ramps tunnels

The M4–M5 Link cut and cover structures would start in about the same location as described in the EIS, but would be realigned so that they are positioned between the M4 East on- and off-ramps. The on- ramp dive structure would be lengthened, while the off-ramp dive structure would be shortened.

Martin Street intersection works

As a result of the realignment of the M4 East westbound tunnel entry from Wattle Street, the on-ramp would become the eastern-most (kerbside) lane, while the surface Wattle Street lanes would continue as the centre lanes. A cul-de-sac would therefore be established at Martin Street on the eastern side of Wattle Street. This reconfiguration would mean that no access to the Wattle Street lanes or the M4 East on-ramp would be provided from Martin Street to Wattle Street.

Alternative access to Wattle Street would be available via Alt Street and Ramsay Street/Waratah Street. As the on-ramp for the M4 East tunnel entrance from Wattle Street would start on the northern side of Martin Street, access to the M4 East tunnel entrance would be via the intersection of Waratah Street and Wattle Street.

7.6.2 Community consultation

As part of the consultation process for the proposed change at the Wattle Street interchange and specifically the proposed closure of Martin Street, SMC undertook a doorknock of properties located on Alt St (between Martin and Waratah Street) and Martin St Haberfield to discuss the proposed change with residents. Where residents weren't home, calling cards were left requesting the resident call SMC to discuss the change and follow up calls were made to contact residents

Table 7.1 provides a summary of the response of residents to the proposed closure of Martin Street east.

Table 7.1 Results of consultation with residents on proposed closure of Martin Street east

Properties project attempted to consult	Consulted	In Favour	Neutral	Not in favour	NA
49	36	27	6	2	1

7.6.3 Environmental overview of change

Although the reconfiguration of Wattle Street interchange is substantial, the reconfiguration would reduce its operational footprint. The reconfiguration would not therefore result in significant additional impacts to the environment.

7.6.4 Traffic and transport

The reconfiguration of Wattle Street interchange would provide a more intuitive alignment for drivers entering and exiting, while the potential traffic and transport performance of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The activities and effort involved in the construction of Wattle Street interchange would not differ significantly from those described in the EIS and as such the assessment of construction and operation traffic in sections 8.3 and 8.4 of the EIS remains applicable.

The establishment of a cul-de-sac at Martin Street (east) would not generate significant impacts for local traffic given the limited use of the intersection under existing conditions (about three left turns during morning peak, five left turns during afternoon peak (recorded during a single day survey)) and accessibility of an alternative route to Martin Street via Alt Street and Ramsay Street/Waratah Street.

A traffic and transport report for the reconfigured Wattle Street interchange is provided in **Appendix C**.

7.6.5 Air quality

The potential air quality impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS. The activities involved in the construction of Wattle Street interchange would not differ from those described in the EIS. Construction dust impacts are therefore expected to be as described in section 9.6 of the EIS.

The operation of Wattle Street interchange would not be materially affected by the reconfiguration, in terms of volumes of traffic or typical level of service. Emissions of nitrogen oxide, particulate matter and air toxics from surface roads would therefore be negligible and undetectable in ambient air quality, as described in section 9.7.2 of the EIS.

7.6.6 Noise and vibration

The potential noise and vibration impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfiguration marginally reduces predicted noise at receivers adjacent to main areas of change, near the Wattle Street access ramps, and produces noise levels comparable to those described in the EIS at remaining receptors.

The reconfiguration and associated noise barriers would lessen maximum noise levels in some noise catchment areas (NCA) by two to three decibels – namely the predominantly residential NCA17 and NCA18. The reconfigured interchange produces increases in maximum noise levels comparable to those described in the EIS at remaining receptors. A detailed investigation of maximum noise levels due to the project would be undertaken during detailed design, including consideration of feasible and reasonable noise mitigation on the basis of maximum noise levels. A management measure has been added to Chapter 8 (Revised summary of environmental management measures) to reflect this commitment.

It is noted that the precise location and design of noise barriers (and hence predicted noise levels) would be subject to further considerations such as constructability and community preferences. A noise and vibration report for the reconfigured Wattle Street interchange is provided in **Appendix D**.

7.6.7 Human health

The potential air quality and noise and vibration impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. In the predominantly residential areas where predicted maximum noise levels decrease (NCA17 and NCA18) there may be lower potential for health impacts to occur. However, the assessment of potential health impacts in sections 11.3 and 11.4 of the EIS remains generally applicable.

7.6.8 Property and land use

The potential property and land use impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS but would require the use of one additional property on Martin Street, which is already owned by NSW Roads and Maritime Services (Roads and Maritime). As shown in **Figure 7.12**, three properties would no longer be affected by subsurface acquisition. Additional subsurface acquisition would be required at 14 properties that were already affected by subsurface acquisition (ie the area of subsurface acquisition would increase).

The assessment of potential property and land use impacts in sections 12.3 and 12.4 of the EIS therefore remains applicable.

7.6.9 Urban design and visual amenity

The potential urban design and visual amenity impacts reconfigured Wattle Street interchange would be broadly similar to those described in the EIS.

While the reconfiguration would mean a previously relatively large contiguous planting area would be bisected (adjacent to Wattle Street and south of Ramsay Street), the relocation of the tunnel entry would result in a net increase in the area available for deep soil planting. Establishment of mature trees is more likely to succeed in these deeper areas, which may provide a net visual benefit. The

resizing of cut-and-cover structures at Ramsay Street would both restrict and enhance opportunities for shallower planting in various places. The establishment of a cul-de-sac and acquisition of an additional property on Martin Street would also result in residual areas being available for planting.

The overall impact of the reconfigured interchange on the landscape character would be as described in section 13.4 of the EIS. An urban design and visual amenity assessment for the reconfigured Wattle Street interchange is provided in **Appendix F**.

7.6.10 Social and economic

The potential social and economic impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. Economic stimulus from the construction of the reconfigured interchange, as a component of the project, would remain in the order of that described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS but would require the use of one additional property on Martin Street, which is already owned by Roads and Maritime. Changes in amenity and accessibility would be as described in the EIS. The assessment of potential social and economic impacts in sections 14.3 and 14.4 of the EIS therefore remains applicable.

7.6.11 Soil and water quality

The potential soil and water quality impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS, would not involve significant additional ground disturbance and would not cross any mapped waterways. Construction and operation of the interchange would be subject to the same soil and water quality management plans and design standards as described in the EIS. The assessment of potential soil and water quality impacts in sections 15.3 and 15.4 of the EIS therefore remains applicable.

7.6.12 Contamination

The potential contamination impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS, with low contamination potential. As identified in the EIS, the main area of concern is in the vicinity of Dobroyd Canal where there is potential for acid sulfate soils. Excavation of acid sulfate soil would be undertaken following further investigation and would be managed in accordance with relevant legislation, policies and guidelines. The assessment of potential contamination impacts in sections 16.4 and 16.5 of the EIS remains applicable.

7.6.13 Flooding and drainage

The potential flooding and drainage impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The exception to this is the potential for adverse flood impacts in existing residential development located to the east (upstream) of Wattle Street and north of Martin Street.

Flood modelling of the revised design indicates that there would be an increase in peak 100 year ARI flood levels in existing residential development located to the east (upstream) of Wattle Street and north of Martin Street. This is due to the raised level of the tunnel entry ramp immediately east of Martin Street under the revised design, which obstructs overland flow that discharges in a northerly direction across the low point in Wattle Street. Peak 100 year ARI flood levels within properties that lie south of Wattle Street would be increased by a maximum of 0.08 metres. In comparison, the preferred design assessed for the EIS resulted in no increase in 100 year ARI flood levels in this area.

The impact of the alternative design arrangement on flooding conditions in existing development south of Wattle Street could be mitigated by increasing the size of the proposed cross drainage structures across Wattle Street, between Martin Street and Waratah Street, as described in **Appendix E**. The implementation of these measures would mitigate the impacts of the project on flooding behaviour in existing residential development located to the south (upstream) of Wattle Street. A management measure has been added to **Chapter 8** (Revised summary of environmental management measures) to reflect this commitment.

The flood modelling also shows that there would be a localised increase in PMF levels in the vicinity of Loudon Avenue, by a maximum of 0.2 metres relative to present day conditions, which is slightly less than the corresponding impact of the preferred design assessed for the EIS.

A flooding and drainage report for the reconfigured Wattle Street interchange is provided in **Appendix E**.

7.6.14 Groundwater

The potential groundwater impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area as described in the EIS and would not involve significant additional ground disturbance or excavation. The assessment of potential groundwater impacts in sections 18.3 and 18.4 of the EIS therefore remains applicable.

7.6.15 Non-Aboriginal heritage

The reconfigured interchange would occupy a part of the Haberfield Heritage Conservation Area and would require the demolition of one additional building at 23 Martin Street, which is owned by Roads and Maritime. The property is not listed as a heritage item on the Ashfield Local Environmental Plan 2013 (LEP 2013) or on the RMS section 170 Heritage and Conservation Register. It was identified as a neutral item in the Non-Aboriginal Heritage Impact Assessment (Appendix S of the EIS). It has not been identified as a potential heritage item.

The residence to be demolished does not contribute to the predominant Federation architectural style within the Haberfield HCA. The original subdivision design is evident in the existing street layout and the pattern of the freestanding and semi-detached houses. Its freestanding character is complementary to that of the streetscapes in the Haberfield heritage conservation area.

Notwithstanding that it is rated neutral, demolition of 23 Martin Street would impact on the historic significance of the Haberfield heritage conservation area, as it would result in the further diminution of the original subdivision layout. It would also contribute to high visual impacts within the Haberfield heritage conservation area.

The Wattle Street re-design and the demolition of 23 Martin Street may also add to an impact on the social significance of the Haberfield Heritage Conservation Area, particularly for the residents who live west of Wattle Street who would be visually and spatially separated from the remainder of the suburb by the project.

The general and specific management measures identified in section 19.4 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) would still apply to the management of heritage for the demolition of 23 Martin Street in the wider context of the project.

A non-Aboriginal heritage report for the reconfigured Wattle Street interchange is provided in **Appendix G**.

7.6.16 Biodiversity

The potential biodiversity impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area as described in the EIS and would involve minimal or no additional clearing. This area is highly urbanised and does not contain remnant vegetation; any additional clearing would be limited to vegetation located at the additional affected property. The assessment of potential biodiversity impacts in sections 20.3 and 20.4 of the EIS therefore remains applicable.

7.6.17 Greenhouse gas

Greenhouse gas emissions due to the construction and operation of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area as described in the EIS and would not involve additional clearing while the activities involved in its construction would be as described in the EIS. The operation of Wattle Street interchange would not be affected in terms of traffic. The greenhouse gas assessment in sections 21.3 and 21.4 of the EIS therefore remains applicable.

7.6.18 Aboriginal heritage

The potential Aboriginal heritage impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area as described in the EIS and would not directly disturb any registered Aboriginal heritage sites. The land in this area is highly disturbed and unlikely to contain unidentified Aboriginal heritage objects. The assessment of potential Aboriginal heritage in section 22.4 of the EIS therefore remains applicable.

7.6.19 Resource use and waste minimisation

The construction and operation of the reconfigured Wattle Street interchange would require construction materials, water resources and power as described in section 23.3 and 23.4 of the EIS. The measures to minimise waste generated by the project described in section 23.5 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) would apply equally to the reconfigured interchange. As such, the assessment of resource use and waste minimisation remains applicable.

7.6.20 Hazards and risk

The construction and operation of the reconfigured Wattle Street interchange would present the same environmental risks as described in section 25.2 of the EIS. The measures to control the level of risk described in section 25.3 of the EIS (as amended in **Chapter 8** (Revised environmental management measures) of this report) would apply equally to the reconfigured interchange, including compliance with relevant standards for transport and storage of dangerous goods. As such, the assessment of hazards and risk remains applicable.

7.6.21 Cumulative impacts

The cumulative impacts of the reconfigured Wattle Street interchange would not differ substantially from those described in the EIS. The reconfigured interchange would occupy the same general area described in the EIS and would not result in a material increase in potential impacts. As such, the assessment of cumulative impacts in Chapter 26 of the EIS remains applicable.

7.6.22 Sustainability

The reconfigured Wattle Street interchange would be constructed and operated in line with the WestConnex Sustainability Strategy as described in section 27.3 of the EIS.

7.7 Ramsay Street and Martin Street (west) intersection works

7.7.1 Description of change

The Wattle Street (City West Link) interchange as described in the EIS and as amended by the design change described in **section 7.6** would limit traffic movements into and out of Martin Street, on the western side of Wattle Street to left in and left out only. As the intersection of Martin Street and Ramsay Street is currently closed to traffic, vehicles leaving Martin Street and wishing to travel westbound on Wattle Street would need to turn left onto Wattle Street then travel about 700 metres to Timbrell Drive, and then perform a U-turn at the roundabout at the intersection on Timbrell Drive and Henley Marine Drive. Similarly, eastbound vehicles on Wattle Street wishing to enter Martin Street would need to turn right at Timbrell Drive, and then travel along a circuitous route via Henley Marine Drive, Ramsay Street, Wattle Street and then left into Martin Street. Both of these routes would add considerable travel time to residents and visitors to Martin Street (west).

In order to provide acceptable connections to Martin Street, it is proposed to undertake works at the currently closed intersection of Ramsay Street and Martin Street. This intersection would be reopened to traffic, and all turning movements into and out of the western end of Martin Street would be permitted. Signal control is not proposed at this location due to the low turning volumes anticipated. The proximity of the upstream and downstream signals is anticipated to provide sufficient gaps for turning vehicles. Parking restrictions on Ramsay Street may require further investigation to ensure right turning vehicles do not impact through traffic on Ramsay Street.

In addition, to prevent rat-running by motorists seeking to avoid the Ramsay Street and Wattle Street intersection, the eastern end of Martin Street (west) would be altered to be left in only, with the left turn out movement onto Wattle Street prohibited. Geometric changes to the intersection would be required to physically restrict egress to Wattle Street. This would retain the low volume, residential nature of the existing street.

Figure 7.14 illustrates the proposed movements.

7.7.2 Community consultation

As part of the consultation process for the proposed change at Martin Street (west) and specifically the proposed opening of Martin Street at Ramsay Street and removal of turning movements out of Martin Street on to Wattle Street, SMC undertook a doorknock of properties located on Martin Street between Wattle and Ramsay Streets Haberfield to discuss the proposed change with residents. Where residents weren't home, calling cards were left requesting the resident call SMC to discuss the change and follow up calls were made to contact residents.

Table 7.2 provides a summary of the response of residents to the proposed closure of Martin Street east.

Table 7.2 Results of consultation with residents on proposed closure of Martin Street west

Properties project attempted to consult	Consulted with	In Favour	Neutral	Not in favour	NA
22	15	10	3	1	1

7.7.3 Environmental impacts of change

This option provides significant benefits for residents in comparison to the scenario assessed in the EIS. The design change means that the affected residents would be afforded access to and egress from their properties in all directions without necessitating lengthy detours.

Due to the small number of trips anticipated to utilise Martin Street on completion of these modifications, it is expected that the impact on the surrounding network would be minimal. A slight increase in vehicles at the Ramsay Street and Wattle Street intersection would be the most significant outcome; however, this increase would be minor when considering existing overall traffic volumes at this location.

With appropriate assessment of parking provision on Ramsay Street, it is unlikely that vehicles accessing Martin Street would have a notable impact on through traffic on Ramsay Street.

Figure 7.14 Proposed alterations to the Ramsay Street and Martin Street (west) intersection

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8 Revised summary of environmental management measures

The environmental impact statement (EIS) for the M4 East project identified the framework for environmental management, including management measures that would be adopted to avoid or reduce environmental impacts (Chapter 29 of the EIS).

After consideration of the issues raised in the public submissions, the environmental management measures for the project have been revised.

The adjustments to the measures were made to:

- Make additional commitments based on the response to submissions within this report
- Make additional commitments based on the findings of the studies 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~~.

All measures identified would be incorporated into management plans and the operational framework for the project. A framework for managing potential impacts is provided with reference to environmental management plans.

8.1 Construction environmental management plan

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the project. These management measures would be incorporated into the detailed design and applied during the construction and operation of the project. The safeguards and management measures are summarised in **Table 8.1**.

A construction environmental management plan (CEMP) would be prepared to describe safeguards and management measures identified. The plan would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The plan would be prepared prior to construction of the project and must be reviewed and certified by Sydney Motorway Corporation (SMC), prior to the commencement of any on-site works. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

Table 8.1 Summary of safeguards and management measures

Impact	Ref #	Environmental management measure	Responsibility	Timing
Traffic and Transport				
General	TT1	• A Traffic Management and Safety Plan (TMSP) will be prepared as part of the construction environmental management plan (CEMP), in consultation with the relevant road authority, local councils, emergency services, road user groups and pedestrian and bicycle groups. The TMSP will include the guidelines, general requirements and principles of traffic management to be implemented during construction. It will be prepared in accordance with *Austroads Guide to Road Design* (with appropriate Roads and Maritime supplements), the *RTA Traffic Control at Work Sites manual* and *AS1742.3: Manual of uniform traffic control devices – Part 3:Traffic control for works on roads*, and any other relevant standard, guide or manual. It will seek to minimise delays and disruptions, and identify and respond to any changes in road safety as a result of highway construction works.	Construction Contractor	Pre-construction and construction
	TT2	The TMSP will include: • A traffic route and haulage management plan • Site traffic and access management plans • An incident response plan • A detailed travel management plan for construction staff at the various worksites, in consultation with local councils and stakeholders associated with the sporting facilities adjacent to the project site. This will include the promotion of public transport and car-pooling to reduce work site-related vehicle movements, and also investigate feasible options for the provision of off-site car parking to reduce parking on local roads.	Construction Contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Impacts to road network performance (delays) and safety	TT3	Construction and temporary works will be staged to avoid conflicts with the existing road network and maximise spatial separation between work areas and travel lanes.	Construction Contractor	Construction
	TT4	Analyse traffic volume data 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 will be limited, road capacities maximised and peak traffic periods avoided where possible.	Construction Contractor	Construction
	TT5	Temporary closed-circuit television (CCTV) and variable message signs (VMS) will be provided to link with the existing **Transport Management Centre** (TMC) network to facilitate monitoring and management of impacts	Construction Contractor	Construction
	TT6	Throughout construction, consultation with the Transport Management Centre will be undertaken to ensure impacts to traffic flows are minimised.	Construction Contractor	Construction
	TT7	Road occupancy licences will be obtained for work that impacts traffic on existing roads in accordance with the requirements of council or Roads and Maritime.	Construction Contractor/ Roads and Maritime	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	TT8	**A traffic management and safety plan (TMSP) will be prepared in addition to the construction environmental management plan (CEMP). The TMSP will include the guidelines, general requirements and principles of traffic management to be implemented during the proposed Ramsay Street closure** **In addition to development of a TMSP, the following mitigation strategies would be implemented to manage and control traffic operation and access during the closure period:** • **The contractor will further review and develop the three proposed Ramsay Street closure options to establish an optimum construction strategy that would aim to have the minimum amount of disruption to affected residents** • **Manage and maintain adequate property access by providing reasonable and practical alternate traffic routes; which will be effectively communicated to the community. This would be undertaken in consultation with Roads and Maritime, local councils and property owners likely to be impacted.**	**Construction contractor**	**Pre-construction and construction**
Impacts on pedestrians and cyclists	TT**9**	Pedestrian and cyclist access will be maintained where possible throughout construction. Where not feasible, alternate routes will be provided and communicated to the community.	Construction Contractor	Prior to construction commencing
Impacts to public transport	TT**10**	Changes in bus stops will be undertaken in consultation with Transport for NSW and bus operators, with the community informed of any potential changes in advance.	Construction Contractor	Construction
Impacts to access	TT**11**	Local road closures will be managed and adequate property access will be maintained. Where road closures are required, reasonable and practical alternate traffic routes will be provided and communicated to the community. This will be undertaken in consultation with Roads and Maritime, local councils and property owners likely to be affected.	Construction Contractor	Construction
Impacts on existing road surfaces	TT**12**	A Road Dilapidation Report will be prepared and will include identification of the existing conditions of local roads and mechanisms to repair any damage caused by the project.	Construction Contractor	Post-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Impacts to emergency services	TT**13**	The TMSP will be developed in consultation with local emergency services and procedures will be implemented to maintain priority access and a safe environment will be maintained for emergency vehicles to travel through construction areas.	Construction Contractor	Construction
	TT**14**	Local emergency services will be frequently updated on the staging and progress of construction works.	Construction Contractor	Construction
Confirmation of assessed impacts	OpTT1	An operational traffic review will be undertaken 12 months after the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections. This review will be undertaken by a suitably qualified traffic consultant that is independent of the design and studies undertaken as part of the EIS.	Roads and Maritime	12 months from start of operation
Network and corridor optimisation	OpTT2	A network and corridor optimisation approach will be adopted to manage delay and queuing impacts with optimisation works occurring at the following locations: • Parramatta Road/George Street intersection in Homebush/North Strathfield • Concord Road corridor between Patterson Street and Parramatta Road in Concord • Parramatta Road/Shaftesbury Road intersection in Burwood/Concord (post M4-M5 Link opening) • Dobroyd Parade/Timbrell Drive intersection in Haberfield • Parramatta Road/Great North Road intersection in Croydon/Five Dock (post M4–M5 Link opening) • Parramatta Road/Wattle Street intersection in Ashfield/Haberfield (post M4–M5 Link opening) • Parramatta Road (east of Bland Street) • Parramatta Road/Crystal Street/Balmain Road in Leichhardt/Petersham • Sydney Olympic Park access. Further detail of the proposed optimisation is outlined in section 10.2.3 of the Traffic and Transport Assessment **at Appendix G of the EIS**.	Roads and Maritime	Operation

Impact	Ref #	Environmental management measure	Responsibility	Timing
Maintenance of existing network	OpTT3	A review of existing SCATS infrastructure at key intersections in the study area, including detectors, will be undertaken and upgrades will be implemented where appropriate to improve any impacts resulting from the project.	Roads and Maritime	Operation
Network upgrades	OpTT4	The following network upgrades will be investigated in consultation with relevant local councils, Roads and Maritime and affected communities: • Conversion of Mortley Avenue to entry only (except buses) at the Timbrell Drive / Dobroyd Parade intersection, with an additional entry lane to facilitate amended lane utilisation on the Timbrell Drive approach. Layout amendments could be required on Mortley Avenue which will need to consider impacts on existing parking provision, the location of the bus stop and some existing mature trees • Extension of left turn bay from Dobroyd Parade to Timbrell Avenue providing additional capacity for traffic reassigned from Mortley Avenue via Waratah Avenue and Dobroyd Parade • Provision of additional short lane on the Timbrell Drive approach to Dobroyd Parade potentially facilitated by using the old footpath area which is currently being replaced by the construction of a footbridge (subject to bridge assessment). The additional capacity will allow a greater share of green time for Dobroyd Parade movements • Provision of a new signalised left turn slip lane from Parramatta Road to Wattle Street to accommodate the high number of movements to the M4-M5 tunnel in the PM peak • Increase in parking restrictions on the southbound side of Great North Road to provide increased capacity. Further detail of the identified network upgrades is outlined in section 10.2.3 of the Traffic and Transport Assessment **at Appendix G of the EIS**.	Roads and Maritime	Operation

Impact	Ref #	Environmental management measure	Responsibility	Timing
	OpTT5	The following network upgrades will be investigated in consultation with relevant local councils, Roads and Maritime and affected communities, and implemented as and when required based on traffic growth and changing traffic patterns: • Enabling right turn movements from the kerbside lane from George Street southbound to Parramatta Road • Extension of parking restrictions on the southern (westbound) side of Ramsay Street between Wattle Street and Walker Avenue • Reassignment of the second right turn lane on the Wattle Street westbound approach to Parramatta Road post opening of the M4–M5 Link, to provide an additional right turn bay for traffic exiting the M4–M5 Link and leaving a single right turn lane from Wattle Street • Creation of a double right turn on the Wattle Street westbound approach to Ramsay Street post opening of the M4–M5 Link. This could be achieved by reallocating the right hand through lane, leaving a single through/left lane.	Roads and Maritime	Operation
Smart motorways	OpTT6	Smart motorway management will be considered for implementation within the project tunnel and associated ramps and approaches.	Roads and Maritime/Motorway operator	Operation
Air quality				
General	AQ1	Develop and implement a Construction Air Quality Management Plan which requires consultation with 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.	Construction contractor	Pre-construction
	AQ2	Carry out regular site inspections to monitor compliance with the Construction Air Quality Management Plan, record inspection results.	Construction contractor	Construction
	AQ3	Develop and implement a **community communication strategy (or equivalent plan)** ~~stakeholder communications plan~~ that includes community engagement before work commences on site.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	AQ4	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 **project hotline,** environment manager/engineer or the site manager. ~~Display the head or regional office contact information~~	Construction contractor	Construction
Dust Management	AQ5	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	Construction contractor	Construction
	~~AQ6~~	~~Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.~~	~~Construction contractor~~	~~Construction~~
	AQ**6**	Ensure where reasonable and feasible appropriate control methods are implemented to minimise dust emissions from the project site.	Construction contractor	Construction
	AQ**7**	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 contractor	Construction
	AQ**8**	Impose and signpost a maximum-speed-limit of 20 km/h on surfaced and unsurfaced haul roads and in work areas.	Construction contractor	Construction
	AQ**9**	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, (eg suitable local exhaust ventilation systems).	Construction contractor	Construction
	AQ**10**	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	Construction contractor	Construction
	AQ**11**	Where possible, use enclosed chutes and conveyors and covered skips.	Construction contractor	Construction
	AQ**12**	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 contractor	Construction
	AQ**13**	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 contractor	Construction
	AQ**14**	Avoid scabbling (roughening of concrete surfaces) if possible.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Stockpile Management	AQ**15**	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 **and are undisturbed** for longer than 28 days would be stabilised by compaction, covering with anchored fabrics, or seeded with sterile grass where appropriate.	Construction contractor	Construction
	AQ**16**	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 contractor	Construction
	AQ**17**	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 contractor	Construction
	AQ**18**	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	Construction contractor	Construction
Tracking of material on roads	AQ**19**	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.	Construction contractor	Construction
	AQ**20**	Avoid dry sweeping of large areas.	Construction contractor	Construction
	AQ**21**	Ensure vehicles **carrying materials or spoil** entering and leaving sites are covered to prevent escape of materials during transport.	Construction contractor	Construction
	AQ**22**	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	Construction contractor	Construction
	AQ**23**	Record all inspections of haul routes and any subsequent action in a site ~~log book~~ **inspection checklist.**	Construction contractor	Construction
	AQ**24**	Where reasonable and feasible, haul roads will be maintained with water carts and graders, and the condition of the roads will be monitored.	Construction contractor	Construction
	AQ**25**	Implement site exit controls (eg wheel washing system and rumble grids) to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	AQ**26**	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 contractor	Construction
	AQ**27**	Access gates to be located at least 10 metres from receptors where possible.	Construction contractor	Construction
Emissions management	AQ**28**	Ensure all construction vehicles comply with their relevant emission standards.	Construction contractor	Construction
	AQ**29**	Ensure that, where practicable engines idling is minimised when stationary.	Construction contractor	Construction
	AQ**30**	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	Construction contractor	Construction
	AQ**31**	Promote and encourage sustainable travel (public transport, cycling, walking, and car-sharing).	Construction contractor	Construction
	AQ**32**	No bonfires and burning of waste materials	Construction contractor	Construction
Demolition	AQ**33**	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 contractor	Construction
	AQ**34**	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 contractor	Construction
	AQ**35**	~~Minimise~~ **No** explosive blasting ~~where possible~~ during demolition**.** ~~using a~~ **A**ppropriate manual or mechanical alternatives **will be used.**	Construction contractor	Construction
	AQ**36**	Bag and remove any biological debris or other hazardous materials such as asbestos, damp down such material before demolition.	Construction contractor	Construction
Earthworks	AQ**37**	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	AQ**38**	Use hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	Construction contractor	Construction
	AQ**39**	Where possible, only remove any cover for exposed areas in small areas during work and not all at once.	Construction contractor	Construction
Cumulative impacts	AQ**40**	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 contractor	Construction
	AQ**41**	Undertake regular on-site and off-site inspection, where receptors are nearby, to monitor dust, record inspection results.	Construction contractor	Construction
Complaints management	AQ**42**	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 contractor	Construction
	AQ**43**	Make complaints available to the Secretary upon request.	Construction contractor	Construction
	AQ**44**	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 contractor	Construction
Monitoring	AQ**45**	Ambient air quality will be monitored continuously for at least twelve months prior to project opening, during construction and for at least two years after project opening. Monitoring results will be made publicly available and will be subject to an independent audit.	Construction contractor and motorway operator	Pre-construction, construction and operation
	OpAQ1	Sampling points with safe access will be installed at the ventilation outlets during construction. The sampling points will be designed and located in accordance with the Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (EPA 2007, or as updated), or an equivalent methodology approved by the Secretary in consultation with the EPA.	Construction contractor	Operation

Impact	Ref #	Environmental management measure	Responsibility	Timing
	OpAQ2	Ventilation will be automatically controlled using real-time traffic data and feedback from air quality sensors in the tunnel, to ensure in-tunnel conditions are managed effectively in accordance with the agreed criteria.	Motorway operator	Operation
	OpAQ3	Specific ventilation modes and procedures will be developed to manage breakdown, congested and emergency situations.	Motorway operator	Operation
Human Health				
Moving house due to property acquisition	HH1	Provision of access for affected households to a counselling service, WestConnex Assist, to support them in negotiating the land acquisition process and relocation.	~~WDA~~**SMC**	Pre-construction
Noise and vibration				
General	NV1	A Construction Noise and Vibration Management Plan 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 all 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.	Construction contractor	Pre-construction
Construction noise	NV2	Induction and training will be provided to relevant staff and subcontractors outlining their responsibilities with regard to noise.	Construction contractor	Construction
	NV3	**Surface** ~~W~~**w**ork will be undertaken during standard construction hours as far as feasible and reasonable.	Construction contractor	Construction
	NV4	Where feasible and reasonable, particularly noisy activities such as the use of impact piling rigs, road and concrete saws and rockbreakers, will be scheduled around times of high background noise to provide masking.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	NV5	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 contractor	Construction
	NV6	Particularly noisy activities will be scheduled during the less sensitive times of 9.00 am to 12.00 pm or 2.00 pm to 5.00 pm where appropriate**, or in accordance with the environment protection licence.**	Construction contractor	Construction
	NV7	Permanent noise barriers will be scheduled for completion as early as possible in order to minimise construction noise.	Construction contractor	Construction
	NV8	Property treatments identified for the operational phase of the project will be considered for installation ~~before construction~~ **as early as possible** where they would improve **construction** noise levels.	Construction contractor	Construction
	NV9	Acoustic sheds to be erected at the Underwood Road tunnel site (C3), Concord Road tunnel site (C5), Cintra Park tunnel site (C6) and Northcote Street tunnel site (C7) will be reviewed during construction planning to determine the attenuation level required.	Construction contractor	Pre-construction
	NV10	Temporary acoustic barriers (walls or hoarding) will be considered at all construction ancillary facility and work areas where feasible and reasonable. Recommended heights and locations of these barriers are provided in Table 42 of the Noise and Vibration Assessment **at Appendix J of the EIS**.	Construction contractor	Pre-construction
	NV11	Night works**, other than tunnelling,** will be programmed to minimise the number of consecutive nights that work affects the same receivers.	Construction contractor	Construction
	NV12	When working adjacent to schools, particularly noisy activities will be scheduled outside normal school hours, where practicable.	Construction contractor	Construction
	NV13	Works will be scheduled to avoid the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers.	Construction contractor	Construction
	NV14	Equipment that is used intermittently will be shut down when not in use.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	NV15	Where feasible and reasonable, heavy vehicle movements **which are utilised for surface works** will be limited to daytime hours.	Construction contractor	Construction
	NV16	Where feasible and reasonable, the offset distance between noisy plant items and nearby noise sensitive receivers will be as large as possible.	Construction contractor	Construction
	NV17	Where feasible and reasonable, equipment with directional noise emissions will be oriented away from sensitive receivers.	Construction contractor	Construction
	NV18	Regular compliance checks on the noise emissions of ~~all~~ plant and machinery will be conducted.	Construction contractor	Construction
	NV19	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 contractor	Construction
	NV20	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 contractor	Construction
	NV21	Loading and unloading will be carried out away from sensitive receivers, where practicable.	Construction contractor	Construction
	NV22	Deliver~~ies~~ **of materials** will be carried out during standard construction hours where feasible and reasonable**, or as required by NSW Police or other authorities for safety reasons.**	Construction contractor	Construction
	NV23	Alternative works methods, such as use of hydraulic or electric controlled units in place of diesel units, will be considered and implemented where feasible and reasonable.	Construction contractor	Construction
	NV24	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 contractor	Construction
	NV25	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 contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	NV26	**Should the second storey of buildings at construction ancillary facilities be proposed to be used for any purpose other than site offices and amenities, and particularly where plant and equipment would be used, additional noise assessment will be undertaken.**	**Construction contractor**	**Pre-construction**
Construction traffic noise	NV**27**	Deliveries and spoil removal will be planned to avoid queuing of trucks around construction ancillary facilities.	Construction contractor	Construction
	NV**28**	As far as practicable, construction vehicle movements along local roads at night will be restricted to light vehicles only, subject to further investigation of potential night-time maximum noise levels during detailed design.	Construction contractor	Construction
	NV**29**	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) will be limited to access and egress directly to and from the arterial road network.	Construction contractor	Construction
	NV**30**	~~As far as practicable, spoil removal will be undertaken during the day evening and night-time periods will be minimisedas far as practicable~~**Spoil removal will be minimised between 10.00 pm and ~~6~~7.00 am**.	Construction contractor	Construction
Construction vibration	NV**31**	~~Before the start of tunnelling or other vibration intensive works at each site,~~ **Building** condition surveys will be undertaken on properties and structures **located:** • ~~w~~**W**ithin the preferred project corridor (the zone on the surface equal to 50 metres from the outer edge of the tunnels) ~~and~~ • **Where the potential for exceedances of the blasting criteria is identified** ~~w~~ • **W**ithin 50 metres of surface works. **Building condition surveys of potentially affected structures will 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 due to the works.**	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	NV**32**	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 contractor	Construction
	NV**33**	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 contractor	Construction
	NV**34**	Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment to less sensitive times such as 9.00 am to 12.00 pm or 2.00 pm to 5.00 pm~~,~~ **where appropriate, or in accordance with the environment protection licence** ~~if agreed by the community affected~~.	Construction contractor	Construction
	NV**35**	Investigations will be undertaken into all heritage items located within the safe working boundary to determine if these structures are structurally unsound, to assist with determining the applicable criteria for each item.	Construction contractor	Construction
	~~NV35~~	~~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.~~	~~Construction contractor~~	~~Construction~~
Ground borne noise	NV36	Vibration intensive construction works will be confined to the less sensitive daytime period (9.00 am to 12.00 pm or 2.00 pm to 5.00 pm) as far as reasonably practicable**, or in accordance with the environment protection licence.**	Construction contractor	Construction
	NV37	A detailed ground-borne vibration assessment will be undertaken following further geotechnical investigations. This will include developing the vibration site law for the project.	Construction contractor	Pre-construction
Blasting	NV38	Noise and vibration mitigation methods specific to blasting will be incorporated into the CNVMP~~s~~ where required.	Construction contractor	Pre-construction and post construction
	NV39	Blasting will be restricted to standard daytime hours (except where approved by the relevant authority).	Construction contractor	Construction
	NV40	Site investigations will be conducted prior to production blasting to define suitable blast sizes to comply with project blasting noise and vibration criteria.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	~~NV41~~	~~Dilapidation studies of nearby receiver buildings will be undertaken where the potential for exceedances of the blasting criteria is identified.~~	~~Construction contractor~~	~~Construction~~
	NV**41**	Where the predicted levels exceed the noise or vibration criteria for blasting, alternative construction methods, such as penetrating cone fracture, will be utilised.	Construction contractor	Pre-construction
	~~NV43~~	~~Noise and vibration mitigation methods specific to blasting will be incorporated into the CNVMPs where required.~~	~~Construction contractor~~	~~Construction~~
Operational ventilation facility	NV**42**	Once plant items within the ventilation building are confirmed during detailed design, impacts will be assessed with consideration of the ***Industrial Noise Policy*** (INP) modifying factors. Where modifying factors are found to be applicable they will be added to the assessment, and compliance with the INP criteria checked at all receivers.	Construction contractor	Pre-construction
Consultation with impacted receivers	NV**43**	Community consultation protocols for sensitive receivers likely to be impacted by construction activities such as blasting, vibration and noise will be prepared and implemented.	Construction contractor	Pre-construction and construction
Road noise impact	OpNV1	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.	Roads and Maritime	Operation
	OpNV2	Noise barriers will be refined during detailed design to maximise the number of receivers that receive a reduction in exceedances of noise criteria.	Construction contractor	Pre-construction
	OpNV3	**Within 12 months of commencement of operation,** ~~O~~**o**perational traffic noise will be monitored at sensitive receivers~~for between six months and one year after opening~~**to compare actual noise performance of the project against predicted noise performance**. If the traffic noise levels are above the predicted levels, consideration of additional feasible and reasonable mitigation measures will be undertaken.	Construction contractor **and motorway operator**	Operation
Operational ancillary facilities	OpNV4	Operational ancillary facilities will be designed to meet project specific noise criteria derived in accordance with the NSW Industrial Noise Policy.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Property and land use				
Acquisition of property required for the project	PL1	Land acquisition for the project will be undertaken in accordance with the Roads and Maritime Services *land acquisition information guide* (Roads and Maritime 2014~~b~~) and the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).	Roads and Maritime	Pre-construction
Temporary lease or acquisition of property required for the project	PL2	Consultation will occur with the relevant property owners in relation to temporary land leases and acquisition of properties required for construction. Where acquisition is identified as the preferred option, this will be undertaken 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).	Roads and Maritime	Pre-construction
Loss of land use and property access	PL3	Property accesses that are affected as a result of the project will be reinstated in consultation with the affected landowners.	Construction contractor	Pre- construction
Property access	PL4	Affected property owners will be consulted where temporary property access will be required.	Construction contractor	Pre-construction and construction
	PL5	Affected property owners will be provided with advanced notification of relevant project schedules, construction works and changes to access arrangements.	Construction contractor	Pre-construction and Construction
	PL6	Community updates will be provided on changes to the local road network within the project area during construction.	Construction contractor	Construction
Overshadowing	PL7	A Solar Access and Overshadowing report will be developed during detailed design to assess the impacts of overshadowing as a result of the final **operational** design.	Construction contractor	Pre-construction
	PL8	**A Solar Access and Overshadowing report will be developed during construction planning to assess the impacts of overshadowing as a result of buildings at construction ancillary facilities that are two storeys (or equivalent) or greater in height, where they are immediately adjacent to residential properties.**	**Construction contractor**	**Pre-construction**
Urban design and visual amenity				
General	V1	The urban design and landscape objectives would continue to be considered during development.	Contractor	Pre-construction
	V2	Explore opportunities to rationalise the project footprint during pre-construction.	Contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	V3	Engineer slopes with gradients no steeper than 3H:1V where possible.	Contractor	Pre-construction
	V4	Explore ways to integrate the project into existing streetscapes, to improve connectivity, amenity and community value.	Contractor	Pre-construction
	V5	Optimise the integration of noise barriers and other features to improve amenity.	Contractor	Pre-construction
	V6	Consider a standard design for retaining walls and major structures across the project, to present a coordinated 'suite of elements'.	Contractor	Pre-construction
	V7	Consider use of LED lighting, which saves energy, costs less to maintain and provides better, safer light quality for roads.	Contractor	Pre-construction
	V8	Consider ways to maximise opportunities for tree planting, while also satisfying road design requirements.	Contractor	Pre-construction
	V9	Consider the inclusion of an arts strategy across the project.	Contractor	Pre-construction
	V10	~~Where practicable, areas of residual land should be made good with appropriately sized street planting, especially those areas w~~**W**here mature street trees have been removed **as part of construction of the project, these will be reinstated, where practicable, with appropriate species, in accordance with the Urban Design and Landscape Plan.**	Contractor	Construction
	V11	Provide guidance about the future development of residual land, including ways to promote project integration and activation.	Roads and Maritime	Pre-construction/ construction
	V12	Consider having the detailed design regularly reviewed by an independent design and sustainability review panel to ensure design quality throughout each stage of works, in accordance with the WUDF Principle 6.6.	Contractor	Pre-construction
General visual amenity	V13	Retain existing vegetation around the perimeter of construction sites where feasible and reasonable.	Contractor	Construction
	V14	Early implementation of noise barriers and landscape planting around ancillary facilities to provide visual screening and minimise noise impacts during construction.	Contractor	Construction
	V15	Locate equipment on construction sites**, including buildings that are two storeys (or equivalent) or greater in height,** to minimise visual impacts as far as feasible and reasonable.	Contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	V16	Acoustic shed**, acoustic barrier and two storey site offices and amenities building** design would aim to blend into the background where feasible and reasonable.	Contractor	Pre-construction/ construction
	V17	Design of site hoardings would consider the use of artwork or project information.	Contractor	Pre-construction/ construction
	V18	Maintain site hoardings and perimeter areas including the prompt removal of graffiti.	Contractor	Construction
	V19	Revegetation and landscaping would be undertaken progressively.	Contractor	Construction
Construction lighting	V20	Cut-off and directed lighting would be used to ensure glare and light spill are minimised.	Contractor	Construction
	V21	Lighting within ancillary facilities will be turned off or reduced to a level which maintains site safety, whenever the facility is not in use.	Contractor	Construction
Signage	V22	~~Develop a signage strategy during pre-construction.~~ **For operational signage to be installed for the project, p~~P~~**otentially affected receivers would be consulted on the final signage in relation to its location and associated impacts **where applicable.**	Contractor	**Construction** ~~Pre-construction/ constructionOperation~~
Tree planting on structures	V23	Consider engaging an appropriately qualified and experienced arborist and/or soil scientist to assess the feasibility of proposed tree planting (such as above the cut-and-cover sections) on structures.	Contractor	Pre-construction
	V24	Consider the use of water sensitive urban design (WSUD) measures eg water harvesting off roads, incorporation of bio-retention planting areas/planted swale treatment for stormwater polishing.	Contractor	Pre-construction
Tunnel interiors	V25	Consider the 'integration of lighting and ~~art~~ **signage in-tunnel** to enhance the travel experience,' subject to detailed design, and user and safety audits.	**SMC/**Contractor	Pre-construction
	V26	During pre-construction, consider the gradation of light on approach to tunnel portals, subject to detailed design, and user and safety audits.	Contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	V27	Consider 3D animation testing of the tunnel interior designs from the driver's perspective.	Contractor	Pre-construction
Ventilation and substation facilities	V28	During pre-construction, refinements to the ventilation facilities' designs should be considered to further moderate their visual impact.	Contractor	Pre-construction
	V29	Refine substation designs during pre-construction to be integrated as far as possible within each landscape and urban context.	Contractor	Pre-construction
	V30	During pre-construction (if feasible), consider how the eastern ventilation facility addresses Walker Avenue. Explore whether the exterior of the ventilation facility can be oriented to mirror the Bunnings 'street-wall', with street trees providing scale mitigation and shade amenity.	Contractor	Pre-construction
Bridges	V31	Further develop the interface between the project pedestrian bridge**s** and the existing shared paths and retaining walls.	Contractor	Pre-construction
	V32	Further develop the bridge lighting, in particular pedestrian bridges and connecting shared path systems, during pre-construction.	Contractor	Pre-construction
	V33	Design the highly visible bridge parts, such as piers, girders and parapets, to ensure a controlled, integrated and high quality finish taking into account the Roads and Maritime *Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW*.	Contractor	Pre-construction
	V34	Refine composite sub-structures − such as Super-T girders, headstocks and piers − having regard to the bridge aesthetics guidelines.	Contractor	Pre-construction
	V35	Develop the lighting of bridges and undercrofts to enhance safety and add character to these spaces.	Contractor	Pre-construction
	V36	Explore opportunities to enhance accessible public areas under viaduct and bridge structures to create inviting, safe and interesting environments with good solar access.	Contractor	Pre-construction
	V37	Develop the design of the Powells Creek on-ramp to consider access, amenity and safety.	Contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	V38	Develop the integral abutment connection with the proposed ~~cantilevered~~ Concord **Road** ~~B~~**b**ridge deck.	Contractor	Pre-construction
	V39	Create links between the project elements and realigned pedestrian access, and the existing footpaths.	Contractor	Pre-construction
	V40	Develop fascia wall panels and/or reinforced earth wall details for the proposed soil nail walls and reinforced earth walls.	Contractor	Pre-construction
Landscaping	V41	Refine the size, numbers and densities of proposed trees, to foster robust, rapid growth and canopy closure for shade and screening.	Contractor	Pre-construction
	V42	Undertake appropriate soil analysis and ~~adopt a soil management strategy~~**identify soil preparation requirements for landscaping treatments to inform the Urban Design and Landscaping Plan.**	Contractor	Pre-construction
	V43	~~Engage an ecologist to select appropriate species for mass plantings at project boundaries, and for sedimentation basin planting.~~**Selection of appropriate species for mass plantings at project boundaries, and for sedimentation basin planting, to be undertaken as part of the Urban Design and Landscaping Plan by an appropriately qualified person.**	Contractor	Pre-construction
	V44	Minimise the earthworks and embankment modifications required to support the proposed cycleway on-ramp at Queen~~s~~ Street, in order to minimise tree loss.	Contractor	Pre-construction
Parramatta Road Transformation Program	V45	Maintain and enhance pedestrian and cycle connectivity across the Parramatta Road corridor.	Roads and Maritime	Operation
	V46	Residual land redevelopment typology, land use and design controls would be developed to provide certainty about future street amenity and activation	Roads and Maritime	Operation
	V47	Maintain and enhance public transport connectivity across the Parramatta Road corridor and to adjacent suburbs, through appropriate location of bus stops, provision of shelters and attendant furniture	Roads and Maritime	Operation

Impact	Ref #	Environmental management measure	Responsibility	Timing
	V48	Consider opportunities to improve pedestrian and shared path amenity, for example by: • Introducing shade trees of appropriate scale • Separating users from busy traffic lanes behind a landscape amenity strip • Providing appropriate lighting for pedestrian functions.	Roads and Maritime	Operation
LCZ 1 – M4	V49	Maximise opportunities for tree planting within the road corridor, where this is feasible and appropriate.	Construction contractor	Pre-construction
	V50	Provide a visually compelling, beautiful urban design overlay for the corridor that includes vegetation as one component.	Construction contractor	Pre-construction
	V51	Minimise tall tree planting between Powells Creek and the Northern Line to maintain district views from the M4.	Construction contractor	Pre-construction
	V52	Consider at-receiver planting to reduce visual and lighting impacts on residential receivers.	Construction contractor	Pre-construction
LCZ 2 –Homebush commercial	V53	Where practicable, incorporate substantial avenue planting along the northern edge of the motorway operations complex access road.	Construction contractor	Pre-construction
	V54	Where possible, provide trees within the carpark within the motorway operations complex to provide shade and visually break up the hard landscape.	Construction contractor	Pre-construction
	V55	Consider the incorporation of WSUD measures to provide passive irrigation of trees, particularly within carparks and other areas where stormwater run-on is limited.	Construction contractor	Pre-construction
LCZ 3 – Parramatta Road (west)	V56	Explore opportunities with Strathfield Council to provide landscape screening and tree planting between the project corridor and the Park Road/Powell Street precinct.	Construction contractor	Pre-construction
	V57	Investigate with Strathfield Council the feasibility of providing a pedestrian/cycleway link along the northern edge of Powell Street where it joins the M4, to link directly to the Powells Creek Corridor between the M4 and the property on the eastern corner of Powell Street and Parramatta Road.	~~Construction contractor~~**SMC**	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
LCZ 4 – Underwood Road	V58	During pre-construction, consider a formal park design that incorporates measures (eg mounding/deeper soils areas) to facilitate a successful large tree planting program between Underwood Road and Ismay Avenue.	Construction contractor	Pre-construction
	V59	Explore opportunities with local councils to provide avenue planting down both sides of the street, and a linking canopy across the road.	Construction contractor	Pre-construction
	V60	Consider the use of a planting mix for the proposed park on the corner of Short Street East and Underwood Road that draws upon the suburban setting of cultural plantings, and which may include elements such as park seating, other park furniture, paving, signage and lighting.	Construction contractor	Pre-construction
	V61	Consider at-receiver planting for residences at 65−71 and 73 Underwood Road and at the end of Short Street East.	Construction contractor	Pre-construction
	V62	Consider the use of street trees along both sides of Short Street East.	Construction contractor**/ SMC**	Pre-construction
LCZ 5 – Powells Creek	V63	During pre-construction of the M4 on-ramp at Powells Creek, consider incorporating design features that maximise the height of the opening, and facilitate views and pedestrian/cycle access under the structure to the northern end of the park.	Construction contractor	Pre-construction
	V64	~~Consider the provision of active recreation facilities within the park area, e.g. basketball or skateboarding, which are compatible with traffic noise, relatively high background light levels at night and adjacent development.~~**On completion of construction, the portion of land comprising Arnotts Reserve utilised by the project, will be re-instated in sympathy with elements of Council's Masterplan for the site.**	Construction contractor	Pre-construction
	V65	Consider ways to increase the level of screening between the apartment block at the eastern end of Powell Street and the project.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
LCZ 6 – Concord Road	V66	Design the ~~two~~ large 'island' park~~s~~ **that will be publicly accessible** within the ramps to meet Crime Prevention Through Environmental Design (CPTED) requirements including, where feasible, **a** space~~s~~ that would actively encourage a significant level of park use~~.eg active recreational facilities such as basketball courts or a skateboard facility.~~	Construction contractor	Pre-construction
	V67	~~Where~~ **Consider the streetscape in front of the** residual land **on Sydney Street**~~is used~~ **for future** for housing, ~~provide an architectural outcome that~~ **to ensure that elements such as kerb and guttering, footpaths and street plantings** ~~is~~**are** responsive to the adjoining/adjacent Powell's Estate HCA.	Construction contractor	Pre-construction
	V68	For the replacement boundary wall on Concord Road fronting the Sydney Cheil Church, consider matching the design and materials of the existing wall, which is in keeping with the design of the church.	Construction contractor	Pre-construction
LCZ 7 – Edward Street	V69	Refine the design of the end of Edward Street to minimise the visual prominence of the on-ramp wall and noise barrier. Facilitate a planting edge between the on-ramp wall and the footpath, and between the footpath and the Edward Street turning head, that reflects the Federation-era character of the streetscape.	Construction contractor	Pre-construction
	V70	Minimise the landscaping required between the carriageway and noise barrier (between Parramatta Road and the pedestrian bridge over the tunnel on- and off-ramps), which could be difficult to maintain. Instead, retain sufficient room to provide screen planting along the edge of the M4.	Construction contractor	Pre-construction
	V71	Consider ways to better integrate the existing disused land between the end of Alexandra Street and Parramatta Road eg a pocket park responding to the Federation era residential setting of the Edward Street area.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
LCZ 8 – Concord Oval	V72	Configure the construction and operational layout of the Cintra Park site so as to retain the mature line of trees running along the boundary and screening to adjoining receivers**, where feasible and reasonable.**	Construction contractor	Pre-construction
	V73	Investigate opportunities during pre-construction to minimise the removal of established trees at Cintra Park.	Construction contractor	Pre-construction
LCZ 9 – Dobroyd Parade	V74	Consider the provision of a landscape design response to Reg Coady Reserve that re-integrates the new road edge with the landscape character of the park.	Construction contractor	Pre-construction
	V75	Consider a landscape response along the edge of Reg Coady Reserve edge which more closely reflects the existing, generally informal planting character of the reserve.	Construction contractor	Pre-construction
	V76	Where feasible, consider moving the footpath away from the busy road edge on both sides of Dobroyd Parade.	Construction contractor	Pre-construction
	V77	Consider augmentation of the existing screen planting to the area between Waratah Street and Crane Avenue on the residential side to maximise screening of the noise barrier on the southern edge of Dobroyd Parade.	Construction contractor	Pre-construction
	V78	Consider setting the noise barrier far enough back from Dobroyd Parade to provide an avenue of tall planting continuing up to Martin Street, as currently proposed north of Martin Street.	Construction contractor	Pre-construction
LCZ 10 – Wattle Street	V79	Consider an opportunity to extend the street tree planting along the western side of Wattle Street and Dobroyd Parade.	Construction contractor	Pre-construction
	V80	Investigate opportunities to locate the footpath away from the busy kerb and provide tall tree planting between the kerb and the footpath, to match that proposed between Ramsey Street and Martin Street.	Construction contractor	Pre-construction
	V81	Consider an integrated ~~artwork~~ approach to the noise barriers along Wattle Street and Dobroyd Parade.	Construction contractor	Pre-construction
	V82	Consider ways to provide pedestrian and streetscape amenity between the noise barriers and the street, and to integrate the area between the back fences of the Walker Street residences and the curving noise barrier.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
LCZ 11 – Parramatta Road (east)	V83	Consider increasing the extent of street tree planting along the frontage between Chandos Street and Rogers Avenue.	Construction contractor	Pre-construction
	V84	Consider refining the verge design to the southern edge of Parramatta Road to create a planted verge and avenue tree planting.	Construction contractor	Pre-construction
	V85	Consider providing a planted verge and avenue tree planting between the footpath and the carriageway to the Parramatta Road frontage to the residual land on the corner of Bland Street.	Construction contractor	Pre-construction
LCZ 12 – Haberfield	V86	Investigate opportunities to increase the proposed street tree planting to Walker Avenue, and seek to reinstate the original brush box street tree avenue character. This would reduce the view of the infrastructure for pedestrians and residential receivers.	Construction contractor	Pre-construction
	~~V87~~	~~Consider whether the proposed development of residual land on Walker Avenue visually complements the remaining row of low density housing on the other side/end of the street, and whether it reinforces the Federation-era landscape/heritage qualities and character of the street.~~	~~Construction contractor~~	~~Pre-construction~~
LCZ 13 – Yasmar Juvenile Training Facility	**V87**	Ensure that no street trees are removed from **the northern side of Parramatta Road in** front of, and immediately adjoining, Yasmar Estate.	Construction contractor	Pre-construction
~~LCZ 14 – Ashfield medium density~~	~~V89~~	~~Consider the provision for street tree planting within the parking lanes along Loftus Street to provide an increased level of street amenity and to mitigate the landscape character impact of the Parramatta Road edge effect on the street.~~	~~Construction contractor~~	~~Pre-construction~~
LCZ 15 – Ashfield Park	**V88**	Consider establishing a stand of brush box trees to the northern corner of Orpington Street and Parramatta Road to tie in with the brush box tree planting in the opposite northern corner of Ashfield Park.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Collaboration with councils	OpV1	In consultation with the relevant council, provide ~~pre-construction~~ **detailed design** for park/residual area landscape treatments that reflect the cultural setting of the adjoining residential precincts.	Contractor	Operation
	OpV2	Undertake the design, development and implementation of proposed 'pocket park' spaces **within the project footprint directly affected by construction of the project** adjacent to residential areas **in consultation with the local council, such that upon completion of approved projects and an agreed plant establishment period, the ongoing care, control and management of these areas could be taken on by council.**	**SMC/**Contractor	Operation
	OpV3	Undertake screen planting in consultation with the relevant council to council verge areas.	Contractor	Operation
Socio-economic				
Property acquisition	SE1	All acquisitions will be under the terms of *the Land Acquisition (Just Terms Compensation) Act 1991* (NSW) and in accordance with the Land Acquisition Information Guide (Roads and Maritime 2014d).	Roads and Maritime	Pre-construction
Relocation	SE2	Home owners will be supported to acquire alternative independent property valuations, with a commitment from Roads and Maritime to ensure property owners will not be left out of pocket (ie property valuation fees to be paid at the time the invoice is due, if this is before settlement). Relocation support teams will be provided to assist households that must relocate (both renters and owners) and land owners. These services could include: • Assistance with identifying alternate properties • 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 the logistics of moving including required administrative tasks) • Access to financial advice for affected households • Advertising of the WestConnex Assist counselling program will continue as well as providing first language support for households with English as a second language.	~~WDA~~**SMC**	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Access and connectivity	SE3	A community communication strategy (or equivalent plan) will 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 will be provided in a variety of ways including letter box drops, media releases, website, signage and 24 hour project information line.	~~WDA~~**SMC**/Construction contractor	Pre-construction and construction
	SE4	The following specific measures will be undertaken to minimise traffic-related impacts on the community: • Consultation (with Haberfield Public School and Ashfield Council) to determine if traffic management is required at egress points at the Parramatta Road civil site exit at Bland Street • Consultation with key local infrastructure providers will be undertaken when developing the construction traffic and safety management plan (or equivalent plan), including notification to local emergency services about changes to local road networks, particularly road closures • Relocating Orpington Street bus stop in consultation with the Willows Private Nursing Home to minimise walking distance between the relocated bus stop and the nursing home where possible • Bus stop, pedestrian and cycle way changes will be advertised locally, including to local social infrastructure providers • Appropriate signage will be applied to ensure motorists understand how to access local businesses adjacent to construction works.	Construction contractor	Pre-construction and construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Amenity - visual	SE5	Support will be given to local beautification of construction ancillary infrastructure sites through temporary plantings, decorated hoardings, or similar, to assist in reducing visual impacts. Consultation will be undertaken with ~~the community~~ **immediately adjoining landowners** in planning and implementing these approaches to contribute to sustaining community cohesion and identity throughout the construction period.	~~WDA~~**SMC**/Construction contractor	Construction
	SE6	Local communities will be consulted in the development of options and plans for the reuse of residual land for open public spaces, or as part of the public domain to increase community connectedness and sense of belonging through landscaped areas with public art.	~~WDA~~**SMC** and Roads and Maritime	
Business impacts	SE7	Providing support for local community development activities, such as community events, to assist with restoring and increasing community cohesion during construction.	~~WDA~~**SMC**	Construction
	SE8	A business management plan will be developed to effectively communicate with affected businesses during the construction of the project. The plan will address the key issues raised by businesses, including access arrangements, traffic conditions, parking and local supplier opportunities.	~~WDA~~**SMC**	Construction
Social infrastructure	SE9	A 24 hour project information line and website will be maintained to enable business owners and operators to receive prompt responses to their concerns, access information and view assistance measures in place during construction related work.	~~WDA~~**SMC** and construction contractor	Pre-construction and construction
	SE10	Consultation will continue with all key social infrastructure providers to assist them and their clients in planning for and adapting to the changes expected during the construction period.	Construction contractor	Pre-construction and construction
	SE11	Notification of any traffic and access changes during construction periods will be provided to emergency services well in advance of the changes occurring.	Construction contractor	Pre-construction and construction
	SE12	Route changes will be notified to emergency services and social infrastructure providers to ensure they can continue to operate effectively.	Roads and Maritime and ~~WDA~~**SMC**	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	SE13	Opportunities will be explored to provide alternative land for the Cheil Church to accommodate open space, a children's playground and parking in consultation with the property owners and the congregation of users.	Roads and Maritime and ~~WDA~~**SMC**	Pre-construction
	SE14	Strathfield Council and Strathfield Girl Guides will be assisted to identify and access temporary premises.	Roads and Maritime and ~~WDA~~**SMC**	Pre-construction
	SE15	Continued support will be provided to the Zongde Temple in planning for relocation in the short and long term.	Roads and Maritime and ~~WDA~~**SMC**	Pre-construction
	SE16	Restoration of Bill Boyce and Reg Coady reserves to at least their pre-construction condition in consultation with the relevant councils and local communities.	Construction contractor	Pre-construction
	SE17	Consultation will be undertaken with social infrastructure providers (specifically aged care and child care facilities) in regard to any respite periods (where reasonable and feasible) for the most intrusive construction activities undertaken during the day.	Construction contractor	Pre-construction
Access and connectivity	OpSE1	Opportunities for providing increased pedestrian and cyclist connectivity, especially in the vicinity of Wentworth Street, Underwood Road and Allen Street, Homebush, will be explored.	~~WDA~~**SMC**	Operation
	OpSE2	Consult with Transport for NSW in regard to improving pedestrian access in the vicinity of the Concord Road Interchange and specifically to bus stops.	**SMC**	**Operation**
Amenity – noise and vibration	OpSE3	Long-term amenity impacts (eg changes to local noise) can affect individual wellbeing and also the cohesion and connectedness of communities. Support for local community development activities (eg grants provided through councils or local community organisations) will assist with restoring and increasing community cohesion following construction, through activities such as community events.	~~WDA~~**SMC**	Operation

Impact	Ref #	Environmental management measure	Responsibility	Timing
Amenity - Visual	OpSE4	Support will be given to local beautification of operational facilities and spaces through public art and landscaping to assist in reducing visual impacts associated with these facilities. Consultation will be undertaken with the community in planning and implementing these approaches to contribute to sustaining community cohesion and identity following the construction period. Support will be provided for local community development activities such as community events to assist with restoring and increasing community cohesion post construction. Consideration will be given to the creation of legacy projects that deliver social benefit, such as developing residual land as open space areas. Legacy projects will be identified and developed in consultation with local councils. Tree planting will be maximised in those areas within the project corridor where this is feasible and appropriate within an overall design framework.	~~WDA~~**SMC**	Operation
Soil and water				
Managing soil and water in general	SW1	A soil and water quality management plan will be prepared in consultation with the New South Wales Environment Protection Agency and NSW Office of Water and in accordance with: • Blue Book requirements • *RTA Code of Practice for Water Management* (RTA 1999).	Construction contractor	Pre-construction
	SW2	Work method statements will be prepared for waterway works with particular emphasis on the early implementation of erosion and scour protection requirements.	Construction contractor	Pre-construction
	SW3	A qualified soil conservationist will develop the initial project erosion and sediment control plans and advise on appropriate controls, implementation and monitoring and management processes.	Construction contractor	Pre-construction and construction
	SW4	Tool box talks or similar inductions will be carried out to inform employees of erosion and sedimentation control plans.	Construction contractor	Pre-construction and construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	SW5	A surface water quality monitoring program for the pre-construction, construction and operation will be undertaken in accordance with the ANZECC Guidelines and RTA Guideline. The program will be periodically reviewed so that it provides appropriate information relevant to the project implementation phase.	**SMC and** ~~C~~**c**onstruction contractor~~and Roads and Maritime~~	Pre-construction and construction
Erosion risk	SW6	Measures will be implemented to minimise the risk of erosion and sedimentation. These measures may include: • Disturbed areas will be minimised and revegetated or stabilised as soon as practical • Erosion control measures such as sediment fences, check dams, temporary ground stabilising, diversion berm or site regrading will be installed as appropriate • Where practical, clean water will be diverted away from works or disturbed areas • Measures will be employed to control ground stability and limit run-off lengths and velocities within the construction ancillary facilities • Wheel wash or rumble grid systems will be installed, where practical, at compound heavy vehicle exit points to minimise the transfer of soil from construction areas to roadways • Erosion and sedimentation controls will be regularly inspected to maintain performance to the design criteria and design specifications. Controls are to be upgraded or altered if these objectives are found to not be satisfied.	Construction contractor	Pre-construction and construction
Scour protection	SW7	Measures will be implemented to minimise the risk of scour of waterways. These measures may include: • Permanent scour protection measures required for the operational phase will be installed early, where practical • Work platforms or access tracks required in the vicinity of waterways will be constructed of large clean rock material wrapped or underlain with geofabric.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Stockpile management	SW8	Measures will be implemented to manage stockpiles. These measures may include: • Stockpiles will to be located 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 will be stabilised by compaction then either: – Sprayed with suitable tackifier – Covering with anchored fabrics – Seeded with sterile grass.	Construction contractor	Construction
Pollution control	SW9	Measures will be implemented to minimise the risk of spills. These measures may include: • Spill containment will be included at locations where there is direct discharge of stormwater to receiving waterways • Appropriately bunded areas will be provided for storage of hazardous materials such as oils, chemicals and fuels • Adequate controls around stockpile areas and excavation works will be installed to minimise the risk of contaminants being washed into waterways or stormwater systems • Maintenance of containment/spill infrastructure and clean-up procedures for on-site spills will be undertaken • Spilt materials and/or any contaminated materials will be disposed of appropriately.	Construction contractor	Construction
Rehabilitation of disturbed and riparian zones	SW10	Disturbed areas, including riparian environments, will be rehabilitated as soon as practical. Measures will include revegetation (using native species from the relevant local vegetation communities) and stabilisation.	Construction contractor	Construction
Operational water quality	OpSW1	Measures to prevent runoff, stormwater or spillage being directed onto other roadways outside of the project footprint will be implemented.	Construction contractor	Operation
	OpSW2	Water quality monitoring will continue from SW5 for at least 12 months post-construction or until any affected waterways are certified by an independent expert as being rehabilitated to an acceptable condition as required by any condition of approval.	**SMC**~~Construction contractor~~	Operation

Impact	Ref #	Environmental management measure	Responsibility	Timing
Contamination				
Confirmation of contamination	~~C1~~	~~Further intrusive investigation will be undertaken within the Powells Creek construction ancillary facility (at Arnotts Reserve) to obtain a statistically complete dataset. The investigation will include sampling of soils likely to be disturbed during construction, analysed for benzo(a)pyrene, lead and asbestos.~~	~~Construction contractor~~	~~Pre-construction~~
	C**1**	**Should there be construction work in the vicinity of BH1344, f**urther site investigations will be undertaken ~~in the vicinity of BH1344~~ to confirm the presence and determine the nature of contaminant**s** of potential concern in this area.	Construction contractor	Pre-construction
	C**2**	Hazardous materials assessments will be undertaken for buildings proposed for demolition to manage potential risk of exposure to site workers during these works. Management strategies will be developed from these assessments and will be included safe work method statements and/or Waste Management Plan.	Construction contractor	Pre-construction
	C**3**	Further site investigations will be undertaken to assess the level and extent of asbestos in publicly accessible areas beside the M4 in Section 1 of the project footprint.	Construction contractor	Pre-construction
	C**4**	Targeted site investigations will be undertaken at the former laundry/dry cleaners at 225-227 Parramatta Road, Ashfield and the former service station located at 186 Parramatta Road, to confirm the presence of any latent contamination.	Construction contractor	Pre-construction
Management of contamination	C**5**	Procedures to manage unexpected contamination finds and hazardous materials identified during site preparation and/or construction works will be prepared. The procedures will include details for the management of the following identified contaminants: • PAHs and benzo(a)pyrene TEQ • Latent contamination.	Construction contractor	Construction
	C**6**	Potentially contaminated areas directly affected by the project will be investigated and managed in accordance with the requirements of the *Contaminated Land Management Act 1997* (NSW) and *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (OEH 2011).	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Contaminated groundwater	C**7**	Where passive dewatering of the aquifer system is required, additional contamination sampling (of groundwater and seepage quality) ~~would~~**will** be completed to assess the potential management and disposal options. A **pre-construction** baseline groundwater monitoring plan ~~would be~~ **has been** implemented to gather water quality data to inform management and disposal options of groundwater seepage during construction.	**SMC and construction contractor**	**Pre-construction and construction**
Management of potentially contaminated waste	C**8**	Any excavated soil contaminated with benzo(a)pyrene will be managed to prevent spreading potentially contaminated soil on final ground surfaces where the general public could be exposed post construction.	Construction contractor	Construction
Waste classification	C**9**	Further waste classification will be undertaken during construction to allow appropriate soil management and disposal, in particular for areas that were not accessible during this assessment (including private properties). Details of sampling and analysis protocols will be included in the Spoil Management Plan **and Construction Soil and Water Quality Management Plan** (refer to Chapter 23 (Resource Use and Waste) **of the EIS**).	Construction contractor	Construction
Asbestos	C**10**	Asbestos handling and management will be undertaken in accordance with an Asbestos Management Plan and relevant State legislation, government policies and Australian Standards. The plan will include: • Protocols and procedures for entering and safe working in areas with surface asbestos (eg Sections 1 and 3) with respect to asbestos containing materials (fibrous and cement-bound) • Appropriate remediation/management strategies.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Acid sulfate soils	C**11**	Confirmatory testing of areas identified as disturbed terrain (eg such as near, to Bedford Road and Verley Drive (Section 1), Concord Oval (Section 5), and Wattle Street (Section 6)) ~~and stockpiled spoil during construction~~ will be carried out in areas where potential acid sulfate soils have been mapped, to confirm their presence or absence and**, if required, of stockpiles** to obtain a specific liming rate~~for stockpiles (if required)~~.	Construction contractor	Construction
	C**12**	If acid sulfate soils are encountered, they will be managed in accordance with the *Acid Sulfate Soil Manual* (Acid Sulfate Soil Management Advisory Committee, 1998).	Construction contractor	Construction
Demolition	C**13**	Demolition works will be undertaken in accordance with Australian and NSW WorkCover Standards.	Construction contractor	Construction
	C**14**	Appropriate mitigation measures including stockpiling and management of potentially contaminated material will be undertaken at building demolition sites to prevent movement of material into receiving waters.	Construction contractor	Construction
Contamination during operation	OpC1	Procedures to address spills, leaks and tunnel washing will be developed and implemented during operation of the project.	Construction contractor	Operation

Impact	Ref #	Environmental management measure	Responsibility	Timing
Flooding and drainage				
Management of flood and stormwater − General	FD01	A flood management strategy (FMS) will be prepared to manage flooding and stormwater related issues and will include: • The layout of construction ancillary facilities • Location of amenities buildings and equipment outside high flood hazard areas • Controlled diversion of overland flow either through or around work areas • Staging construction to limit the extent and duration of temporary works on the floodplain • Monitoring weather conditions • Ensuring construction equipment and materials are removed from floodplain areas at the completion of each work activity, or upon issuing of a weather warning of impending flood producing rain • Provision of temporary flood protection for properties identified as being at risk of adverse flood impacts during any stage of construction of the project • Development of flood emergency response procedures to remove temporary works during periods of heavy rainfall and staff evacuation plans • For site facilities located within the floodplain, the FMS will identify how risks to personal safety and damage to construction facilities will be managed.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Flooding impacts on adjacent development	FD02	Adverse flood impacts on existing development will be managed through the F~~S~~M**S**. This ~~will~~**may** include: • A detailed hydrologic and hydraulic assessment into flooding behaviour and mitigation 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 will also be made of impacts during flooding in excess of the 100 year ARI event up to the PMF, in the context of impacts on critical infrastructure and flood hazards • Floor level survey will be carried out at all properties at risk (where there is a potential increase in flood levels) to confirm whether construction activities will increase flood damages. Where flooding potential is confirmed, management measures for construction works and operational design will be incorporated.	Construction contractor	Pre-construction
Management of stormwater	FD03	Appropriate local stormwater measures will be provided, where required.	Construction contractor	Pre-construction and construction
Impacts of future climate change on flooding behaviour	FD04	The project will be designed to manage the potential impacts due to climate change in accordance with the *Practical Considerations of Climate Change – Floodplain Risk Management Guideline* (DECC 2007).	Construction contractor	Pre-construction
Homebush Bay Drive interchange	FD05	Refinement of XD02 realignment and reshaping of the overbank area will partially divert overland flow away from the affected properties.	Construction contractor	Pre-construction and construction
Homebush Bay Drive interchange − bridge over Saleyards Creek	FD06	The detailed design will exceed minimum clearance requirements. The longer spans of the new bridges will offset the increased hydraulic losses associated with their larger footprint and multiple bridges, when compared to the existing arrangement. Continuous walls will be provided between the abutments of the new bridges to provide a uniform waterway section. The eastbound cycleway bridge will be managed through provision of a waterway area consistent with that of the M4.	Construction contractor	Pre-construction and construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Homebush Bay Drive interchange − Underwood Road distribution substation and western ventilation facility	FD07	Openings to the buildings will be located to prevent the ingress of floodwaters in a PMF event, providing a freeboard allowance greater than 0.5 metres freeboard to the 100 year ARI flood level.	Construction contractor	Pre-construction and construction
Powells Creek on-ramp − bridge over Powells Creek	FD08	The bridge over Powells Creek will be designed to provide a minimum 0.5 m clearance between the underside of the bridge and the 100 year ARI flood level. The bridge abutment at Parramatta Road will be located to minimise impacts during a 100 year ARI event.	Construction contractor	Pre-construction and construction
Concord Road interchange − tunnel dive structure	FD09	A barrier wall and overland flow path will be provided along the eastern side of the on- and off-ramps to direct overland flow around the tunnel entry during a PMF event. The top of the barrier wall will be located a minimum 0.5 metres above the 100 year ARI flood level.	Construction contractor	Pre-construction and construction
Concord Road interchange − realignment of existing stormwater drainage line XD04	FD10	A grassed channel will be provided to divert overland flow from stormwater drainage line XD04 around the surface road works. The grassed channel will be sized to contain 100 year ARI flows within the project footprint and thus prevent an increase in the extent of inundation within residential properties in Sydney Street.	Construction contractor	Pre-construction and construction
Cintra Park facilities	FD11	Openings to the facility will be located ~~at a minimum elevation of 6.2 metres AHD,~~ to prevent the ingress of floodwater in a PMF event and to provide a freeboard greater than 0.5 metres to the 100 year ARI flood level.	Construction contractor	Pre-construction and construction
Cintra Park facilities	FD12	The size and layout of the overland flow path will be integrated with the layout of the water treatment facility.	Construction contractor	Pre-construction and construction
Parramatta Road interchange − tunnel dive structure	FD13	A barrier wall will be provided along the eastern side of the tunnel dive structure to direct overland flow around the tunnel entry during a PMF event. The top of the barrier wall will be located a minimum 0.5 m above the 100 year ARI flood level.	Construction contractor	Pre-construction and construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Parramatta Road interchange − realignment of stormwater drainage line XD09c	FD14	The diversion of stormwater drainage line XD09c and the overland flow path at Chandos Street will be designed to contain flows within the project footprint, preventing an increase in the extent of inundation within the adjacent commercial property. Refinement of the pit and pipe drainage system design will be undertaken to prevent an increases in flows and flood levels along Parramatta Road and Bland Street.	Construction contractor	Pre-construction and construction
Wattle Street interchange − dive structure	FD15	Road level and barriers at the entry to the tunnel portals will prevent ingress of floodwaters during a PMF event, providing a freeboard allowance greater than 0.5 metres freeboard to the peak 100 year ARI flood level. A drainage path will be provided to drain local catchment runoff from Allum Street around the tunnel dive structure during a PMF event.	Construction contractor	Pre-construction and construction
	FD16	***"A new drainage structure near XD11 will be constructed to mitigate the impacts of flooding on existing residential development located to the east (upstream) of Wattle Street."*** ~~The existing cross drainage structure at XD11 will be augmented to mitigate the impacts of flooding on existing residential development located to the east (upstream) of Wattle Street.~~	Construction contractor	Pre-construction
Changes to flooding behaviour – bridge construction	FD**17**	Temporary bridge works and access roads will be staged and removed as soon as practical after serving their primary purpose.	Construction contractor	Construction
Scour prevention	FD**18**	Measures will be implemented and maintained to intercept concentrated flow and divert it in a controlled manner to prevent scour of disturbed surfaces and transportation of sediment and construction materials.	Construction contractor	Construction
M4 Motorway - Homebush Bay Drive to Pomeroy Street and Homebush Bay Drive Civil Site (C1)	FD**19**	The resulting increase in peak flood levels will be managed by providing a setback (up to about 8.0 m) between the edge of the existing concrete channel and the construction site.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Homebush Bay Drive interchange and Underwood Road civil site (C3a)	FD**20**	The width of the flow path where it crosses the cut-and-cover section of tunnel will be increased and ground levels lowered on the eastern side of Underwood Street. The overland flow path will be maintained so as not to increase depths of inundation in adjacent residential development.	Construction contractor	Construction
Powells Creek civil site (C4) Incorporating Powells Creek on ramp	FD**21**	The location and dimensions of the temporary access crossings across the Powells Creek channel will be managed. Temporary flood protection measures at the allotment level will be implemented as required.	Construction contractor	Construction
Concord Road interchange, M4 Motorway – Sydney Street to Parramatta Road and Concord Road civil and tunnel site (C5)	FD**22**	The impacts on depths of overland flow in existing residential development are localised and will be addressed by providing an overland flow path through the site or around its perimeter to control flows that exceed the capacity of stormwater drainage line XD04.	Construction contractor	Construction
Cintra Park tunnel site (C6) Incorporating Cintra Park fresh air supply and water treatment facility	FD**23**	An overland flow path through the site will be provided.	Construction contractor	Construction
Wattle Street (City West Link) interchange and Wattle Street and Walker Avenue civil site (C9)	FD**24**	Bunding will be provided to direct overland flow along the haul road and around the Sydney Water pump station.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Parramatta Road interchange and Parramatta Road civil site (C10)	FD**25**	An overland flow path will be provided along Parramatta Road between Chandos Street and Bland Street to control flows that exceed the capacity of stormwater drainage line XD09c. Subject to land access, the detention tank at Bland Street and upgrades to the drainage line along Parramatta Road and Bland Street will be built as part of enabling works or temporary storage on site C10 will be considered as an alternative measure. Temporary flood protection measures will be implemented at the allotment level, as required, to address residual flood impacts.	Construction contractor	Construction
All tunnel structures	FD**26**	The flood standard adopted at each tunnel entry during construction will take account of the duration of construction, the magnitude of inflows and the potential risks to personal safety and the project works.	Construction contractor	Construction
Groundwater				
Managing groundwater general	GW1	Pre-construction surface and groundwater monitoring will continue on a monthly basis to establish baseline conditions**, or as otherwise agreed with the relevant agency.**	Roads and Maritime	Pre-construction
	GW2	Prior to construction, a groundwater monitoring plan for the construction and operational phases of the project will be developed in consultation with the Department of Primary Industries – Water and the NSW Environment Protection Authority. This ~~will~~**may** include**, but not be limited to**: • Tunnel inflow rates and chemistry compared with the predicted inflows • Mineral precipitation relating to blockage of inflow collection, reticulation and treatment systems.	Construction contractor	Pre-construction,
Precipitation of iron and manganese	GW3	Following further groundwater monitoring, the potential for clogging of groundwater drainage and collection systems will be considered during detailed design. Where ferrous (soluble) iron concentrations remain high, consideration will be given to treating captured groundwater prior to discharge for: • Aeration to reduce dissolved iron and manganese • Settlement to remove precipitated iron and sediments.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Groundwater discharge to surface waters	GW4	The location of the groundwater discharge to St Lukes Park Canal will be confirmed following further surface water monitoring. Untreated saline groundwater will be discharged to a location that is influenced by existing saline conditions. If a suitable discharge location is unable to be identified, saline groundwater will be treated prior to discharge.	Construction contractor	Pre-construction
Licensed bore drawdown	GW5	Management of licensed bores identified as being at risk of drawdown **will be managed in accordance with relevant guidelines, and mitigation measures that will be implemented may** ~~will~~ include**, but not be limited to**: • Inspect and confirm existing status of the licensed bores prior to tunnel excavation and, if active, confirm their current purpose • Monitoring water chemistry and water levels pre-construction, construction and during operation • Appropriate make good trigger levels and make good requirements for impacted bores • Where appropriate, provide compensatory measures for adverse impacts.	Construction contractor	Pre-construction, construction and operation
Ground movement and settlement	GW6	Further assessments will be undertaken during detailed design to determine the level of potential impact on structures and to identify feasible and reasonable mitigation and management measures required to minimise potential ground movement impacts and make good identified impacts.	Construction contractor	Pre-construction
	GW7	Prior to the commencement of tunnelling works, existing condition surveys will be undertaken on properties and structures within the project corridor (the zone on the surface equal to 50 m from the outer edge of the tunnels) and within 50 m of surface works.	Construction contractor	Pre-construction and construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Non-Aboriginal heritage				
Detailed design	NAH1	Where practical, heritage specialists (built and landscape heritage and historical archaeology) and urban designers will provide input into the detailed design and documentation phase to assist in identifying opportunities to enhance the conservation options for heritage items and archaeological sites and ensure adverse impacts are avoided or minimised. This will include, but not be limited to, the alignment and design of noise barriers to avoid or minimise impacts on heritage items. (moderately effective).	Construction contractor	Pre-construction
	NAH2	New structures will be of a high quality, sympathetic design to minimise visual impacts on the setting of heritage buildings and landscapes taking into account a range of design considerations. (somewhat effective).	Construction contractor	Pre-construction
	NAH3	As part of the construction heritage management plan, an overarching historical archaeological research design **(HARD)** will be prepared prior to commencement of ~~construction~~**works within any heritage archaeological management unit (HAMU).** ~~It~~ **The HARD** will describe clear significance thresholds ~~to possible~~ **for historical** archaeological items**,** ~~that~~ **as** may be uncovered during **the** works. **The significance threshold assessment will underpin if and, if so, where** ~~and designate when~~ **test excavation,** monitoring, ~~testing~~ and/or salvage ~~and~~ excavation should occur in relation to the project works and timing. **The criteria for the significance thresholds will be in the form of a checklist prepared in line with the NSW Heritage Threshold System, that is, items will be assigned with no value, local value or State value.** Post-excavation reporting, including artefact analysis and additional historical research (where necessary), ~~would~~ **will** be required for any historical archaeological investigations undertaken (moderately effective).	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
General	NAH4	A construction heritage management plan would be prepared prior to construction detailing how construction impacts on heritage will 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 (highly effective).	Construction contractor	Pre-construction
	NAH5	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).	Construction contractor	Pre-construction and construction
	NAH6	The Roads and Maritime *Standard Management Procedure—Unexpected Heritage Items* (2015) will be applied in the event any unanticipated archaeological remains are discovered during the project. The procedure covers identification of heritage items and archaeological sites; recording and reporting on items including guidelines for photography; key environmental contacts; and procedural information for example on uncovering human remains (moderately effective). If human remains were discovered during any phase of works associated with the project, works will cease immediately in the surrounding area. The findings will be reported immediately to the NSW Coroner's Office and/or the NSW Police (moderately effective).	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Impacts on heritage items – general	NAH7	An Interpretation Plan will be developed and implemented **to identify and interpret the key heritage values and stories of certain areas affected by** ~~for~~ the project, in accordance with the NSW Heritage Division guidelines **(Interpretation Plan).** The Interpretation Plan will focus on the **affected sections of heritage conservation area contributory streetscapes and houses where a major impact is predicted in the** Powell's Estate heritage conservation area, Thornleigh House gates and driveway, Longbottom Stockade (Concord Oval) and the Haberfield Conservation Area, and ~~will~~ **may** include interpretive initiatives in new public reserves and walkways. **Affected sections will be selected based on the advice of a qualified heritage consultant, and identified in the Construction Heritage Management Plan.** Artefacts and archaeological remains will be considered for their interpretative value when identified or recovered by excavation (somewhat effective).	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	NAH8	Photographic recording ~~would~~ **will** be undertaken of **listed** ~~heritage items,~~ and contributory **heritage** items **and affected sections of the heritage conservation areas – contributory streetscapes and houses where a major adverse impact will be caused by the project, as identified in the Construction Heritage Management Plan in the Powell's Estate Conservation Area, Thornleigh House gates and driveway, and the Haberfield Conservation Area.**~~groups/streetscapes comprisi~~ **During demolition, where practical and as advised by a qualified heritage consultant, recycle elements of heritage fabric from listed heritage items and affected sections of the heritage conservation areas – contributory streetscapes and houses where a major adverse impact will be caused by the project, as identified in the Construction Heritage Management Plan in the Powell's Estate Conservation Area, Thornleigh House gates and driveway, and the Haberfield Conservation Area.**~~ngcombinations of heritage items and contributory items, and potential heritage items that would be directly impacted by the project.~~ The recording methodology ~~would~~**will** be generally in accordance with the NSW Heritage Office guidelines *Photographic Recording of Heritage Items Using Film or Digital Capture* (2006b), but the detail of the recording required ~~would~~**will** be determined by the significance of the items/groups/streetscapes (least effective).	Construction contractor	Pre-construction and construction
	NAH9	During demolition, where practical **and as advised by a qualified heritage consultant,** recycle elements of heritage fabric from **listed heritage items and affected sections of the heritage conservation areas – contributory streetscapes and houses where a major adverse impact will be caused by the project, as identified in the Construction Heritage Management Plan in the Powell's Estate Conservation Area, Thornleigh House gates and driveway, and the Haberfield Conservation Area**~~items of heritage significance using recycling agents.~~ (least effective).	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Impacts on archaeology - general	NAH10	Where required by the historical archaeological research design and prior to the commencement of pre-construction and/or construction activities that will impact historical archaeological sites identified in the EIS, an archaeological excavation program in accordance with the Heritage Council of NSW *Archaeological Assessment Guidelines* (1996). This work will be undertaken by an appropriately qualified archaeological consultant (moderately effective).	Construction contractor	Pre-construction and construction
	NAH11	Mitigation methodologies for the management of impacts on known and potential significant historical archaeological resources will be further developed at the detailed design stage, once key ground disturbance impacts have been finalised (in terms of exact depth, width, extent and type of impact). This would ensure that the archaeological mitigation strategies are streamlined and reduced in scope to target the key areas of unavoidable impact on significant archaeological resources (moderately effective).	Construction contractor	Pre-construction
	NAH 12	~~All archaeological mitigation measures including a~~**A**rchaeological **investigations (testing,** monitoring~~, testing~~ and/or salvage**)** ~~excavation, as required~~**consistent with the HARD,** ~~would~~ **will** be undertaken in accordance with standards and processes stipulated by the NSW Heritage Division, Office of Environment and Heritage with respect to the archaeological resource (moderately effective).	Construction contractor	Pre-construction and construction
	NAH13	The construction heritage management plan would include detailed procedures/ strategies for the conservation and curation of any historical artefacts recovered during works (moderately effective).	Construction contractor	Pre-construction and construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
State-significant archaeology	NAH14	In the event that historical archaeological relics of State significance are identified (eg HAMU 8), they will be managed in accordance with the following measures: • An excavation director who meets the NSW Heritage Branch requirements for directing State significant archaeological investigations must monitor the works • In situ retention of the archaeological resource may be required, unless it is highly disturbed and/or of a fragmentary nature – or if the impacts are assessed by the excavation director to be minor in nature • A work method statement or historical archaeological research design will be prepared by a qualified historical archaeologist in accordance with **NSW** Heritage Division requirements, prior to the commencement of works. This will outline a methodology for the investigation, salvage and/or conservation of archaeological resources • Where required, an archaeological excavation program will be implemented in accordance with the Heritage Council of NSW *Archaeological Assessments Guidelines* (1996). This work will be undertaken by an appropriately qualified archaeological consultant • The NSW Heritage Division and Roads and Maritime must be notified when intact State significant relics are discovered • Public engagement such as media releases, public open days during the works program, and/or post-works heritage interpretation may be warranted • If relics are found, post-excavation reporting, artefact analysis and conservation of relics (moderately effective). • In the event that State significant historical archaeology remains are identified within Cintra Park (HAMU 8) rearrangement of elements within the site compound will be considered and other conservation measures applied as necessary. Ground works in the existing carpark north of Concord Oval would be avoided (highly effective).	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Locally significant archaeology	NAH15	In the event that historical archaeological relics of local significance are identified, they will be managed in accordance with the following measures: • A work method statement or heritage archaeological research design will be prepared by a qualified historical archaeologist in accordance with **NSW** Heritage Division requirements, prior to the commencement of works. The work method statement or **Heritage** Archaeological Research Design will outline a methodology for the investigation, monitoring and/or salvage of archaeological resources • Archaeological monitoring will be led by a suitably qualified Excavation Director for the works. Monitoring will be followed by open-area excavation as required. This will depend on the nature, extent and integrity of the archaeological resource to be impacted, and the level of impact proposed • Where required, an archaeological excavation program will be implemented in accordance with the Heritage Council of NSW *Archaeological Assessments Guidelines* (1996). This work will be undertaken by an appropriately qualified archaeological consultant • If unexpected State significant relics were to be discovered, such relics may need to be managed in accordance with State significant requirements as listed above. The Excavation Director should determine if the unexpected relics are likely to be reassessed as State significant, and then determine appropriate mitigation • The NSW Heritage Division and Roads and Maritime are to be notified if intact State significant relics are discovered • Public engagement, such as heritage interpretation and/or public open days may be warranted, depending on the nature and significance of the archaeological resource • If relics are found, post-excavation reporting, artefact analysis and conservation (moderately effective).	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Welfare Street Conservation Area	NAH16	Where feasible and reasonable, a vegetated buffer will be retained between the conservation area and the widened M4 off-ramps to Homebush Bay Drive (highly effective).	Construction contractor	Pre-construction and construction
Powell's Estate Conservation Area, North Strathfield	NAH17	Where feasible, the size and form of the proposed distribution substation to be located near the corner of Sydney Street and Concord Road will be designed to be as recessive as possible and incorporate sensitive landscaping treatment to reduce permanent visual impacts on the remaining portion of Powell's Estate Conservation Area (somewhat effective).	Construction contractor	Pre-construction and construction
House, 99 Concord Road, Concord	NAH18	The front garden and fence will be re-established on completion of construction works (highly effective).	Construction contractor	Construction
House and garden, 10 Thornleigh Road, Concord	NAH19	A landscape buffer will be established between the house and the widened Concord Road (highly effective).	Construction contractor	Pre-construction and construction
Wesley Uniting Church and hall, Concord	NAH20	Subject to agreement with the landowner, the church grounds, entrance gates and boundary fence will be re-established along the new Concord Road boundary (moderately effective).	Construction contractor	Pre-construction and construction
	NAH21	A photographic archival recording of the entrance gates with measured drawings will be undertaken before construction, to assist with their relocation. The sandstone cobble driveway will be included in the recording (moderately effective).	Construction contractor	Pre-construction and construction
	NAH22	The condition of the church and tower and its vulnerability to construction vibration will be confirmed prior to works commencing, and appropriate strategies will be implemented to avoid or minimise impacts if required. This will include, as a minimum, vibration monitoring (highly effective).	Construction contractor	Pre-construction and construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Street trees: Sydney Street, Concord and Edward Street, Concord	NAH23	Where feasible and reasonable, the detailed design and construction stages will seek to maximise the number of trees retained (highly effective).	Construction contractor	Pre-construction
	NAH24	Significant trees in the vicinity of the project along Sydney Street and Edward Street will be protected during construction works, on the advice of a suitably qualified and experienced arborist (highly effective).	Construction contractor	Construction
	NAH25	New trees planted at the western end of Sydney Street will be brush box or a similar, sympathetic species (highly effective).	Construction contractor	Construction
St Luke's Park gateway/entrance − gates and trees only, Concord	NAH26	If feasible, the Moreton Bay fig trees along the Loftus Street boundary of Concord Oval, within the car park, will be retained and protected during construction works, in accordance with the advice of a suitably qualified and experienced arborist (highly effective).	Construction contractor	Pre-construction and construction
Haberfield Heritage Conservation Area	NAH27	The vents and motorway facilities would be sited as close as possible to Parramatta Road to minimise their intrusion into the conservation area. An orientation that is more consistent with the Haberfield built form and subdivision would also be investigated. Where feasible, the proposed ventilation outlet and motorway facilities will be as recessive as feasible and reasonable to reduce permanent visual impacts on the Haberfield Conservation Area. They will be of high-quality design and materials (somewhat effective).	Construction contractor	Pre-construction
	NAH28	The urban design and landscape plan will include planting strategies for the impacted area of the Haberfield Heritage Conservation Area to guide the landscaping along the project, around the ventilation facility and motorway facilities and along streets. The planting strategies would be developed with a view to complementing the existing historic streetscape plantings where relevant, with particular focus on Martin Street, Walker Avenue and Northcote Streets (moderately effective).	Construction contractor	Pre-construction and construction
	NAH29	The photographic archival recording of the affected areas of the Haberfield Conservation Area will include the streetscapes affected by the demolition of individual buildings (least effective).	Construction contractor	Pre-construction and construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Yasmar, Parramatta Road, Haberfield	NAH30	The urban design and landscape plan ~~would~~ **will** ensure views to the front gates and landmark Moreton Bay figs within Yasmar's mature garden are not obscured (highly effective).	Construction contractor	Pre-construction and construction
	NAH31	If required, the front entrance gates and mature trees along Yasmar's front (Parramatta Road) boundary will be protected during construction works (highly effective).	Construction contractor	Pre-construction and construction
	NAH32	If impacted by construction works, the access way from Parramatta Road into Yasmar ~~would~~ **will** be re-instated (highly effective).	Construction contractor	Pre-construction and construction
	NAH33	Significant trees in the vicinity of the project will be protected during construction works (highly effective).	Construction contractor	Pre-construction and construction
Dobroyd Stormwater Channel No. 53, Haberfield	NAH34	The fabric of the channel ~~would~~ **will** be protected during construction works on the advice of a suitably qualified civil engineer (highly effective).	Construction contractor	Pre-construction and construction
Urban Design Review Panel	**NAH35**	**An independent urban design review panel will be established for the detailed design phase to review the refinements made to the project as the design progresses and provide advice and recommendations in relation to the integration of built form, urban and landscape design and heritage aspects of the project, including the western and eastern ventilation facilities, tunnel portals, bridges, noise barriers and landscaping elements. An experienced, reputable and independent heritage specialist will also be included on the panel.**	**SMC**	**Pre-construction and construction**
Biodiversity				
General	B1	A Construction Flora and Fauna Management Plan will be developed for the construction phase of the project to confirm potential impacts and provide details of biodiversity management measures and procedures to be undertaken during construction to minimise and manage impacts on biodiversity.	Construction contractor	Pre-construction
Impact on adjacent vegetation	B2	The project footprint will be clearly delineated to minimise impacts on adjacent vegetation.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Impact on adjacent vegetation	B3	Investigate opportunities to retain perimeter plantings where feasible at construction ancillary facilities at Cintra Park and Powells Creek.	Construction contractor	Pre-construction
Impact on fauna	B4	A pre-clearing survey will be carried out to identify any habitat trees or other features that require the presence of an appropriately qualified fauna handler during clearing.	Construction contractor	Construction
Impact on threatened microbats	B5	An appropriately qualified fauna handler will be present during removal of habitat trees identified during pre-clearing surveys to guide clearing activities and undertake rescue and relocation of fauna.	Construction contractor	Construction
	B6	**Pre-construction surveys will be undertaken prior to commencing works in the vicinity of potential sites for hibernating or roosting bats. A bat management plan will be prepared if hibernating bats are identified.**	**Construction contractor**	**Construction**
Impacts on Grey-headed Flying-fox	B**7**	Landscaping should incorporate planting of Grey-headed Flying-fox feed trees where feasible.	Construction contractor	Construction
Spread of weeds and pathogens	B**8**	Weed and pathogen management and control will be undertaken in accordance with the *Biodiversity Guidelines* (Roads and Traffic Authority (RTA) 2011).	Construction contractor	Construction
Saleyards Creek	B**9**	The water quality basin at Saleyards Creek will be designed to minimise impacts on the creek corridor and the setback area along this boundary should be appropriately landscaped.	Construction contractor	Pre- construction and construction
Rehabilitation	B**10**	At the completion of construction, complementary landscaping using locally endemic species will be undertaken in areas of construction ancillary facilities abutting creeks, canals and open space areas, where feasible.	Construction contractor	Post-construction
General	OpB1	Weed management and control will be undertaken in accordance with the *Biodiversity Guidelines* (RTA 2011).	Motorway operator and Roads and Maritime	Operation
Greenhouse gas				
Greenhouse gas	GHG1	Prepare an Energy Efficiency and GHG Emissions Strategy for the project.	Construction contractor	Detailed design
	GHG2	Undertake an updated GHG assessment (Scope 1 and Scope 2) based on detailed design.	Construction contractor	Detailed design

Impact	Ref #	Environmental management measure	Responsibility	Timing
	GHG3	The emissions intensity of significant construction materials specified in the design of the project ~~would~~ **will** be assessed and, where feasible and in compliance with technical specifications, purchasing power would be used to drive the procurement and use of low emission construction materials.	Construction contractor	Detailed design
	GHG4	Where feasible, recycled content road construction materials such as recycled aggregates in road pavement and surfacing, or similar, ~~would~~ **will** be used.	Construction contractor	Detailed design
	GHG5	The fuel efficiency of construction plant and equipment ~~would~~ **will** be assessed before selection and, where feasible and reasonable, equipment with the highest fuel efficiency or equipment that uses lower GHG intensive fuel such as biofuels (eg biodiesel, ethanol) ~~would~~ **will** be used.	Construction contractor	~~Detailed design~~**Pre-construction/construction**
	GHG6	Project planning ~~would~~ **will** 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.	Construction contractor	Detailed design
	GHG7	Locally produced goods and services ~~would~~ **will** be procured where feasible **and where cost effective and meeting the project design and specifications,** ~~and where cost effective and cost effective~~ to reduce transport fuel emissions.	Construction contractor	Detailed design and construction
	GHG8	A minimum of six per cent of the project's estimated electricity consumption ~~would~~ **will** be sourced from a renewable energy source or GreenPower, where reasonable and feasible.	Construction contractor	Detailed design and construction
	GHG9	Waste ~~would~~**will** be diverted from landfill, including diversion of spoil, construction and demolition waste, and commercial and industrial waste, where reasonable and feasible.	Construction contractor	Detailed design and construction
	GHG10	The tunnel ~~would~~ **will** 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.	Construction contractor	Detailed design

Impact	Ref #	Environmental management measure	Responsibility	Timing
	GHG11	A life cycle assessment ~~would~~**will** 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.	Construction contractor	Detailed design
	GHG12	Low carbon energy generation options ~~would~~**will** be investigated as part of the design process in order to reduce the demand on mains electricity and generate renewable energy onsite, where feasible.	Construction contractor	Detailed design
	GHG13	A portion of the project's estimated electricity consumption ~~would~~**will** be sourced from a renewable energy source or GreenPower, where reasonable and feasible.	Motorway operator	Detailed design/ operation
Aboriginal heritage				
Unexpected finds	AH1	If an Aboriginal object(s) is discovered during construction it will be managed in accordance with the standard management procedure, *Unexpected Archaeological Finds* (Roads and Maritime 2015a), which includes the following provisions: • Relevant works in the vicinity of the object(s), with the potential to directly or indirectly impact on the object(s), will cease • The construction Environmental Representative, OEH and the Metropolitan Local Aboriginal Land Council will be notified of the discovery • A qualified archaeologist will be engaged to determine the nature, extent and scientific significance of the object(s) • Management recommendations will be developed in consultation with the qualified archaeologist, OEH and the Metropolitan Local Aboriginal Land Council.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Unexpected finds	AH2	If human remains are discovered during construction, the find will be managed in accordance with the standard management procedure, *Unexpected Archaeological Finds* (Roads and Maritime 2015a), which includes the following provisions: • Relevant works in the vicinity of the remains, with the potential to directly or indirectly impact on the remains, will cease • The construction Environmental Representative, OEH and NSW Police will be notified of the discovery • Directions from the NSW Police and/or OEH, as relevant, will be followed, depending on the nature of the remains and the outcome of forensic investigations.	Construction contractor	Construction
Resource use and waste minimisation				
Resource consumption	RW1	Wherever feasible and reasonable, construction material will be sourced from within the Sydney region.	Construction contractor	Pre-construction/ Construction
	RW2	Unnecessary resource consumption will be avoided by making realistic predictions on the required quantities of resources, such as construction materials.	Construction contractor	Pre-construction/ Construction
Management of waste	RW3	Wastes will be managed and disposed of in accordance with relevant State legislation and government policies.	Construction contractor	Construction
	RW4	A Waste Management Plan will be prepared for the construction phase of the project, detailing appropriate procedures for waste management.	Construction contractor	Construction
	RW5	Wastes will be managed using the waste hierarchy principles of: • Avoidance of unnecessary resource consumption to reduce the quantity of waste being generated. • Recover of resources for reuse on site or off site for the same or similar use, without reprocessing • Recover of resources through recycling and reprocessing so that waste can be processed into a similar non-waste product and reused • Disposal of residual waste.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
	RW6	Residual waste will be classified, handled and stored on site in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA 2014) until collection by a contractor for disposal.	Construction contractor	Construction
	RW7	Off-site reuse of waste will comply with relevant EPA resource recovery exemptions and requirements.	Construction contractor	Construction
Management of asbestos	RW8	An asbestos survey will be undertaken of buildings to be demolished as part of the project. The survey will be conducted by a suitably qualified person.	Construction contractor	Construction
	RW9	Asbestos handling and management will be undertaken in accordance with an Asbestos Management Plan and relevant State legislation, government policies and Australian Standards.	Construction contractor	Construction
Excess spoil	RW10	A spoil management plan will be developed in accordance with the spoil management strategy **(refer section 6.9.5 of the EIS)** prior to the commencement of tunnelling works. The plan will identify spoil disposal site/s and describe the management of spoil on site and during off-site transport.	Construction contractor	Pre-construction
Management of waste	OpRW1	Wastes will be manage and disposed of in accordance with relevant State legislation and government policies.	Motorway operator	Operation
Operational water requirements	OpRW2	Opportunities for reuse of wastewater will be considered including irrigation of landscaped areas within the project or local parks in preference to discharge to the local stormwater system.	Motorway operator	Operation
	OpRW3	In order to reduce demand on local water supplies, options will be investigated to provide water for the deluge system from wastewater produced through the tunnel drainage system where it meets appropriate quality parameters.	Motorway operator	Operation
Climate change				
Climate change impacts	OpCC1	The risks of future climate change will be further considered during detailed design.	Construction contractor	Pre-construction
Climate change impacts	OpCC2	Implement adaptation measures to address high and extreme rated risks identified in the subsequent detailed climate change risk assessment.	Construction contractor	Pre-construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Climate change impacts	OpCC3	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 will be undertaken to consider the impacts of climate change.	Construction contractor	Pre-construction
Hazard and risk				
General	HR1	Site-specific hazard and risk management measures will be included within the CEMP, which will 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 • Training for relevant personnel (including subcontractors) and site inductions, including the recognition and awareness of site hazards and locations of relevant equipment.	Construction contractor	Pre-construction/ construction
Storage of dangerous goods and hazardous substances	HR2	Dangerous goods and hazardous materials will be stored in accordance with: • *Work Health and Safety Act 2011* (NSW) • *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW 2005) • Supplier's instructions • Relevant Australian Standards • *The Environment Protection Manual for Authorised Officers: Bunding and Spill Management, technical bulletin* (Environment Protection Authority 1997). For liquids, a minimum bund volume requirement of 110 per cent of the volume of the largest single stored volume within the bund will be provided.	Construction contractor	Construction
	HR3	Material Safety Data Sheets for dangerous goods and hazardous substances will be obtained before these materials arrive on site.	Construction contractor	Construction

Impact	Ref #	Environmental management measure	Responsibility	Timing
Transport of dangerous goods and hazardous substances	HR4	Transport of dangerous goods and hazardous substances will be conducted in accordance with relevant legislation and codes, including the *Dangerous Goods (Road and Rail Transport) 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* (National Transport Commission 2008).	Construction contractor	Construction
Storage of dangerous goods and substances	**Op**HR~~op~~1	Dangerous goods and hazardous materials will be stored in accordance with: • *Work Health and Safety Act 2011* (NSW) • *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW 2005) • Supplier's instructions • Relevant Australian Standards • *The Environment Protection Manual for Authorised Officers: Bunding and Spill Management, technical bulletin* (Environment Protection Authority 1997). For liquids, a minimum bund volume requirement of 110 per cent of the volume of the largest single stored volume within the bund will be provided.	Motorway operator	Operation
	OpHR~~op~~2	Material Safety Data Sheets for dangerous goods and hazardous substances will be obtained before these materials arrive on site.	Motorway operator	Operation
Transportation of dangerous goods and hazardous substances	**Op**HR~~op~~3	Transport of dangerous goods and hazardous substances will be conducted in accordance with relevant legislation and codes, including the *Dangerous Goods (Road and Rail Transport) 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* (National Transport Commission 2008).	Motorway operator	Operation
Incident response	**Op**HR~~op~~4	An Incident Response Plan will be developed and implemented in the event of an accident or incident.	Motorway operator	Operation

Impact	Ref #	Environmental management measure	Responsibility	Timing
Cumulative impacts				
Cumulative impacts	CI1	Consultation will be undertaken with local communities potentially affected by the impacts of multiple projects in addition to the project.	~~WDA~~**SMC**/Construction Contractor	Construction
	CI2	Where relevant, consultation will be undertaken with proponents of other nearby developments to increase the overall awareness of project timeframes and impacts.	~~WDA~~**SMC**/Construction Contractor	Construction
Sustainability				
Sustainability	S1	The construction contractor would develop and implement a Sustainability Management Plan during detailed design. The Sustainability Management Plan would establish governance structures, processes and systems that ensure integration of all sustainability considerations (vision, commitments, principles, objectives and targets), initiatives, monitoring and reporting during the detailed design and construction phases of the project.	Construction contractor	Pre-construction

9 Conclusion and next steps

The NSW 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 may then approve the project (with any conditions considered appropriate) or refuse to give approval.

A copy of the submissions and preferred infrastructure report will be published on DP&E's website. The NSW Minister for Planning's determination and the Secretary's report will be published on DP&E's website immediately following determination.

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