



Australian Government

BUILDING OUR FUTURE



The new state
of business



WestConnex Enabling Works - Airport East Precinct

Review of Environmental Factors

Volume I Main report
Appendix A – E

February 2015

Roads and Maritime Services

WestConnex Enabling Works – Airport East Precinct

Review of environmental factors
February 2015

Prepared by Jacobs
ABN: 37 001 024 095

710 Hunter Street
Newcastle West NSW 2302
Australia
PO Box 2147 Dangar NSW 2309 Australia

Tel: +61 2 4979 2600
Fax: +61 2 4979 2666
www.jacobs.com

Executive summary

The proposal

New South Wales (NSW) Roads and Maritime Services proposes to upgrade a number of roads east of Sydney Kingsford Smith Airport (Sydney Airport) to improve traffic flow and access to Sydney Airport, Port Botany and the future WestConnex Motorway.

These improvements would be delivered by a project named the WestConnex Enabling Works – Airport East Precinct (the proposal).

The main features of the proposal are to:

- Separate the road network from the Port Botany Freight Rail Line. This would involve:
 - Extending Wentworth Avenue beneath the Port Botany Freight Rail Line to link with General Holmes Drive. The Wentworth Avenue underpass would have nine lanes, with five lanes eastbound and four lanes westbound, and a minimum 4.7 metres clearance
 - Building two rail bridges over the Wentworth Avenue underpass
 - Removing the General Holmes Drive rail level crossing of the Port Botany Freight Rail Line, improving safety and enabling increased speed for freight trains.
- Adjust, protect and locally relocate utilities
- Provide a bridge over the stormwater channel which runs parallel to General Holmes Drive and a protection slab over sewer and gas utilities on the extension of Wentworth Avenue
- Provide a new intersection at General Holmes Drive and the extension of Wentworth Avenue
- Upgrade or adjust the intersections at:
 - Wentworth Avenue and Botany Road
 - General Holmes Drive and Mill Pond Road
 - Botany Road and Mill Pond Road
 - General Holmes Drive, Joyce Drive and Ross Smith Avenue
 - General Holmes Drive and Botany Road.
- Widen Joyce Drive and General Holmes Drive between about 100 metres east of O'Riordan Street and 175 metres south of Mill Pond Road to three lanes in each direction
- Adjust and locally relocate drainage infrastructure including:
 - Replacing the grassed swale along Joyce Drive with a pipe and pit system
 - Installing a permanent pump at the low point of the Wentworth Avenue underpass.
- Landscape and replant generally on road verges and in the area of land between General Holmes Drive and the Port Botany Freight Rail Line
- Provide new facilities – and relocate existing facilities – for pedestrians, cyclists and public transport, including:

- A new shared-use path linking to the existing cycleway at Todd Reserve on Wentworth Avenue
 - A new shared path on Botany Road from the Botany Road and Wentworth Avenue intersection to Baxter Road
 - Removing the pedestrian path on the northern side of Joyce Drive, which would be replaced with a new shared path along Baxter Road as part of a separate project in the WestConnex Enabling Works program
 - Relocating the northbound bus stop on Botany Road about 70 metres to the south of its current location.
- Provide temporary construction ancillary facilities, including construction compounds, stockpile sites and erosion and sedimentation control measures.

Need for the proposal

Sydney Airport and Port Botany are two of Australia's most important international gateways. However, roads around Sydney Airport and Port Botany are becoming increasingly congested due to rising numbers of passenger, freight, and commuter vehicles.

The proposal would address road congestion by providing a feasible and cost-effective road network improvement that would:

- Provide sufficient capacity to support the airport ground access function and increased taxi and bus volumes accessing the Sydney Airport precinct
- Allow for the future duplication of the Port Botany rail line and the separation of road and rail infrastructure to improve rail freight throughput

Proposal objectives

The primary objectives of the proposal are to:

- Provide, as a minimum, a light-vehicle standard rail underpass to replace the General Holmes Drive rail level crossing
- Reduce current levels of congestion and improve the flow of road and rail traffic.

Options considered

In 2013, Roads and Maritime assessed five strategic project options to meet the project objectives. Through this assessment process, a preferred strategic project option was selected that was superior to the other options in terms of technical and environmental criteria.

Following further technical investigations, Roads and Maritime identified three refinements of the preferred strategic project option. Roads and Maritime then investigated these alternatives in more detail so it could select the preferred alternative – which is the proposal assessed in this report.

The proposal was selected ahead of the other alternatives as it represents the best technical outcome to improve the road network and reduce traffic congestion at General Holmes Drive, Joyce Drive, Mill Pond Road and Botany Road.

Statutory and planning framework

The State Environmental Planning Policy (Infrastructure) 2007 aims to facilitate the effective delivery of infrastructure across NSW. Clause 94 of the ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. The proposal can therefore be assessed under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) by Roads and Maritime as both the proponent and the determining authority. Development consent from Botany Bay City Council – in whose jurisdiction the proposal is located – is not required.

As the proposal is located partly on Commonwealth land, additional permits and approvals are also required for this proposal in addition to the Part 5 determination and include:

- A Commonwealth application for a building permit is required in accordance with Section 2.02 of the Airports (Building Control) Regulations 1996 – the activity being defined as earthworks or engineering works. Airport Lessee Consent in accordance with Section 2.03 of the Regulations is also required, who in this case is Sydney Airport Corporation Limited (SACL)
- A Commonwealth controlled activity approval would be required from SACL and potentially the Department of Infrastructure and Regional Development (DIRD) under Section 183 of the Airports Act – as the activity intrudes into the Obstacle Limitation Surface (OLS).

An approval from the Commonwealth Minister for the Environment under the *Environment Protection Conservation Act 1999* (EPBC Act) is not required as the proposal would not constitute a significant impact on matters of national environmental significance, the activity on Commonwealth land is not likely to have a significant impact on the environment (including impacts outside of Commonwealth land) and is not likely to have a significant impact on the environment on Commonwealth land.

This review of environmental factors (REF) fulfils the requirements of Section 111 of the EP&A Act and has been prepared in accordance with Clause 228 of the Environmental Planning and Assessment Regulation 2000, matters of national environmental significance and the Airports (Building Control) Regulations 1996.

Community and stakeholder consultation

Consultation with the community and affected stakeholders has been ongoing since September 2013.

The WestConnex Enabling Works Proposal Report (Roads and Maritime, 2013a) and strategic concept design were placed on display for community comment between November and January 2014.

This REF is also being placed on public display for comment. After the display period, Roads and Maritime will consider and address all comments in a submissions report, which will be made publicly available on its website (http://www.rms.nsw.gov.au/roadprojects/projects/sydney_region/southern_sydney/westconnex_enabling_works/airport-east.html).

During the REF display period, Roads and Maritime will maintain the project's toll-free information line (1300 862 844) to answer any queries that the community or affected road users may have, and will continue to update the project website and

issue community update newsletters. In addition, two information sessions will be held during the public exhibition period, including:

- Thursday 5 March (between 4pm and 6pm) at Mascot Public School
- Saturday 7 March (between 10am and 12pm) at Eastlakes Hall.

These sessions will provide the community with the opportunity to meet with project team members to ask further questions.

Should the project proceed, Roads and Maritime will maintain the information line, and continue to update the project website and issue community update newsletters during the construction period.

Environmental impacts

A number of detailed technical investigations were completed to assess the potential impacts of the proposal, and identify safeguards and management measures to mitigate these impacts.

Land transport

During construction, the proposal would have a minor adverse impact on the road network. This temporary impact would be associated with traffic delays from construction speed zones, restriction of residential and commercial access, lane closures, impact on bus routes and services, and safety risks associated with construction activities next to traffic. Pedestrian and cyclist access within the proposal area would also be changed and limited by construction activities.

During operation, the proposal would improve access to and within the study area for road vehicles (including buses), pedestrians and cyclists. Improved access would be achieved via a road network with higher average traffic speeds, lower travel times, less congestion and less potential for gridlock, when compared to the scenario without the proposal. The proposal would also result in a minor change to routes within and near the proposal area, and would improve safety for pedestrians and cyclists.

Airport operations

The operation of the east-west runway would need to be temporarily restricted for two short periods to ensure a safe environment for construction crews and aircraft, while the Wentworth Avenue underpass and railway bridges are being built. These restrictions would be about one to two weeks each. The runway closures would be scheduled to occur when the runway is used least frequently due to weather conditions, in the months of March and October.

The restriction of the east-west runway would require redistribution of aircraft arrivals and departures to the other two runways at Sydney Airport for each period. This would also result in:

- A reduction in the noise respite of up to three per cent available for two flight zones to the north and one flight zone to the south of Sydney Airport. This change is unlikely to be perceived by most people affected by aircraft noise in these flight zones
- An increase in the noise respite available in flight zones to the east and west of Sydney Airport
- No change in respite in zones to the north-east, north west and south-east of the Sydney Airport.

The proposal's impact on airport operations is not considered notable or significant in the meaning of the EPBC Act. The proposal is also consistent with the Sydney Airport T2/T3 Ground Access Solutions and Hotel Preliminary Draft Major Development Plan.

Noise and vibration

The majority of construction for the proposal would occur at night. The proposal is likely to result in exceedances of noise management levels during all stages. Further, during the Botany Road and Wentworth Avenue intersection upgrade stage, four receivers may experience noise levels in the 'highly noise affected' range (greater than 75 dB(A)). All sensitive receivers identified in the assessment would potentially be affected by sleep disturbance during construction of the proposal. Environmental safeguards and mitigation measures have been outlined in the REF to reduce construction impacts as far as possible. Management of work outside of normal hours would also be addressed via the Construction Noise and Vibration Management Plan.

Ground vibration would also be generated by the proposal during construction. The human comfort criteria for vibration may be exceeded at sensitive receivers within about 10 metres of any vibration-causing activity, however no material risk of structural damage is anticipated.

An estimated increase of less than 2 dB(A) between the proposal and 'no build' scenarios is expected at most sensitive receivers. However, three receivers may experience increased noise levels due to the removal of properties on Wentworth Avenue. The proposal is not expected to result in an increase in maximum noise levels during operation. However, up to 38 receivers are identified as being 'potentially acutely affected' by the proposal, and would be considered for noise mitigation during detailed design.

Non-Aboriginal heritage

During construction, the proposal would require the removal of three items of local heritage significance listed on the Botany Bay Local Environmental Plan 2013 and two unlisted heritage items, the acquisition of four heritage-listed properties and partial acquisition of two heritage-listed properties.

There may also be indirect visual impacts and impacts from vibration.

These impacts are assessed in the Statement of Heritage Impact. These impacts are not considered to be significant and would be managed during construction through the application of safeguards and mitigation measures identified in the REF.

No non-Aboriginal heritage impacts are expected during operation of the proposal.

Biodiversity

The proposal would require a total of about 3.3 hectares of vegetation to be removed, however, most of the vegetation is planted, exotic or in poor condition. This would result in the loss or degradation of habitat (including nectar-producing trees), potential indirect impacts on wetland plant communities, minor loss of foraging habitat for the migratory Fork-tailed Swift and White-throated Needletail, and minor loss of structural diversity. Other potential impacts include injury and mortality of fauna species from vegetation removal during construction and vehicle strikes during operation.

The wetland to the south of the proposed Wentworth Avenue underpass is expected to experience a decrease in flood waters during operation. The assessment found that this reduction in flood waters would not have a major impact on vegetation characteristics, aquatic habitat and fauna assemblages of the groundwater-dependent wetland, provided that water quality measures are implemented.

Hydrology

The proposed drainage structures would improve existing drainage conditions by introducing more flows to the stormwater channel in the proposal area and increase flooding in unpopulated areas. This would result in reduced flood risk to existing development along Botany Road, and an unnoticeable to negligible impact on Sydney Airport and upstream catchments. The Wentworth Avenue underpass would be designed to drain stormwater away from the low point. The proposal would result in a less than one per cent increase in impervious areas within the catchment for the proposal, and therefore have a negligible impact on the peak flows within the hydrological system.

Construction of the Wentworth Avenue underpass would require excavation below the groundwater table. Dewatering to maintain the excavation may result in drawdown in areas around the underpass, and may affect buildings along Botany Road and the Port Botany Freight Rail Line. Options to manage groundwater levels and flows during construction are currently being investigated and would be confirmed during detailed design.

Landscape character and visual amenity

Construction activities for the proposal would reduce the visual amenity of the proposal area but, overall, the visual impact of the proposal would be moderate.

During construction, the proposal would impact on landscape character within the proposal area, due to the removal of trees, widening of roads, increased paved areas, intersection upgrades and construction of the railway bridges and underpass. However, the proposal would also provide opportunities for the landscape character in the proposal area to be rehabilitated, particularly for an area of degraded landscape that includes remnant wetlands.

Topography, geology, soils and water quality

During construction, there is potential for the proposal to impact soil and water quality due to:

- The erosion of soil from stockpiles, or exposed soil
- Accidental contamination of soils and pollution of downstream waterways
- General earthworks, including stripping of topsoil and excavation
- Disposal of water from dewatering of underpass excavation
- The potential to intercept groundwater.

However, these risks to water quality are expected to be managed through the implementation of mitigation measures, so impacts are not expected. The proposal would reinject or re-infiltrate any groundwater from dewatering activities and is expected to result in minimal to no water quality impacts.

Land use, property and socio-economic issues

Roads and Maritime would need to acquire or partially acquire about 18 properties to construct the proposal. Areas of acquisition or lease would be finalised during

detailed design in consultation with these affected landowners and carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and Roads and Maritime's Land Acquisition Policy (Roads and Maritime, 2012). Commonwealth land would also be directly leased from Sydney Airport Corporation Limited (SACL) until the permanent transfer of Commonwealth land to Roads and Maritime is possible.

During construction, the community and local businesses would be likely to experience temporary traffic delays, property access restrictions and noise, air quality and visual amenity impacts. During operation, there would be a minor reduction in the availability of social infrastructure due to the removal of the Beckenham Church School Hall.

Justification and conclusion

The proposal would:

- Improve traffic flow and reduce congestion on the road network by upgrading intersections and removing the rail level crossing at General Holmes Drive. This would benefit all vehicles, including buses, as well as pedestrians and cyclists
- Improve road safety for cyclists and pedestrians
- Allow for increased speed of freight trains on the Port Botany line and facilitate the duplication of the line if deemed necessary in the future
- Improve access for most motorists.

Of the alternatives investigated, the proposal would best meet the objectives in terms of removing the General Holmes Drive rail level crossing and reducing road congestion. This would be achieved by replacing the rail level crossing at General Holmes Drive with the Wentworth Avenue underpass, improving intersections and widening General Holmes Drive and Joyce Drive.

This REF is based on thorough technical investigations that examined and took into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal. These investigations enabled Roads and Maritime to develop a design that would avoid or reduce a number of potential environmental impacts that would otherwise occur. The proposal as described in this REF best meets the proposal objectives. The proposal would still result in some impacts including noise and vibration, temporary disruptions to traffic flow and impacts on non-Aboriginal heritage, flooding, water quality and groundwater. A range of measures have been developed to minimise and mitigate the potential adverse impacts of the proposal, and these have been summarised in this REF.

This REF finds that:

- The proposal would not have a significant impact on the environment and therefore an environmental impact statement (EIS) and assessment under Part 5.1 of the EP&A Act is not required
- There would be no significant impact on matters of national environmental significance or the environment of Commonwealth land
- The proposal does not meet the criteria for a major airport development, and therefore a major development plan under Section 89(1) of the *Airports Act 1996* is not required
- The adverse impacts of the proposal would be outweighed by the longer-term community benefits of improved traffic flow, reduced congestion and improved safety and facilities for all road users.

On balance, the proposal is therefore considered justified.

Where to access the REF

This REF and associated specialist studies are on display for comment 16 February 2015 to 13 March 2015. You can access the REF in the following ways.

Internet

The REF and specialist studies are available as pdf files on the Roads and Maritime website at
http://www.rms.nsw.gov.au/roadprojects/projects/sydney_region/southern_sydney/we-stconnex_enabling_works/airport-east.html.

Display

The REF and specialist studies can be viewed at the following locations until Friday 13 March:

- Transport Information Centre
Corner George and King Streets
388 George Street
Sydney NSW 2000
Monday-Friday 9am-5pm
- City of Botany Bay Council
Administration Centre
141 Coward Street
Mascot NSW 2020
Monday-Friday 8:30am-4:30pm
- Central Library
Westfield Shoppingtown
Ground floor, Banks Avenue
Eastgardens NSW 2035
Monday-Friday 10am-6pm; Saturdays 9:30am-4pm

Purchase

The REF and specialist studies can be purchased on CD (\$10.00) by contacting Airport East Precinct on 1300 862 844.

How to make a submission

To make a submission on the proposal, please send your written comments to:

Airport East Precinct
Roads and Maritime Services
PO Box 973
Parramatta CBD NSW 2124

Or email AirportEast@rms.nsw.gov.au

Privacy information

All information included in submissions is collected for the sole purpose of helping to assess this proposal. The information may therefore be used during the environmental impact assessment process by relevant Roads and Maritime staff and its contractors.

If you wish your submission to be kept confidential, please mark it 'confidential', and Roads and Maritime will attempt to keep it confidential. However, please note that confidentiality cannot be guaranteed as there may be a legislative or legal justification for the release of the information, for example under the *Government Information (Public Access) Act 2009* or under subpoena or statutory instrument.

The supply of this information is voluntary. Each respondent has free access at all times to the information provided by that respondent but not to any identifying information provided by other respondents if a respondent has indicated that the representation should be kept confidential.

Any respondent may make a correction to the information that they have provided by writing to the Roads and Maritime project manager (see above).

The information will be held by the Roads and Maritime, Sydney Office.

What happens next?

Following the submissions period, Roads and Maritime will collate submissions and send acknowledgement letters to each respondent. The details of submission authors will be retained and authors will be advised when project information is published.

After considering the submissions, Roads and Maritime will determine whether the proposal should proceed as proposed, or whether any alterations are necessary. The community will be kept informed of Roads and Maritime's determination.

If Roads and Maritime determines that the proposal should proceed, final design will be completed and tenders invited for construction of the project.

Any questions?

For further information about the Airport East proposal, please contact the project team:

Phone: 1300 862 844

Email: AirportEast@rms.nsw.gov.au

Web: www.rms.nsw.gov.au/roadprojects/AirportEast

Mail: Airport East Precinct
Roads and Maritime Services
PO Box 973
Parramatta CBD NSW 2124

Contents

Executive summary	i
1 Introduction	1
1.1 Proposal identification.....	1
1.1.1 The proposal	1
1.1.2 Timeframe and cost estimate	2
1.1.3 Terms used in this report.....	5
1.1.4 The locality.....	5
1.2 Purpose of this report	5
2 Need and existing infrastructure	7
2.1 Strategic need for the proposal.....	7
2.2 Strategic planning and policy framework.....	7
2.2.1 NSW 2021: A plan to make NSW number one	7
2.2.2 State Infrastructure Strategy 2012–2032.....	7
2.2.3 Draft Metropolitan Strategy for Sydney to 2031	8
2.2.4 NSW Long Term Transport Master Plan 2012.....	8
2.2.5 NSW Freight and Ports Strategy	8
2.2.6 Sydney Airport Master Plan 2033.....	8
2.2.7 Sydney Airport Environment Strategy (2010-2015)	9
2.3 Existing roads and infrastructure.....	9
2.3.1 General Holmes Drive	9
2.3.2 Joyce Drive	10
2.3.3 Botany Road	11
2.3.4 Mill Pond Road.....	12
2.3.5 Wentworth Avenue.....	14
2.3.6 Intersections.....	15
2.3.7 Sydney Airport	18
2.3.8 Rail	19
2.3.9 Pedestrian, cyclist and bus facilities	19
2.3.10 Drainage infrastructure.....	20
2.3.11 Utility infrastructure	21
3 Proposal objectives and options considered.....	23
3.1 Proposal objectives.....	23
3.2 Options and alternatives considered.....	23
3.2.1 Strategic project options.....	24
3.2.2 Options	29
3.3 The preferred option	33
4 Description of the proposal.....	34
4.1 The proposal.....	34
4.2 Design	37
4.2.1 Design criteria	37
4.2.2 Engineering constraints.....	38
4.2.3 Major design features.....	39
4.3 Construction activities	50
4.3.1 Work methodology	51

4.3.2	Groundwater management during construction.....	56
4.3.3	Construction hours and duration	56
4.3.4	Plant and equipment	57
4.3.5	Earthworks.....	59
4.3.6	Source and quantity of materials.....	59
4.3.7	Traffic management and access	60
4.4	Interaction with Sydney Airport operations.....	61
4.4.1	Restriction of Sydney Airport east-west runway	62
4.4.2	Construction during night time hours.....	64
4.5	Ancillary facilities	64
4.5.1	Stockpile sites.....	64
4.5.2	Compound site.....	65
4.5.3	Tall vehicle storage area	65
4.6	Water management facilities.....	65
4.7	Public utility adjustments	65
4.8	Property.....	67
4.8.1	Property ownership	67
4.8.2	Property acquisition.....	67
5	Statutory and planning framework.....	71
5.1	Approvals framework.....	71
5.2	Commonwealth legislation.....	71
5.2.1	Airports Act 1996	72
5.2.2	Environment Protection and Biodiversity Conservation Act 1999	75
5.3	State environmental planning policies.....	76
5.3.1	State Environmental Planning Policy (Infrastructure) 2007.....	76
5.3.2	State Environmental Planning Policy No 55 – Remediation of Land... ..	76
5.4	Local environmental plans	77
5.4.1	Botany Bay Local Environmental Plan 2013.....	77
5.5	Other relevant State legislation.....	78
5.5.1	Protection of the Environment Operations Act 1997.....	78
5.5.2	Contaminated Land Management Act 1997	79
5.5.3	Heritage Act 1977	79
5.5.4	Land Acquisition (Just Terms Compensation) Act 1991	81
5.5.5	Water Management Act 2000.....	81
5.6	Policies and guidelines	82
5.6.1	Sydney Airport Master Plan 2033.....	82
5.6.2	Sydney Airport Environment Strategy 2013-2018.....	84
5.6.3	National Airports Safeguarding Framework.....	84
5.7	Confirmation of statutory position.....	84
6	Stakeholder and community consultation	86
6.1	Consultation strategy	86
6.2	Community involvement	86
6.2.1	Proposal report	86
6.2.2	Preferred proposal report.....	88
6.3	Aboriginal community involvement.....	88
6.4	ISEPP consultation.....	89
6.5	Government agency and stakeholder involvement	91

6.6	Ongoing or future consultation.....	93
6.6.1	Consultation with affected landowners	93
6.6.2	Consultation with government agencies and service providers	94
7	Environmental assessment	95
7.1	Land transport and access.....	95
7.1.1	Methodology	95
7.1.2	Existing environment.....	96
7.1.3	Potential impacts.....	101
7.1.4	Safeguards and management measures.....	109
7.2	Airport operations	110
7.2.1	Methodology	111
7.2.2	Existing environment.....	111
7.2.3	Potential impacts.....	114
7.2.4	Safeguards and mitigation measures	116
7.3	Noise and vibration	117
7.3.1	Policies and guidelines.....	117
7.3.2	Existing environment.....	118
7.3.3	Assessment criteria.....	121
7.3.4	Construction noise and vibration assessment	126
7.3.5	Operational noise and vibration assessment	129
7.3.6	Safeguards and management measures.....	133
7.4	Non-Aboriginal heritage	134
7.4.1	Methodology	134
7.4.2	Existing environment.....	135
7.4.3	Potential impacts.....	146
7.4.4	Safeguards and management measures.....	148
7.5	Biodiversity	151
7.5.1	Methodology	151
7.5.2	Existing environment.....	153
7.5.3	Potential impacts.....	161
7.5.4	Safeguards and management measures.....	164
7.6	Hydrology	167
7.6.3	Potential impacts.....	175
7.7	Landscape character and visual amenity	181
7.7.1	Methodology	181
7.7.2	Existing environment.....	182
7.7.3	Potential impacts.....	184
7.7.4	Safeguards and management measures.....	192
7.8	Topography, geology, soils and water quality	193
7.8.1	Methodology	193
7.8.2	Existing environment.....	194
7.8.3	Potential impacts.....	196
7.8.4	Safeguards and management measures.....	199
7.9	Contamination	202
7.9.1	Methodology	202
7.9.2	Existing environment.....	203
7.9.3	Potential impacts.....	205
7.9.4	Safeguards and management measures.....	207
7.10	Air quality.....	208

7.10.1	Criteria	209
7.10.2	Existing environment.....	209
7.10.3	Potential impacts.....	212
7.10.4	Safeguards and management measures.....	213
7.11	Aboriginal heritage.....	214
7.11.1	Existing environment.....	215
7.11.2	Potential impacts.....	215
7.11.3	Safeguards and management measures.....	216
7.12	Land use and property.....	216
7.12.1	Methodology	216
7.12.2	Existing environment.....	216
7.12.3	Potential impacts.....	218
7.12.4	Safeguards and management measures.....	219
7.13	Socio-economic	219
7.13.1	Methodology	219
7.13.2	Existing environment.....	219
7.13.3	Potential impacts.....	222
7.13.4	Safeguards and management measures.....	223
7.14	Greenhouse gas and climate change	224
7.14.1	Existing environment.....	224
7.14.2	Potential impacts.....	225
7.14.3	Safeguards and management measures.....	226
7.15	Waste and resource management	227
7.15.1	Policy setting.....	227
7.15.2	Existing environment.....	227
7.15.3	Potential impacts.....	227
7.15.4	Safeguards and management measures.....	228
7.16	Cumulative environmental impacts	229
7.16.1	Methodology	229
7.16.2	Potential impacts.....	231
7.16.3	Safeguards and management measures.....	231
7.17	Conclusions	232
7.17.1	Summary of beneficial effects	232
7.17.2	Summary of adverse effects.....	232
8	Environmental management.....	234
8.1	Environmental management plans (or system).....	234
8.2	Summary of safeguards and management measures.....	234
8.3	Licences and approvals	255
9	Conclusion	256
9.1	Justification.....	256
9.2	Objects of the EP&A Act.....	256
9.2.1	The precautionary principle	257
9.2.2	Intergenerational equity.....	258
9.2.3	Conservation of biological diversity and ecological integrity	258
9.2.4	Improved valuation, pricing and incentive mechanisms.....	258
9.3	Objects of the Airports Act	259
9.4	Conclusion.....	259
10	Certification	261

11	References	262
12	Terms and acronyms used in this REF	266

Appendices

Appendix A	Checklists
Appendix B	Concept design and typical cross sections
Appendix C	Consideration of clause 228(2) factors and matters of national environmental significance
Appendix D	Utility adjustments
Appendix E	Stakeholder consultation
Appendix F	Landscape character and visual impact assessment
Appendix G	Traffic and transport working paper
Appendix H	Noise and vibration impact assessments
Appendix I	Statement of heritage impact
Appendix J	Biodiversity assessment
Appendix K	Hydrologic and hydraulic assessment report
Appendix L	Review of airport operations impact report
Appendix M	Phase 1 and 2 environmental site assessment
Appendix N	Aboriginal heritage clearance letter

1 Introduction

This chapter provides an overview of the proposal and outlines the purpose of this report.

1.1 Proposal identification

1.1.1 The proposal

Sydney Kingsford Smith Airport (Sydney Airport) and Port Botany are two of Australia's most important international gateways, however, the road network around Sydney Airport and Port Botany is becoming increasingly congested due to rising numbers of passenger, freight and commuter vehicles.

To help address this issue, Roads and Maritime Services proposes to build the WestConnex Enabling Works – Airport East Precinct (the proposal), which would improve traffic flow and access to Sydney Airport, Port Botany and the future WestConnex Motorway. It would also allow the future duplication of the Port Botany Freight Rail Line and improve the overall efficiency of the rail line.

Figure 1-1 shows the location of the proposal area, and **Figure 1-2** shows an overview of the proposal. The proposal is located on Commonwealth land leased to Sydney Airport Corporation Limited (SACL) in the west, and a mix of private and State-owned land in the east, as shown in **Figure 1-2**. The proposal is described in more detail in **Chapter 4** and detailed drawings are included in **Appendix B**.

The main features of the proposal are to:

- Separate the road network from the Port Botany Freight Rail Line. This would involve:
 - Extending Wentworth Avenue beneath the Port Botany Freight Rail Line to link with General Holmes Drive. The Wentworth Avenue underpass would have nine lanes, with five lanes eastbound and four lanes westbound, and a minimum 4.7 metres clearance
 - Building two rail bridges over the Wentworth Avenue underpass
 - Removing the General Holmes Drive rail level crossing of the Port Botany Freight Rail Line, improving safety and enabling increased speed for freight trains.
- Adjust and locally relocate utilities
- Provide a bridge over the stormwater channel which runs parallel to General Holmes Drive and a protection slab over sewer and gas utilities on the extension of Wentworth Avenue
- Provide a new intersection at General Holmes Drive and Wentworth Avenue
- Upgrade or adjust the intersections at:
 - Wentworth Avenue and Botany Road
 - General Holmes Drive and Mill Pond Road
 - Botany Road and Mill Pond Road
 - General Holmes Drive, Joyce Drive and Ross Smith Avenue
 - General Holmes Drive and Botany Road.

- Widen Joyce Drive and General Holmes Drive between about 100 metres east of O'Riordan Street and 175 metres south of Mill Pond Road to three lanes in each direction
- Adjust and locally relocate drainage infrastructure including:
 - Replacing grassed swale at Joyce Drive with a pipe and pit system
 - Installing a permanent pump at the low point of the Wentworth Avenue underpass.
- Landscape and replant generally on road verges and in the area of land between General Holmes Drive and the Port Botany Freight Rail Line
- Provide new facilities – and relocate existing facilities – for pedestrians, cyclists and public transport, including:
 - A new shared-use path linking to the existing cycleway at Todd Reserve on Wentworth Avenue
 - A new shared path on Botany Road from the Botany Road and Wentworth Avenue intersection to Baxter Road
 - Removing the pedestrian path on the northern side of Joyce Drive, which would be replaced with a new shared path along Baxter Road as part of a separate project in the WestConnex Enabling Works packages of work
 - Relocating the northbound bus stop on Botany Road about 70 metres to the south of its current location.
- Provide temporary construction ancillary facilities, including construction compounds, stockpile sites and erosion and sedimentation control measures.

1.1.2 Timeframe and cost estimate

The proposal would take about 30 months to build, with construction expected to start in late 2015. Roads and Maritime would stage construction to minimise impacts on vehicles that use the local road network as well as Sydney Airport operations and Port Botany Freight Rail operations.

The proposal would cost about \$115 million to build. The Australian and NSW governments are jointly funding the proposal. Sydney Airport is also providing land and access for sections of the proposal.

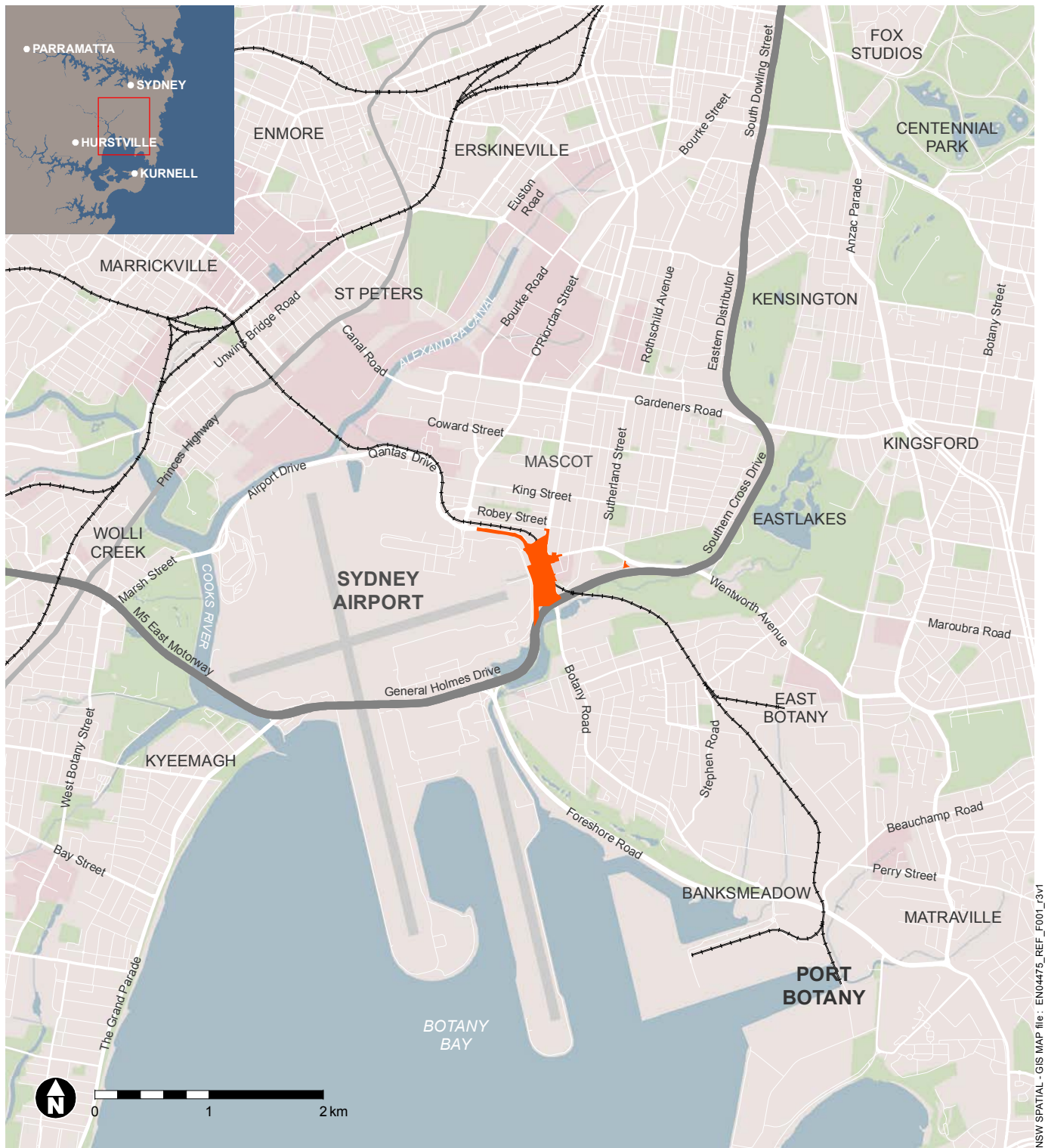


Figure 1-1 Regional context for the proposal

Legend

- Proposal area
- Parklands
- Industrial areas
- Motorway
- Railway

Roads and Maritime Services 2014
 AUSIMAGE 2014
 LPI 2014



Figure 1-2 The proposal

1.1.3 Terms used in this report

The following terms are used in this review of environmental factors (REF):

- 'The proposal' refers to the design, construction and operation of the road upgrade to the east of Sydney Airport
- 'The proposal area' refers to the area that would be directly impacted by construction and operation of the proposal. It encompasses the road, rail, batters, cuts and embankments. It also includes the total construction footprint, compound sites, stockpile sites and any other areas that would be temporarily disturbed (such as construction basins and access tracks)
- 'The study area' encompasses the proposal area and the area that may be indirectly impacted by the proposal. This term refers to the area considered for various specialist studies, and may differ according to the environmental issue. Definitions are provided in **Chapter 7**.

1.1.4 The locality

As shown in **Figure 1-1**, the proposal area is located in the suburb of Mascot, in the Botany Bay local government area (LGA). Parts of the Botany Bay LGA include Commonwealth-owned airport land. The study area includes:

- Residential, commercial and light industrial land uses
- Transport infrastructure, including the Botany Bay freight rail corridor, major roads and Sydney Airport
- Heritage items listed on the local environmental plan for Botany Bay and other heritage registers. There are 17 listed and unlisted heritage items located next to or within the proposal area
- Natural features such as undeveloped land between Botany Road and General Holmes Drive; and the Mill Ponds wetlands and pond system, directly to the south
- A range of vegetation, including remnant native vegetation, roadside plantings and disturbed areas dominated by exotic plants and weeds
- A portion of the Botany Bay catchment, including wetlands and stormwater infrastructure, which drains to Botany Bay.

1.2 Purpose of this report

This REF was prepared by Jacobs on behalf of Roads and Maritime Sydney Region. The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail protective measures to be implemented.

The REF has been prepared to address requirements under the following legislation:

- Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)
- Commonwealth *Airports Act 1996* (Airports Act) for activities on Commonwealth Airport land.

Roads and Maritime is the proponent and the determining authority for the proposal under Part 5 of the EP&A Act for the component of the proposal on non-Commonwealth land. The REF describes the proposal and associated environmental impacts in the context of clause 228 of the Environmental Planning and Assessment Regulation 2000 (summarised in **Appendix C**), the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM

Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so, the REF helps to fulfil the requirements of section 111 of the EP&A Act that Roads and Maritime examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity. The REF also addresses the requirements of the Airports Act for activities on Commonwealth land.

The REF has also been prepared to address the requirements of section 2.05 of the Sydney Airports (Building Control) Regulations 1996, as outlined in **Table 5-1**. The Commonwealth-appointed Airport Building Controller and the airport lessee company (being SACL) are the consent authorities for the component of the works on Commonwealth land.

Roads and Maritime will consider the findings of the REF when assessing:

- Whether the proposal is likely to have a significant impact on the environment and, therefore, whether an environmental impact statement (EIS) must be prepared and approval sought from the NSW Minister for Planning under Part 5.1 of the EP&A Act
- Whether the proposal meets the criteria outlined in Section 89 of the Airports Act, and whether a major development plan (MDP) must be prepared and approval sought from the Commonwealth Minister of Infrastructure and Regional Development
- The significance of any impact on threatened species as defined by the TSC Act and/or FM Act, in section 5A of the EP&A Act and, therefore, the requirement for a species impact statement (SIS)
- The potential for the proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and existing infrastructure

This chapter describes the need for the proposal, and the existing environment.

2.1 Strategic need for the proposal

Sydney Airport and Port Botany are two of Australia's most important international gateways. However, the roads around Sydney Airport and Port Botany are becoming increasingly congested due to rising numbers of passenger, freight and commuter vehicles.

Traffic modelling predicts that congestion will worsen by 2018, with a substantial number of locations within the proposal area operating at or above capacity (refer to **Section 7.1.3**). Road improvements are required to address traffic congestions and support proposed Sydney Airport roadwork to the west of the proposal.

The rail level crossing at General Holmes Drive is a primary contributor to the traffic congestion on General Holmes Drive, Joyce Drive and Botany Road. The removal of the rail level crossing would remove the interaction between road and rail and would improve safety and provide for the future duplication of the Port Botany Freight Rail Line.

2.2 Strategic planning and policy framework

The proposal supports the goals of a number of Commonwealth and State strategies and plans. The strategic planning and policy framework for the proposal is discussed in more detail in the following sections.

2.2.1 NSW 2021: A plan to make NSW number one

NSW 2021: A plan to make NSW number one (NSW 2021) (NSW Department of Premier and Cabinet, 2011) is the NSW Government's 10-year strategic business plan which sets priorities for action and guides resource allocation to deliver economic growth and critical infrastructure through NSW.

NSW 2021 places emphasis on investing in and delivering an efficient and effective transport system, including delivering road infrastructure that will relieve congestion, improve travel times, improve road safety and enhance and expand capacity on key road corridors.

The proposal would help to achieve the following priority actions in NSW by reducing travel times (Goal 7) and improving traffic flow and access to key infrastructure such as Sydney Airport and Port Botany.

2.2.2 State Infrastructure Strategy 2012–2032

The *State Infrastructure Strategy 2012–2032* (NSW Government, 2012) was developed by Infrastructure NSW in 2012 and was updated in late 2014. It is a 20-year strategy that identifies and priorities the delivery of critical public infrastructure to drive productivity and economic growth. The Strategy also identifies strategic infrastructure options to meet the challenges of population growth and substantial increases in freight volumes. The Strategy identifies Sydney Airport and Port Botany precinct as the location of two of Australia's most important international air and sea gateways and identifies road network pinch points which are of special concern.

In particular, the strategy recommends that the Roads and Maritime package of short-term road investments documented in the Port Botany and Sydney Airport, Preliminary Review of Short to Medium Term Road Projects (Roads and Maritime, May 2012) be completed by 2017. The proposal is one of the work packages in the project list.

2.2.3 Draft Metropolitan Strategy for Sydney to 2031

The *Draft Metropolitan Strategy for Sydney to 2031* (Draft Metropolitan Strategy) (NSW Government, 2013) sets the framework and strategic planning foundation for Sydney's housing and job growth to 2031. The Draft Metropolitan Strategy has recently been placed on public display.

The Draft Metropolitan Strategy aims to unlock capacity constraints in transport corridors to 'global Sydney' and the 'global economic corridor.' It recognises that the transport network between Port Botany, the major clusters of industrial land in Western Sydney and destinations beyond the Sydney Metropolitan Area will see a dramatic increase in freight movements that will need to be accommodated by upgrades to the freight rail and road networks.

The proposal would support connections between WestConnex, Sydney Airport and Port Botany, which would help accommodate the growth in air travel and freight movements.

2.2.4 NSW Long Term Transport Master Plan 2012

The *NSW Long Term Transport Master Plan 2012* (TfNSW, 2012) provides a framework to deliver an integrated, modern transport system by identifying NSW's transport actions and investment priorities over the next 20 years. It includes a precinct action plan to improve the efficiency of the transport network servicing Port Botany and Sydney Airport. Specific goals of the precinct action plan include reducing congestion by targeting traffic pinch points, increasing rail services, investigating additional bus service options to and from Sydney Airport and improving the infrastructure that supports freight flows to and from Port Botany.

Specific short-term actions in the Master Plan are to replace the rail level crossing at General Holmes Drive with a grade-separated crossing, and to improve related road infrastructure, as proposed in this REF.

2.2.5 NSW Freight and Ports Strategy

The *NSW Freight and Ports Strategy* (TfNSW, 2013) identifies key actions to deliver an efficient freight network while balancing these needs with those of the broader community and the environment. Actions in the Strategy that are relevant to the proposal include:

- Closing the rail level crossing at General Holmes Drive
- Upgrading the capacity of the Port Botany Freight Rail Line
- Separating passenger and freight movements at General Holmes Drive
- Providing funding for the WestConnex link to Port Botany; and for the Port Botany Freight Rail Line duplication between Cooks River and Mascot, and between Mascot and Port Botany.

2.2.6 Sydney Airport Master Plan 2033

The *Sydney Airport Master Plan* (SACL, 2014) outlines Sydney Airport's plan for the operation and development of Sydney Airport to 2033. The Master Plan references

the recommendations in the State Infrastructure Strategy for building WestConnex, fixing road pinch points in the Sydney Airport and Port Botany precinct, adding new bus routes to the airport and enhancing the capacity of the freight rail lines. Appendix A of the Master Plan outlines Sydney Airport's Five Year Ground Transport Plan.

A review of the proposal against the objectives of each zone found that the proposal is consistent with the Sydney Airport Master Plan, as demonstrated in **Section 5.6.1**.

2.2.7 Sydney Airport Environment Strategy (2010-2015)

The Sydney Airport Environment Strategy (2010-2015) provides the strategic direction for the environmental management of Sydney Airport. Its purpose is to ensure that all operations at Sydney Airport are carried out in accordance with and assessed for compliance with relevant environmental legislation and standards, as well as to promote the continual improvement of environmental management and performance at Sydney Airport.

The REF for the proposal has been prepared with consideration to the Strategy, as discussed in **Section 5.6.2**.

2.3 Existing roads and infrastructure

2.3.1 General Holmes Drive

General Holmes Drive is a classified main road. It links Mascot with suburbs to the west and south of Sydney Airport, such as Brighton-Le-Sands, Arncliffe and Rockdale.

The section of road in the proposal area is about 700 metres long with a posted speed limit of 70 kilometres per hour. It is a four-lane, two-way road, mainly configured as a divided carriageway. A rail level crossing allows vehicles on General Holmes Drive to cross the Port Botany Freight Rail Line. The road is a 24-hour clearway, with no parking allowed.

Ross Smith Avenue, Joyce Drive, Mill Pond Road and Botany Road intersect with General Holmes Drive.

No residents have direct access onto General Holmes Drive, but businesses such as Park n Fly and Ascot Lodge, and the maintenance access road to billboards along Joyce Drive and General Holmes Drive, have direct access onto General Holmes Drive.

The relevant sections of General Holmes Drive are shown on **Figure 2-1** and in **Photo 2-1** to **Photo 2-4**.



Photo 2-1 Intersection of General Holmes Drive with Botany Road (facing west)



Photo 2-2 The level crossing at General Holmes Drive (facing west)



Photo 2-3 Intersection of General Holmes Drive with Joyce Drive



Photo 2-4 General Holmes Drive (facing south)

2.3.2 Joyce Drive

Joyce Drive is a classified main road. It extends in an east–west direction, linking General Holmes Drive in the east with Qantas Drive in the west.

The section of road in the proposal area is about 470 metres long and has a posted speed limit of 70 kilometres per hour. The road is four lanes wide, and is mainly configured as a divided two-way carriageway. It is a 24-hour clearway, with no parking allowed. Joyce Drive is shown on **Figure 2-1** and in **Photo 2-5** and **Photo 2-6**.



Photo 2-5 Joyce Drive, approaching the General Holmes Drive intersection (next to southbound lane)



Photo 2-6 Joyce Drive (facing east)

2.3.3 Botany Road

Botany Road is a classified main road. It extends in a north–south direction, linking Port Botany and Banksmeadow to the south with inner city suburbs such as Alexandria, Waterloo, Redfern and Surry Hills to the north.

The section of road in the proposal area is about 330 metres long and has a posted speed limit of 60 kilometres per hour. The road varies between two and four lanes, and is mainly configured as a divided two-way carriageway. It is a 24-hour clearway, with no parking allowed.

General Holmes Drive, Wentworth Avenue, Bronti Street and Baxter Road intersect with Botany Road. Botany Road passes under Southern Cross Drive at Mill Pond Road.

A number of residences and businesses have direct access onto the road, as do Central Foundry, and the Beckenham Memorial Church and School Hall.

Botany Road is shown on **Figure 2-1** and in **Photo 2-7** to **Photo 2-10**.



Photo 2-7 Botany Road (facing north)



Photo 2-8 Botany Road (facing south)



Photo 2-9 Botany Road (facing south from Wentworth Avenue intersection)



Photo 2-10 Botany Road (facing north from Wentworth Avenue intersection)

2.3.4 Mill Pond Road

Mill Pond Road is a classified main road that extends in an east–west direction. It is south of the unused land between General Holmes Drive and Botany Road, and connects with General Holmes Drive in the west, and Botany Road/Southern Cross Drive in the east. Mill Pond Road is north of the Southern Cross Drive flyover, and north of the Mill Pond, which is one of the last wetland ponds in a chain of 11 interconnecting ponds between Centennial Park and Botany Bay.



NSW SPATIAL - GIS MAP file : EN04475_REF_F003_rv1

Figure 2-1 Existing roads and infrastructure

Legend

- | | | |
|------------------------|--------------------------|-----------------------------------|
| Proposal area boundary | Major intersections | Traffic light pedestrian crossing |
| Motorway | Local road intersections | Zebra crossing |
| Railway | Bus stops | Formal footpath |
| Waterway | Bus routes | Informal footpath |
| | | Cycleway |

Ref_Design7D.dwg
 Roads and Maritime Services 2014
 AUSIMAGE 2014
 LPI 2014

The section of road in the proposal area is about 160 metres long and has a speed limit of 60 kilometres per hour. The road varies between nine lanes and 11 lanes, and mostly comprises turning lanes. It is divided into a two-way carriageway. The western section of the road is a bridge supported by pre-stressed concrete plank girders on abutments and piles. The bridge is located over a stormwater channel which runs generally parallel to General Holmes Drive. There are no residences or businesses along the road. It is a 24-hour clearway, with no parking allowed.

Mill Pond Road is shown on **Figure 2-1** and in **Photo 2-11** and **Photo 2-12**.



Photo 2-11 Mill Pond Road intersection with General Holmes Drive



Photo 2-12 Mill Pond Road intersection with Botany Road

2.3.5 Wentworth Avenue

Wentworth Avenue is a classified main road. It extends in an east–west direction, between the suburb of Eastgardens in the east and Mascot in the west.

The section of road within the proposal area is about 410 metres long and has a speed limit of 60 kilometres per hour. The road generally has four lanes, with two lanes in each direction.

The following roads intersect with Wentworth Avenue: Beresford Street, Merchant Street, McBurney Avenue, Botany Lane, Hardie Street, Hardie Lane, Johnson Street, Johnson Lane, Alfred Street, Alfred Lane and Frogmore Street.

Residential areas to the north and south of Wentworth Avenue use the road for access, either by direct access onto the road, or via back lanes and local streets. Wentworth Avenue also provides access to light industrial and commercial businesses via Beresford Street, Bronti Street and Merchant Street.

Wentworth Avenue is shown on **Figure 2-1** and in **Photo 2-13** and **Photo 2-14**.



Photo 2-13 Wentworth Avenue intersection with Botany Road (facing west)



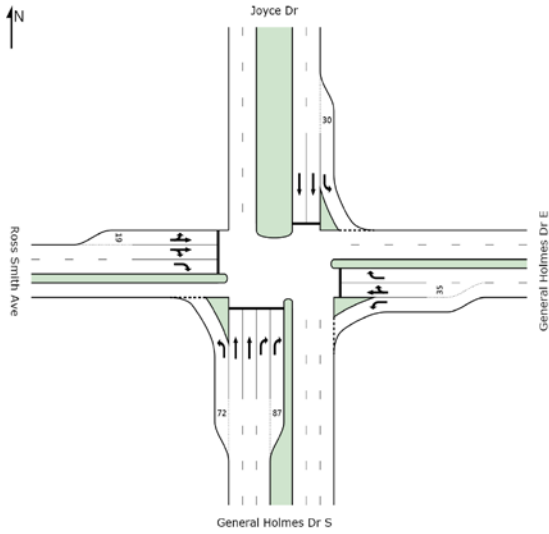
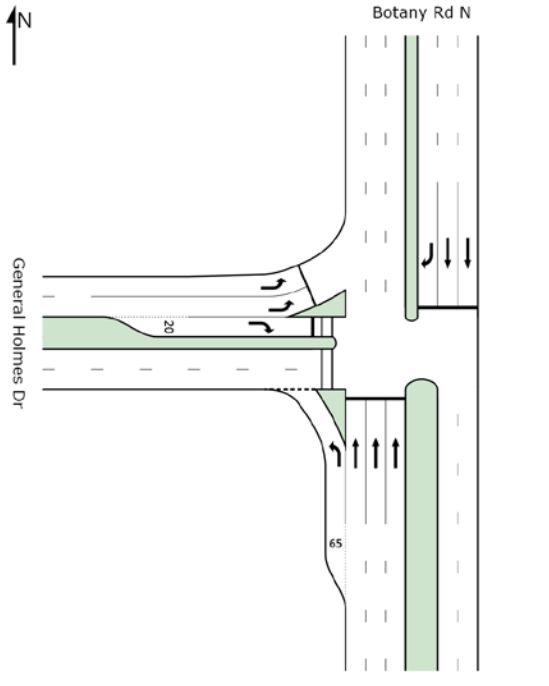
Photo 2-14 Wentworth Avenue and Dr Darragh Reserve (facing east)

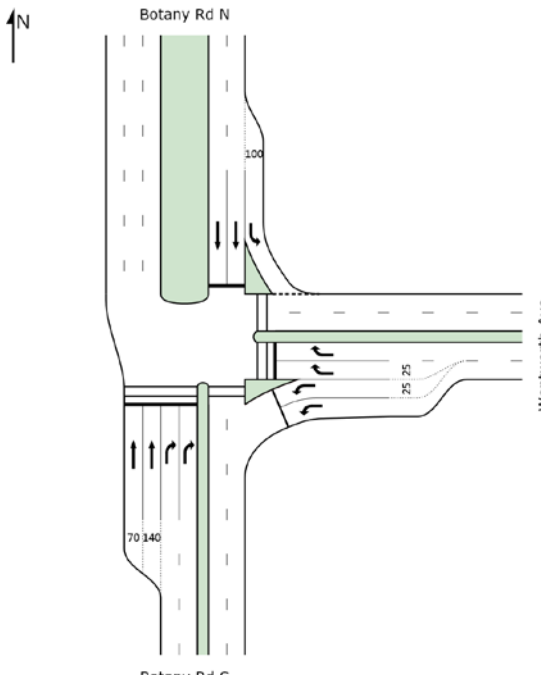
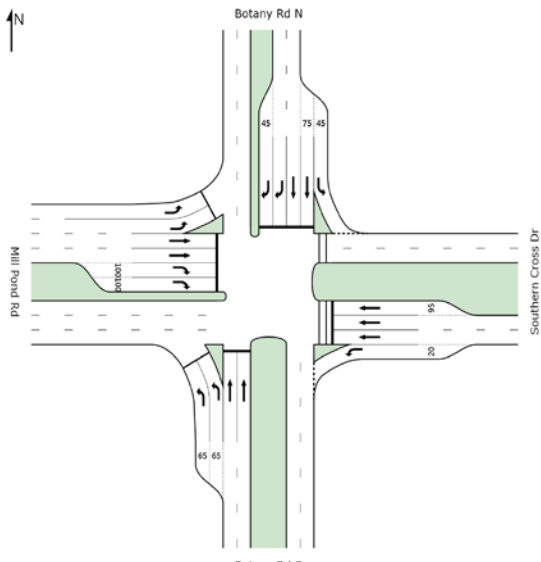
2.3.6 Intersections

There are 18 intersections in the proposal area, including five major intersections with traffic lights. These intersections are described in **Table 2-1**.

Table 2-1 Intersections in the proposal area

No	Intersection	Existing intersection features
Major road intersections		
1	<p>General Holmes Drive and Mill Pond Road</p>	<p>Traffic lights with:</p> <ul style="list-style-type: none"> • Three dedicated left-turn lanes and three dedicated right-turn lanes from Mill Pond Road onto General Holmes Drive • Three dedicated right-turn lanes and two dedicated left-turn lanes from General Holmes Drive onto Mill Pond Road • Three through lanes on General Holmes Drive southbound • Two through lanes on General Holmes Drive northbound.

No	Intersection	Existing intersection features
2	<p>General Holmes Drive, Joyce Drive and Ross Smith Avenue</p> 	<p>Traffic lights with:</p> <ul style="list-style-type: none"> • One dedicated right-turn lane from General Holmes Drive onto Joyce Drive • One combined through and right-turn lane from General Holmes Drive onto Ross Smith Avenue or onto Joyce Drive respectively • Two dedicated right-turn lanes from General Holmes Drive onto General Holmes Drive eastbound • One dedicated right-turn lane from Ross Smith Avenue onto General Holmes Drive • One combined through and right-turn lane from Ross Smith Avenue onto General Holmes Drive • One combined through and left-turn lane from Ross Smith Avenue onto General Holmes Drive or Joyce Drive respectively • Two through lanes from Joyce Drive onto General Holmes Drive southbound • Two through lanes from General Homes Drive onto Joyce Drive.
3	<p>General Holmes Drive and Botany Road</p> 	<ul style="list-style-type: none"> • Slip lane for left turns from Botany Road onto General Holmes Drive • Traffic lights with: <ul style="list-style-type: none"> – Two dedicated left-turn lanes and one dedicated right-turn lane from General Holmes Drive onto Botany Road – One dedicated right-turn lane from Botany Road into General Holmes Drive • Three through lanes on Botany Road northbound • Two through lanes from Botany Road southbound.

No	Intersection	Existing intersection features
4	<p>Botany Road and Wentworth Avenue</p> 	<ul style="list-style-type: none"> • Slip lane for left turns from Botany Road onto Wentworth Avenue • Traffic lights with: <ul style="list-style-type: none"> – Two dedicated right-turn lanes from Botany Road onto Wentworth Avenue – Two dedicated left-turn lanes and two dedicated right-turn lanes from Wentworth Avenue onto Botany Road • Two through lanes on Botany Road northbound • Two through lanes on Botany Road southbound.
5	<p>Botany Road, Mill Pond Road and Southern Cross Drive</p> 	<p>Traffic lights with:</p> <ul style="list-style-type: none"> • Two dedicated left-turn lanes and two dedicated right-turn lanes from Mill Pond Road onto Botany Road • Two dedicated left-turn lanes and two dedicated right-turn lanes from Botany Road onto Mill Pond Road.
Local road intersections		
6	Botany Road and Bronti Street	<p>Left-in, left-out arrangement with:</p> <ul style="list-style-type: none"> • No right turn from Bronti Street onto Botany Road • No right turn from Botany Road onto Bronti Street.
7	Wentworth Avenue and Botany Lane	<ul style="list-style-type: none"> • Left turn only onto Wentworth Avenue • No entry from Wentworth Avenue onto Botany Lane.

No	Intersection	Existing intersection features
8	Wentworth Avenue and Hardie Street	All vehicle movements permitted except: <ul style="list-style-type: none"> • No right turn onto Wentworth Avenue • No right turn from Wentworth Avenue onto Hardie Street, 6–10am and 3–7pm.
9	Wentworth Avenue and Beresford Street	Left-in, left-out arrangement with: <ul style="list-style-type: none"> • No right turn onto Wentworth Avenue • No right turn from Wentworth Avenue onto Beresford Street.
10	Wentworth Avenue and Hardie Lane	All vehicle movements permitted, except no right turn from Wentworth Avenue onto Hardie Lane, 6–10am and 3–7pm.
11, 16	Wentworth Avenue and Merchant Street / Alfred Lane	All vehicle movements permitted except no right turn onto Wentworth Avenue.
12	Wentworth Avenue and Johnson Street	All vehicle movements permitted, except no right turn from Wentworth Avenue onto Johnson Street, 6–10am and 3–7pm.
13, 15	Wentworth Avenue and Johnson Lane / McBurney Avenue	All vehicle movements permitted.
14	Wentworth Avenue and Alfred Street	All vehicle movements permitted except no right turn from Alfred Street onto Wentworth Avenue, 6–10am and 3–7pm.
17, 18	Wentworth Avenue and Frogmore Street / Frogmore Lane	Left-in, left-out arrangement with: <ul style="list-style-type: none"> • No right turn onto Wentworth Avenue • No right turn from Wentworth Avenue into Frogmore Street or Frogmore Lane.

2.3.7 Sydney Airport

Sydney Airport is the main airport in NSW, Australia's busiest airport and primary international gateway. It is located about eight kilometres from the Sydney city centre. Over 35 million passengers use Sydney Airport each year.

Joyce Drive and General Holmes Drive make up the eastern boundaries of the aerodrome. As shown in **Figure 1-2**, Commonwealth land leased to Sydney Airport Corporation Limited (SACL) extends further to the north and east from the boundary of Sydney Airport towards the Port Botany Freight Rail Line within the proposal area. Infrastructure located within Commonwealth land leased to SACL within the proposal area includes:

- Joyce Drive north and south verges
- General Holmes Drive verge
- Ross Smith Avenue
- Drainage infrastructure:
 - Kerb, pipe and pit drainage system running alongside roads
 - Grassed swale running alongside Joyce Drive
 - Detention basin between General Holmes Drive and Ross Smith Avenue
 - Stormwater channel running north-south through the proposal area, between General Holmes Drive and the Port Botany Freight Rail Line.

Sydney Airport has three runways. Two are aligned north–south and one is east-west. The proposal is directly to the east of the east–west runway, next to

General Holmes Drive, as shown on **Figure 2-1**. Airspace in the vicinity of Sydney Airport is protected under the *Airports Act 1996* and *Airports (Protection of Airspace) Regulations 1996*. The protected airspace is established in accordance with International Civil Aviation Organisation specifications, as adopted by Australia's Civil Aviation Safety Authority. The protected airspace comprises the following:

- Obstacle Limitation Surface (OLS). The OLS is a series of surfaces in the airspace surrounding an airport. It defines the airspace to be protected for aircraft operating during the initial and final stages of flight, or manoeuvring in the vicinity of the airport (SACL, 2014) (refer to **Figure 4-9**)
- Procedures for Air Navigational Services – Aircraft Operations (PANS-OPS) Surface. PANS-OPS are established to protect those stages of take-off, landing or manoeuvring when aircraft are operating in non-visual (instrument) conditions (SACL, 2014).

2.3.8 Rail

The Port Botany Freight Rail Line traverses the study area in a north–south direction. It is a dedicated rail freight line linking Port Botany and Enfield / Chullora, a distance of about 18 kilometres. The rail line comprises a single track that carries both northbound and southbound trains.

The rail line has a basic level crossing with General Holmes Drive, which is a major focus of this REF (refer to **Photo 2-2**).

There are no stations or yards for the freight rail line within the proposal area.

2.3.9 Pedestrian, cyclist and bus facilities

Pedestrian and bus facilities within the proposal area are described in **Table 2-2** and shown in **Figure 2-1**. No formal cycling facilities are currently located within the proposal area.

Table 2-2 Existing pedestrian and bus facilities in the proposal area

Location	Pedestrian facilities	Bus facilities
Joyce Drive	<ul style="list-style-type: none"> • There are footpaths on both sides of Joyce Drive • No crossing facilities are provided at the General Holmes Drive, Joyce Drive and Ross Smith Avenue intersection. 	<ul style="list-style-type: none"> • There are no bus stops along Joyce Drive.
General Holmes Drive	<ul style="list-style-type: none"> • No formal footpaths are provided alongside General Holmes Drive • A short formal footpath on the northern side of General Holmes Drive, between its intersection with Ross Smith Drive and Joyce Drive and the rail level crossing. 	<ul style="list-style-type: none"> • There are no bus stops along General Holmes Drive.
Botany Road	<ul style="list-style-type: none"> • There is a footpath alongside the southbound lane of Botany Road • There is a short footpath alongside the northbound lanes of Botany Road to Central Foundry • There is no formal footpath, but pedestrians use an informal path on the grass verge alongside the northbound lanes to access the bus stop on the northbound side of Botany Road • There are zebra pedestrian crossings over the left-turn slip lane from Botany Road onto General Holmes Drive and over the left-turn slip lane from Botany Road onto Wentworth Avenue • There are traffic light crossings: 	<ul style="list-style-type: none"> • There are two bus stops on Botany Road The northbound bus stop is near Wentworth Avenue, and the southbound bus stop is near Bronti Street • A bus lane is provided northbound between Bronti Street and Baxter Road.

Location	Pedestrian facilities	Bus facilities
	<ul style="list-style-type: none"> – Across the two left-turn lanes from General Holmes Drive onto Botany Road – Across General Holmes Drive onto Botany Road on the western approach. 	
Wentworth Avenue	<ul style="list-style-type: none"> • There are footpaths on both sides of Wentworth Avenue • There are traffic light crossings: <ul style="list-style-type: none"> – Across Wentworth Avenue entering Botany Road on the eastern approach – Across the two left-turn lanes from Wentworth Avenue onto Botany Road – Across Botany Road intersection on the southern approach. 	<ul style="list-style-type: none"> • There are two bus stops along Wentworth Avenue. The eastbound bus stop is near Alfred Lane, and the westbound bus stop is near Merchant Street.
Mill Pond Road	<ul style="list-style-type: none"> • There are no formal pedestrian facilities on Mill Pond Road. 	<ul style="list-style-type: none"> • There are no bus stops along Mill Pond Road.

2.3.10 Drainage infrastructure

Road drainage collects runoff from catchments within and around the proposal area. These catchments include a mix of land uses, including residential, infrastructure (airport, road and rail) and vegetated land (refer to **Figure 7-9**).

The drainage network mainly comprises kerbs, pipes and pits along the road network. A stormwater channel that runs generally parallel to General Holmes Drive collects most of the stormwater runoff in the study area. The relative level of the invert of the drain ranges from about 2.40 metres (Australian Height Datum (AHD)) in the north (at outlet of underground stormwater pipe network) to about 1.65 mAHD in the south at the culvert under Mill Pond Road. A review of historical aerial photographs indicates that the stormwater channel was constructed at about the same time as Sydney Airport and General Holmes Drive.

Known drainage infrastructure and current drainage pathways are shown on **Figure 7-9**.

Runoff from Joyce Drive is collected via drainage pits along the southern side of Joyce Drive. The drainage pits discharge to a grassed swale connected to a detention basin on Sydney Airport land (refer to **Figure 7-9**). This detention basin collects stormwater from the west of General Holmes Drive and Joyce Drive. It is connected to the stormwater channel via a culvert under General Holmes Drive. This culvert allows for flows to and from the stormwater channel, effectively attenuating flows during flood events.

Runoff from General Holmes Drive is collected via the pipe and pit network, and runs into the detention basin on Sydney Airport land or the stormwater channel to the east of General Holmes Drive. This runoff then moves in a southward direction and discharges into the Mill Ponds.

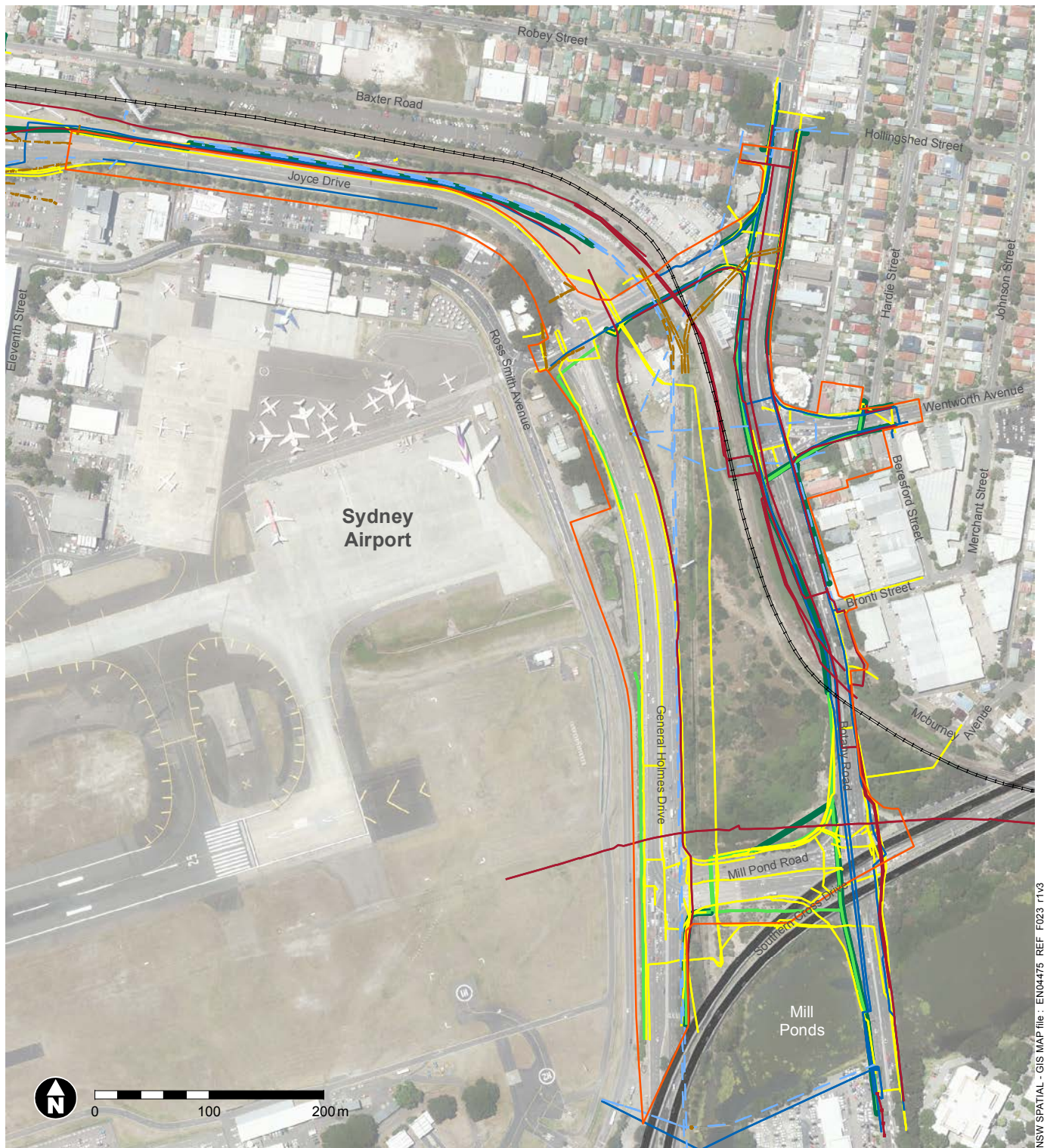
Stormwater runoff from Botany Road and Wentworth Avenue generally moves south along the kerb system. Some of the runoff passes under the rail track via the Horse Bridge (a bridge under the railway line, as shown on **Figure 7-9**) and a culvert about 120 metres south of the Botany Road and Wentworth Avenue intersection to join the stormwater channel. The other runoff from Botany Road flows south to the Mill Ponds.

2.3.11 Utility infrastructure

A number of utilities are located within and near the proposal area. These are listed in **Table 2-3** and shown on **Figure 2-2**.

Table 2-3 Utilities within and near the proposal area

Electricity
<ul style="list-style-type: none"> • 132 kV transmission lines owned by Ausgrid, between the stormwater channel and the rail line • High-voltage 11 kV transmission lines across Wentworth Avenue • Low voltage, overhead distribution power lines.
Gas pipelines
<ul style="list-style-type: none"> • High-pressure ethane pipeline (10,000 kPa) parallel to the northern side of Mill Pond Road • High-pressure ethylene gas pipeline (150 mm in diameter) owned by Savcor and Qenos. The pipeline is on the eastern side of the railway embankment west of Botany Road. It also passes over Botany Road strapped to the northern side-girder of the Botany Road rail overbridge • High pressure hydrogen and nitrogen gas pipelines between Botany Road and the Port Botany Freight Rail Line. These are understood to be redundant and scheduled for decommissioning • A 550 mm high-pressure primary gas main next to the eastern side of General Holmes Drive and mainly on Sydney Airport land. This main is maintained by Jemena • A 50 mm diameter local natural gas distribution polythene pipe alongside Botany Road below the western footpath • A 100 mm high-pressure secondary natural gas main on the western side of Botany Road, maintained by Jemena • Other low-pressure natural gas distribution mains and polyethylene pipelines near Wentworth Avenue.
Sewer
<ul style="list-style-type: none"> • The Southern Division Sub Main of the South West Suburbs Ocean Outfall Sewer (SWSOOS), owned by Sydney Water. It is a box structure of nominal dimensions 1800 mm by 1300 mm which transitions into twin 1400 mm diameter pipes beneath the proposed approaches to the connection with General Holmes Drive • A sewer main beneath the intersection of General Holmes Drive and Botany Road running towards the end of the east–west runway • Local collection sewer mains to residences and commercial and industrial buildings.
Stormwater
<ul style="list-style-type: none"> • An open stormwater channel on the eastern side of General Holmes Drive and south of the rail level crossing managed by the Botany Bay City Council and SACL. The stormwater channel in the proposal area is at Mill Pond Road.
Water
<ul style="list-style-type: none"> • A 500 mm main owned by Sydney Water, near the western footpath alongside Botany Road • Other water mains (375 mm, 300 mm and 150 mm).
Telecommunications
<ul style="list-style-type: none"> • Underground Telstra distribution network along Wentworth Avenue and Botany Road. Larger ducting also carries cables belonging to Telstra and other carriers. Some assets are also located on the western side of General Holmes Drive • Fibre optic cable, including National Broadband Network (NBN) fibre optic cable (ranging from 324 strand to 12 strand) • Local Telstra and Optus reticulation.
Rail
<ul style="list-style-type: none"> • Signalling, electrical and communication cables.
Street lighting
<ul style="list-style-type: none"> • Street lighting, along Botany Road, General Holmes Drive and Joyce Drive • Intersection lighting (serviced by a combination of overhead and underground cables).
Road traffic signal infrastructure
<ul style="list-style-type: none"> • Underground cables associated with traffic signals.



NSW SPATIAL - GIS MAP file : EN04475_REF_F023_r1v3

Figure 2-2 Key utilities in and near the proposal area

Legend

- | | | |
|------------------------|-------------------------|----------------------|
| Proposal area boundary | Existing utilities | Optical fibre |
| Motorway | Drainage infrastructure | Sewer infrastructure |
| Railway | Electricity | Water infrastructure |
| | Gas infrastructure | Telephone line |

J.Wyndham Prince 2014
 Roads and Maritime Services 2014
 AUSIMAGE 2014
 LPI 2014

3 Proposal objectives and options considered

This chapter describes the proposal objectives, and the alternatives that Roads and Maritime considered in the selection of the preferred option.

3.1 Proposal objectives

The primary objectives of the proposal are to:

- Provide, as a minimum, a light-vehicle standard rail underpass to replace the General Holmes Drive rail level crossing
- Reduce current levels of congestion and improve the flow of road and rail traffic.

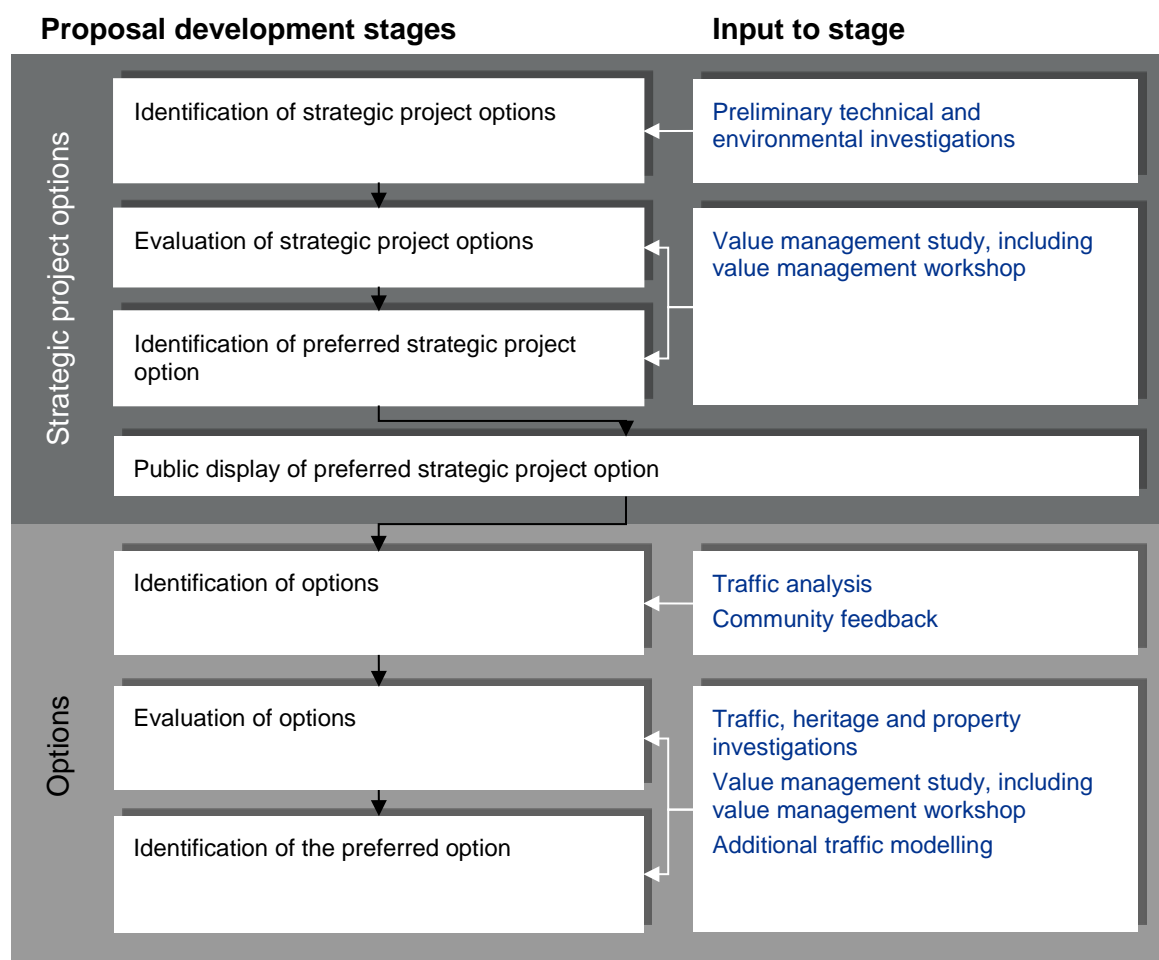
The supporting objectives of the proposal are to:

- Maintain or improve road and rail safety
- Provide a constructible design solution
- Minimise environmental and work health and safety risks during road construction
- Minimise the social and environmental impacts of the development including minimising the property acquisition footprint as far as possible
- Maintain existing flood immunity
- Provide a fit-for-purpose urban landscape outcome that complements the surrounding urban environment
- Provide value for money.

3.2 Options and alternatives considered

The development of the proposal has followed an iterative process and has considered a number of inputs. These are outlined in the following sections. **Figure 3-1** illustrates how the process has progressed from the identification of strategic (broad-based) project options to more detailed options and, finally, the preferred proposal that is assessed in this REF.

Figure 3-1 Development of the proposal



3.2.1 Strategic project options

In 2013, after identifying the need for the proposal, Roads and Maritime developed strategic project options and selected a preferred strategic project option. Its decision-making was guided by a number of inputs, including desktop and field investigations, engineering design, traffic modelling, stakeholder feedback and technical workshops (Roads and Maritime, 2013).

The key steps associated with this process included:

- Identification of strategic project options, based on study area investigations of road, traffic, geotechnical, utility and environmental conditions
- Development of options. This included conducting field investigations to confirm technical and environmental constraints, engineering design and consulting with key stakeholders (SACL, Australian Rail Track Corporation (ARTC) and utility providers) and holding a workshop to identify issues with each option
- Assessment of the options and selection of a preferred option. This was carried out during a value management workshop on 4 September 2013 which included:
 - Reviewing the strategic project options against the project objectives

- Performance of the options against technical, social and environmental criteria as outlined below.

The process consolidated all prior investigations, and led to the identification of five strategic project options. All had the following common aspects:

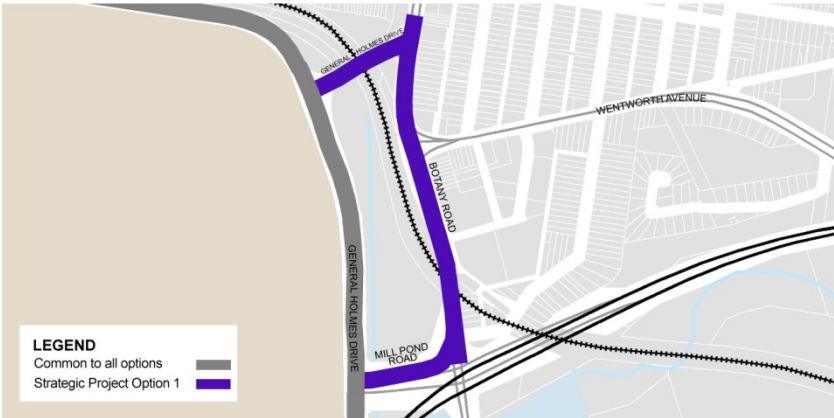
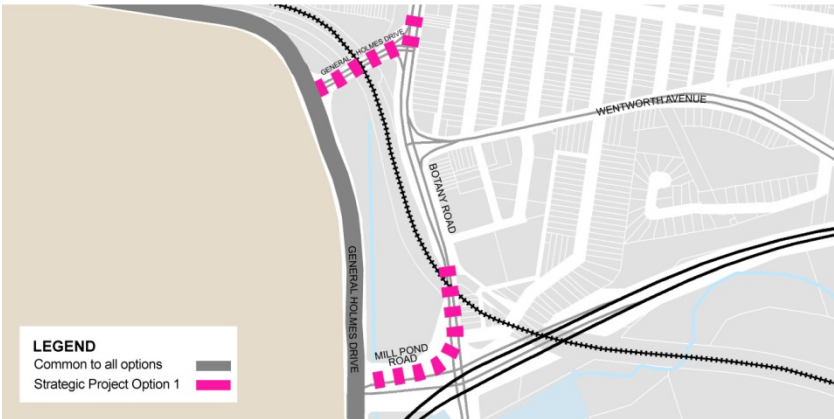
- Widen General Holmes Drive and Joyce Drive, from four to six lanes, between Mill Pond Road and O’Riordan Street
- Replace the rail level crossing at General Holmes Drive with an underpass
- Provide an extra through lane at the northern and southern approaches to the General Holmes Drive and Mill Pond Road intersection.



The process by which a preferred strategic project option was identified included a value management study which involved:

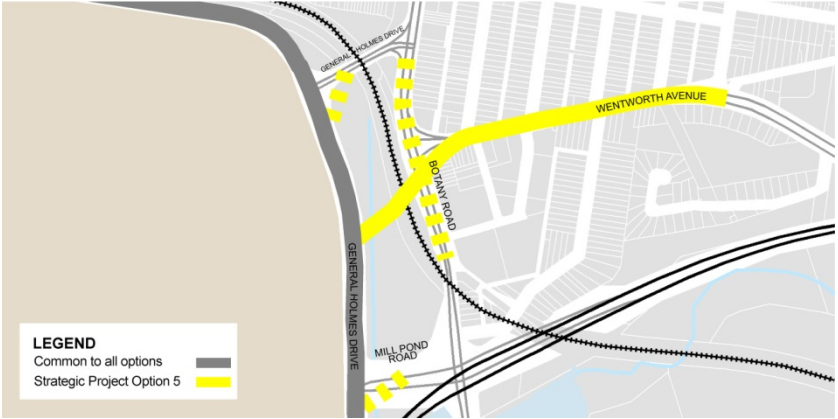
- Reviewing the strategic project options against the proposal objectives
- Performance against technical, social and environmental criteria which were based on proposal objectives. These criteria include:
 - Reducing congestion and improved throughput for road and rail
 - Providing Port Botany access for freight (including high vehicles)
 - Maintaining access to Sydney Airport
 - Constructability (including staging and phasing)
 - Utility relocations
 - Catering for future developments
 - Bridge structures
 - Maintaining flood immunity levels
 - Minimising environmental impacts
 - Reducing community impact and property acquisitions
 - Approval requirements
 - Value for money.

The strategic project options evaluated by Roads and Maritime are illustrated and described in **Table 3-1**.

Table 3-1 Strategic project options considered for the proposal

Strategic project option	Description
<p>Strategic Project Option 1</p>  <p>LEGEND Common to all options — Grey line Strategic Project Option 1 — Blue line</p>	<p>Strategic Project Option 1 would involve:</p> <ul style="list-style-type: none"> • Replacing the rail level crossing at General Holmes Drive with a four-lane low-clearance underpass suitable for light-vehicles • Upgrading Botany Road to three lanes in each direction between Mill Pond Road and Wentworth Avenue • Replacing and extending the Botany Road rail bridge • Adjusting the Joyce Drive and General Holmes Drive intersection to include a northern approach left-turn slip lane from Joyce Drive into General Holmes Drive • Increasing the number of northern approach lanes from Botany Road into Mill Pond Road from two right-turn lanes to three • Increasing the number of eastern approach lanes from Mill Pond Road into Botany Road from two left-turn lanes to three • Realigning and duplicating the Port Botany Freight Rail Line over a distance of about 750 m.
<p>Strategic Project Option 2</p>  <p>LEGEND Common to all options — Grey line Strategic Project Option 1 — Pink line</p>	<p>Strategic Project Option 2 would involve:</p> <ul style="list-style-type: none"> • Replacing the rail level crossing at General Holmes Drive with a four-lane low-clearance underpass suitable for light-vehicles • Adjusting the Joyce Drive and General Holmes Drive intersection to include a northern approach left-turn slip lane from Joyce Drive into General Holmes Drive • Increasing the number of eastern approach lanes from Mill Pond Road into Botany Road from two left-turn lanes to three • Making minor adjustments to the Port Botany Freight Rail Line.

Strategic project option	Description
<p>Strategic Project Option 3</p>  <p>LEGEND Common to all options — Grey line Strategic Project Option 3 — Blue dashed line</p>	<p>Strategic Project Option 3 would involve:</p> <ul style="list-style-type: none"> • Closing the rail level crossing at General Holmes Drive (and the access to Botany Road) and replacing it with a four-lane, high clearance underpass suitable for heavy vehicles, and connecting General Holmes Drive to Botany Road at Wentworth Avenue • Adjusting the General Holmes Drive and Joyce Drive intersection to limit access to the eastern intersection leg, next to the closed rail level crossing at General Holmes Drive, to left-in and left-out only • Changing the Wentworth Avenue and Botany Road intersection from a three-way to a four-way intersection to accommodate a new road underpass connection to General Holmes Drive. The new western approach at the intersection would have one through lane, one shared through/ left-turn lane, and one right-turn lane • Creating a new intersection at General Holmes Drive and Wentworth Avenue • Removing the northbound bus lane and bus stop on Botany Road between Mill Pond Road and Wentworth Avenue • Making minor adjustments to the Port Botany Freight Rail Line.
<p>Strategic Project Option 4</p>  <p>LEGEND Common to all options — Grey line Strategic Project Option 4 — Orange dashed line</p>	<p>Strategic Project Option 4 would involve:</p> <ul style="list-style-type: none"> • Closing the rail level crossing at General Holmes Drive (and the access to Botany Road) and replacing it with a four-lane, high clearance underpass suitable for heavy vehicles, and connecting General Holmes Drive to Botany Road at Wentworth Avenue • Adjusting the General Holmes Drive and Joyce Drive intersection to limit access to the eastern intersection leg, next to the closed rail level crossing at General Holmes Drive, to left-in and left-out only • Changing the Wentworth Avenue and Botany Road intersection from a three-way to a four-way intersection to accommodate a new road underpass connection to General Holmes Drive. The new western approach at the intersection would have two through lanes, one left-turn lane, and one right-turn lane • Creating a new intersection at General Holmes Drive and Wentworth Avenue • Removing the northbound bus lane and bus stop on Botany Road between Mill Pond Road and Wentworth Avenue • Making minor adjustments to the Port Botany Freight Rail Line.

Strategic project option	Description
<p>Strategic Project Option 5</p>  <p>LEGEND</p> <p>Common to all options</p> <p>Strategic Project Option 5</p>	<p>Strategic Project Option 5 would involve:</p> <ul style="list-style-type: none"> <li>• Closing the rail level crossing at General Holmes Drive (and the access to Botany Road) and replacing it with a high clearance underpass suitable for heavy vehicles (two lanes eastbound and three lanes westbound), and connecting General Holmes Drive under the Port Botany Freight Rail Line and Botany Road to Wentworth Avenue <li>• Adjusting the General Holmes Drive and Joyce Drive intersection to limit access to the eastern intersection leg, adjacent to the closed rail level crossing at General Holmes Drive, to left-in and left-out only <li>• Adjusting the Botany Road and Wentworth Avenue intersection to remove the eastern approach right-turn and left-turn access from Wentworth Avenue into Botany Road and reducing the southern approach lanes from Botany Road into Wentworth Avenue from two right-turn lanes to one <li>• Widening Wentworth Avenue from four to six lanes between Botany Road and Sutherland Street <li>• Providing an intersection with traffic lights at Wentworth Avenue, Johnson Street and Merchant Street <li>• Reducing the number of southern approach lanes from General Holmes Drive into Mill Pond Road from three right-turn lanes to two <li>• Making minor adjustments to the Port Botany Freight Rail Line.

Selection of the preferred strategic project option

Roads and Maritime held a value management study to evaluate the five strategic project options to ascertain how well they would meet the project objectives and perform against the technical, social and environmental criteria. The value management study included a value management workshop on 4 September 2013 attended by representatives from Roads and Maritime, Sydney Motorways Project Office, Transport for NSW, ARTC, MI Engineers, Sinclair Knight Merz (now Jacobs) and the Australian Centre of Value Management.

In the first phase of the study, Roads and Maritime broadly assessed the five strategic project options against the project objectives. Strategic Project Options 2 and 3 were eliminated from further consideration as they would not meet the proposal objectives. In particular:

- Strategic Project Option 2 would not improve traffic flow on Botany Road, and would result in adverse impacts to traffic on Southern Cross Drive
- Strategic Project Option 3 would not provide a dedicated left-turn lane into Botany Road and, as a result, would not improve traffic flow.

Evaluation criteria derived from the project objectives were developed during the value management workshop (listed above). The remaining strategic project options (options 1, 4 and 5) were assessed against the criteria at the value management workshop. In comparison to Strategic Project Options 1 and 5, Strategic Project Option 4 would:

- Provide an optimal configuration for the underpass with regards to vehicle clearance and grade
- Provide opportunities to integrate into future development
- Offer the greatest opportunity to improve bus and taxi access to Sydney Airport, particularly in the context of potential future developments at Southern Cross Drive
- Offer the greatest flexibility for improvements to lane and intersection configurations
- Require the least amount of utility relocations
- Require less construction, and in general, entail the least environmental impacts
- Require the least amount of property acquisition
- Provide an efficient solution with the best value-for-money outcome.

A summary of the strategic project options qualitative assessment is provided in the Proposal Report (Roads and Maritime, 2013).

In November 2013, Roads and Maritime announced and displayed Strategic Project Option 4. Roads and Maritime consulted with the wider community and other stakeholders and received submissions, which it considered during further development of the proposal (refer to **Section 3.2.2** and **Section 6.2**).

3.2.2 Options

Roads and Maritime then developed three options for the preferred strategic project option with a view to improving road and intersection capacity (Roads and Maritime, 2014a). The options were developed to reduce congestion and improve local access, while ensuring best value for money and limiting environmental and property impacts.

The options are illustrated and described in **Table 3-2**, together with the do-nothing option.



The options incorporated the following refinements to the preferred strategic project option:



- Adding turning and through lanes to the Wentworth Avenue underpass
- Adding lanes to the Wentworth Avenue and Botany Road intersection
- Adjusting the Wentworth Avenue and Merchant Street intersection.

The following aspects are common to all options:

- Widening of General Holmes Drive and Joyce Drive between Mill Pond Road and O’Riordan Street from four to six lanes
- Replacing the General Holmes Drive rail level crossing with a road underpass
- Utility adjustments.

Table 3-2 Options considered for the proposal

Options	Description
<p>The do-nothing option</p> 	<p>The do-nothing option would involve the road network remaining in its current state. Normal road maintenance would continue to be carried out.</p>
<p>Option 1</p>  <p>LEGEND Common to all options Option 1 </p>	<p>The key aspects of Option 1 are:</p> <ul style="list-style-type: none"> • The provision of eight lanes in the Wentworth Avenue underpass, with five lanes eastbound and three lanes westbound • No change to the existing four lanes on Wentworth Avenue between Botany Road and Sutherland Street.

Options	Description
<p>Option 2</p> 	<p>The key aspects of Option 2 are:</p> <ul style="list-style-type: none"> • The provision of nine lanes in the Wentworth Avenue underpass, with five lanes eastbound and four lanes westbound • No change to the existing four lanes on Wentworth Avenue between Botany Road and Sutherland Street • The provision of a seagull intersection at Merchant Street, with a separate lane for vehicles turning to and from Merchant Street to Wentworth Avenue. This would provide eastbound access for residents and businesses south of Wentworth Avenue. (This intersection would not have traffic lights.)
<p>Option 3</p> 	<p>The key aspects of Option 3 are:</p> <ul style="list-style-type: none"> • The provision of nine lanes in the Wentworth Avenue underpass, with five lanes eastbound and four lanes westbound • The widening of Wentworth Avenue from four to six through lanes between Botany Road and Sutherland Street • The provision of a seagull intersection at Merchant Street, with a separate lane for vehicles turning to and from Merchant Street to Wentworth Avenue. This would provide eastbound access for residents and businesses south of Wentworth Avenue. (This intersection would not have traffic lights.)

Evaluation of the options

Additional technical investigations were carried out to inform the assessment of the options. These investigations related to traffic, heritage, and property impact.

Roads and Maritime carried out a second value management study to evaluate the three options and the do-nothing option. This study was informed by the outcomes of the additional traffic, heritage and property investigations and a value management workshop.

The value management workshop was held on 19 March 2014 and attended by representatives of Roads and Maritime, ARTC, Botany Bay City Council, Transport for New South Wales, WestConnex Delivery Authority, Sydney Airport Corporation Limited, Corkery Consulting, Jacobs, ARRB Group and MI Engineers.

At the workshop, groups of participants evaluated the options, the original Strategic Project Option 4 and the do-nothing option against proposal objectives and the assessment criteria developed during the first value management workshop. Options were ranked from 1 (best) and 5 (worst) according to how well they performed

against each criterion. These criteria are outlined in **Table 3-3** together with the analysis of options against the project objectives and criteria.

Table 3-3 Summary of options analysis against the project objectives and assessment criteria

Objectives and criteria	Do nothing	Strategic Project Option 4	Option 1	Option 2	Option 3
Proposal objectives, indicating whether options meet proposal objectives					
Provide, as a minimum, a light-vehicle standard rail underpass to replace the General Holmes Drive rail level crossing	✘	✓	✓	✓	✓
Reduce current levels of congestion and improve the flow of road and rail traffic	✘	✓	✓	✓	✓
Assessment criteria, with rankings from 1 (best) and 5 (worst) for each option					
Improve traffic congestion	5	4	3	2	1
Improve road safety	5	4	3	1	2
Minimising work health and safety risks	5	2	2	3	4
Minimising environmental impacts	5	2	1	3	4
Constructability	1	2	3	5	4
Improving urban design	5	4	3	2	1
Minimising flooding impacts	5	4	4	2	2
Minimising property acquisition	1	2	3	4	5
Improving access	5	4	3	2	1
Value for money	1	2	3	4	5
Catering for future requirements	5	4	3	2	1
Catering for public transport	5	4	4	4	1
Total	48	38	35	34	31

The value management workshop confirmed that Options 2 and 3 were the best performing across all assessment criteria, and would have lower environmental and social impacts than the other alternative proposals. Options 2 and 3 would also meet the project objectives more completely than the Strategic Project Option 4 and Option 1.

Additional traffic investigations were carried out after the value management workshop to select the preferred option. This involved evaluating traffic performance for the road network across the study area, including predictive modelling for peak periods. Modelling found that Option 3 would result in only a marginal traffic improvement compared to the Option 2 at Wentworth Avenue.

Given the additional property acquisition required for widening along Wentworth Avenue and marginal traffic benefits of Option 3, Roads and Maritime adopted Option 2.

Option 2 was then further refined by removing the proposed seagull intersection at Merchant Street, as it would involve additional property acquisitions. The intersection was replaced by a loop route using the proposed underpass and a restricted left turn at Mill Pond Road onto Botany Road. This would provide similar benefits to the seagull intersection but without the added property impact (refer to **Figure 7-1**).

3.3 The preferred option

The preferred option comprises the following key features:

- Closing the rail level crossing at General Holmes Drive (and the access to Botany Road) and replacing it with an road underpass which would connect General Holmes Drive with Botany Road at Wentworth Avenue
- Nine lanes in the Wentworth Avenue underpass, with five lanes eastbound and four lanes westbound
- Changing the Wentworth Avenue and Botany Road intersection from a three-way to a four-way intersection to accommodate a new road underpass connection to General Holmes Drive
- A new intersection at General Holmes Drive and Wentworth Avenue
- Adjusting the General Holmes Drive and Joyce Drive intersection to limit access to the eastern intersection leg, next to the closed rail level crossing at General Holmes Drive, to left-in and left-out only
- No change to the existing four lanes on Wentworth Avenue between Botany Road and Sutherland Street
- Eastbound access for residents and businesses south of Wentworth Avenue via a loop route using the proposed Wentworth Avenue road underpass and a restricted left turn at Mill Pond Road onto Botany Road.

The preferred option would satisfy the strategic need and the proposal objectives as it would:

- Provide the best technical design to deliver road network improvements
- Provide a rail underpass to replace the General Holmes Drive rail level crossing, thereby removing an operational slow point in the rail freight network
- Reduce congestion and improve the flow of road and rail traffic, while maintaining or improving road and rail safety. In particular, it would reduce congestion at General Holmes Drive, Joyce Drive, Mill Pond Road and Botany Road and associated intersections within the proposal area
- Provide a constructible design solution which considers social and environmental impacts during construction and operation
- Provide a fit-for-purpose urban landscape outcome that complements the surrounding urban environment
- Provide a value-for-money solution
- Accommodate planned developments in the area.

The preferred option is described in further detail in the next chapter.

4 Description of the proposal

This chapter describes the proposal and provides descriptions of the design parameters and major design features, the construction method and associated infrastructure and activities.

4.1 The proposal

Roads and Maritime is proposing to upgrade a number of roads east of Sydney Airport and remove the rail level crossing at General Holmes Drive. This would improve traffic flow and access to Sydney Airport, Port Botany, the existing motorway network and the future WestConnex Motorway.

As shown on **Figure 1-2**, the proposal is partially located on Commonwealth land leased to SACL in the west of the proposal area, with the remainder occurring on a mix of private and State-owned land in the east of the proposal area.

The description of the proposal is based on a concept design that has been prepared using the available information and current design standards and criteria. Some elements of the proposal may be further refined during detailed design.

The main features of the proposal are to:

- Separate the road network from the Port Botany Freight Rail Line. This would involve:
 - Extending Wentworth Avenue beneath the Port Botany Freight Rail Line to link with General Holmes Drive. The Wentworth Avenue underpass would have nine lanes, with five lanes eastbound and four lanes westbound, and a minimum 4.7 metres clearance
 - Building two rail bridges over the Wentworth Avenue underpass
 - Removing the General Holmes Drive rail level crossing of the Port Botany Freight Rail Line, improving safety and enabling increased speed for freight trains.
- Adjust, protect and locally relocate utilities
- Provide a bridge over the stormwater channel and a protection slab over sewer and gas utilities on the extension of Wentworth Avenue
- Provide a new intersection at General Holmes Drive and the extension of Wentworth Avenue
- Upgrade or adjust the intersections at:
 - Wentworth Avenue and Botany Road
 - General Holmes Drive and Mill Pond Road
 - Botany Road and Mill Pond Road
 - General Holmes Drive, Joyce Drive and Ross Smith Avenue
 - General Holmes Drive and Botany Road.
- Widen Joyce Drive and General Holmes Drive between about 100 metres east of O'Riordan Street and 175 metres south of Mill Pond Road to three lanes in each direction
- Adjust and locally relocate drainage infrastructure including:
 - Replacing the grassed swale at Joyce Drive with a pipe and pit system
 - Installing a permanent pump at the low point of the Wentworth Avenue

underpass.

- Landscape and replant generally on road verges and in the area of land between General Holmes Drive and the Port Botany Freight Rail Line
- Provide new facilities – and relocate existing facilities – for pedestrians, cyclists and public transport, including:
 - A new shared-use path linking to the existing cycleway at Todd Reserve on Wentworth Avenue
 - A new shared path on Botany Road from the Botany Road and Wentworth Avenue intersection to Baxter Road
 - Removing the pedestrian path on the northern side of Joyce Drive, which would be replaced with a new shared path along Baxter Road as part of a separate project in the WestConnex Enabling Works packages of work
 - Relocating the northbound bus stop on Botany Road about 70 metres to the south of its current location.
- Provide temporary construction ancillary facilities, including construction compounds, stockpile sites and erosion and sedimentation control measures.

An overview of the proposal showing key features is shown on **Figure 4-1**. A detailed description of the concept design is provided in the sections below.

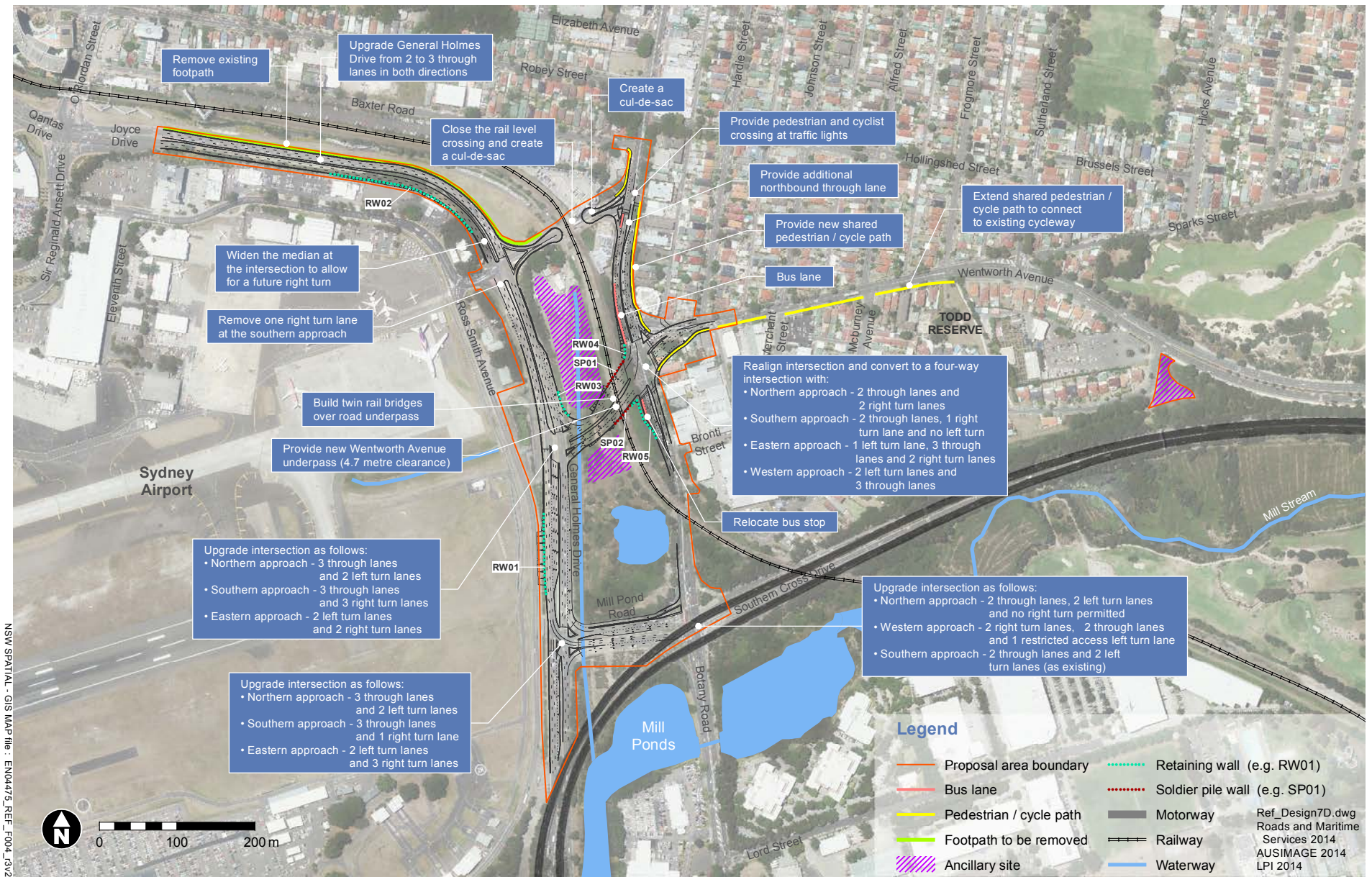


Figure 4-1 Design overview

4.2 Design

The concept design is described below and would be refined further during detailed design.

4.2.1 Design criteria

The concept design for the proposal was prepared in accordance with a design management system certified under AS/NZS ISO 9001:2008 Quality Management Systems. Other design guides and policies considered were:

- Austroads Guide to Road Design (Austroads, 2009a) and Roads and Maritime supplements to the Austroads Guide
- Austroads Road Safety Audit Manual (Austroads, 2009b)
- Soils and construction – Managing Urban Stormwater, Volume 1 (Landcom, 2004) and Volume 2D (DECC, 2008b).

The adopted design criteria are summarised in **Table 4-1**.

Table 4-1 Design criteria

Requirement	Criteria
Design speed	<ul style="list-style-type: none"> • General Holmes Drive and Joyce Drive – 70 km/h • Wentworth Avenue, Botany Road and Mill Pond Road – 60 km/h.
Adopted minimum curve radii	<ul style="list-style-type: none"> • 110 m for a speed of 60 km/h on Wentworth Avenue • 150 m at Joyce Drive.
Cross-section / lane width	<ul style="list-style-type: none"> • Traffic lane width: 3.3–3.8 m • Auxiliary lane width: 3.0 m • Bus lane width: 4.0 m. <p>Refer to typical cross sections in Appendix B.</p>
Tie-ins	Provided at each interface of the proposal with the road network.
Property access	Property access would be available throughout the length of the proposal in all directions of travel.
Road surface	<p>Preliminary road surface design includes:</p> <ul style="list-style-type: none"> • Areas of widening: 245 mm asphalt, 150 mm base gravel and 300 mm selected material • New pavement: 180 mm asphalt, 220 mm concrete and 300 mm selected material • Heavy patching treatment: 245 mm asphalt • Bridge deck pavement: 75 mm asphalt, 10 mm waterproofing membrane.
Drainage	<ul style="list-style-type: none"> • 2–2.5 % crossfall along Joyce Drive/ General Holmes Drive • Adverse crossfall along Wentworth Avenue and Botany Road.
Horizontal sight distance	<ul style="list-style-type: none"> • Minimum sight distance required is 64 m.
Shoulder width	<ul style="list-style-type: none"> • 0.5 m next to concrete safety barriers.
Medians/ safety barriers	<ul style="list-style-type: none"> • Concrete safety barriers to protect rail bridge piers • Concrete safety barriers next to retaining walls for bridge abutments • Wide central median for future proposed bridge piers.
Vertical clearance of Wentworth Avenue underpass	<ul style="list-style-type: none"> • Minimum 4.7 m.
Typical cross sections	Typical cross sections for various sections of the proposal are provided in Appendix B .

The concept design also reflects the following considerations:

- The need to minimise environmental impacts by developing a design that requires minimal vegetation removal and complements the existing streetscape
- The need to minimise land acquisition and disruption to residents and businesses
- The need to provide for pedestrians, cyclists, and public transport users
- Urban and landscape design objectives (as outlined in **Appendix F**), which are to:
 - Contribute to the urban structure and revitalisation
 - Fit into the built fabric
 - Connect modes and communities
 - Respond to the natural pattern and landform
 - Design the road as an experience in movement
 - Incorporate heritage and cultural contexts
 - Create self-explaining road environments
 - Achieve safe, integrated and minimal maintenance design
 - Create a site-specific entry and exit experience to and from Sydney Airport
 - Respond to the existing airport infrastructure and aesthetics.

4.2.2 Engineering constraints

Roads and Maritime has identified a number of engineering issues and constraints for the design and construction of the proposal. The main issues and constraints are:

- Protection or relocation of existing utility infrastructure: The Southern Division Sub Main of the SWSOOS and 550 millimetre high-pressure gas main would need to be protected, while the stormwater channel would be crossed by a temporary bridge about six metres wide during construction, over three steel pipes with dimensions 1200 millimetres x six metres. The 100 millimetre steel high-pressure gas main, 132 kV transmission lines and 500 millimetre water main would need to be relocated beneath the Wentworth Avenue extension. Other utilities would need to be relocated within the proposal area, or avoid the proposal area (refer to **Section 4.7**)
- Maintaining traffic flows during construction: The proposal would need to be built without reducing the number of traffic lanes during peak periods
- Obstacle limitation surface (OLS): The OLS to the east of Sydney Airport would limit the height of plant and equipment able to be used during construction, as well as the height of design features. Use of the east-west runway of Sydney Airport would need to be temporarily restricted to enable construction that requires high equipment, such as piling cranes for bridges and retaining walls. All work would need to be carried out outside of operational hours for Sydney Airport (refer to **Section 4.4**)
- Staging of the proposal during construction, in particular:
 - Lowering the Botany Road and Wentworth Avenue intersection while maintaining traffic capacity and minimising road closures
 - Maintaining operation of the Port Botany Freight Rail network with minimal closures
 - Piling for bridge structures and retaining walls without encroaching the OLS.

- Coordination with other proposed developments: Sydney Airport plan to carry out other works along the entrance to the T2/T3 Terminals and on Qantas Drive. The proposal would need to be coordinated with these developments to minimise construction impacts such as traffic and noise and vibration.

4.2.3 Major design features

Road widening

General Holmes Drive would be widened for a total distance of about 490 metres between Mill Pond Road and the intersection with Joyce Drive and Ross Smith Avenue. General Holmes Drive would be widened about six metres on the western side. Widening is generally within the road reserve, although in one location to the north of the General Holmes Drive and Mill Pond Road intersection, the widened road would overlap with SACL land.

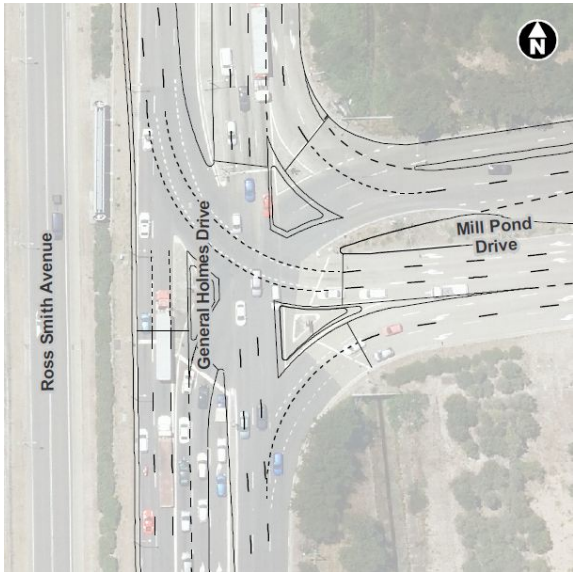
Joyce Drive would be widened for a total distance of about 470 metres between O’Riordan Street and the intersection with Ross Smith Drive and General Holmes Drive to accommodate an additional lane in both directions. Joyce Drive would be widened about 12 metres on the southern side. While widening is generally within the road reserve, in the widening would also overlap with SACL land to the south of Joyce Drive. Detailed design would be carried out in consultation with SACL to minimise the impact on airport land.

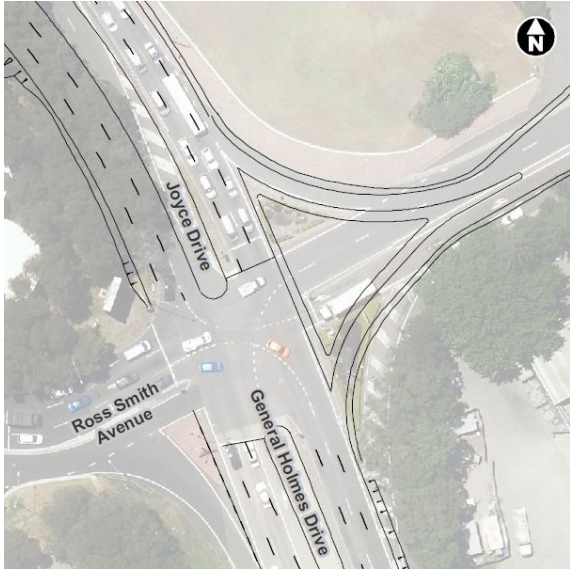
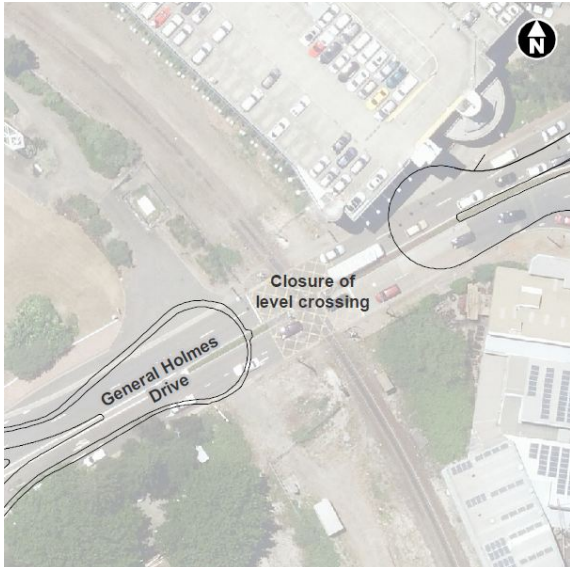
Tie-ins to existing pavement at General Holmes Drive, Joyce Drive, Botany Road, Wentworth Avenue and Mill Pond Road and Botany Lane. The tie-ins to the proposal at these locations would be adjusted to accommodate intersection amendments and road widening. Tie-ins would also accommodate other road projects such as the works identified in the Sydney Airport T2/T3 Ground Access Solutions and Hotel Preliminary Draft Major Development Plan, in consultation with SACL.


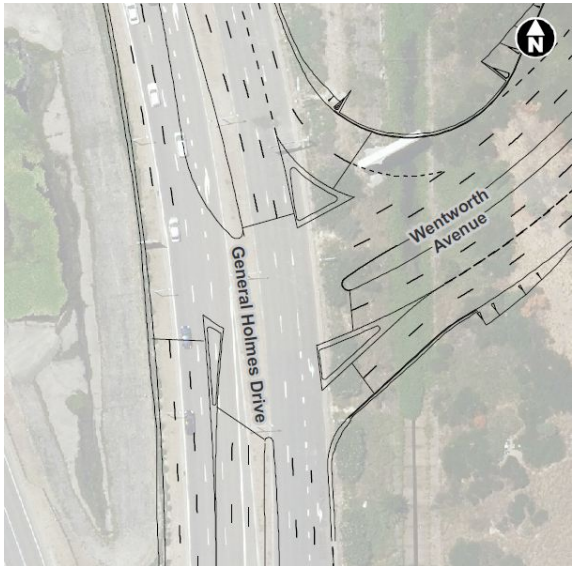
Intersections

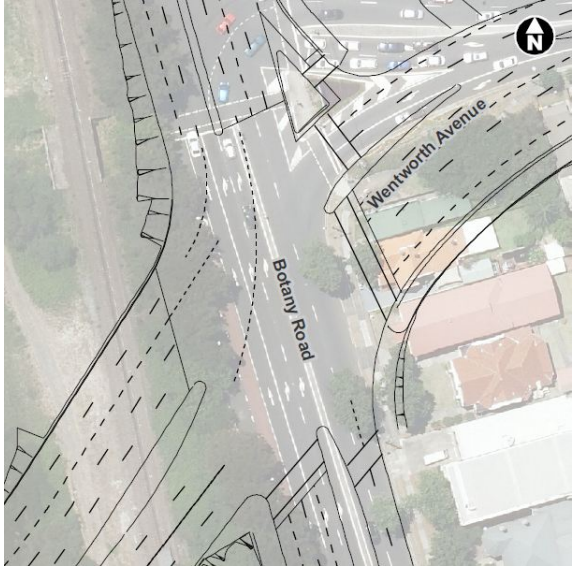
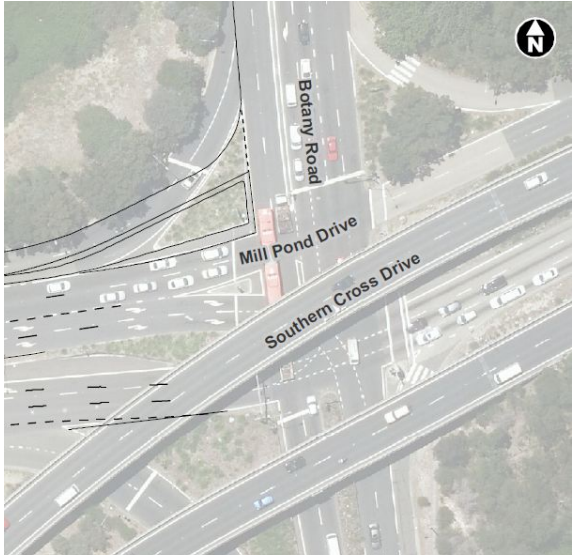
Table 4-2 describes the proposed intersection upgrades and adjustments.

Table 4-2 Proposed intersection upgrades and adjustments

Intersection upgrade	Description
<p>General Holmes Drive and Mill Pond Road</p> 	<p>The intersection would be upgraded as follows:</p> <ul style="list-style-type: none"> • Northern approach: 3 through lanes and 2 left-turn lanes • Southern approach: 3 through lanes and 1 right-turn • Eastern approach: 2 left-turn lanes and 3 right-turn lanes.

Intersection upgrade	Description
<p>General Holmes Drive, Joyce Drive and Ross Smith Avenue</p> 	<p>The intersection would be adjusted by closing access for the eastern leg of General Holmes Drive to the traffic signals.</p> <p>Access to the eastern leg of General Holmes Drive would be provided via a left-in, left-out arrangement clear of the traffic lights.</p>
<p>General Holmes Drive and railway level crossing</p> 	<p>The railway level crossing would be decommissioned, and General Holmes Drive would be closed with a cul-de-sac on both sides of the railway crossing. The eastbound section of General Holmes Drive would also be renamed after the level crossing is closed.</p>

Intersection upgrade	Description
<p>General Holmes Drive and Botany Road</p> 	<p>The intersection would be adjusted by:</p> <ul style="list-style-type: none"> • Removing traffic lights for motorists • Retaining crossing lights for pedestrians and cyclists • Reducing the road to a single left turn and right turn into General Holmes Drive.
<p>General Holmes Drive and Wentworth Avenue</p> 	<p>Wentworth Avenue would be extended to General Holmes Drive, and the new intersection with General Holmes Drive would be configured as follows:</p> <ul style="list-style-type: none"> • Northern approach: 3 through lanes and 2 left-turn lanes • Southern approach: 3 through lanes and 3 right-turn lanes • Eastern approach: 2 left-turn lanes and 2 right-turn lanes. <p>This intersection would have additional median islands to mount traffic signals to avoid breaching the OLS.</p>

Intersection upgrade	Description
<p>Botany Road and Wentworth Avenue</p> 	<p>The Botany Road and Wentworth Avenue intersection would be relocated about 60 m to the south to align with the proposed underpass. The intersection would also be lowered by about 1.5 m to align with the underpass.</p> <p>This intersection would be upgraded as follows:</p> <ul style="list-style-type: none"> • Northern approach: 2 through lanes and 2 right-turn lanes • Southern approach: 2 through lanes and 1 right-turn lane; no left turns permitted • Eastern approach: 1 left-turn lane, 3 through lanes and 2 right-turn lanes • Western approach: 2 left-turn lanes and 3 through lanes.
<p>Botany Road and Mill Pond Road</p> 	<p>The intersection would be upgraded as follows:</p> <ul style="list-style-type: none"> • Northern approach: 2 through lanes, 2 left-turn lanes; no right turns permitted • Western approach: 2 right-turn lanes, 2 through lanes and 1 restricted access left-turn lane (accessible only for traffic from General Holmes Drive southbound) • Southern approach: 2 through lanes and 2 left-turn lanes (as existing).

Wentworth Avenue underpass and twin rail bridges

The proposal would involve Wentworth Avenue passing under twin rail bridges (refer to **Figure 4-1** and **Figure 4-2**). The road underpass would have a minimum 4.7 metres clearance, providing access for unrestricted heavy vehicle movements allowed in NSW without an over height vehicle permit. Wentworth Avenue would have nine lanes through the underpass, comprising five eastbound lanes and four westbound lanes. Both sides of Wentworth Avenue under the railway bridges would have soldier piled walls (refer to **Figure 4-1**). The section of Wentworth Avenue between the underpass and General Holmes Drive would also be fenced.

The Wentworth Avenue underpass would form a low point within the proposal area, and would be prone to flooding. To allow the underpass to remain open to traffic during up to 10 per cent AEP storm events (also known as the 10 year average recurrence interval event), drainage and pumping infrastructure would be installed in the underpass. The underpass would also be protected to avoid groundwater inflow.

The railway crossing over Wentworth Avenue would be built using two post-tensioned girder bridges.

The western bridge would be built first, to the west of the existing railway line. It would be about 62.5 metres long and six metres wide, with a maximum span of 34.5 metres. The eastern bridge would be built on the existing railway alignment. It would be about 64 metres long and six metres wide, with a maximum span of 35 metres. Both bridges would have approach slabs six metres long to the north and south.

While the eastern bridge is being built, the western bridge would carry temporary railway track to maintain freight rail access. After construction is complete, the temporary rail track on the western bridge would be decommissioned until it is needed for a future duplicated line, while the eastern bridge would accommodate existing freight rail.

An artist's impression of the Wentworth Avenue underpass and rail bridges over Wentworth Avenue is shown in **Figure 4-3**.

Figure 4-2 The rail bridges and bridge over stormwater channel

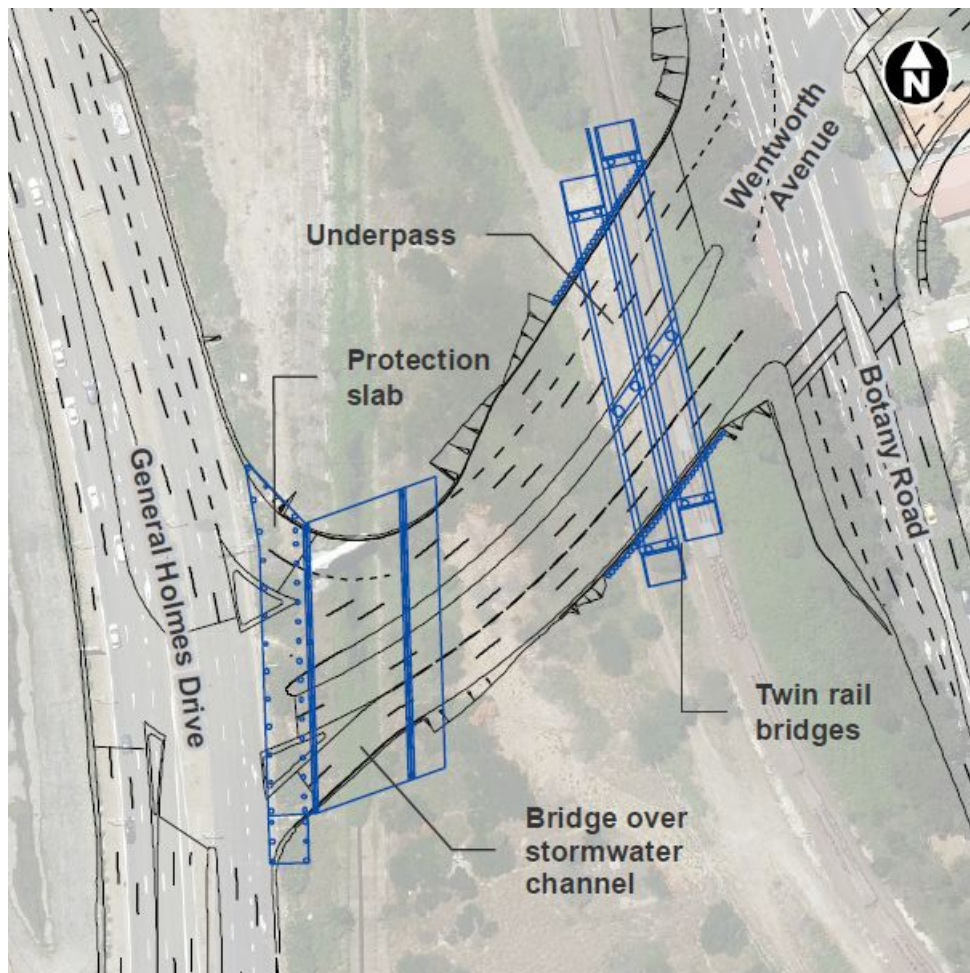


Figure 4-3 Artist's impression of the rail bridges over Wentworth Avenue (facing west)



Bridge over stormwater channel on Wentworth Avenue

The bridge over the stormwater channel on Wentworth Avenue would be about 19.7 metres long and about 53 metres wide. To the west of the bridge a protection slab (continuous reinforced concrete structure connected to the bridge abutment) would protect underground sewer pipes and a high pressure gas main between General Holmes Drive and the stormwater channel (refer to **Figure 4-2**).

Walls, cut and fill

The retaining and soldier piled walls required for the proposal are listed in **Table 4-3** and shown on **Figure 4-1**. The retaining walls would typically be about one metre high, with a maximum height of about two metres. Soldier piled walls on both sides of the Wentworth Avenue underpass would be up to five metres in height.

Table 4-3 Proposed retaining walls

No.	Location description	Length (m)
RW01 (Potential wall)	Next to the northbound lane of General Holmes Drive.	120
RW02	Next to the westbound lane of Joyce Drive	200
RW03	Next to the left slip lane from General Holmes Drive to Wentworth Avenue	35
RW04	Next to the northbound lane of Botany Road, north of the Botany Road and Wentworth Avenue intersection	25
RW05	Next to the northbound lane of Botany Road, south of the Botany Road and Wentworth Avenue intersection	65
SP01	On the northern side of the Wentworth Avenue underpass	35
SP02	On the southern side of the Wentworth Avenue underpass	35

Retaining wall materials and form would be coordinated for consistency. Finishing materials for these retaining walls would be confirmed during detailed design.

Earthworks associated with the proposal would be generally associated with excavation. The most substantial earthworks would be associated with the excavation for the Wentworth Avenue underpass. Other activities requiring excavation include utility relocations, and minor excavations to install kerb, guttering and pits. Further details on excavation are provided in **Section 4.3.5**.

Some small cut batters less than one metre in height are expected as part of the proposal. These would be located along the eastern boundary of Botany Road.

Drainage infrastructure

The proposal would not result in substantial change to the kerb and gutter stormwater system within the study area. The key changes to drainage infrastructure would be limited to: local adjustments, replacing the grassed swale near Joyce Drive with a traditional pipe network, replacing existing pipes with stronger pipes to withstand vehicle loading, and drainage infrastructure associated with the Wentworth Avenue underpass.

The drainage arrangement for the proposal is shown on **Figure 4-4** and includes:

- Precast concrete and fibre reinforced concrete pipes (375, 450, 525 and 750 millimetres diameter)
- Kerbs and gutters
- Drainage and inspection pits
- Stormwater pump and stormwater pump house.

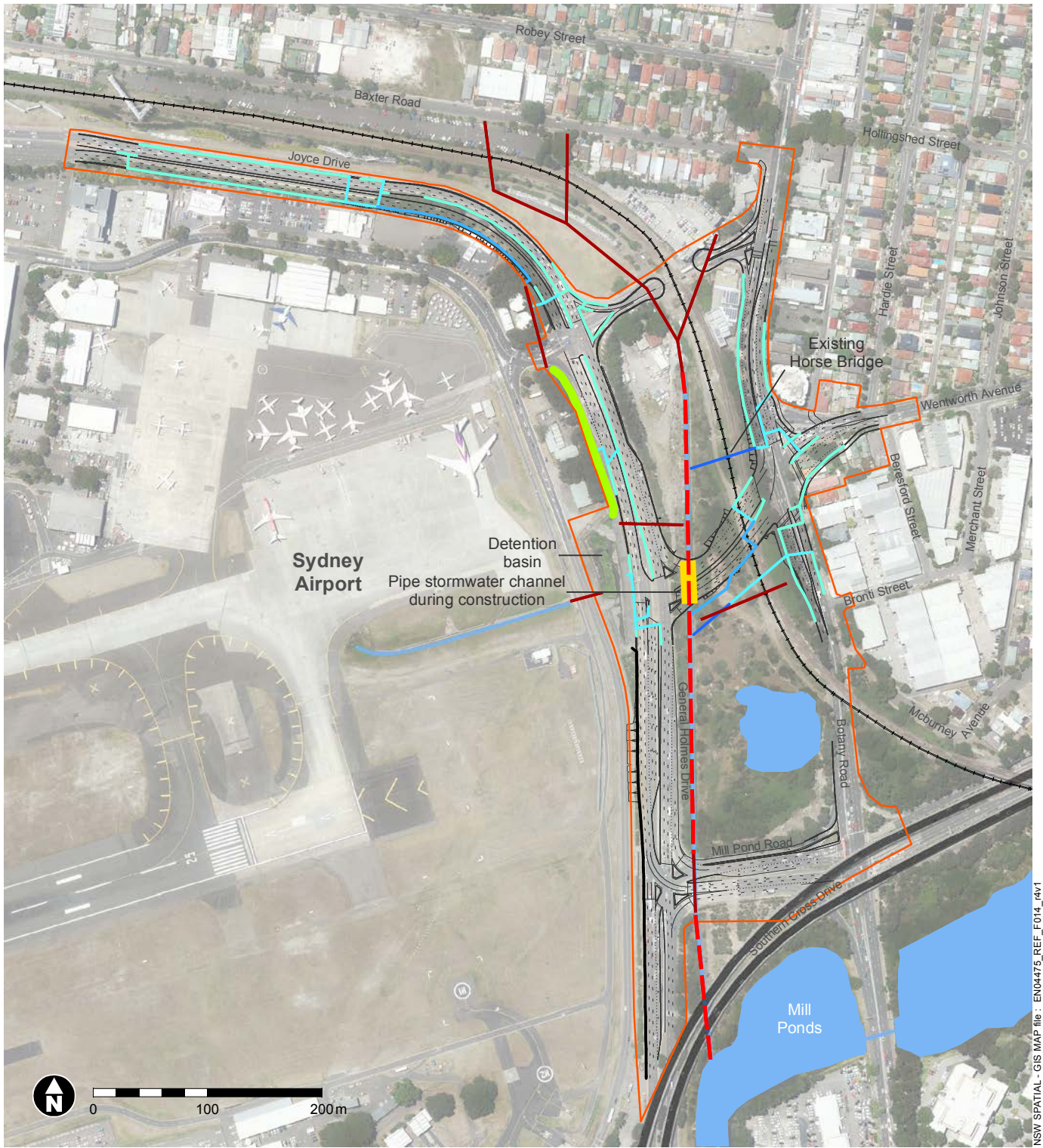
The grassed swale to the south of Joyce Drive would be replaced with a traditional pipe network due to the space limitations in this area. This network would continue to discharge to the Sydney Airport detention basin and eventually the stormwater channel. Widening along General Holmes Drive would require the drainage structures to be relocated along new kerb lines. The existing connection between the detention basin and the stormwater channel would be retained.

To facilitate the connection to the stormwater channel, it would be necessary to have less cover over some drainage pipes. As a result, the new pipes to be installed would be capable of withstanding higher vehicle loads.

The Wentworth Avenue underpass would create a low point from where stormwater would need to be drained. Because the base of the underpass would be below the surrounding stormwater network, high-volume pumps would be installed to the south of the underpass to pump runoff from the underpass. If during larger storm events the stormwater channel becomes inundated, the channel would surcharge to the pipe draining the underpass. A weir within the stormwater pump house would divert the water to a sump where it would be pumped out into the channel (refer to **Section 7.6**). Detailed design will investigate the need for grated trench drains across the pavement on the Wentworth Avenue underpass to intercept stormwater and discharge it before it enters the low point, reducing the pumping need.

Drainage would be adjusted to allow for the Wentworth Avenue and Botany Road intersection upgrade. The adjustment would occur along Botany Road between General Holmes Drive and Bronti Street.

Drainage infrastructure would be investigated in further detail and confirmed during detailed design.



NSW SPATIAL - GIS MAP file - EN04475_REF_F014_r4v1

Figure 4-4 Drainage infrastructure design overview

Legend

	Proposal area boundary		Existing infrastructure		Proposed drainage pipes (mm diameter)		Pipe stormwater channel during construction
	Motorway		Stormwater channel		375 mm		
	Railway		Known existing stormwater pipes		450 mm		
	Waterway		Grassed swale		525 mm		
	Water body				750 mm		
					Unknown		

Ref_Design7D.dwg
 Roads and Maritime Services 2014
 AUSIMAGE 2014
 LPI 2014

Overland flows and flooding

As discussed in **Sections 2.3.10** and **7.6.2**, surface flows within the proposal area currently move in a general southward direction towards the Mill Ponds (refer to **Figure 7-9**). Drainage associated with the proposal would continue to facilitate the same direction of surface water movement. However, improvements in drainage would result in more water entering the stormwater channel, and less water along Joyce Drive and Botany Road.

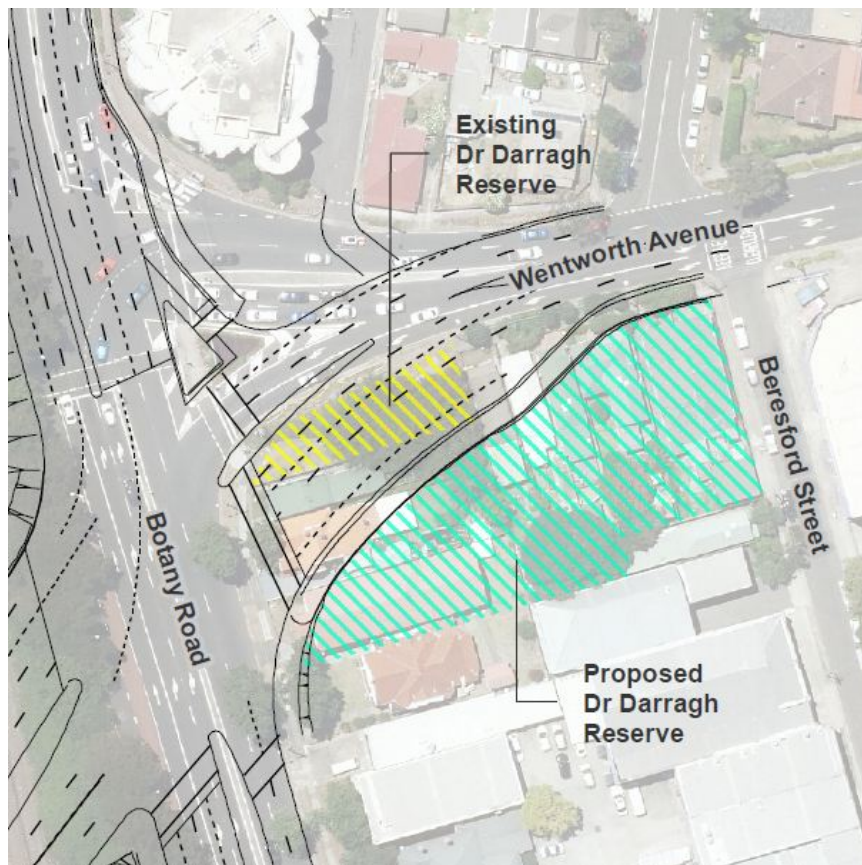
Further investigations and modelling would be carried out during detailed design to confirm the drainage within the study area, including required pump-out flow rates for the underpass. Detailed design would also investigate the need for grated trench drains across Wentworth Avenue to capture stormwater before it enters the low point of the underpass.

Social infrastructure

Parks and reserves

Dr Darragh Reserve is currently located on the corner of Botany Road and Wentworth Avenue (refer to **Figure 7-18**). The existing reserve would be moved about 25 metres south east of its current location to adjoin the Beckenham Memorial Church, to allow for the expansion of the Botany Road and Wentworth Avenue intersection. New parkland facilities, shade trees and night time lighting would be provided at the redeveloped Dr Darragh Reserve in consultation with the community, agencies and other stakeholders.

Figure 4-5 Dr Darragh Reserve



Pedestrian and cyclist facilities

The proposal includes upgrading footpaths (refer to **Figure 4-1**) and providing the following shared-use paths (2.5 metres wide) for pedestrians and cyclists:

- About 400 metres of shared-use path along the south of Wentworth Avenue to connect to the existing cycleway at Todd Reserve, Mascot
- About 130 metres of shared-use path alongside the southbound lane of Botany Road between Wentworth Avenue and General Holmes Drive
- About 70 metres of shared-use path alongside the former General Holmes Drive (east of the level crossing), to the northbound lane of Botany Road to connect with a proposed shared-use path that would be built as part of another Roads and Maritime upgrade project.

The footpath alongside the eastbound lane of Joyce Drive would be removed as part of the proposal. The informal pedestrian access along General Holmes Drive across the rail level crossing would also be removed. Alternative pedestrian access would be provided between residential areas in Mascot and Sydney Airport via Baxter Road and O’Riordan Street as part of another Roads and Maritime upgrade project.

A pedestrian and cyclist crossing would be provided at traffic lights at the former General Holmes Drive and Botany Road intersection.

Bus stops

The bus stop located to the south of the Botany Road and Wentworth Avenue intersection would be relocated about 70 metres to the south. The relocation is required to accommodate the larger footprint associated with the Botany Road and Wentworth Avenue intersection upgrade.

Urban design

Urban design strategies for the proposal are based on the urban design objectives identified in the Landscape Character and Visual Impact Assessment Technical Paper (Corkery Consulting + Studio Colin Polwarth, 2014) (**Appendix F**) and listed in **Section 4.2.1**. These urban design principles reflect the underlying urban design principles contained in Beyond the Pavement (Roads and Maritime, 2009) and reflect the proposal’s relationship to its surrounding environment. These principles contribute to the creation of four distinctive components of the visual environment. These components and associated design principles are summarised in **Table 4-4**, while detailed maps illustrating the urban design principle plan are included in **Appendix F**.

Table 4-4 Urban design principles associated with the proposal

Landscape character zone	Design principle
General Holmes Drive and Joyce Drive upgrade	<ul style="list-style-type: none"> • Integrate elements of the proposal with existing features in the corridor to create a context related design • Provide traffic calming and appropriate safety features where road widening occurs • Maintain views to advertising in the corridor (including relocation of any affected structures) • Provide robust, contemporary low maintenance landscape design that responds to the natural and built context of the corridor • Consider the Airport east-west runway flight path OLS in design proposals • Consider opportunities to integrate public art to enhance streetscape quality

Landscape character zone	Design principle
	<ul style="list-style-type: none"> Consider upgrading utilities to improve the streetscape Achieve a high quality urban design outcome along General Holmes Drive that responds to the sense of arrival and departure at Sydney Airport.
The gateway – the extension of Wentworth Avenue, rail bridge and road underpass	<ul style="list-style-type: none"> Create a memorable experience at the airport interface area through an integrated road and urban design response Maintain views to advertising in the corridor (including relocation of any affected structures) Create new infrastructure structures that are of high quality and appropriate to the context Provide an upgraded landscape design with indigenous planting and gently undulating coastal dune landforms Consider the design of utilities to improve the streetscape.
Coastal Sydney – the area of land between the new road underpass, General Holmes Drive, Mill Pond Road and Botany Road	<ul style="list-style-type: none"> Create a high quality landscape design that emphasises the indigenous coastal landscape character Open up views to the airport runways and infrastructure to reinforce the sense of place and assist with wayfinding Consider the design of utilities and safety elements such as fences to improve the streetscape and landscape quality.
Urban Sydney – the area west of Botany Road, including the intersection of Botany Road and Wentworth Avenue	<ul style="list-style-type: none"> Consider enhancing the streetscape with context related landscape design Revitalise the public realm including a new pocket park, intersection design, median design and a new shared path that forms part of the proposal area Extend the existing formalised landscape design associated with local roads Provide public transport amenities such as the bus stop shelter, pedestrian crossings and shared path amenities Remove the existing rail level crossing to improve the movement of freight trains servicing Port Botany Provide new road furniture, signage and safety barriers Consider the design of utilities to be located underground where possible to improve the streetscape Consult with the local community, agencies and stakeholders in the area in relation to the detailed design aspects of the proposal.

The proposal would involve restoration of the degraded land between General Holmes Drive and the Port Botany Freight Rail Line (refer to **Figure 4-6**). Restoration activities would include:

- Weed removal in the area of rehabilitation indicated in **Figure 4-6**. Native vegetation (if present) would be retained wherever possible
- Regrading and replanting of the area between the stormwater channel and General Holmes Drive to provide motorists with open views to the wetland area. This area would also be replanted with native groundcover and grass species (as per the planting palette) to open views from the road to the wetland area
- Replanting of native grasses and low shrub vegetation in area of rehabilitation in accordance with the planting palette.

The planting palette as listed in the Landscape Character and Visual Impact Assessment (**Appendix F**) has considered native species for replanting that would not attract birds which would pose a safety risk for airport operations. A buffer area of about five metres in width would be established around the wetland south of the proposed Wentworth Avenue underpass to protect the wetland in accordance with the NSW Wetlands Policy (DECCW 2010). This buffer area is shown on **Figure 4-6**.

Figure 4-6 Buffer area near wetland



Contamination is present within the proposal area as non-friable asbestos north of Mill Pond Road, stockpiled material within the wetland north of Mill Pond Road, total petroleum hydrocarbons (TPH) and polycyclic aromatic compounds (PAH) within soil (refer to **Section 7.9**). The proposal would involve activities for the remediation of contaminated areas and would be outlined in the Contamination Management Plan (CMP).

4.3 Construction activities

This section provides a summary of the indicative construction methodology, staging, work hours, plant and equipment that would be used to build the proposal and associated activities. The detailed construction staging plans and methodology would be determined by the construction contractor(s) after detailed design. The actual construction methods may vary from those described in this chapter due to:

- The identification and location of underground utilities and services
- On-site conditions identified during pre-construction activities
- Ongoing refinement of the detailed design
- Feedback and submissions from the community.

The final construction environmental management plan (CEMP) and methods used for construction would be consistent with statutory requirements, including any work, health and safety (WH&S) regulations, and all conditions issued following determination of the proposal.

A contractor environmental management framework to manage and mitigate impacts is presented in **Chapter 8**. The final construction plan and methods would be consistent with this framework.

4.3.1 Work methodology

A Construction Work Method Statement was prepared for Roads and Maritime to identify the likely construction activities and stages for the proposal (MI Engineers, 2014). The construction staging strategy aims to:

- Provide certainty that the proposal can be constructed
- Ensure that current traffic flows in the area are maintained with minimal disruption during construction
- Reduce disruption to Sydney Airport and Port Botany Freight Rail operations during construction.

The construction stages and activities are summarised in **Table 4-5**. Each stage would be dependent on site conditions, community/stakeholder consultation, property access, and traffic management requirements.

The staging would be developed further after some of the stages and constraints are confirmed, and during detailed design. Staging would be confirmed by the construction contractor and Sydney Airport before construction begins. Depending on the construction staging and methods determined by the contractor, the stages or substages may be constructed in parallel.

Table 4-5 Proposed construction stages and key activities

Construction stage	Description of work and key activities
Stage 1: Utility relocation and protection	<p>This stage would require utilities to be protected and adjusted to accommodate the changes to roads associated with the proposal. This stage would also involve construction of a temporary crossing over the stormwater channel to allow construction vehicles access between the areas east and west of the channel. This stage would occur both on and outside of Sydney Airport/Commonwealth land.</p> <p>The following utilities would require protection:</p> <ul style="list-style-type: none"> • Southern Division Sub Main of the South West Suburbs Ocean Outfall • Jemena 550 mm diameter high pressure gas main • Stormwater channel, located generally parallel to General Holmes Drive. <p>The construction activities associated with the protection of the Jemena 550 mm diameter high pressure gas main and the Southern Division Submain include:</p> <ul style="list-style-type: none"> • Potholing works to confirm exact location of gas main • Excavation around the gas main • Removal of the existing concrete slab protection and recoating of gas main • Installation of in-situ formwork to confine fill around gas main • Minor earthworks to create pads for the piling rig at the bridge over stormwater channel • Bored piling to install 4 piles to support gas main and Southern Division Submain protection slab • Installation of concrete cast insitu pile caps • Backfilling and compaction of fill • Removal of fill containment formwork • Pouring of concrete for protection slab • Minor finishing works. <p>The temporary stormwater channel crossing would be about 6 metres wide, and located to the north of the Wentworth Avenue bridge over the stormwater channel. The construction activities associated with temporary stormwater channel crossing include:</p> <ul style="list-style-type: none"> • Installation of temporary bunds up and downstream of crossing location

Construction stage	Description of work and key activities
	<ul style="list-style-type: none"> • Dewatering of bunded area to sediment basin • Installation of temporary bedding material • Installation of steel pipes (three pipes with 1200 mm x 6 m dimensions) • Construction of temporary head walls • Filling of area over pipes with large rocks • Construction of trafficable surface over rock fill. <p>The type and extent of utility relocations are provided in Section 4.7. Preliminary drawings of utility relocations are provided in Appendix D.</p> <p>Generally the following construction activities would be undertaken for the underground utility relocations:</p> <ul style="list-style-type: none"> • Potholing to confirm the location and extent of the utilities to be relocated or other utilities potentially impacted • Excavation of a trench for the new alignment of the relocated utility • Installation of bedding material • Installation of pipelines or conduits • Where power or communication cabling is being relocated, cable pulling would be required to install new cable • Excavation and installation of pits at cutover locations • Installation of valves, switches or other infrastructure to allow the cutover of utility to the new alignment • Testing and commissioning of relocated section of utility • Pouring of concrete protection slabs where required • Backfilling and compaction of trenches and around pits • Restoration of ground surface.
<p>Stage 2: Joyce Drive widening</p>	<p>This stage would involve widening the southern side of Joyce Drive to provide an additional northbound and southbound lane. The work would occur within and outside Sydney Airport/Commonwealth land. The main activities would be to:</p> <ul style="list-style-type: none"> • Install traffic controls, temporary barriers and temporary line marking • Construct access to any ancillary areas (if required) • Locate and identify existing utilities • Relocate general and major utilities (see above) • Install erosion and sedimentation controls • Install temporary fencing • Carry out clearing and grubbing • Construction of low retaining wall next to the carwash on Joyce Drive • Box out and prepare subgrade • Install new longitudinal and cross drainage • Place and compact pavement layers • Mill and resheet existing pavement layers and replace kerbs • Construct a new median • Lay the final asphalt layers. <p>Construction constraints</p> <p>During this stage, there would be a need to:</p> <ul style="list-style-type: none"> • Build the proposal under live traffic and sometimes congested conditions along Joyce Drive • Limit road closures to short durations (up to about 4 hours) • Avoid damage to the Ausgrid 132 kV feeder located along Joyce Drive • Retain existing landscaping where possible • Restrict breaches of the Sydney Airport OLS.
<p>Stage 3: General Holmes Drive widening Bridge over stormwater channel</p>	<p>This stage would involve widening General Holmes Drive, protecting major utilities which run parallel to General Holmes Drive with a utility protection slab and building the bridge over the stormwater channel on Wentworth Avenue (which would eventually be part of the Wentworth Avenue extension).</p> <p>This stage would mainly occur on Sydney Airport/Commonwealth land and the General Holmes Drive road reserve. The main activities for the General Holmes Drive work would be to:</p> <ul style="list-style-type: none"> • Install traffic controls, temporary barriers and temporary linemarking • Construct access to ancillary areas (if required) • Locate and identify existing utilities

Construction stage	Description of work and key activities
	<ul style="list-style-type: none"> • Install erosion and sedimentation controls • Install temporary fencing • Carry out clearing and grubbing • Box out and prepare subgrade • Install longitudinal and cross drainage • Place and compact the road pavement layers • Demolish median and street lights • Mill and resheet the existing road pavement layers and replace kerbs • Construct a new median • Place final asphalt layers. <p>The construction of the bridge over the stormwater channel would involve the following activities:</p> <ul style="list-style-type: none"> • Minor earthworks to provide a pad for the piling rig • Bored piling of between 4 and 16 piles • Construction of cast insitu pile caps on both sides of stormwater channel • Backfilling and compaction of appropriate fill material behind piles and pile caps • Craning and placement of pre-cast bridge planks over stormwater channel • Casting of concrete bridge deck • Placement of formwork and casting of bridge approach slabs • Bridge finishing works including installation of parapets, joints, railings, other features and pavement wearing surface. <p>The temporary stormwater channel crossing would be removed once the permanent bridge over the stormwater channel has been constructed. The following activities would be undertaken to remove the temporary crossing:</p> <ul style="list-style-type: none"> • Dewatering of bunded area to sediment basin • Removal of rock fill, temporary headwalls, steel pipes and bedding material • Minor restoration works to fix any damage to stormwater channel • Removal of temporary sand bag bunds. <p>Construction constraints</p> <p>During this stage, there would be a need to:</p> <ul style="list-style-type: none"> • Build the proposal under live traffic and sometimes congested conditions along General Holmes Drive • Limit road closures to short durations (up to about 4 hours) • Restrict breaches of the Sydney Airport Obstacle Limitation Surface (OLS) (refer to Section 7.2) • Avoid damage to the spill detention pond east of General Holmes Drive, which is maintained by Sydney Airport • Avoid damage to the Jemena 550 mm diameter high-pressure gas main and twin 1350 mm diameter sewer mains • Be aware that there may be unknown utilities.
<p>Stage 4: Botany Road and Wentworth Avenue intersection upgrade</p>	<p>This stage would involve upgrading the Botany Road and Wentworth Avenue intersection to include another leg to the west extending to Wentworth Avenue underpass. The intersection would be lowered about 1.5 m below the existing surface levels so that the Wentworth Avenue underpass can pass below the Port Botany Freight Rail Line. The construction of the intersection would be completed in a number of substages consisting of:</p> <ul style="list-style-type: none"> • Substage 1 – Construction of Botany Road temporary pavement. This substage would involve constructing temporary pavement adjacent to Botany Road and switching the traffic to the temporary pavement. It would also involve constructing both temporary and permanent pavement on the southern corner of Wentworth Avenue and Botany Road and switching all traffic on Wentworth Avenue to new pavement area • Substage 2 – Construction of new permanent pavement at the northern corner of Wentworth Avenue and Botany Road. As a result of the Substage 1 works and traffic switches, a clear construction zone would be created near the northern corner of Wentworth Avenue and Botany Road. Permanent pavement would be constructed in this area. Once the pavement has been constructed, traffic from Wentworth Avenue would be switched to use this new pavement • Substage 3 – Construction of new permanent pavement in southern corner of Wentworth Avenue and Botany Road. As a result of the Substage 2 works and

Construction stage	Description of work and key activities
	<p>traffic switches, a clear construction zone would be created near the southern corner of Wentworth Avenue and along Botany Road. Permanent pavement would be constructed in this area. Once the new pavement has been installed, southbound traffic on Botany Road would be switched to use this new pavement – whereas the northbound traffic would continue to use the temporary pavement</p> <ul style="list-style-type: none"> • Substage 4 – Construction of new permanent pavement in the intersection. As a result of the Substage 3 works and traffic switches, a clear construction zone would be created in the middle of the new intersection. Permanent pavement would be constructed in this area. Once the new pavement has been installed, traffic would be switched to use the new permanent pavement. The temporary pavement adjacent to Botany Road would no longer be required and would be removed • Substage 5 – Construction of new permanent pavement to tie into the underpass. In the area along Botany Road where previously there was temporary pavement, permanent pavement would be constructed to tie in with the underpass structure. <p>Typical construction activities that would be carried out include:</p> <ul style="list-style-type: none"> • Install traffic controls, temporary barriers and temporary linemarking • Install erosion and sedimentation controls • Install temporary fencing • Carry out clearing and grubbing • Remove tram track from Botany Road • Partially demolish Horse Bridge to allow for the construction of the western railway bridge • Install temporary retaining walls and safety barriers at the Wentworth Avenue and Botany Road intersection as required to enable live traffic to proceed close to the construction site • Demolish existing properties (houses and a church hall) • Box out and prepare subgrade • Install new longitudinal and cross drainage • Place and compact the road pavement layers • Mill and resheet the existing road pavement layers and replace kerbs • Construct a new median • Lay the final asphalt layers. <p>Construction constraints</p> <p>During this stage, there would be a need to:</p> <ul style="list-style-type: none"> • Construct under heavy traffic conditions at the Botany Road and Wentworth Avenue intersection during peak hours • Restrict breaches of the Sydney Airport OLS • Partially demolish the Horse Bridge, while making sure the bridge will still support the existing rail line during subsequent construction work • Remove the redundant tram track along Botany Road • Monitor ground water levels before excavation occurs as groundwater may impact on subgrade preparation for deeper sections of the intersection • Avoid damage to telecommunications, water and gas utilities located under the existing intersection.
<p>Stage 5: Rail bridges</p>	<p>This stage would involve building two rail bridges over the Wentworth Avenue extension. The western bridge would be built first and would carry temporary railway track to maintain freight rail access during construction. During this time, the eastern bridge would be built on the existing rail alignment. After the eastern bridge is complete, the railway track would be switched back to the eastern bridge and the railway track on the western bridge would be removed. Most of the construction work would occur within the rail corridor, with a substantial portion within 3 m of the outer rail.</p> <p>Sydney Airport east-west runway would be restricted to outward westbound flights for two one-week periods while the rail bridges are being built. These restrictions would be separated by six months, and would occur outside of peak usage hours for the east-west runway (refer to Section 4.4).</p> <p>The main activities would be to:</p> <ul style="list-style-type: none"> • Install erosion and sedimentation controls

Construction stage	Description of work and key activities
	<ul style="list-style-type: none"> • Carry out clearing and grubbing • Install temporary power and water • Install temporary fencing and establish hardstand and storage areas • Install height indicators to indicate height of the Sydney Airport OLS • Relocate rail signals and rail communications • Widen the embankment and build piling pads and access ramps • Install stormwater pipes • Install sheet piling and pile boring • Form, reinforce and pour concrete for abutments, piers, slabs, girders and bridge spans • Install ballast, sleepers, rail, rail fixtures, lighting, communications and signalling ducts and other bridge furniture • Complete demolition of the Horse Bridge to allow for construction of the eastern railway bridge (but retain the footings). <p>Construction constraints</p> <p>During this stage, there would be a need to:</p> <ul style="list-style-type: none"> • Use high plant and equipment that would penetrate the Sydney Airport OLS, which is within about 3 m of the existing track in this area. Over-height plant, such as piling rigs and cranes, would not be able to be stored near the construction site because of the OLS • Build most of this stage at night and during runway closures and during the low cross-wind months of March and October, to avoid penetrating the Sydney Airport OLS • Build within the rail corridor, near an operational rail line • Ensure the Horse Bridge will continue to support the existing rail line until it is fully demolished.
<p>Stage 6: Wentworth Avenue underpass</p>	<p>The Wentworth Avenue underpass needs to be a watertight structure to limit the inflow of groundwater into the underpass as the bottom of the underpass would extend into the local groundwater aquifer. To create a watertight structure, a piled wall around the underpass would first be constructed. The area within the piled wall would then be excavated and the watertight base of the underpass would be formed and constructed.</p> <p>The activities that would be undertaken include:</p> <ul style="list-style-type: none"> • Site preparation including construction of piling pads at and near the underpass site and access tracks from the compound site • Bored piling of underpass walls • Excavation of sand and soil from underpass structure • Installation of waterproof membrane • Installation of formwork and steel reinforcing for underpass base • Concrete pours to form base of underpass • Placement of asphalt wearing layer • Installation of pump out and water treatment facilities • Finishing works such as the installation of urban design features, concrete side walls, safety barriers and other items. <p>During this stage, there would be a need to:</p> <ul style="list-style-type: none"> • Use high plant and equipment that would penetrate the Sydney Airport OLS. Over-height plant, such as piling rigs and cranes, would not be able to be stored near the construction site because of the OLS • Build most of this stage at night and during runway closures, to avoid penetrating the Sydney Airport OLS • Build near an operational rail line • Minimise the impact on groundwater levels.
<p>Stage 7: Finalisation work</p>	<p>This final stage would occur both within and outside Sydney Airport land. The main activities would be to:</p> <ul style="list-style-type: none"> • Install traffic controls and temporary barriers • Adjust the left-turn lane at Mill Pond Road onto Botany Road • Adjust utilities, drainage, road pavement and security fences on Mill Pond Road • Place final asphalt, medians and linemarking throughout the proposal area • Remove construction traffic controls

Construction stage	Description of work and key activities
	<ul style="list-style-type: none"> • Open the proposal to traffic • Close the General Holmes Drive rail level crossing. <p>Construction constraints</p> <p>During this stage, there would be a need to:</p> <ul style="list-style-type: none"> • Carry out most of the finalisation work at night to minimise impacts on traffic • Close some lanes for up to 8 hours • Avoid penetrating the OLS, particularly when working on General Holmes Drive.

4.3.2 Groundwater management during construction

The Wentworth Avenue underpass would extend into the local groundwater aquifer and therefore temporary dewatering of the underpass construction site would be required. To mitigate any impacts on nearby wetlands, other Groundwater Dependent Ecosystems and groundwater users, the drawdown of groundwater levels around the underpass construction site would need to be minimised. Further geotechnical information will be required to conclusively identify the preferred methodology for minimising groundwater drawdown, however a number of options have been identified including:

- Installation of a partial or full piled cut-off wall around the underpass construction area. The cut-off wall would isolate the underpass construction site from the local aquifer and therefore this area could be dewatered without causing drawdown of the surrounding groundwater levels. Further geotechnical investigations would be carried out during detailed design to determine whether a partial cut-off wall would be suitable and whether it would be possible to construct a full cut-off wall using bored piling
- Conventional dewatering and either injection or infiltration of collected groundwater. Dewatering of the construction site could be undertaken using spear point bores to lower the groundwater levels around the construction site. The collected water could be directly injected into groundwater aquifer in a location away from the construction site but in a location that ensures that groundwater levels near wetlands, other Groundwater Dependent Ecosystems and groundwater users are maintained. Alternatively an infiltration pond could be used to allow the collected water to naturally percolate into the groundwater aquifer.

These groundwater management options for construction would be investigated further during detailed design.

4.3.3 Construction hours and duration

Construction is anticipated to start in late 2015 and finish in 2018.

The size of the construction workforce would be expected to fluctuate, depending on the stage of construction and associated activities. The workforce would be expected to peak at about 100 personnel per day across all construction locations. The final number of construction workers would be determined by the construction contractor following the detailed design of the proposal.

Most construction would occur during night time hours between 11pm and 6am. The main activities that would be carried out during night time hours that may have a noise impact on residents include:

- Relocating and lowering the Wentworth Avenue and Botany Road intersection
- Constructing the Wentworth Avenue underpass and rail bridges
- Utility relocations along Botany Road and Wentworth Road.

These activities are described in further detail in **Section 4.2.3** and **4.3.1**. As discussed in **Section 4.4**, construction plant would breach the Sydney Airport OLS. The need to avoid breaching the OLS while the airport is operational requires that most construction would need to take place during the Sydney Airport curfew hours (between 11pm and 6am). Working at night would also facilitate maintenance of traffic flows during construction and avoid impact to traffic to and from the airport.

Before construction, the contractor would liaise with the community regarding out of hours work and potential noise mitigation measures (refer to **Section 7.7**). Other construction activities that do not involve breaching the OLS would occur during standard working hours (Monday to Friday 7am to 6pm; Saturday 8am to 1pm)). This work would generally be:

- Located in the eastern and northern areas of the proposal such as at General Holmes Drive, Joyce Drive and at other intersection works (ie further away from the underpass)
- Activities that do not require large plant
- Activities that do not impact on traffic flow.

Where practical, materials and plant would be removed and delivered outside peak traffic periods to minimise delays on traffic. Traffic control measures would be used to manage general earthworks and the import and export of material.

4.3.4 Plant and equipment

The Construction Method Statement prepared for the proposal provides a list of indicative plant and equipment required during construction. This list of plant and equipment has been selected with consideration of the OLS heights within the proposal area. However, in some cases, use of high equipment or plant within the OLS is unavoidable. For instance, piling rigs for the railway bridges and bridge over stormwater channel would range between 15 to 30 metres in height.

(Additional equipment is likely to be used and would be determined during detailed design by the construction contractor.)

Table 4-6 Construction plant and equipment

Plant and equipment	Stage 1	Stage 2	Stage 3	Stages 4 and 6	Stage 5	Stage 7
Air compressor/air pipe		✓	✓		✓	
Asphalt paver		✓	✓	✓		✓
Backhoes		✓	✓	✓	✓	✓
Bentonite slurry plant/tank/pump		✓	✓		✓	
Concrete agitator trucks		✓	✓		✓	
Concrete boom pumps					✓	

Plant and equipment	Stage 1	Stage 2	Stage 3	Stages 4 and 6	Stage 5	Stage 7
Concrete pump		✓	✓		✓	
Concrete saw		✓	✓	✓		✓
Crane (40 – 80 t)		✓	✓			
Crane (40 t)		✓	✓		✓	
Daymaker portable lights		✓	✓	✓	✓	✓
Dewatering pumps and equipment					✓	
Excavator (20 t)	✓				✓	
Excavators (20 – 30 t)		✓	✓	✓	✓	✓
Excavators (30 t)					✓	
Franna cranes		✓	✓	✓	✓	✓
Grader (12H)		✓	✓	✓	✓	
Mobile crane (Grove GMK 6220-L)		✓	✓			
Pavement profiler		✓	✓	✓		✓
Piling rig (Bauer BG40)		✓			✓	
Piling rig (excavator mounted)		✓			✓	
Piling rig (Mait HR150)		✓	✓			
Piling rig (Mait 130)					✓	
Pneumatic hammer (excavator mounted)		✓	✓	✓		✓
Pneumatic hammer (compressed air)			✓		✓	
Post stressing jacks. Hydraulic pumps and tendon coil frames					✓	
Rollers (10 - 16 t)		✓	✓	✓	✓	✓
Semi-trailers		✓	✓	✓	✓	✓
Skidsteer loader		✓	✓		✓	
Small compaction equipment		✓	✓			
Temporary barriers	✓	✓	✓	✓	✓	
Temporary steel fencing		✓	✓	✓	✓	
Tipper trucks		✓	✓	✓	✓	✓

Plant and equipment	Stage 1	Stage 2	Stage 3	Stages 4 and 6	Stage 5	Stage 7
Track tamping machine					✓	
Vacuum sucker truck		✓	✓	✓	✓	✓
Welding Equipment/generators		✓			✓	

4.3.5 Earthworks

The majority of earthworks would be associated with excavation for the underpass and utility relocations. Earthworks would involve about 25,000 m³ of excavation and about 4000 m³ of fill for road construction. The current design would therefore produce an excess of about 21,000 m³ of fill material. Roads and Maritime proposes to use some of the excess fill to landscape the area between Botany Road and General Holmes Drive, south of the new road underpass. The excess fill that cannot be re-used as part of the proposal would be handled in accordance with the principles outlined for surplus materials (refer to **Section 4.3.6**).

Detailed earthwork requirements would be determined during detailed design.

Surplus fill material that cannot be re-used on site as part of the proposal would be re-used or disposed of in the following order of priority:

- Transfer to other nearby Roads and Maritime projects for immediate use
- Disposal at an approved materials recycling or waste disposal facility
- Disposal as otherwise provided for by the relevant waste legislation.

The process for managing excess material would be detailed in a waste management plan that would form part of the CEMP (refer to **Section 7.14**).

4.3.6 Source and quantity of materials

Building the project would require a range of materials, including clean fill, quarry products, water and concrete (refer to **Table 4-7**). The source and quantity of materials required would be finalised during detailed design, when a construction materials and resources plan would be developed.

A number of quarries and suppliers of quarry material are located in the local area including at Mascot, Marrickville, Maroubra and Greenacre.

Table 4-7 Estimate of quantities of materials required to build the proposal

Material type	Quantity estimate
Concrete	10,000 – 20,000 m ³
Steel	350 m ³
Select fill material (imported)	5,800 m ³
Bitumen	20,000 litres
Asphalt	5,800 m ³
Road base	6,700 m ³

4.3.7 Traffic management and access

This section outlines the likely changes to traffic during construction. Impacts on traffic would be kept to a minimum through the management measures outlined in **Section 7.3**.

Construction vehicles

Heavy vehicle movements generated as part of construction are estimated to peak at 20 vehicles per hour, while an estimated 50 light vehicles would be required during construction per day. Construction vehicle movements are expected to peak while railway bridges are being built and when the Sydney Airport east-west runway is shut down.

It is expected that the majority of construction truck movements would be tipper trucks (truck-and-dog trailers or semi-trailers). A number of over-height, over-size or over-mass vehicles would also be required to transport large plant and machinery, including cranes and piling rigs.

The majority of light vehicle movements generated by construction workers would occur outside the traffic peak periods due to shift start and finish times (about 11 pm and 6am, respectively).

Construction vehicle access and haulage routes

Access to the construction site, tall vehicles storage area and compound and stockpile sites would be via General Holmes Drive, directly west of the railway level crossing. Access to the site would be via:

- Joyce Drive and General Holmes Drive for construction traffic accessing the construction site from the west and south west. This forms part of the main haulage route, and as such, the majority of construction traffic would access the construction site via General Holmes Drive, with a right turn at the General Holmes Drive, Joyce Drive and Ross Smith Drive intersection (refer to **Figure 4-1**)
- Botany Road and Wentworth Avenue, for construction traffic accessing the stockpile and parking site near Dransfield Avenue. Only a small number of vehicles (no more than a few per day) would use this route to access the stockpile site.

Any haulage would be in accordance with a construction traffic management plan for the proposal.

Traffic management, control and signage

The following measures would be implemented to minimise impact during construction:

- Construction would be staged so that impacts would be minimised
- Traffic management measures would be used to minimise traffic impacts, and ensure that traffic flow is maintained in the proposal area. These measures would be documented in a traffic management plan (TMP) that would be developed in accordance with Roads and Maritime's Traffic Control at Works Sites Manual (RTA, 2010) and Specification G10 – Control of Traffic. Roads and Maritime would review the TMP before it is implemented
- Access to properties within the proposal area would be maintained. Temporary property access would be provided to residences and businesses where

required. The management of property access would be considered by the construction contractor and detailed in the final staging plan for the proposal.

- Alternative pathways and/or walking routes would be provided to maintain pedestrian and cyclist access within the proposal area
- Traffic management and control measures would be developed in consultation with SACL to minimise cumulative impacts to traffic.

Road and lane closures

Construction would be staged to ensure that no traffic lanes are closed during peak traffic periods. Some short-term lane closures between one and eight hours long may be required during work near live traffic, but it is expected that traffic delays would be minimal as work would mainly be at night when traffic volumes are low.

Impacts on parking

No more than 50 private light vehicles for construction staff use are expected as part of the proposal. The proposal would provide a dedicated parking area for staff. Potential impacts on parking are discussed in **Section 7.1**. Construction parking impacts would be managed through measures identified in the TMP.

4.4 Interaction with Sydney Airport operations

The proposal area is constrained by the OLS for Sydney Airport that is a component of the Prescribed Airspace for Sydney as defined in the *Airports Act 1996* and Airports (Protection of Airspace) Regulations (refer to **Figure 4-9**). The height of the prescribed airspace over the proposal area ranges between nine and 30 mAHD. The areas where the OLS is lowest within the proposal area are General Holmes Drive, the proposed Wentworth Avenue underpass and the wetland to the south of the underpass. During construction, the following elements of the proposal would extend into the OLS:

- Piling rigs which range about 15 to 30 metres in height. These are required to drive the piles for soldier pile walls and bridge footings at the Wentworth Avenue Extension
- Trucks, excavators and other typical construction equipment which range between two and three metres in height for use at the construction site between General Holmes Drive and Botany Road
- Freight rail use of the western railway bridge during construction, which would protrude into the OLS by up to 0.25 metres more than freight rail on the existing railway bridge.

Figure 4-7 and **Figure 4-8** are examples of the typical and tallest equipment that would intrude into the OLS.

Figure 4-7 Typical construction equipment (truck on General Holmes Drive)

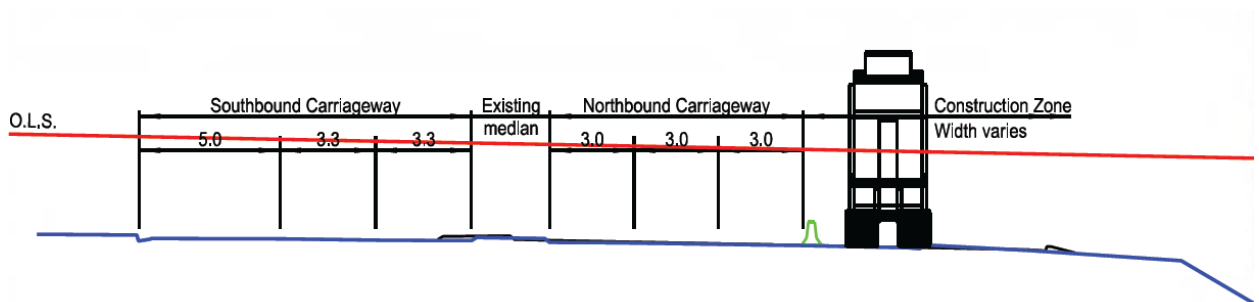
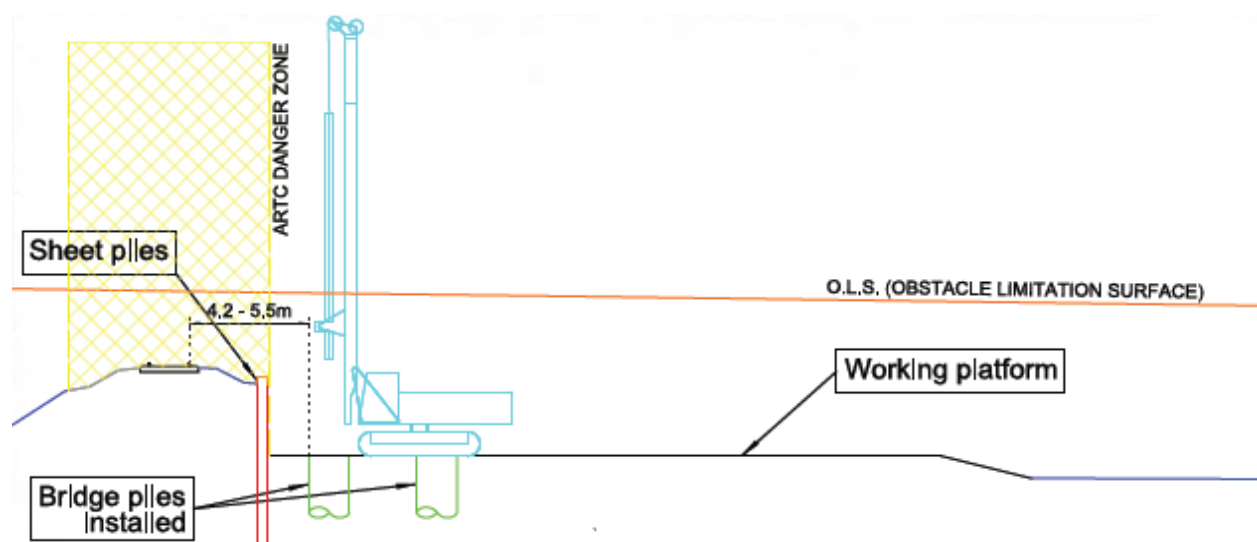


Figure 4-8 Tallest construction equipment (piling rig at Wentworth Avenue extension)



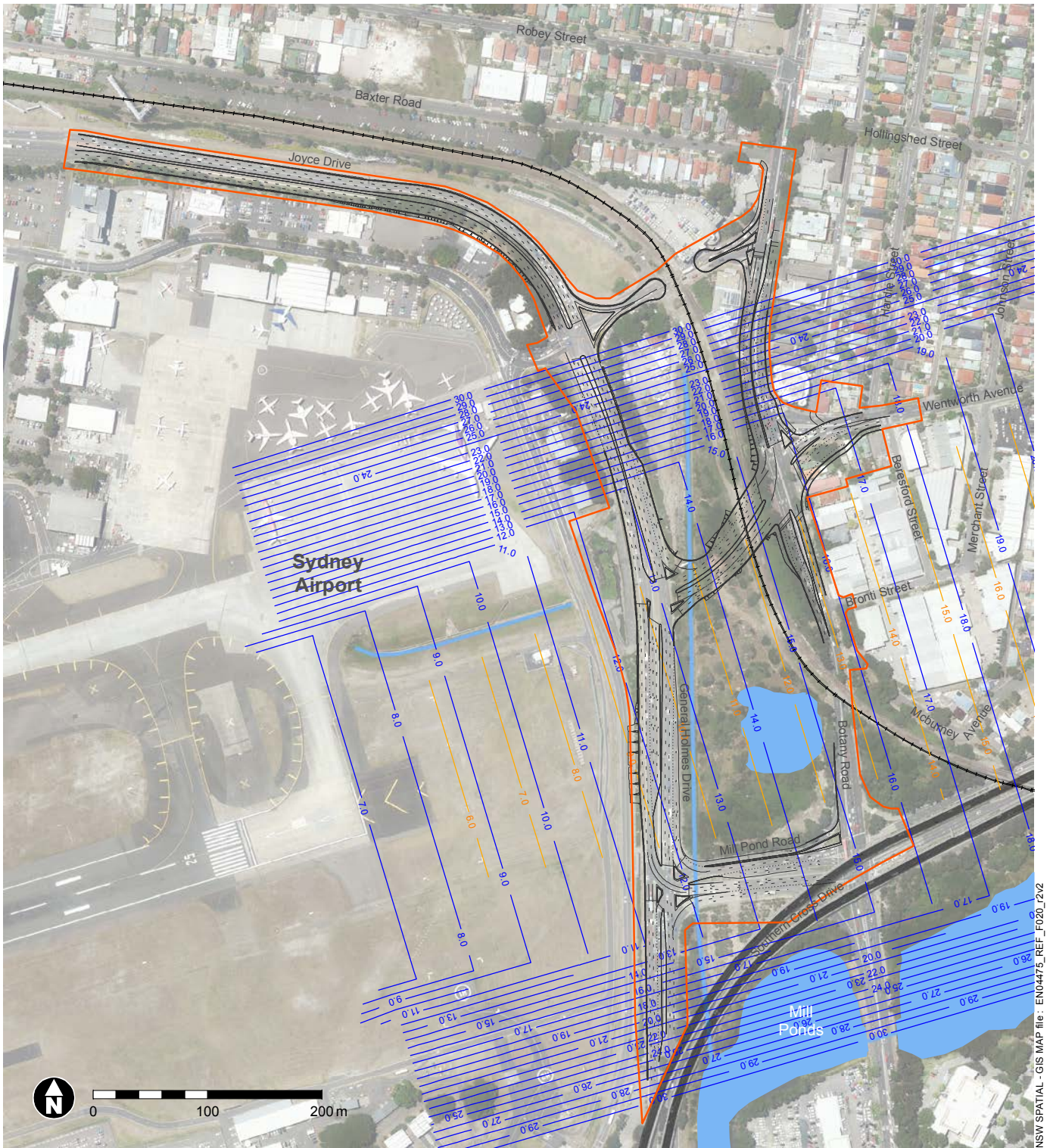
There are no viable alternative construction methodologies or plant to avoid this intrusion. Due to air safety requirements, the following would be required for construction:

- Restricting the Sydney Airport east-west runway to westbound outbound flights only for two periods, ranging between one to two weeks in duration (refer to **Section 4.4.1**)
- Carrying out all construction activities under the lowest section of the OLS during night time hours (refer to **Section 4.4.2**)

4.4.1 Restriction of Sydney Airport east-west runway

Due to construction requirements, the operation of the east-west runway would need to be temporarily restricted for short periods to ensure a safe environment for construction crews and aircraft. Based on current construction planning, there would be two temporary restriction periods of one to two weeks each, in March and October 2016 (refer to **Section 7.2**). These periods would occur during periods where the likelihood of crosswinds are lowest for the east-west runway. During the temporary restrictions of the east-west runway, most air traffic would use the two north-south runways, which would result in a very minor impact on the distribution of noise in areas around the airport.

The restrictions would not allow the full implementation of the Long Term Operating Plan (LTOP), which is the Australian Government plan to share aircraft noise in areas around Sydney Airport. Its aims are to ensure that aircraft flights are over water and non-residential land wherever possible. Where this is not possible the LTOP aims to share the noise across communities in Sydney by using 10 different flight paths and the three runways. The temporary restriction of the east-west runway would limit the options available to share the noise from aircraft for short periods of time. This may result in some areas experiencing marginally higher levels of noise than normal. An assessment of the noise impact on communities from the temporary restrictions on the operation of the east-west runway is provided in **Section 7.7**.



NSW SPATIAL - GIS MAP file: ENG04475_REF_F020_1212

Figure 4-9 Sydney Airport Obstacle Limitation Surface

Legend

- Proposal area boundary
- Obstacle limitation surface - upper limit (m AHD)
- Motorway
- Obstacle limitation surface - lower limit (m AHD)
- Railway

Ref_Design7D.dwg
 Roads and Maritime Services 2014
 Sydney Airport Corporation Limited 2014
 AUSIMAGE 2014
 LPI 2014

4.4.2 Construction during night time hours

The majority of the construction works would be carried out during night time hours to avoid any impacts while intruding into the OLS. The key impacts of construction on Sydney Airport during this time are primarily associated with noise and vibration, and land transport and access. These issues are assessed in **Section 7.3** and **Section 7.1** respectively.

4.5 Ancillary facilities

The proposal would require the following ancillary facilities to support construction:

- Three stockpile sites
- One compound site
- Tall vehicle storage area.

All ancillary sites would be securely fenced with temporary fencing. Signage would be erected advising the general public of access restrictions. After construction is finished, the temporary compound, work area and stockpile sites would be removed, cleared of all rubbish and materials, and rehabilitated.

The final location of and need for all ancillary facility sites would be determined during detailed design and would be confirmed by the construction contractor. Any additional locations recommended by the construction contractor would be discussed with the Roads and Maritime Senior Environmental Officer (Sydney Region) before any work is carried out to determine if any additional environmental assessment is required.

4.5.1 Stockpile sites

Three stockpile sites would be required to build the proposal. As shown on **Figure 4-1**, these sites would be at the following locations:

- On the corner of Dransfield Avenue and Wentworth Avenue
- Between General Holmes Drive and Botany Road, on the northern and southern sides of the Wentworth Avenue underpass. The site to the north of the Wentworth Avenue underpass would also function as a compound site (refer to **Section 4.5.2**).

Stockpile sites would store materials, such as spoil, stripped topsoil, excavated rock and building materials. Some stockpile sites would also have laydown facilities, equipment storage, maintenance sheds, and stores of chemicals and fuel. These stockpile sites would be located on council-owned land, road reserves or Roads and Maritime land.

The final location of the stockpile sites would be subject to the site location criteria set out in Roads and Maritime's Stockpile Site Management Procedures (RTA, 2011b). Wherever practicable, the sites would be located:

- On relatively level ground
- In a place accessible to construction traffic and deliveries
- Away from areas of ecological and heritage conservation value
- In areas previously disturbed within the proposal area that do not require the clearing of native vegetation
- Away from residential buildings or heritage items

- In plain view of the public to deter theft and illegal dumping
- Close to key construction activities to minimise transport of materials and equipment
- Within the proposal area to minimise impacts on private and public property
- In areas not prone to flash flooding and at an appropriate distance from waterways to minimise risks from flooding
- Outside the drip line of trees.

4.5.2 Compound site

One compound site would be required for the proposal. It would be located to the north of the Wentworth Avenue extension, between General Holmes Drive and the Port Botany Freight Rail Line. An overflow parking area may also be located at the stockpile site at the corner of Dransfield Avenue and Wentworth Avenue.

In general, the compound site would include portable buildings with amenities (such as lunch facilities and toilets), secure and bunded storage areas for site materials, including fuel and chemicals, office space for on-site personnel and associated parking.

4.5.3 Tall vehicle storage area

Tall construction plant and equipment require a designated storage area to avoid penetrating the OLS. This storage area would be located at the compound and stockpile site located to the north of the Wentworth Avenue underpass.

4.6 Water management facilities

Construction

Two sediment basins would be installed for use during construction. These would be located to the south of the proposed Wentworth Avenue underpass, on each side of the stormwater channel next to General Holmes Drive. The dimensions of the basins would be confirmed during detailed design.

Operation

The following specific operational measures to manage water quality during operation would be installed:

- Provision of oil/water separators at the Wentworth Avenue underpass drainage discharge point
- Stormwater treatment facility as part of the underpass pump, located within or near the Wentworth Avenue underpass.

These controls would be further assessed during detailed design, which would also determine appropriate sizing and footprint for each control.

4.7 Public utility adjustments

Known utilities in the proposal area are listed in **Section 2.3.11**. The proposal would require utilities to be relocated, adjusted or protected as part of the proposal. Most of the utility adjustments would occur at the start of the project (refer to **Table 4-5**).

Table 4-8 details the known public utilities that would need to be relocated, adjusted or protected (these would be confirmed during detailed design).

Table 4-8 Utilities requiring adjustment

Utility	Description of adjustment
Electricity	
132 kV transmission lines owned by Ausgrid	Relocate the transmission lines parallel to the stormwater canal, and move underground
Low voltage, overhead distribution lines and street lights	Relocate the lines underground, and adjust to suit the roadwork at the Wentworth Avenue / Botany Road and General Holmes Drive / Joyce Drive intersections Remove street lights at General Holmes Drive
Gas pipelines	
550 mm high-pressure primary gas main owned by Jemena	Expose, recoat and backfill the gas main. The work would be done by Jemena after General Holmes Drive is widened to the west, towards Sydney Airport Main would be protected by a concrete protection slab on Wentworth Avenue
100 mm steel high-pressure gas main along the western side of Botany Road owned by Jemena	Lower the gas main parallel to the current alignment, and below the Wentworth Avenue extension
High-pressure nitrogen pipeline (may be redundant) High-pressure hydrogen pipeline (may be redundant) 150 mm ethylene gas pipeline Low-pressure natural gas pipeline along the western side of Botany Road	Relocate the gas pipes to a new alignment parallel and east of the stormwater channel, where utilities have not been decommissioned and flared
Local gas reticulation (typically 50 mm nylon pipes)	Adjust the gas pipes which cross Wentworth Avenue and along Wentworth Avenue to suit the intersection upgrade
Sewer	
Southern Division Sub Main of the South West Suburbs Ocean Outfall Sewer (two 1400 mm diameter pipes)	Protect main with a concrete protection slab on Wentworth Avenue
Local collection sewer mains	Adjust the sewer mains to suit roadwork
Stormwater	
Stormwater channel running generally north-south between General Holmes Drive and Botany Road	Replace channel with pipe during construction
Water	
500 mm water main owned by Sydney Water, near the western footpath alongside Botany Road	Relocate the water main parallel to the existing alignment below the Wentworth Avenue extension
Other water mains (375 mm, 300 mm and 150 mm) including those for local reticulation	Adjust the water mains to suit roadwork – utilities would be located under the new road verges
Telecommunications	
Underground Telstra, NBN, Optus and other services along Wentworth Avenue, Botany Road and the western side of General Holmes Drive	Relocate these services to alternative routes that bypass the site (these alternative routes would be investigated during detailed design)
Local Telstra reticulation along Botany Road and Wentworth Avenue	Adjust these telecommunications utilities to suit roadwork

Utility	Description of adjustment
Street lighting	
Street lighting along General Holmes Drive	Remove lights along General Holmes Drive between Mill Pond Road and Joyce Drive.

4.8 Property

4.8.1 Property ownership

Property near the proposal is owned by:

- State and local authorities such as Roads and Maritime, Sydney Water, and Botany Bay City Council
- Federal authorities such as Australian Rail Track Corporation (ARTC), Sydney Airport and the Commonwealth of Australia
- Private owners of residential and commercial property.

The owners of land near and within the proposal are shown on **Figure 4-10**.

4.8.2 Property acquisition

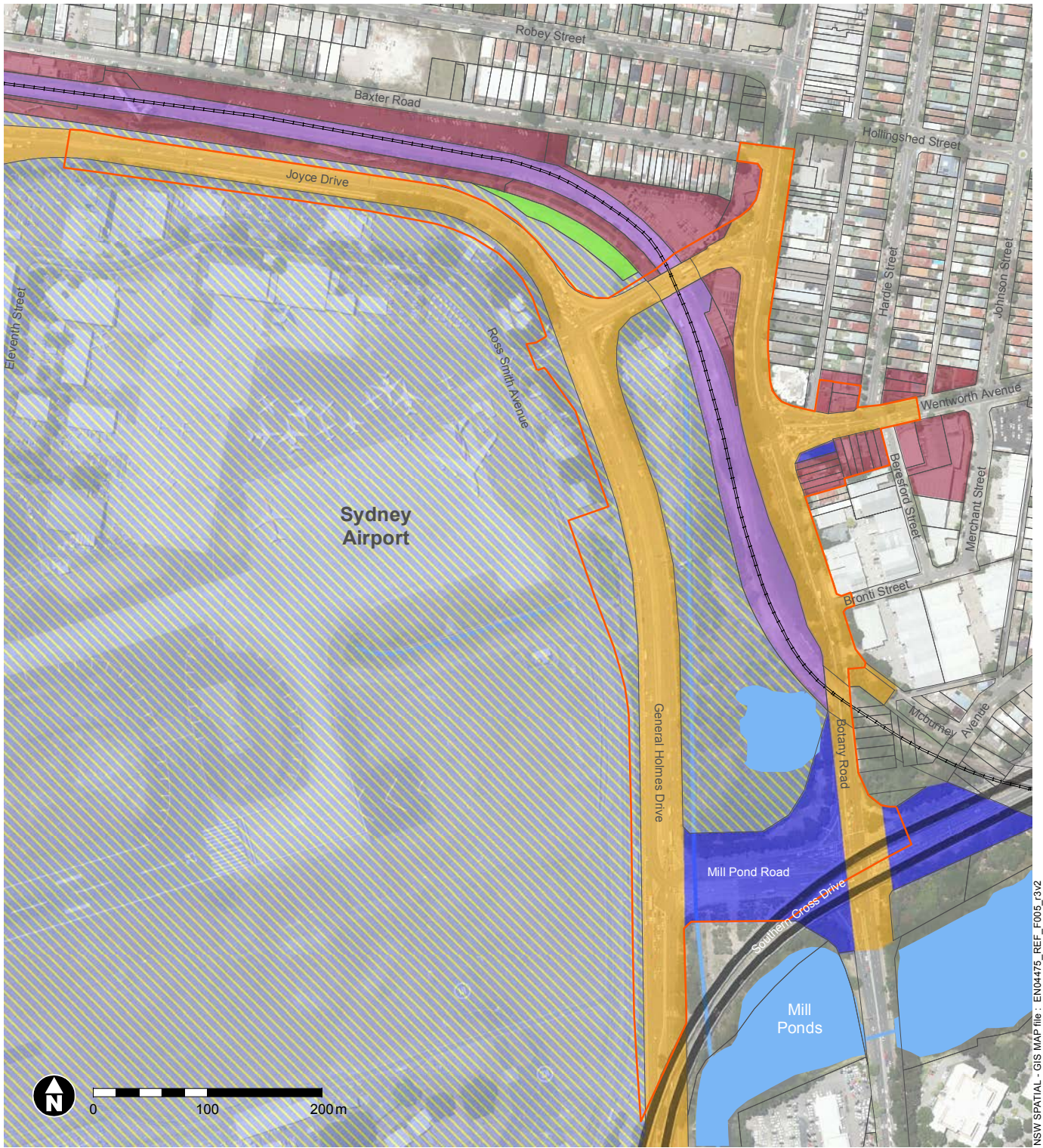
The proposal would require the partial acquisition of about four properties and full acquisition of about 14 properties. Some areas of land may need to be leased by Roads and Maritime for use as compound and stockpile sites. Roads and Maritime is in the process of consulting with affected landowners about acquisition or lease of properties. Areas of acquisition or lease would be finalised during detailed design in consultation with these affected landowners. Based on the current concept design, properties that would be acquired or leased are listed in **Table 4-9** and shown in **Figure 4-11**.

All property acquisitions would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, the *Roads Act 1993* and Roads and Maritime's Land Acquisition Information Guide (Roads and Maritime, 2012b).

Table 4-9 Properties where land would be acquired or leased

Purpose	Lot	DP	Acquisition/ lease area (sqm)	Type of acquisition/ lease	Property owner
Proposal	8	DP1050923	4620	Partial acquisition/ lease	SACL
Proposal	14	DP787029	5288	Partial acquisition/ lease	SACL
Proposal	1	DP455496	386	Full acquisition	Private
Proposal	2	DP455496	226	Full acquisition	Private
Proposal	1	DP668910	333	Full acquisition	Private
Proposal	1 and 2	DP507189	471	Full acquisition	Private
Proposal	A	DP300364	215	Full acquisition	Private
Proposal	B	DP300364	210	Full acquisition	Private
Proposal	C	DP300364	195	Full acquisition	Private
Proposal	D	DP300364	348	Full acquisition	Private

Purpose	Lot	DP	Acquisition/ lease area (sqm)	Type of acquisition/ lease	Property owner
Proposal	10	DP234967	294	Full acquisition	Roads and Maritime
Proposal	13	DP135940	237	Full acquisition	Private
Proposal	14	DP135940	246	Full acquisition	Private
Proposal	5	DP3280	251	Full acquisition	Private
Proposal	6	DP3280	251	Full acquisition	Private
Proposal	7	DP3280	37	Partial acquisition	Private
Proposal	8	DP3280	6	Partial acquisition	Private
Stockpile site (Dransfield Avenue)	5 6	DP775212 DP776212	953	Lease	NSW Department of Planning and Environment
Stockpile site south of underpass	14	DP787029	5288 (assuming whole lot)	Lease	SACL
Stockpile/ compound site north of underpass				Lease	SACL



NSW SPATIAL - GIS MAP file - EN04475_REF_F005_r3v2

Figure 4-10 Property ownership

Legend

- Proposal area boundary
- Motorway
- Railway
- Waterway
- Roads and Maritime Services NSW
- Commonwealth of Australia - leased to Sydney Airport Corporation Limited
- Rail Corporation NSW
- Sydney Water Corporation
- Botany Bay City Council
- Private



NSW SPATIAL - GIS MAP file : EN04475_REF_F018_122

Figure 4-11 Proposed property acquisitions

Legend

- Proposal area boundary
- Areas of property acquisition
- Motorway
- Railway

Ref_Design7D.dwg
 Roads and Maritime Services 2014
 AUSIMAGE 2014
 LPI 2014

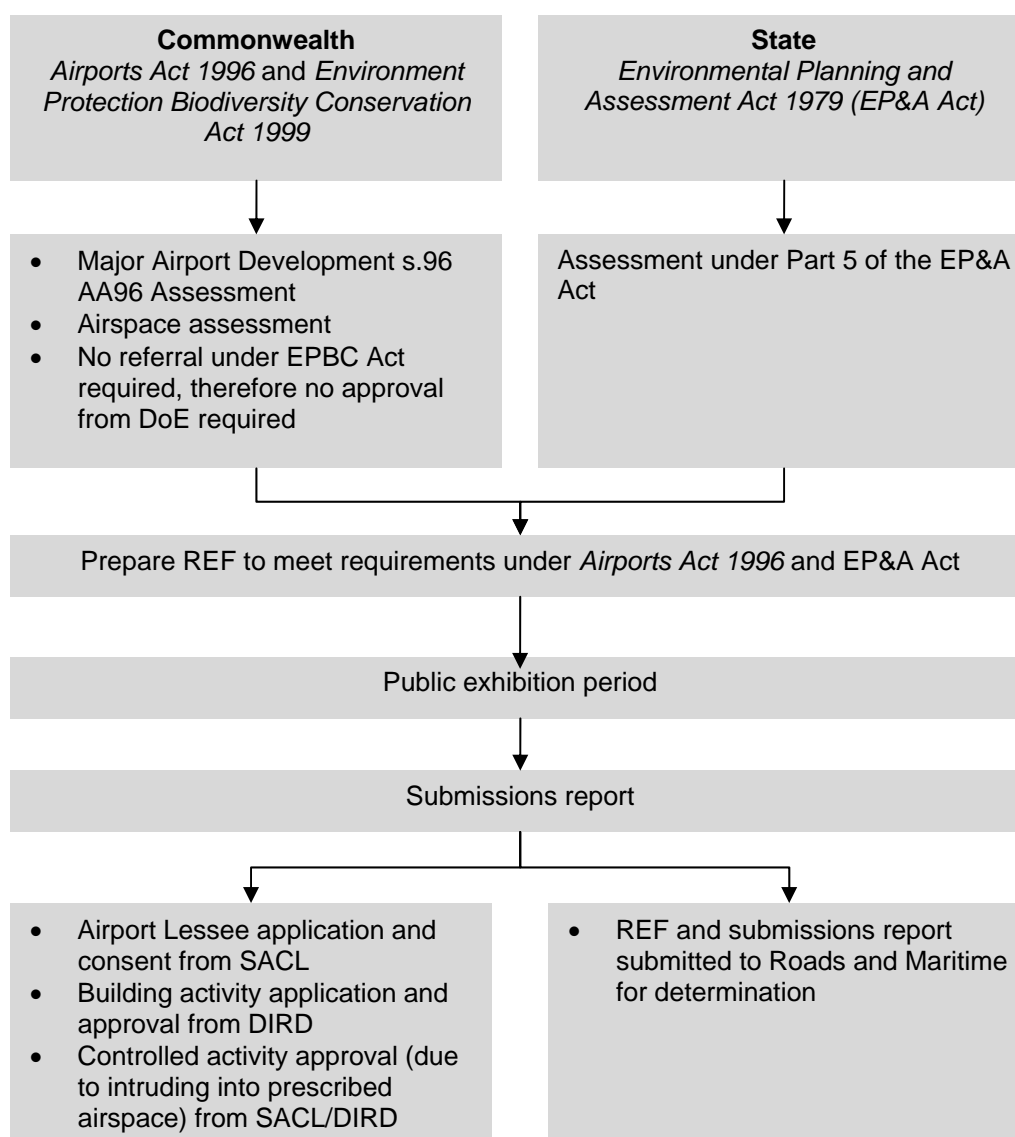
5 Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers provisions of relevant State and Commonwealth legislation, plans and policies. As the proposal is partially located on Commonwealth land leased to Sydney Airport Corporation Limited (SACL), and private/State owned land, requirements under the Commonwealth and NSW law apply.

5.1 Approvals framework

Figure 5-1 summarises the approvals process for the proposal.

Figure 5-1 Commonwealth and State approvals process



5.2 Commonwealth legislation

The proposal is subject to the requirements of Commonwealth legislation and approval processes. The relevant legislation is the *Airports Act 1996* (Airports Act),

the *Environment Protection and Biodiversity Conservation 1999* (EPBC Act), and the regulations to these acts.

As demonstrated by the assessment presented in **Chapter 7** of the REF and discussed below, it is considered that the proposal does not constitute a “major airport development” under Section 89 of the Airports Act. As a result, the preparation and approval of a major development plan (MDP) is not required pursuant to Section 90 of the Airports Act.

The proposal is subject to:

- Sydney Airport’s Development Application and Consent Application processes to satisfy the requirements of the Airports Act
- Application for a Building Permit to the Airport Building Controller (ABC) in accordance with the Airports (Building Control) Regulations 1996. The Sydney Airport Consent Application must comply with the conditions of the Development Approval
- Airspace approval in accordance with the Airports (Protection of Airspace) Regulations 1996C
- Compliance with the Airport (Environmental Protection) Regulations 1997.

The requirements of the Commonwealth legislation are detailed below.

5.2.1 Airports Act 1996

Proposals under the Airports Act require one of the following approvals:

- Major development plan: This applies to any major airport development (as defined by section 89(1) of the Airports Act)
- Building permit and development application: This applies to any proposals for building activity, as defined by sections 2.02 and 2.03 of the Airports (Building Control) Regulations 1996.

Major development plan

Sections of the proposal would be located on Commonwealth owned land prescribed in the Airports Act. Sydney Airport is leased to the SACL and development is managed in accordance with the Sydney Airport Master Plan (refer to **Section 5.6.1**).

Section 89(1) of the Airports Act specifies development on Sydney Airport land that constitutes a ‘major airport development.’ Sydney Airport major airport development includes construction or modification of runways and taxiways, airport terminal buildings and other airport support facilities.

An assessment on whether the proposal is a ‘major airport development’ under Section 89(1) of the Act was carried out, and is provided in full in **Appendix A**.

The assessment confirmed that the proposal would not meet the criteria under section 89(1)(h),(j) and (k). Cost of construction would exceed \$20 million. However, the proposal has been designed to address existing and future traffic congestion and access issues, rather than to significantly increase the capacity of the airport to handle movements of passengers, freight or aircraft.

Section 89(1) also includes environmental, community and sensitive development triggers for ‘major airport developments’ as follows:

(m) a development of a kind that is likely to have significant environmental or ecological impact; or

(n) a development which affects an area identified as environmentally significant in the environment strategy; or

(na) a development of a kind that is likely to have a significant impact on the local or regional community; or

(nb) a development in relation to which the Minister has given an approval under section 89A.

The assessment confirmed that the proposal would not meet the criteria associated with section 89(1)(m), (n), (na), (nb) and (o) (refer to **Appendix A**).

Based on the assessment it is considered that the activity would not constitute a major airport development and a major development plan is not required.

Building activities approval

Section 2.02 of the Airports (Building Control) Regulations 1996 states that building approval applications are required for the following proposed building activities:

- Construction or alteration of a building (clause 2(a))
- Construction or alteration of works (clause 2(b))
- Demolition, destruction, dismantling or removal of a building, or works (clause 2(c)).

The proposal involves the upgrade of roads and building of two railway bridges. In the meaning of the Airports Act, the proposal is characterised as the following building activities:

- The road upgrade and railway is characterised as 'earthworks or engineering works' (Section 98, clause 3(e) and (f) respectively)
- The railway bridges is characterised as 'structures' (Section 98, clause (2)(a)).

A development application for work on Commonwealth land would be submitted to SACL (section 2.03, clause (1) of the regulations). Should the application be successful, SACL consent would be provided to Roads and Maritime with any relevant environmental conditions for the proposal.

Roads and Maritime would then seek building activity approval from Sydney Airport's airport building controller, who is independently employed by the Commonwealth Department of Infrastructure and Regional Development.

Consultation carried out with SACL on 13 December 2013, and subsequent consultation on 22 August 2014 confirmed a single REF would be prepared to address both Commonwealth and State planning requirements. The REF would accompany the development application submitted to SACL for consent, and the building activity approval from DIRD.

Section 2.05 of the Airports (Building Control) Regulations 1996 lists the information that is required within an application. These requirements are listed in **Table 5-1** together with where they are addressed in the REF.

Table 5-1 Requirements for building activity approval application

Information about proposed building activity		Response and relevant section in the REF
(a)	A description of the proposed building activity, and its location on the airport site	A brief description of the proposal is provided in Section 1.1.1 . A more comprehensive description of the proposal is provided in Chapter 4 . Figure 1-2 and Figure 4-10 show the proposal and its relative location to Sydney Airport.
(b)	If there is a final master plan for the airport — a statement describing how the proposed building activity is consistent with the plan	The proposal is consistent with the Sydney Airport Master Plan 2033 and the objectives of the zones it affects, as demonstrated in Section 5.6.1 .
(c)	(c) If the proposed building activity is, or comprises part of, a major airport development (within the meaning of section 89 of the Act) — a statement describing how the proposed building activity is consistent with:	The proposal does not comprise part of a major airport development, as discussed in Section 5.2.1 .
(i)	The approved major development plan for the airport	
(ii)	Any exemption declared under paragraph 90 (1) (d) of the <i>Airport Act 1996</i> .	
(ca)	If the proposed building activity is not, or does not comprise part of, a major airport development — a statement to that effect	The proposal is not, and does not comprise part of a major airport development, as discussed in Section 5.2.1 .
(cb)	If the proposed building activity is, or comprises part of, a draft major development plan — a statement to that effect	The proposal is not, and does not comprise part of a draft major airport development, as discussed in Section 5.2.1 .
(d)	If there is a final environment strategy for the airport — a statement describing how the proposed building activity is consistent with the strategy	The proposal is consistent with the Sydney Environmental Strategy, as discussed in Section 5.6.2 .
(e)	2 copies of the site plan for the proposed building activity, including a depiction of the proposed development resulting from the building activity	Figure 1-2 provides a site plan for the proposal. Cross sections of the proposal are provided in Appendix B .
(f)	A copy of any other information about the proposed building activity required by a regulatory authority, or other body having a regulatory function, in relation to the resulting building, works or demolition.	The REF includes information to meet Roads and Maritime obligations under: <ul style="list-style-type: none"> Part 5 of the EP&A Act, with regards to environmental assessment The <i>Threatened Species Conservation Act 1995</i> (TSC Act), with regards to impact on threatened species and ecological communities.

Protection of airspace approval

The Airports Act protects airspace at and around airports, as described in **Section 2.3.7**. Section 182 of the Airports Act defines any activity that intrudes into prescribed airspace as being a controlled activity. The Airports (Protection of Airspace) Regulations 1996 requires that the Commonwealth Department of Infrastructure and Regional Development (DIRD) or Sydney Airport operator to approve long and short term applications to carry out controlled activities and to impose conditions on an approval.

The equipment required to be used during the construction of the proposal would penetrate the OLS for east-west runway during construction, as discussed in **Section 4.4**. Construction of the proposal also requires freight rail to be diverted via

the western rail bridge while the eastern rail bridge is being built. While the OLS is currently breached by freight rail, use of the western rail bridge would result in breaches of up to 0.25 metres more than what occurs at present. Because the proposal consists of the erection of a building, structure or thing that is not intended to remain in place for longer than three months, the proposal can be considered a short-term controlled activity, as defined in the Airports (Protection of Airspace) Regulations 1996. The proposal would therefore require approval under Section 183 of the Airports Act. In the first instance, the application would be reviewed by SACL, after consultation with the Civil Aviation Safety Authority (CASA) and Airservices, or may be referred by the airport to DIRD for a decision.

Roads and Maritime is consulting SACL with relation to the interaction of the proposal with Sydney Airport's airspace and necessary approvals. The description of the Sydney Airport protected airspace and the assessment of relevant activities in relation to the protected airspace are discussed in further detail in **Section 4.4** and **Section 7.2**.

5.2.2 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval must be obtained from the Commonwealth Minister for the Environment for proposed actions that have the potential to significantly impact on matters of national environmental significance (MNES), including:

- World Heritage properties
- RAMSAR wetlands
- Threatened species and communities listed under the EPBC Act
- Migratory species listed under the EPBC Act
- Nuclear actions, including uranium mining
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act also requires approval from the Minister for the Environment for any action by:

- A Commonwealth agency that is likely to have a significant impact on the environment
- A person on Commonwealth land that is likely to have a significant impact on the environment (including impacts outside of Commonwealth land)
- Any person outside of Commonwealth land that is likely to have a significant impact on the environment on Commonwealth land.

These approval requirements apply irrespective of any approvals obtained under State law.

This REF has considered the Significant Impact Guidelines 1.2: Actions on, or impacting upon Commonwealth land, and actions by Commonwealth agencies (DSEWPaC, 2013) (refer to **Appendix A**). While the proposal is partially located on Commonwealth land, it is not likely to have a significant impact on the environment

(including impacts outside of Commonwealth land), as confirmed by the environmental assessment in **Chapter 7**.

5.3 State environmental planning policies

5.3.1 State Environmental Planning Policy (Infrastructure) 2007

The objective of State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) is to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for a road and is to be carried out on behalf of Roads and Maritime, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and would not affect land or development regulated by State Environmental Planning Policy No. 14 – Coastal Wetlands, State Environmental Planning Policy No. 26 – Littoral Rainforests, State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (Transitional Major Projects) 2005.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities before the start of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in **Chapter 6** of this REF.

5.3.2 State Environmental Planning Policy No 55 – Remediation of Land

The objective of State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55) is to provide a statewide approach to the remediation of contaminated land for the purpose of minimising the risk of harm to the health of humans and the environment. In accordance with clause 7(1) of SEPP 55, a consent authority must not consent to the carrying out of any development on land unless it has considered whether the land is contaminated. If the land is unsuitable, remediation must take place before the land can be developed.

Contamination is present within the proposal area as:

- Non-friable asbestos north of Mill Pond Road
- Stockpiled material within the wetland north of Mill Pond Road
- Total petroleum hydrocarbons (TPH) and polycyclic aromatic compounds (PAH) within soil.

The proposal is considered to be a Category 2 remediation work under SEPP 55 in that it may be carried out without consent under the ISEPP (refer to clause 14(1)(ii)). The notification requirement under clause 16 would apply, and notice would be provided in writing to Botany Bay City Council at least 30 days before construction begins and after the remediation work is complete.

The remediation action plan for the proposal would be developed in accordance with the contaminated land planning guidelines and guidelines under the *Contaminated Land Management Act 1997*, as per section 17 of SEPP 55.

5.4 Local environmental plans

5.4.1 Botany Bay Local Environmental Plan 2013

The proposal is located within the Botany Bay local government area (LGA). The principal relevant local environmental planning instrument under the EP&A Act is the Botany Bay Local Environmental Plan 2013 (Botany Bay LEP).

The proposal is permissible in all the zones relevant to the proposal outlined in **Table 5-2**. However, the proposal would be permissible without consent from Botany Bay Council, in accordance with Clause 94 of the ISEPP (refer to **Section 5.3.1**).

Most of the proposal area is within the existing road corridor, so the proposal would not substantially impact other land uses. However, some land zonings under the LEP would be affected. **Table 5-2** lists these zones, a summary of their objectives and how the proposal is consistent with these objectives. The zones are shown on **Figure 5-2**.

Table 5-2 Local environmental plan zones affected by the proposal

Zone	Objective	Consistency of the proposal with the objectives
SP2 – Airport	<ul style="list-style-type: none"> To provide for special land uses that are not provided for in other zones To provide for sites with special natural characteristics that are not provided for in other zones To facilitate development that is in keeping with the special characteristics of the site or its existing or intended special use, and that minimises any adverse impacts on surrounding land. 	<p>The proposal is consistent with the first objective of these zones as it provides special land uses (railway and classified road uses) that are not provided for in other zones. The proposal is also consistent with the third objective, in that it keeps with the special characteristics of the area and keeps with its existing and intended use, which is road use.</p>
SP2 – Railway		
SP2 – Classified Road		
RE1 – Public Recreation	<ul style="list-style-type: none"> To enable land to be used for public open space or recreational purposes To provide a range of recreational settings and activities and compatible land uses To protect and enhance the natural environment for recreational purposes. 	<p>The proposal is consistent with the first and third objectives, as it would reinstate, enlarge and improve the Dr Darragh Reserve.</p>
IN2 – Light Industrial	<ul style="list-style-type: none"> To provide a wide range of light industrial, warehouse and related land uses To encourage employment opportunities and to support the viability of centres To minimise any adverse effect of industry on other land uses To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area To support and protect industrial land for industrial uses. 	<p>The proposal is consistent with the fourth objective as it would improve walking and cycling facilities.</p>
B4 – Mixed Use	<ul style="list-style-type: none"> To provide a mixture of compatible land uses To integrate suitable business, office, residential, retail and other development in accessible locations so as to maximise public transport patronage and encourage walking and cycling. 	<p>The proposal is consistent with the second objective as it would improve walking and cycling facilities.</p>

Zone	Objective	Consistency of the proposal with the objectives
B5 – Business Development	<ul style="list-style-type: none"> To enable a mix of business and warehouse uses, and bulky goods premises that require a large floor area, in locations that are close to, and that support the viability of, centres. 	The proposal is consistent with the zone’s objective by improving traffic flow and reducing travel times within and to/from Mascot, thereby improving connectivity with centres.

Note: Consent as described in this table is not required from Botany Bay Council, in accordance with Clause 94 of the ISEPP (refer to **Section 5.3.1**).

5.5 Other relevant State legislation

5.5.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* aims to protect, restore and enhance the quality of the environment, to reduce risk to human health and provide information to the public about environmental protection and pollution. The POEO Act is administered by the Environment Protection Authority and provides for the regulation and authorisation of discharges to the environment through issuing of an environment protection licence (EPL) for scheduled developments and activities, as listed on Schedule 1 of the POEO Act.

Schedule 1 lists scheduled activities, including road construction on classified roads. The scheduled activities set out in Schedule 1 that are most relevant to Roads and Maritime include:

- Concrete works (cl 13)
- Crushing, grinding or separating materials (cl 16)
- Land-based or water-based extractive activities, such as extraction, dredging, quarrying, processing or storage (cl 19)
- Dealing with certain types of waste (see below)
- Road construction, widening or re-routing (but not maintenance or operation) where this results in four or more traffic lanes. To activate this clause, the road must be at least one kilometre to five kilometres in length depending on whether it is in a metropolitan or non-metropolitan area and on a freeway, tollway or main road (cl 35).

The proposal involves extractive activities, crushing, grinding or separating waste processing or storage. Therefore, based on the concept design, the proposal is considered a scheduled activity for the purposes of clause 19 under Schedule 1 of the POEO Act and an environment protection licence may be required. This would be confirmed during detailed design investigations.

In addition, the POEO Act and the Protection of the Environment (Waste) Regulation 2005 are the key pieces of legislation that regulate waste in NSW. They contain the requirements for managing, storing, transporting, processing, recovering and disposing of waste. Applying waste to land in NSW (including temporary storage and reusing materials back into the construction of a road for example) may trigger various regulatory requirements such as the need to hold an environment protection licence or pay the waste and environment levy. However, a ‘resource recovery exemption’ may be applicable for the land application if it is a genuine, fit for purpose, reuse of the waste rather than another path to waste disposal.

An exemption facilitates the use of specific waste materials outside of certain requirements of the waste regulatory framework. For each exemption there is a corresponding ‘resource recovery order’ that specifies the requirements that must be

met by suppliers of the material. The EPA has issued general resource recovery orders and exemptions for many materials including:

- Excavated natural material
- Excavated public road material
- Raw mulch
- Reclaimed asphalt pavement
- Recovered aggregate.

These orders and exemptions may be used for the proposal without seeking approval from the EPA.

5.5.2 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* (CLM Act) establishes the processes for investigating, and where appropriate, remediating contaminated land and contaminated groundwater. Section 60 of the CLM Act imposes a duty for proponents to report to the NSW EPA if land contamination poses a significant risk of harm. Section 17 and 23 of the CLM Act regulate the provision of investigation orders and remediation orders.

Contamination within the proposal poses a potential risk to future site users and construction users. Roads and Maritime would carry out remediation of land as part of the proposal, in accordance with the processes outlined in SEPP 55 (refer to **Section 5.3.2**).

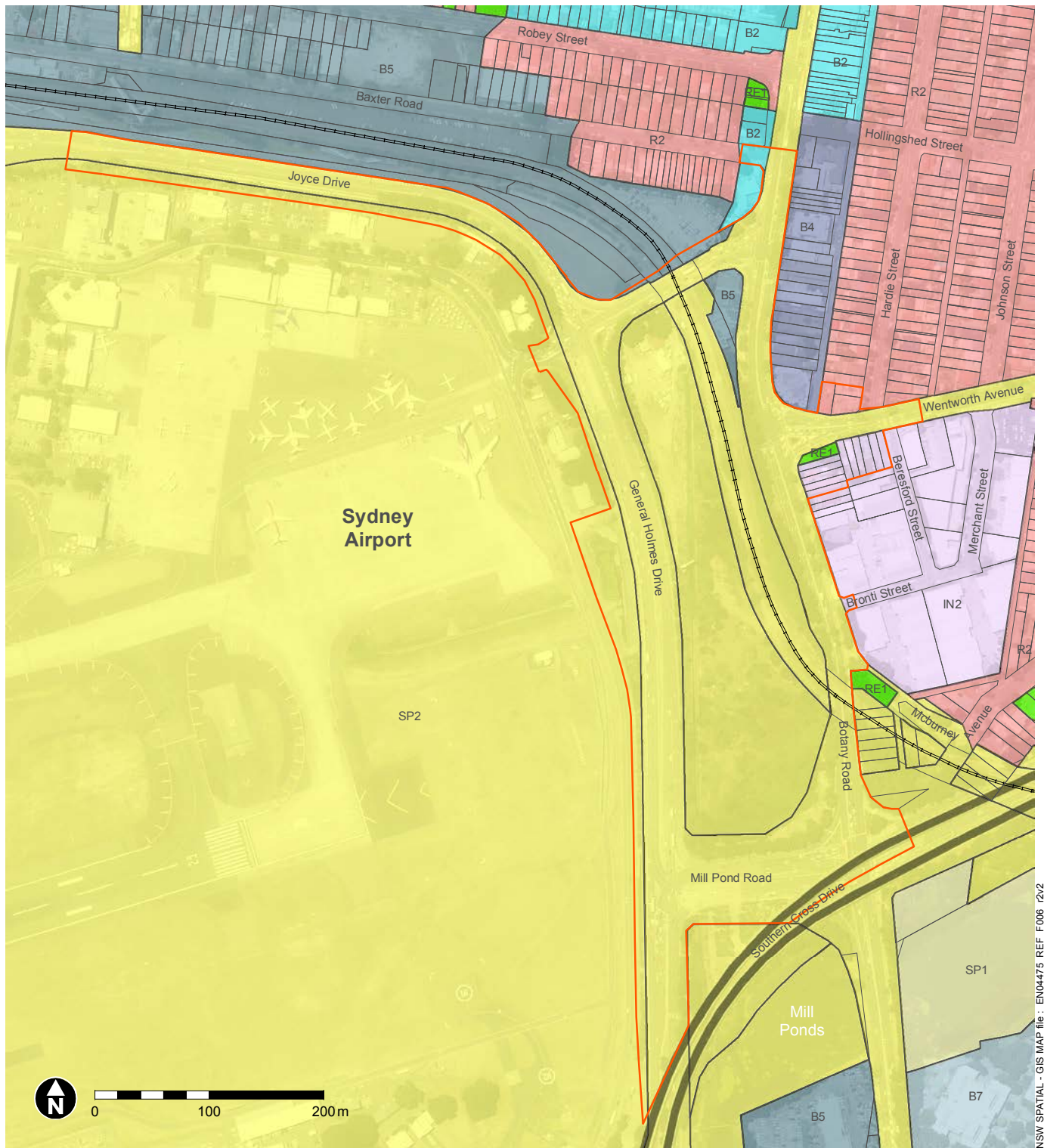
5.5.3 Heritage Act 1977

The *Heritage Act 1977* aims to protect and preserve items of environmental heritage (natural and cultural) in NSW. The Act provides for the protection of items of local, regional and State heritage significance. It establishes a list of State heritage items and outlines processes for approving development that may impact items of heritage significance. The proposal would not disturb or excavate a state heritage listed item, and therefore would not require an approval from the NSW Heritage Council.

The *Heritage Act 1977* protects relics, which can include archaeological material, features and deposits, as defined in Section 4(1) of the Act. Section 139(1) of the Act states that:

“A person must not disturb or excavate any land knowingly or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit.”

The statement of heritage impact prepared for this REF found that the proposal would not have a significant impact on any non-Aboriginal heritage (refer to **Section 7.3** and **Appendix I**). The proposal may impact on areas of archaeological potential. Accordingly, Roads and Maritime would apply for an excavation permit under Section 140 of the Act from the NSW Heritage Council or delegate.



NSW SPATIAL - GIS MAP file - EN04475_REF_F006_12x2

Figure 5-2 Zoning under the Botany Bay LEP

Legend

- Proposal area boundary
 - Motorway
 - Railway
- Zoning under Botany Bay Local Environmental Plan 2013
- | | | |
|---|---|---|
| B2 Local Centre | B7 Business Park | RE1 Public Recreation |
| B4 Mixed Use | IN2 Light Industrial | SP1 Special |
| B5 Business Development | R2 Low Density Residential | SP2 Infrastructure |

5.5.4 Land Acquisition (Just Terms Compensation) Act 1991

Eighteen properties would be partially or wholly acquired as part of the proposal.

All property acquisitions would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, which aims to guarantee just compensation terms for land that is acquired by an authority of the State.

Roads and Maritime would continue to consult with affected landowners during the proposal development.

5.5.5 Water Management Act 2000

The *Water Management Act 2000* (Water Management Act) controls the extraction of water, the use of water, the construction of infrastructure such as dams and weirs, and any activities in or near water sources in NSW. The Greater Metropolitan Region Groundwater Sources and the Greater Metropolitan Region Unregulated River Water Sources plans apply to the proposal. The proposal is therefore subject to the Water Management Act.

Section 56 of the Water Management Act establishes access licences for the taking of water within a particular water management area. Under Section 18(1) of the Water Management (General) Regulation 2011, Roads and Maritime, as a roads authority is exempt from the need to obtain an access licence in relation to water required for road construction and road maintenance.

Sections 89 to 91 of the Water Management Act establish three types of approvals which may be required by a proponent. These are water use approvals, water management work approvals and activity approvals.

Water use approvals

Water use approvals allow the holder of the approval to use water for a particular purpose at a particular location in a water management area. Clause 31(1) of the Water Management (General) Regulation 2011 provides that Roads and Maritime, as a roads authority, is exempt from a water use approval in relation to the use of water for roads purposes.

Water management work approvals

Water management work approvals allow the holder to carry out types of water management work at certain locations, including water supply works, certain drainage works and flood works. Roads and Maritime would not carry out any construction work for the proposal that would require a water management work approval.

Activity approvals

Activity approvals are required when a certain activity is likely to affect waterfront land or interfere with an aquifer. The proposal may have a minor impact on groundwater due to dewatering of sandy soils near the Wentworth Avenue underpass. However, clause 38 of the Water Management (General) Regulation 2011 provides that Roads and Maritime, as a roads authority, is exempt from requiring controlled activity approval for all controlled activities that it carries out in, on or under waterfront land. **Section 7.6** discusses the proposal's potential impact on groundwater.

In September 2012, the NSW Government released the Aquifer Interference Policy which aims to protect groundwater aquifers while balancing different water uses. The *Water Management Act 2000* defines a number of aquifer interference activities including penetration of, interference with and obstruction of water flow within an aquifer. Taking and disposing water from an aquifer are also defined as being aquifer interference activities. Any activity that results in the reduction in the groundwater resource pool of three megalitres per year or more, or at an instantaneous rate of greater than five litres per second will require a groundwater extraction and aquifer interference license.

Groundwater levels in the proposal area are high and relatively close to the surface. The low point of the underpass would be below the top of the groundwater table. However, the underpass would be designed to avoid the inflow of groundwater into the underpass and the relatively small size of the underpass in relation to the aquifer would not result in any obstruction.

Dewatering of the sandy soils around the underpass may be required during construction. The dewatering impacts on groundwater users and groundwater dependent ecosystems would be limited, however, it is likely that an approval under the Water Management Act for dewatering would be required.

Roads and Maritime would consult with the NSW Office of Water to confirm licensing and approval requirements.

5.6 Policies and guidelines

5.6.1 Sydney Airport Master Plan 2033

The Sydney Airport Master Plan 2033 has been prepared in accordance with the Airports Act and Part 5 of the Airports Regulations 1997, with regards to land use and related planning, zoning or development. It was approved by the Australian Government on 17 February 2014.

The Master Plan outlines Sydney Airport's plan for operation and development for a twenty-year period to 2033. It covers new major developments in Sydney Airport terminal and the upgrade of existing infrastructure. The plan also includes the improvement of ground transport infrastructure, including surrounding roads and intersections, while encouraging increased access by public transport, bicycles and pedestrians.

The Master Plan references the recommendations in the State Infrastructure Strategy for building WestConnex, fixing road pinch points in the Sydney Airport and Port Botany precinct, reducing rail fares to Sydney Airport, adding new bus routes to Sydney Airport and enhancing the capacity of freight rail lines. The proposal is therefore consistent with the master plan as it would improve road network efficiency and reduce congestion within the proposal area, thereby facilitating improved access to Sydney Airport.

The proposal has been found to be consistent with the Sydney Airport planning objectives. **Table 5-3** lists the Sydney Airport Master Plan zones which overlap with the proposal area, a summary of their objectives and how the proposal is consistent with these objectives.

Table 5-3 Sydney Airport Master Plan zones affected by the proposal

Zone	Objective	Consistency of the proposal with the objectives
AD1 – Aviation Activity and Aviation Support Facilities	<ul style="list-style-type: none"> • Provide for aviation activities and aviation support facilities • Facilitate compatible and ancillary functions within the zone provided that development does not render the land unfit for aviation activities • Protect the long-term viability and operational efficiency of Sydney Airport for its primary function • To ensure heritage items are appropriately considered and managed • Coordinate the orderly and economic use and development of land until such time as it is required for aviation activities or aviation support facilities. 	<p>The primary use of the proposal is for roads, and is therefore permissible.</p> <p>The proposal is consistent with the second objective in that it would facilitate improved road conditions within the site, which is a compatible function with airport operations.</p>
BD1 – Business Development	<ul style="list-style-type: none"> • To enable a mix of business, retail and industrial uses in locations that are close to and that support the functioning of the airport • To integrate suitable and compatible land uses in accessible locations so as to maximise public transport patronage and encourage cycling • To encourage employment opportunities and promote businesses along main roads • Enable a limited range of other land uses that will provide facilities and services to meet the day-to-day needs of local workforce • To ensure heritage items are appropriately considered and managed • To maximise, where possible, the use of existing access and egress points. 	<p>The primary use of the proposal is for roads, and is therefore permissible.</p> <p>The proposal is consistent with the second objective in that it would improve pedestrian and cyclist facilities in the proposal area. By improving traffic flow and reducing congestion, it would also maximise the existing access from Sydney Airport via Ross Smith Drive, and therefore be consistent with the sixth objective.</p>
EC1 – Environmental Conservation	<ul style="list-style-type: none"> • Protect the ecological and scenic values of the waterways in this area • Maintain the health and natural water flows of the waterway • Enable maintenance dredging of the Mill Stream and related activities to maintain water depths and to ensure sedimentation accumulation is managed and controlled • To ensure heritage items are appropriately considered and managed 	<p>The primary use of the proposal is for roads, and is therefore permissible.</p> <p>The proposal is consistent with the first objective as it would improve the ecological values surrounding the stormwater channel following construction. The proposal is consistent with the second objective as it would maintain water quality within the stormwater channel.</p>

Zone	Objective	Consistency of the proposal with the objectives
BD2 – Enviro-Business Park	<ul style="list-style-type: none"> • Provide for a limited range of sustainable development, particularly for business purposes, that will not compromise the ecological, cultural or scientific value of this land or adjacent land including the Mill and Engine Ponds and the Mill Stream • Ensure buildings achieve design excellence having particular regard to the surrounding natural and built environment and the associated sensitivities • Encourage appropriate employment opportunities in accessible locations • Enable a limited range of other land uses that will provide facilities and services to meet the day-to-day needs of the local workforce • Incorporate appropriate environmental management principles and controls into development proposals • To ensure heritage items are appropriately considered and managed 	<p>The proposal can be characterised as earthworks or engineering works (refer to Section 5.2.1) in the meaning of the Airports Act and therefore is permissible.</p> <p>The proposal is consistent with the fourth objective in that it would provide improved pedestrian and cyclist facilities in the proposal area. It is also consistent with the fifth objective in that it incorporates appropriate management principles and controls into the REF, and would continue to do so in any subsequent environmental assessment documentation.</p>

5.6.2 Sydney Airport Environment Strategy 2013-2018

The proposal is consistent with the Sydney Airport Environment Strategy 2013-2018 which forms part of the Master Plan.

With regards to Section 89(1)(m) of the Airports Act, the proposal is assessed as not being a development of a kind that is likely to have a significant environmental or ecological impact. With regards to Section 89(1)(n), the proposal is assessed as not being a development which affects an area identified as environmentally significant in the Sydney Airport Environment Strategy 2013-2018. While the proposal is upstream of the Mill Ponds/ Sydney Airport Wetlands which is an environmentally significant area, the proposal's impact on its heritage and environmental values has been determined to be negligible (refer to **Section 7.6** and **7.8**).

5.6.3 National Airports Safeguarding Framework

The National Airports Safeguarding Framework aims to improve community amenity by minimising aircraft noise-sensitive development near airports, and to improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning decisions. This proposal is consistent with the National Airports Safeguarding Framework as it recognises and addresses aviation safety requirements during design and construction. The REF also considers the impacts of the proposal on aircraft noise, particularly during construction (refer to **Section 7.7**).

5.7 Confirmation of statutory position

With respect to NSW approvals, Roads and Maritime is both the proponent and determining authority for the proposal. Clause 94 of the ISEPP provides that the proposal may be carried out without development consent and is therefore subject to assessment under Part 5 of the EP&A Act. Development consent from Botany Bay City Council is not required. Additional permits and approvals are required for this proposal in addition to the Part 5 determination, and these are detailed in **Section 8.3**.

With respect to activities on Commonwealth land:

- A Commonwealth building approval is required in accordance with Section 2.02 of the Airports (Building Control) Regulations 1996 – the activity being defined as earthworks or engineering works. Approval through a development application process would be sought from the airport-lessee company, who in this case is SACL
- A Commonwealth controlled activity approval would be required from SACL and potentially DIRD under Section 183 of the Airports Act – as the activity intrudes into prescribed airspace.

An approval from the Minister for the Environment under the EPBC Act is not required, as:

- The proposal would not constitute a significant impact on MNES
- The proposed activity on Commonwealth land is not likely to have a significant impact on the environment (including impacts outside of Commonwealth land)
- The proposed activity is not likely to have a significant impact on the environment on Commonwealth land.

6 Stakeholder and community consultation

This chapter presents consultation that has been carried out for the proposal, proposed consultation activities, and the results of consultations with the local community, the Aboriginal community, and relevant government agencies and stakeholders.

6.1 Consultation strategy

Since September 2013, Roads and Maritime has been consulting with the community and affected stakeholders on an ongoing basis. The purpose of consultation is to:

- Involve key government agencies and stakeholders in the evaluation of project options
- Seek community feedback on Roads and Maritime's proposal
- Receive comments from those affected by the proposal
- Seek community ideas to be considered in the concept design
- Advise directly affected stakeholders of the proposal and potential impacts
- Advise the community how they can obtain further information or communicate concerns, complaints or suggestions.

The following sections outline the consultation that has been carried out to date.

6.2 Community involvement

6.2.1 Proposal report

The WestConnex Enabling Works Proposal Report (Roads and Maritime, 2013) and strategic concept design were placed on display for community comment from 11 November 2013 to 10 January 2014. The report documents the five strategic project options and the process by which the preferred option (the proposal) was selected. The public was invited to comment on the report during the public display period.

In conjunction with the display, Roads and Maritime consulted the community in the following ways:

- Notification of property owners potentially affected by acquisition via a door knock on 11 November 2013. Roads and Maritime also provided a property acquisition fact sheet and a land acquisition information guide to residents who were available. Individual meetings with the project manager were arranged at different times for residents unavailable on 11 November 2013
- Notification of residents near the Wentworth Avenue intersection via a door knock
- Notification of businesses on Botany Road via a door knock on 18 November 2013
- Community update brochure distributed to 24,000 households and businesses on 19 November 2013. It provided information on contact details and planned community information sessions, and requested community feedback
- Community information sessions. Roads and Maritime held two sessions at Mascot Public School on 23 and 28 November 2013. These were to provide residents, business operators and owners an opportunity to speak with and provide feedback to project representatives and representatives from the wider WestConnex project

- Pre-consultation briefings with key stakeholders such as government agencies and corporations, including Sydney Airport Corporation Limited and Australian Rail Track Corporation. The project team also met with business operators, potentially affected property owners and other stakeholders to discuss specific issues and impacts of the proposal.
- A newspaper advertisement published in the *Wentworth Courier* on 20 November 2013. It encouraged community feedback, identified the ways to comment, and invited the community to attend the information sessions
- A project website published on the Roads and Maritime website to provide further information on the proposal. It is updated when new information on the proposal is available.

Roads and Maritime received 58 responses, including 54 from the community and four from local businesses and agencies (Botany Bay City Council, NSW Taxi Council, Park n Fly and Sydney Airport Corporation Ltd). These were received in the form of letters, emails, phone calls, face-to-face responses and feedback from the staffed displays. Twenty-one people registered their attendance at the community information sessions.

The WestConnex Enabling Works – Airport East Precinct: Community Consultation Report (Roads and Maritime, 2014b) outlines issues raised by the community between 11 November 2013 and 10 January 2014. The report also provides responses from Roads and Maritime. These issues and where they are addressed in this REF are summarised in **Table 6-1**. As shown in **Table 6-1**, the most common concern relates to property acquisition. Accordingly, Roads and Maritime held face-to-face meetings with all potentially affected property owners to discuss the proposal, anticipated timeframes and the property acquisition process. Regular contact between the landowners and Roads and Maritime has been promoted and, accordingly, time and effort has been taken to understand concerns and issues associated with compulsory acquisition.

Table 6-1 Main issues raised by the community during consultation for the Proposal Report

Issue category	Summary of issues raised	Where addressed in this REF
Property acquisition	<p>Some respondents queried which properties would be acquired. One respondent raised concern about the adverse impacts of property acquisition.</p> <p>Some respondents also requested additional information on the property acquisition process including the timeframes for acquisition.</p> <p>There were also queries about capital gains tax, property swaps and the impact of the proposal on property values.</p>	<p>Detailed responses to these queries are provided in the Community Consultation Report (Roads and Maritime, 2014b).</p> <p>Details on property acquisition are provided in Section 4.8.2. Impacts of property acquisition are assessed in Section 7.12.</p>
Support or opposition to the proposal	<p>Some respondents expressed strong support for the proposal and the consultation approach. A few respondents were not in favour of the proposal, expressing concern about the effectiveness of the proposal and its value.</p> <p>One respondent expressed concern about the availability of route alternatives within the road network after the proposal is built.</p>	<p>Detailed responses to these queries are provided in the Community Consultation Report (Roads and Maritime, 2014b).</p> <p>The strategic need and justification for the proposal are presented in Section 2.1 and 9.1.</p>

Issue category	Summary of issues raised	Where addressed in this REF
Traffic volume and congestion	Some respondents expressed concern that the proposal would lead to flow-on effects to local roads nearby, including congestion, delays at intersections and increases in traffic.	Detailed responses to these queries are provided in the Community Consultation Report (Roads and Maritime, 2014b). Traffic and transport impacts are assessed in Section 7.1 .
Request for more information	Some respondents expressed interest in receiving further updates on the proposal.	Interested stakeholders have been captured in the update list, and will be included in future updates. The consultation process is presented in Section 6.6 .
Public transport and pedestrian facilities	Some respondents commented on the connectivity of the proposed shared-use paths in the proposal area. Some respondents made suggestions or comments about public transport services and facilities for the proposal area including providing a bus lane, relocating the bus stop and accessing the bus stop.	Detailed responses to these queries are provided in the Community Consultation Report (Roads and Maritime, 2014b). Proposed pedestrian and cyclist connectivity are presented in Section 4.2.3 and assessed in Section 7.1 .
Route design	Some respondents raised concerns and made suggestions about the proposed arrangement of lanes and permitted movements at intersections.	Detailed responses to these queries are provided in the Community Consultation Report (Roads and Maritime, 2014b). Proposed intersection arrangements are presented in Section 4.2 and impacts on traffic and transport are assessed in Section 7.1 .
Drainage and flooding	Some respondents expressed concern that the proposal would impact drainage and flooding in the area. One respondent raised a concern about the safety of the proposed Wentworth Avenue underpass during flood events, and the safety hazards associated with a water-damaged road surface.	Drainage infrastructure is presented in Section 4.2 and the impacts of the proposal on hydrology and flooding are assessed in Section 7.6 .

6.2.2 Preferred proposal report

The Preferred Proposal Report (Roads and Maritime, 2014a) was completed in June 2014. The report outlined the preferred proposal, as well as alternatives. It is currently on the Roads and Maritime website.

6.3 Aboriginal community involvement

As part of preliminary investigations, a preliminary assessment of impact on Aboriginal cultural heritage was carried out for the proposal. It was based on Stage 1 of the Roads and Maritime Services Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime, 2011). This involved a desktop

investigation and site inspection by the Roads and Maritime Aboriginal Cultural Heritage Advisor.

The Aboriginal heritage issue of clearance letter confirmed that the proposal is unlikely to have an impact on Aboriginal cultural heritage (refer to **Appendix N**). The Aboriginal heritage assessment is presented in **Section 7.11**.

6.4 ISEPP consultation

Clause 13 of the ISEPP (refer to **Section 5.1**) requires consultation with Botany Bay City Council for development that would impact Council-related infrastructure or services. Because the proposal involves adjusting and relocating Council-owned utilities, Roads and Maritime is required to consult with Council about potential impacts.

Clause 14 of the ISEPP also requires consultation with Council for a development that would have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item). A number of heritage items listed on the Botany Bay LEP are located within and next to the proposal area. Roads and Maritime is required to consult with Council regarding impact on non-Aboriginal heritage, as two heritage-listed houses would need to be demolished for the proposal.

Clause 15 of the ISEPP states that a public authority must not carry out a development on flood-labile land that would change flood patterns other than to a minor extent, unless the authority has given written notice of the intention to carry out the development to the relevant council. Roads and Maritime has consulted with Council regarding the proposal and flooding as the proposal area is known to flood.

Clause 16 of the ISEPP states that a consent authority must not carry out specific types of development without giving written notice to the specified authority and taking their responses into consideration. No part of the proposal would be located on land reserved under the *National Parks and Wildlife Act 1974* (NPW Act), next to a declared marine park, declared aquatic reserve or foreshore area. Further, the proposal would not involve development over navigable waters or for the purposes of an educational establishment, health services facility, correction centre, group home or for residential purposes. Therefore, Roads and Maritime is not required to carry out formal consultation with Botany Bay City Council under this clause.

ISEPP consultation with Botany Bay City Council under clauses 13, 14 and 15 was carried out on 1 August 2014. The ISEPP consultation letter to Council also included a copy of the draft Non-Aboriginal Statement of Heritage Impact (SOHI) for review and comment. Botany Bay City Council confirmed it has no comments to add to those it already provided as part of consultation for the Proposal Report. Comments received from Botany Bay City Council and responses to these comments are provided in the Community Issues Report (Roads and Maritime, 2014b) which is available on the project website. **Table 6-2** summarises the issues raised by Botany Bay City Council and notes where these issues are addressed in this REF.

Table 6-2 Summary of issues raised by Botany Bay City Council

Issue category	Issues raised	Relevant REF section
Non-Aboriginal heritage	Council requested that local heritage items be appropriately documented before any demolition, to ensure they are included on a local heritage register, and for this register	A statement of heritage impact was prepared for this REF. It is summarised in Section 7.3 and provided in full in Appendix I .

Issue category	Issues raised	Relevant REF section
	to be provided to council.	
Traffic volume and congestion	<p>Council:</p> <ul style="list-style-type: none"> • Asked if additional studies are being carried out to assess traffic and parking impacts in local streets • Raised concerns about increased traffic movements in Botany Bay LGA and additional traffic in local streets • Requested traffic lights for the Wentworth Avenue, Johnson Street and Merchant Street intersection • Expressed concern about restricting the left turn from Botany Bay to Wentworth Avenue during construction. 	A traffic and transport assessment was prepared for this REF. It is summarised in Section 7.1 , and provided in full in Appendix G .
Request for more information	Council requested survey data, construction plans and landscape plans.	Roads and Maritime is continuing discussions and encouraging free exchange of information with Botany Bay City Council. Survey data, construction plans and landscape plans will be made available to council as they are completed for the concept design.
Public transport, pedestrian and cyclist facilities	<p>Council:</p> <ul style="list-style-type: none"> • Requested details on additional public transport provision or improvements for existing public transport • Stated that the existing shared-use path alongside Joyce Drive is deficient as a link to the Mascot retail shopping area and Sydney Airport domestic terminal • Requested that pedestrian connectivity along Baxter Road be considered as part of the proposal • Requested that consideration be given to reconstructing General Holmes Drive on the western side of the rail line at the connection with Joyce Drive as a driveway and maintenance access to deter use and improve safety for pedestrians and cyclists • Stated that it supports a shared-use path at General Holmes Drive (over the freight rail line) as well as a connection with the current shared-use path along Joyce Drive • Proposed that a T-intersection be created at the Joyce Drive and General Holmes Drive intersection to cater for a pedestrian and cyclist crossing • Suggested that an alternative could be to provide a shared-use path in the proposed Wentworth Avenue underpass, linking to the existing shared-use path in Joyce Drive. 	<p>Pedestrian connectivity outside of the proposal area will be considered by Roads and Maritime as part of a different project. Roads and Maritime will continue to consult with Council regarding pedestrian and cyclist facilities.</p> <p>The traffic and transport assessment considers public transport, pedestrian and cyclist connectivity. It is summarised in Section 7.1 and provided in full in Appendix G.</p>
Drainage and flooding	Council requested that a detailed flood study be carried out and the results made available to council.	A hydrologic and hydraulic assessment was prepared for the REF. It is summarised in Section 7.6 and provided in full in Appendix K .

6.5 Government agency and stakeholder involvement

Roads and Maritime has consulted with government authorities and agencies throughout the proposal's development. This has involved regular correspondence, meetings and briefings.

In July 2013, relevant government authorities, agencies and utilities were contacted by letter detailing the proposal and providing an opportunity to comment. The stakeholders contacted were:

- The Commonwealth Department of Infrastructure and Regional Development
- Sydney Airport Corporation Limited (SACL)
- Botany Bay City Council
- Sydney Ports
- NSW Ports
- Australian Rail Track Corporation (ARTC)
- Jemena
- Savcor
- Gorodok/ Qenos
- Caltex
- Ausgrid
- NBN Co
- Telstra
- Optus
- Sydney Water
- BIKESydney
- Bicycle NSW
- Transport for NSW (TfNSW).

Table 6-3 Summary of issues raised by government agencies and stakeholders prior to the REF

Agency/ stakeholder	Issue category	Issues raised	Response and relevant REF section
TfNSW	Public transport	TfNSW requested that the bus stop south of the intersection of Botany Road and Wentworth Avenue provide for increases in bus service volume and additional routes.	The bus stop has been redeveloped to allow for additional capacity as part of the proposal (refer to Section 4.2.3).
ARTC	Rail design	ARTC requested that the design for rail track and bridges meet ARTC regulations.	A rail design consultant was engaged to design the rail track in accordance ARTC regulations as part of the concept design.

During REF preparation, Roads and Maritime provided ARTC and the NSW EPA with an opportunity to comment on the proposal. The outcomes of this consultation with EPA are summarised in **Table 6-4**. No responses specific to the REF consultation were received from ARTC, however, Roads and Maritime are continuing to work closely with ARTC during the detailed design process.

Table 6-4 Summary of issues raised by government agencies and stakeholders during consultation for the REF

Agency/ stakeholder	Issue category	Issues raised	Relevant REF section
EPA	Noise and vibration	The EPA stated that the REF should include a comprehensive noise impact assessment that clearly identifies noise impacts on the community and any planned noise mitigation measures.	A construction and operational noise and vibration impact assessment was prepared for the REF. It is summarised in Section 7.2 and provided in full in Appendix H .
	Cumulative noise impacts	The EPA stated that the noise impact assessment should address cumulative noise impacts from the projects and activities carried out at Sydney Airport and Port Botany.	A construction and operational noise and vibration impact assessment was prepared for the REF. It is summarised in Section 7.2 and provided in full in Appendix H . Cumulative noise impacts are assessed in Section 7.16 .
	Licensing	The EPA stated that the REF should investigate the requirement for the proposal to be licensed under the <i>Protection of the Environment Operations Act 1997</i> (POEO Act), particularly in relation to railway systems activities, as defined in Schedule 1 of the POEO Act.	The primary purpose of the proposal is for road construction and accordingly would be characterised as such for the purposes of the POEO Act. An EPL for road construction is not required for this proposal as discussed in Section 5.5.1 .
	Ongoing or future consultation	The EPA requested the opportunity to provide more detailed comments after the REF is completed and before construction begins.	Ongoing and future consultation is discussed in Section 6.6 .

Roads and Maritime has been and will continue to work closely with SACL regarding the road improvements in the proposal, as well as discussing the content and structure of the REF. The key issues discussed with SACL are summarised in **Table 6-5**.

Table 6-5 Summary of issues raised by SACL

Issue category	Issues raised	Response and relevant REF section
Environment	SACL stated that the impact on the environment should be assessed in the REF.	The environmental impact assessment for the proposal is documented in detail in Chapter 7 .
Wetlands	SACL stated that the REF should assess potential impact on Botany Wetlands, downstream of the proposal.	The potential impacts on Botany Wetlands have been assessed in Sections 7.5, 7.6, and 7.8 .
Heritage	SACL stated that the REF should assess potential impact on non-Aboriginal heritage that is located on SACL land.	The potential impacts on non-Aboriginal heritage located on Commonwealth land have been assessed in Section 7.4 .
Sydney Airport runway	SACL stated that the east-west runway would not need to be closed. Rather, to ensure aviation safety, use of the runway would need to be temporarily restricted.	This has been noted, and referred to as a restriction in relevant sections of the REF, rather than a closure.
Aviation safety	SACL stated that the impact on aviation safety during construction and	Aviation safety during construction and operation of the proposal has been

Issue category	Issues raised	Response and relevant REF section
	operation of the proposal should be considered.	considered in the REF (refer to Section 4.4).
Approvals process	SACL provided information on the major development plan process provided the major development plan checklist to review the proposal against. SACL also requested that the regulatory pathways for the proposal be clearly outlined in the REF.	The major development plan process has been outlined in Chapter 5 and a copy of the major development plan checklist provided in Appendix A . An outline of the regulatory pathways relevant for the proposal is provided in Chapter 5 .
Ongoing communication	SACL stated the need to continue communication between the two agencies to ensure design integration between Roads and Maritime and SACL developments.	Roads and Maritime are continuing to liaise with SACL to ensure design integration between various Roads and Maritime projects and SACL developments (refer to Section 6.6).
Detailed construction staging	SACL stated that construction staging plans be provided in detail.	A copy of the construction method statement has been provided to SACL.
Runway restriction - noise impacts	SACL requested that an impact assessment of the runway restriction be carried out as part of the REF.	An assessment of the impact of the runway restriction has been carried out for the REF, summarised in Section 7.2 .

6.6 Ongoing or future consultation

While this REF is on public display, all members of the public, government agencies and stakeholders are invited to provide feedback. In addition, two sessions will be held during the public exhibition period to provide the public with an opportunity to learn more about the proposal and to provide feedback. Feedback received during the consultation period will be considered in finalising the proposal. Roads and Maritime will prepare a submissions report to summarise and respond to the issues raised. The submissions report will also detail any design changes required to properly address issues raised. The submissions report will be published on the project website, as outlined below.

Roads and Maritime will:

- Continue to consult with the community, including potentially directly impacted and adjacent property owners, interest groups, government and non-government agencies and the wider community
- Provide regular updates to the community throughout subsequent planning and construction phases
- Invite the community to contact the project team via project phone number and email address with enquiries or concerns about the proposal
- Continue to update the project web page: www.rms.nsw.gov.au/roadprojects/AirportEast.

Roads and Maritime will continue to keep the community informed during construction if it is determined that the proposal should proceed.

6.6.1 Consultation with affected landowners

If the proposal proceeds, Roads and Maritime would consult with all directly affected landholders before the start of construction. Roads and Maritime would consult with:

- Landowners whose land would be acquired, to ensure their concerns are clearly understood and can be addressed wherever possible
- Landowners whose access could be affected (access to private properties would be maintained during construction)
- Landowners affected by construction noise impacts (to discuss individual noise mitigation treatments) and night work (consultation would occur before and during construction).

6.6.2 Consultation with government agencies and service providers

Roads and Maritime would continue to consult with all affected government agencies and service providers during subsequent stages of the proposal. During this time, Roads and Maritime would also provide additional opportunities for comment.

7 Environmental assessment

This chapter provides a detailed description of all potential environmental impacts that could result from the construction and operation of the proposal. It considers the factors specified in the guideline, *Is an EIS Required?* (DUAP, 1999), as required under clause 228(1)(b) of the Environmental Planning and Assessment Regulation 2000. (The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in **Appendix C**). This chapter also includes site-specific safeguards to ameliorate the potential impacts.

As detailed in **Section 4.8.1**, the proposal area is located on private, State and Commonwealth land. The environmental assessment in this chapter considered environmental impacts as a result of the proposal as a whole. However, impacts have been described separately where impacts to Commonwealth land or Commonwealth land leased to SACL differ to impacts to private or State-owned land.

7.1 Land transport and access

The extent and magnitude of potential impacts of the proposal on the road network and road users are assessed in the Traffic and Transport Working Paper (Jacobs, 2014b), which is provided in **Appendix G**. A summary of the assessment is presented in this section.

7.1.1 Methodology

Traffic modelling results discussed in this section were obtained for the study area. The study area for the traffic and transport assessment is bounded by O’Riordan Street, Botany Road, Robey Street and Southern Cross Drive.

Due to the complexity of the road network in and around the proposal area, a traffic model was developed to assess the strategic network and local traffic networks. The extent of the network traffic model encompassed areas between the southern edge of the Sydney central business district, Botany Bay, Anzac Parade and Princes Highway.

Traffic counts carried out at 11 locations between 5 August 2013 and 11 August 2013 provided an indication of existing light and heavy traffic volumes and distribution on the roads within and near the proposal area. These traffic counts were also used to inform the traffic model.

The assessment used a combination of actual data and modelling to identify the following for two scenarios for 2018, the no-build and the operational proposal:

- Network performance. This is commonly measured in terms of the vehicle kilometres travelled (VKT) and vehicle hours travelled (VHT). Increases in VKT indicate that vehicles are forced to travel longer distances, while increases in VHT indicate increased congestion in the road network. Together, these parameters reflect average speed on the network
- Travel time along various routes within the study area. Travel time within the study area is the most appropriate and representative method of measuring performance for this proposal. This is because travel time considers midblock and intersection performance, while considering the impacts of upstream queues upstream on downstream traffic behaviour and performance. Travel time also provides a consistent indicator for network performance that is not

confounded by substantial changes in travel routes and intersection arrangements associated with the proposal

- Average daily traffic. This is the total volume of vehicle traffic for a year, averaged to provide a number of vehicles per day.

7.1.2 Existing environment

Road network

Section 2.3 describes the road network in the proposal area. As noted, the proposal area includes main roads such as General Holmes Drive, Joyce Drive, Botany Road, and Wentworth Avenue, and five major intersections with traffic lights.

Existing traffic volumes and peak periods

The road network within the study area carries high volumes of traffic. Most roads carry an average weekday daily traffic flow of 25,000 to 55,000 vehicles per day. Traffic counts in August 2013 identified that the highest average weekday daily traffic volumes occur at the following locations:

- General Holmes Drive between Joyce Drive and Mill Pond Road: 26,848 vehicles northbound and 27,823 vehicles southbound
- Joyce Drive between O’Riordan Street and General Holmes Drive: 19,819 vehicles eastbound and 20,183 vehicles westbound
- Mill Pond Road between General Holmes Drive and Botany Road: 27,049 vehicles eastbound and 27,566 vehicles westbound.

The traffic volume at the section of General Holmes Drive between Joyce Drive and Botany Road was found to be substantially lower than traffic volumes at other locations within the study area (refer to **Table 7-1**). This is due to the level crossing with the Port Botany Freight Rail Line, which requires General Holmes Drive to be closed periodically to allow freight trains to pass during the day.

Heavy vehicles make up between three and 11 per cent of the traffic within the study area as shown in **Table 7-1**. The highest proportion of heavy vehicles was recorded on Botany Road between General Holmes Drive and Wentworth Avenue. The lowest proportion of heavy vehicles was recorded on the Southern Cross Drive exit ramp to Mill Pond Road and Mill Pond Road itself. This ramp is the primary access route between the city and Sydney Airport domestic passenger terminals, which would explain the higher proportion of cars on this route.

Buses represent between 1.5 and 2.7 per cent of all vehicle movements on an average weekday on Botany Road. They make up between 21 and 26 per cent of the heavy vehicle movements on Botany Road.

Table 7-1 provides the traffic volumes for the proposal area for weekdays and weekends and peak periods.

Table 7-1 Midblock traffic volumes

Road	Location	Direction	Average weekday and weekend traffic (veh/day)	Average weekday traffic (veh/day)	Morning peak hour (veh/hr)	Evening peak hour (veh/hr)	Heavy vehicles as % of total traffic (weekday)
General Holmes Drive	Between Mill Pond Road and Southern Cross Drive	NB	19,239	20,800	1,883	1,047	9 %
		SB	22,208	23,941	937	2,243	8 %
Botany Road	Between Mill Pond Road and Lord Street	NB	10,383	12,073	654	1,149	8 %
		SB	11,705	13,273	1,042	818	8 %
Southern Cross Drive	Off ramp to Mill Pond Road	WB	17,519	18,936	1,585	1,066	3 %
General Holmes Drive	Between Joyce Drive and Mill Pond Road	NB	24,704	26,848	2,188	1,466	7 %
		SB	25,786	27,823	1,241	2,032	6 %
Botany Road	Between Wentworth Avenue and Southern Cross Drive	NB	15,759	17,164	1,290	1,172	6 %
		SB	14,067	15,105	825	1,162	7 %
Wentworth Avenue	Between Botany Road and Sutherland Street	EB	11,287	12,454	663	900	5 %
		WB	12,599	13,256	789	1,033	7 %
Botany Road	Between General Holmes Drive and Wentworth Avenue	NB	11,876	12,945	919	898	11 %
		SB	12,026	12,926	729	880	10 %
General Holmes Drive	Between Joyce Drive and Botany Road	EB	4,331	4,619	378	238	6 %
		WB	6,752	7,282	308	688	7 %
Botany Road	Between Robey Street and General Holmes Drive	NB	14,845	16,285	1,247	1,124	9 %
		SB	15,443	16,699	853	1,320	9 %
Joyce	Between	EB	18,381	19,819	1,061	1,250	7 %

Road	Location	Direction	Average weekday and weekend traffic (veh/day)	Average weekday traffic (veh/day)	Morning peak hour (veh/hr)	Evening peak hour (veh/hr)	Heavy vehicles as % of total traffic (weekday)
Drive	O’Riordan Street and General Holmes Drive	WB	18,618	20,183	1,510	1,191	8 %
Mill Pond Road	Between General Holmes Drive and Botany Road	EB	25,314	27,049	1,887	1,520	4 %
		WB	25,625	27,566	1,825	2,034	4 %

Note: NB – Northbound; SB – Southbound; EB – Eastbound; WB – Westbound. Grey shading indicates routes that are adjacent to the proposal, but are not within the proposal area.

The average weekday morning peak was observed between 8am and 9am and the evening peak between 5pm and 6pm. These peak periods are when travel times are generally longest for major routes through the study area. The most significant variation for peak periods was on Southern Cross Drive (off-ramp to Mill Pond Road) where the morning peak was 6am to 7am and the evening peak was 4pm to 5pm, with 60 per cent of the traffic volume observed during the morning peak. These traffic numbers are for southbound traffic only, and traffic volumes are likely to reflect airport passengers accessing Sydney Airport by car and taxi.

Travel times

Travel times for selected major routes within the proposal area are outlined in **Table 7-2**.

Table 7-2 Existing travel times

From	To	Morning peak		Evening peak	
		Demand (veh)	Travel time (minutes: seconds)	Demand (veh)	Travel time (minutes: seconds)
Botany Road (north of Robey Street)	Botany Road (south of Mill Pond Road)	1,020	3:13	1,018	2:39
Botany Road (south of Mill Pond Road)	Botany Road (north of Robey Street)	895	3:16	1,143	2:48
Northbound of General Holmes Drive (south of Mill Pond Road)	Southern Cross Drive (eastbound traffic, north of Wentworth Avenue)	9,918	3:12	11,945	3:04

From	To	Morning peak		Evening peak	
		Demand (veh)	Travel time (minutes: seconds)	Demand (veh)	Travel time (minutes: seconds)
Southern Cross Drive (westbound traffic, north of Wentworth Avenue)	Southbound of General Holmes Drive (south of Mill Pond Road)	6,952	2:27	7,401	3:09
Botany Road (north of Robey Street)	Southbound of General Holmes Drive (south of Mill Pond Road)	377	3:26	1,847	4:01
Northbound of General Holmes Drive (south of Mill Pond Road)	Botany Road (north of Robey Street)	1,320	4:05	522	4:01
Sir Reginald Ansett Drive / Shiers Avenue (South of Joyce Drive)	Southbound of General Holmes Drive (south of Mill Pond Road)	141	3:34	218	4:17
Northbound of General Holmes Drive (south of Mill Pond Road)	Sir Reginald Ansett Drive / Shiers Avenue (South of Joyce Drive)	157	5:00	179	3:45
Sir Reginald Ansett Drive / Shiers Avenue (South of Joyce Drive)	Southern Cross Drive (eastbound traffic, north of Wentworth Avenue)	904	4:21	1,511	4:52
Southern Cross Drive (westbound traffic, north of Wentworth Avenue)	Sir Reginald Ansett Drive / Shiers Avenue (South of Joyce Drive)	1,705	6:07	1,456	4:46

Crash history

A preliminary review and assessment of crash history was carried out for the study area. Crash data for the period July 2008 to June 2013 show there were 169 crashes, comprising no fatal crashes, 62 injury crashes and 107 non-casualty crashes. **Table 7-3** outlines the types of crashes experienced within the study area for the five year period, while the locations of these crashes are shown in the Traffic and Transport Working Paper (refer to **Appendix G**).

Table 7-3 Types of crashes within the study area

Type of crash	Number of crashes	Type of crash	Number of crashes
Opposing vehicles; turning	65	Hit pedestrian	2

Type of crash	Number of crashes	Type of crash	Number of crashes
Rear-end	50	Off road on straight, hit object	2
Intersection, adjacent approaches	21	Parallel lines; turning	1
Lane change	16	Hit parked vehicle	1
Off road on curve, hit object	3	Off road, on curve	1
Head-on (not overtaking)	2	Other crash type	5

The following roads were identified as having a crash rate higher than the average for their road classes (class averages between 2001 and 2005 for casualty crashes per kilometre per year):

- Botany Road between Robey Street and General Holmes Drive, which was significantly above average. Contributing factors include the relatively short length of road which includes a major intersection at Botany Road and General Holmes Drive. The majority of crashes occurred at the Botany Road and General Holmes Drive intersection from cars turning right into General Holmes Drive
- Botany Road between General Holmes Drive and Wentworth Avenue, which was substantially above average
- General Holmes Drive between Joyce Drive and Botany Road, which was moderately above average
- General Holmes Drive between Mill Pond Road and Southern Cross Drive, which was moderately above average
- General Holmes Drive between Joyce Drive and Mill Pond Road, which was slightly above average.

Road infrastructure and services

Public transport

An extensive bus network operates throughout the study area. Twelve bus routes pass through the study area, linking the Sydney CBD with suburbs to the south-west, east and west.

There is a northbound bus lane on Botany Road between Sutherland Street and High Street, and another on Botany Road next to the southbound lanes, terminating at Hollingshed Street to the north of the proposal area.

Two bus stops are located within the proposal area. These are located on Botany Road next to the northbound lane opposite Wentworth Avenue, and south of Bronti Street, next to the southbound lane (refer to **Figure 2-1**).

During the morning peak hour, between 29 and 41 buses pass through the study area. During the evening peak hour, between 27 and 33 buses pass through the study area. Botany Road, between Wentworth Avenue and King Street, carries the highest daily bus flows (707 trips each weekday). Wentworth Avenue carries 167 bus trips each weekday.

Pedestrian and cyclist facilities

Section 2.3.9 describes the pedestrian facilities within the proposal area.

No specific cyclist routes are located within the proposal area, but the proposal would connect to an existing cycleway at Todd Reserve, Mascot. Botany Road, the Wentworth Avenue approaches to Southern Cross Drive, and Southern Cross Drive north of Wentworth Avenue have been identified by Sydney's Cycling Future (TfNSW, 2013) as bicycle-friendly roads. Local residential roads can also be considered as bicycle-friendly.

Parking and access

Limited parking is available as all of the major roads within the proposal area are full-time or part-time clearways. Public parking opportunities within or close to the proposal area are located on local streets off Wentworth Avenue and the Park n Fly parking station on General Holmes Drive.

Parking for private use is limited to parking at residences along Wentworth Avenue and Botany Road, and at businesses and light industry sites.

Most residences within the proposal area have vehicular access via Wentworth Avenue, Botany Road and adjoining local streets. Commercial business and light industry are located along Joyce Drive, Botany Road, Wentworth Avenue and General Holmes Drive. These businesses access the road network via these major streets and local roads.

Rail

The Port Botany Freight Rail Line comprises a single track (catering for northbound and southbound freight rail) with a basic level crossing at General Holmes Drive. The level crossing generally closes seven times during peak hours for two to three minutes at a time during week days.

7.1.3 Potential impacts

Construction

Construction traffic volumes and road performance

Construction is planned to occur over a 30-month period from 2015 to 2018. As discussed in **Section 4.3.7**, an estimated maximum of 20 heavy vehicles an hour would be required for construction (comprising haulage trucks, concrete trucks and delivery trucks), while an estimated 50 light vehicles would be required during construction per day.

Potential impacts caused by construction vehicle traffic would include:

- Increased travel times on roads within the proposal area due to construction speed limits near the site
- Increased travel times for motorists due to construction vehicles on roads and construction vehicles accessing the construction site
- Temporary partial or complete closure of roads
- Traffic switching and temporary partial closure of roads where the proposal would tie into the existing road surface.

Delivery and heavy vehicle movements would generally occur within the working shift. Any heavy vehicle movements or materials delivery required during the day would be scheduled to occur outside of peak hours. Further, only minor quantities of excavated material or fill would need to be moved via the road network between the construction areas. This is because the majority of the fill material would be

stockpiled in the vacant land between General Holmes Drive and Botany Road and this location would be directly accessible from most construction areas.

The temporary increase in vehicle numbers during construction of the proposal would not result in a substantial increase of existing vehicle numbers or change in LoS for roads in the study area. Construction traffic would not impact significantly on current heavy vehicle volumes on the roads within the study area. Most traffic generated during construction would occur outside of peak traffic hours.

Partial road closures and construction speed limits

During construction, short-term lane closures of one to eight hours may be required during roadwork near live traffic. This would occur in areas where construction stages involve tying into the existing road network, such as at Wentworth Avenue, Botany Road, General Holmes Drive and Joyce Drive. This would also occur where construction work would occur on the existing road surface at General Holmes Drive and Joyce Drive. These lane closures would result in short-term delays for vehicles, during traffic switching or when vehicles are diverted to other lanes. This impact is expected to be minimal, as through traffic would be maintained with minimal lane closures for the majority of the work. Furthermore, as the majority of construction would be during the night-time, which would limit the number of motorists affected. The impact of lane closures during construction is expected to be minor due to their limited duration.

The new Wentworth Avenue and Botany Road intersection requires the road surface to be lowered about 1.5 metres to align with the Wentworth Avenue underpass. During construction of the intersection, motorists travelling through would experience short-term delays due to construction speed zones and narrower lanes. Through traffic would be maintained through the intersection for the majority of the work, which would minimise the proposal's impact to travel times. The feasibility of completely closing the Wentworth Avenue and Botany Road intersection during construction will be investigated during detailed design. The closure would occur during a low traffic period (eg January school holidays) for one to two weeks to minimise impacts. Further investigation and consultation is required to assess the possibility and impacts of using this option for construction.

During construction, access to and from Botany Lane may be restricted during the upgrade of the Wentworth Avenue and Botany Road intersection. An alternative route via Hardie Street and Hollingshed Street may be required, which is about 600 metres. The low volumes of traffic which would normally use Botany Lane are not expected to have an adverse impact on traffic volumes when detouring through Hardie Street and Hollingshed Street.

Emergency vehicle access would be maintained at all times for the duration of construction.

Parking and access

Access to private properties would be maintained during construction although localised changes to access arrangements and locations may be implemented where necessary. The main areas where access would temporarily be affected are:

- Along Wentworth Avenue, where the driveways may be temporarily affected when the shared path along Wentworth Avenue is being built. This impact would be temporary, and would be managed in consultation with affected landowners (refer to **Section 7.1.4**)

- Commercial and industrial areas along Botany Road, whose access may be affected when work occurs on Botany Road. However, because the majority of the construction work would occur at night and outside of working hours, the impacts to access to and from these commercial and industrial areas is expected to be negligible
- Businesses with access via Ross Smith Drive, which may be temporarily affected by construction on the Ross Smith Drive, Joyce Drive and General Holmes Drive intersection improvement works. Access to these businesses would be maintained via O’Riordan Street. Impacts to access are expected to be limited, short-term in duration and occur during night time hours.

Footpaths may be temporarily blocked during construction and construction on roads may affect on-road cyclist access. Specific footpaths that would be affected by construction would be those located along Botany Road and Joyce Drive within the proposal area. However, alternative paths and walking routes would be provided during construction which would reduce the impact of construction on pedestrian connectivity within the proposal area.

Construction would require road lanes to be narrowed, which would affect on-road cyclist access. During detailed design, alternate cyclist routes would be investigated for use during construction.

The proposal would provide separate parking facilities for construction staff within its compound or stockpile sites, or on land especially leased for this purpose. Construction staff would not use public parking facilities in the proposal area and therefore are not expected to have an impact on the limited public parking facilities within the proposal area. Further, the road construction works on the main roads in the proposal area (Joyce Drive, General Holmes Drive, Mill Pond Road, Botany Road and Wentworth Avenue) would not alter the existing parking arrangements within the proposal area as these roads are designated clearways and would not normally provide parking opportunities. Parking arrangements for construction would be determined during detailed design.

Bus routes and services

The proposal would affect bus movements while the bus lane on Botany Road is under construction. Buses would experience similar delays to other motorists while using roads within the proposal area. However, bus access through the proposal would be maintained during construction. These short-term road closures are expected to occur outside of peak hour at night.

Construction may also require temporary changes to bus stops on Botany Road and Wentworth Avenue. Local bus operators would be consulted during detailed design to identify suitable locations for bus stops during construction.

Freight rail

Construction of the rail bridge over Wentworth Avenue is expected to require at least two rail track possessions during scheduled rail shutdowns (refer to **Section 4.3**). (A rail track possession results in the suspension of train movements on the rail track.) Rail bridges would be connected to the Port Botany Freight Rail track during scheduled rail shutdowns and would not affect regular Port Botany freight operations.

Operation

The proposal would improve access to and within the study area for road vehicles (including buses), pedestrians and cyclists. Improved access would be achieved via

a road network with higher average traffic speeds, lower travel times, less congestion and less potential for gridlock. The proposal would address congestion issues associated with the general growth in traffic volumes within the local road network. The proposal would also result in a minor change to routes within the study area, and would improve safety by removing the level crossing, as discussed in the sections below.

Network performance

Traffic modelling for peak hours in 2018 indicates that the proposal would result in substantial improvement to network operations and performance when compared to the no-build scenario (refer to **Table 7-4**). In summary, average speeds are predicted to increase by up to 30 per cent during the morning peak period and 10 to 15 per cent during the evening peak period, indicating an improvement in traffic flows.

Table 7-4 Modelled traffic performance during peak hours for the study area

Scenarios	Morning peak			Evening peak		
	VKT (km)	VHT (hr)	Average speed (km/h)	VKT (km)	VHT (hr)	Average speed (km/h)
Current (2013)	35,276	1084	33	42,362	1057	41
No build (2018)	36,057	1572	24	43,423	1357	32.5
Proposal (2018)	36,472	1250	29.8	43,672	1176	37.6

VKT: vehicle kilometres travelled; VHT: vehicle hours travelled

Traffic modelling indicates that, if the proposal does not proceed (the no-build scenario), severe congestion would occur in the study area in 2018.

The proposal would improve performance by increasing travel speed as a proportion of free-flow speeds for the dominant areas within the proposal area.

The proposal would also improve connectivity within the study area, facilitating more vehicles accessing more locations within the study area.

The proposal would improve movements into and out of local roads, by reducing queuing and congestion. An improvement in traffic flows and reduction of congestion would result in more gaps in traffic, and would increase opportunities to turn into and out of local roads.

Access and routes

The proposal would change local and regional access for some users of the road network. The proposal would provide industrial and residential properties south of Wentworth Avenue with eastbound access along Wentworth Avenue. This would be via a loop route using the new Wentworth Avenue underpass and a restricted left turn at Mill Pond Road onto Botany Road (refer to **Figure 7-1**). This loop route would be about 500 metres shorter than the existing loop route via the General Holmes Drive rail level crossing for residences and businesses south of Wentworth Avenue, as shown in **Figure 7-1**. A small number of motorists wishing to travel south from the Central Foundry on Botany Road would firstly need to travel north to join Joyce Drive at Baxter Street. This would be an additional distance of about 1.3 kilometres. There would be no changes to the movements permitted at side streets adjoining Wentworth Avenue as part of the proposal.

Travel times

The proposal would markedly reduce the travel time for the majority of surveyed routes during peak periods, as outlined in **Table 7-5**. The greatest reductions in travel time would be on routes that start or end at Sydney Airport. For instance:

- During the morning peak, vehicles travelling from Southern Cross Drive to Sydney Airport would experience travel times reduced by about 50 per cent. More than 5000 vehicles would benefit from this travel time reduction
- During the evening peak, the greatest benefit would be experienced by vehicles on the Southern Cross Drive eastbound route, with reductions in travel times of about 60 per cent. More than 10,000 vehicles would benefit from this travel time reduction.

Two routes would experience incremental travel time increases of less than one minute as part of the proposal, as a result of the reconfiguration of the road network, and specifically the introduction of the upgraded intersections along Wentworth Avenue on each side of the underpass. The impact associated with these minor increases in travel time is considered minimal considering the substantial reductions in travel times for the other routes.

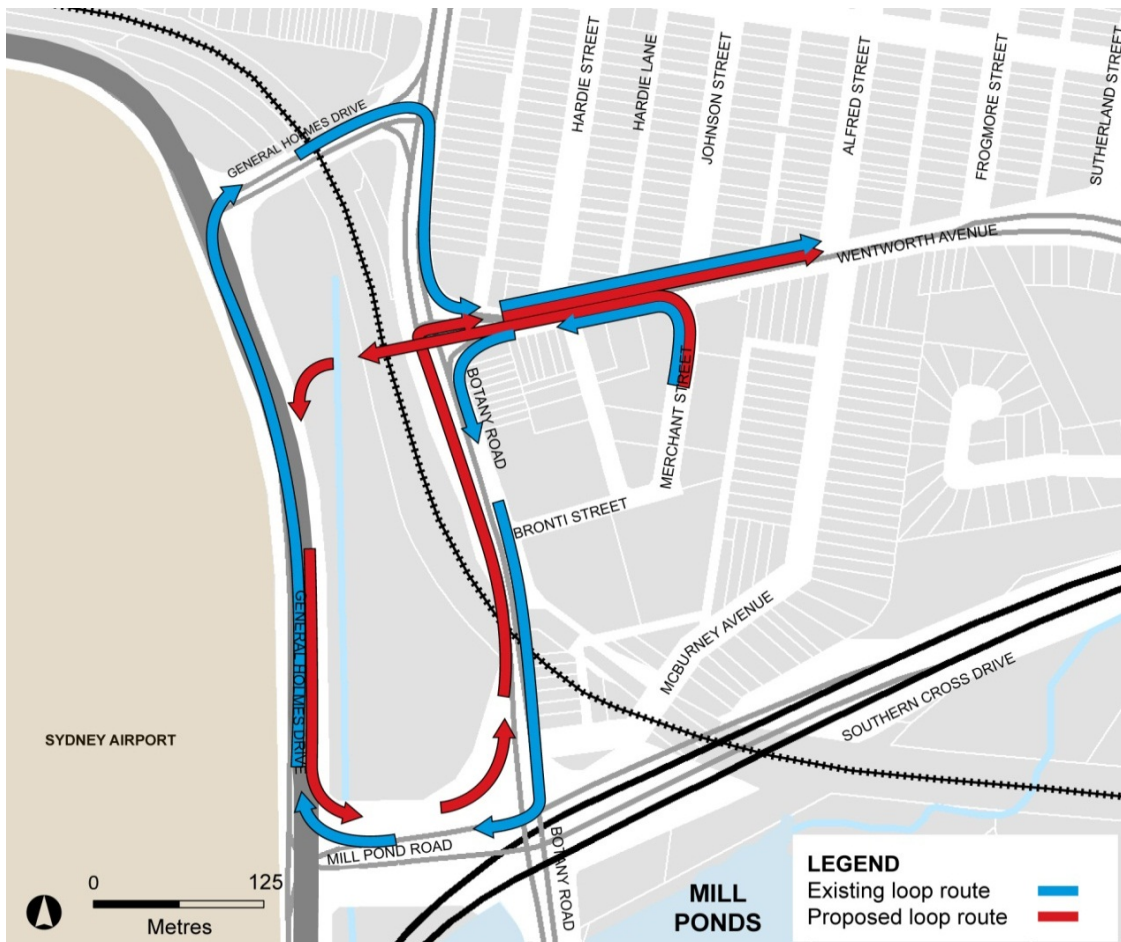


Figure 7-1 Existing and proposed loop route for residents and businesses south of Wentworth Avenue

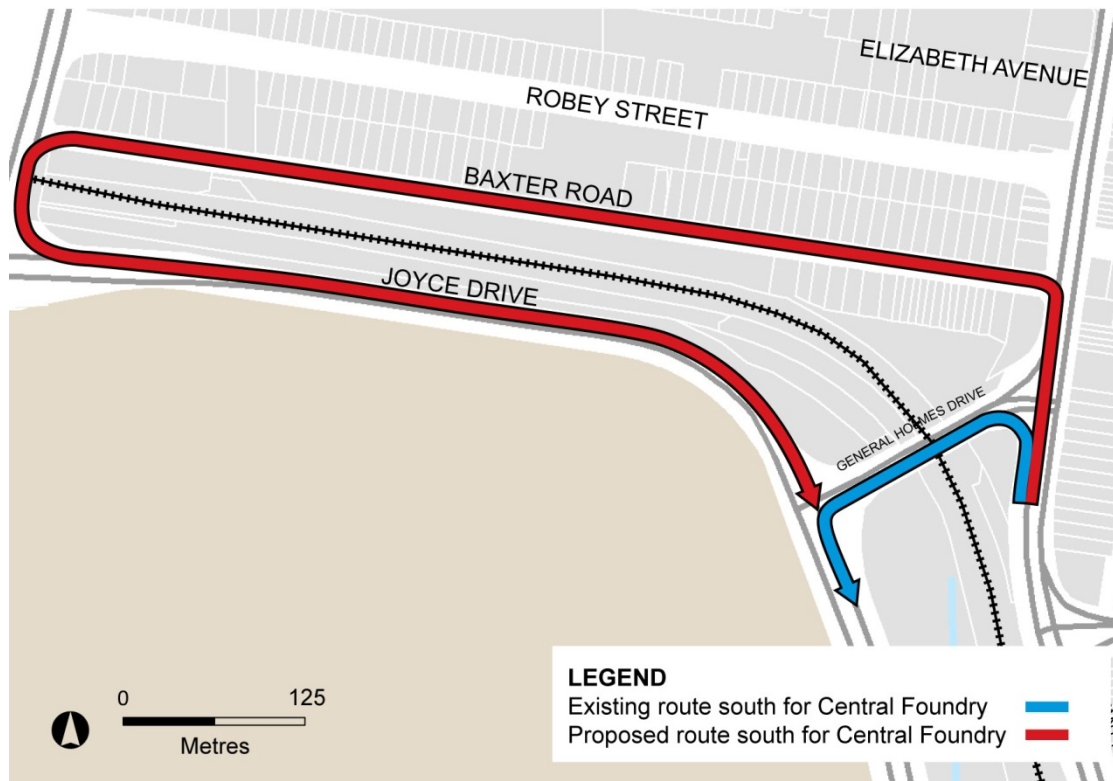


Figure 7-2 Existing and proposed route for Central Foundry

Table 7-5 Modelled travel times for peak hours

From	To	Morning peak				Evening peak			
		Demand in 2018 (veh)	No build (2018)	Proposal (2018)	Difference	Demand in 2018 (veh)	No build (2018)	Proposal (2018)	Difference
Botany Road (north of Robey Street)	Botany Road (south of Mill Pond Road)	841	04:22	05:05	+ 00:42	1314	10:03	08:04	- 02:00
Botany Road (south of Mill Pond Road)	Botany Road (north of Robey Street)	1119	05:11	04:41	- 00:30	946	07:27	03:44	- 03:43
General Holmes Drive (northbound traffic, south of Mill Pond Road)	Southern Cross Drive (eastbound traffic, north of Wentworth Avenue)	11,484	10:34	10:43	+ 00:10	10,602	05:59	02:20	- 03:39
Southern Cross Drive (westbound traffic, north of Wentworth Avenue)	General Holmes Drive (southbound traffic, south of Mill Pond Road)	6252	12:26	07:24	- 05:02	8567	05:44	03:58	- 01:47
Botany Road (north of Robey Street)	General Holmes Drive (southbound traffic, south of Mill Pond Road)	746	07:38	07:24	- 00:14	3379	12:30	08:59	- 03:31
Northbound on General Holmes Drive (south of Mill Pond Road)	Botany Road (north of Robey Street)	2453	15:15	13:11	- 02:04	892	06:44	04:50	- 01:53
Sir Reginald Ansett Drive / Shiers Avenue (south of Joyce Drive)	Southbound on General Holmes Drive (south of Mill Pond Road)	234	08:15	04:37	- 03:38	417	07:55	03:19	- 04:36

From	To	Morning peak				Evening peak			
		Demand in 2018 (veh)	No build (2018)	Proposal (2018)	Difference	Demand in 2018 (veh)	No build (2018)	Proposal (2018)	Difference
Northbound on General Holmes Drive (south of Mill Pond Road)	Sir Reginald Ansett Drive / Shiers Avenue (south of Joyce Drive)	794	16:52	09:38	- 07:14	840	05:19	02:33	- 02:46
Sir Reginald Ansett Drive / Shiers Avenue (south of Joyce Drive)	Southern Cross Drive (eastbound traffic, north of Wentworth Avenue)	725	09:03	05:52	- 03:11	1261	07:31	04:29	- 03:02
Southern Cross Drive (westbound traffic, north of Wentworth Avenue)	Sir Reginald Ansett Drive / Shiers Avenue (south of Joyce Drive)	3231	20:07	09:33	- 10:34	3627	07:40	05:31	- 02:09

Road user safety

The safety of pedestrians and cyclists would be improved during the operation of the proposal. This is because:

- The proposal includes pedestrian and cyclist routes separated from road traffic along Botany Road and Wentworth Avenue
- The proposal would remove the level crossing, which currently poses a risk to pedestrians and cyclists who currently use it.

7.1.4 Safeguards and management measures

Table 7-6 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on transport.

Table 7-6 Mitigation measures for transport

ID	Impact	Environmental safeguards	Responsibility	Timing
TR-1	General traffic impacts	<p>A Traffic Management Plan (TMP) will be prepared as part of the Construction Environmental Management Plan (CEMP). The TMP will be prepared in accordance with Roads and Maritime's Traffic Control at Work Sites (RTA, 2010), Australian Standard AS1742 and the worksite manual Roads and Maritime Specification G10. The TMP will outline:</p> <ul style="list-style-type: none"> • Traffic controls to regulate traffic movements and minimising traffic switching • Coordination of: <ul style="list-style-type: none"> – General traffic flows at major construction work areas, such as the tie-ins for the Wentworth Avenue extension – Delivery of construction materials and movement of construction plant and equipment to and from the site to limit traffic delays – Other Roads and Maritime roadwork and any work by other agencies that affect traffic flow – Schedules, abnormal loads and other specific aspects of transport with transport operators – Consultation with local councils to identify, evaluate and document alternative routes – Incident response with emergency services. • Maintenance of continuous, safe and efficient movement of traffic for both the public and construction crew • Haulage routes and access arrangements to minimise impacts on local routes • Construction traffic zones around work areas • Access provisions for local roads and properties • Maintenance of pedestrian access • Provision for appropriate warning and signposting 	Construction contractor	<p>Detailed design</p> <p>Pre-construction</p> <p>Pre-construction</p>

ID	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Requirements and methods to consult with and inform the local community of impacts on the local road network and traffic, as well as impacts on individual property access. <p>A Vehicle Movement Plan will be prepared as part of the overall TMP. The Vehicle Movement Plan will assess construction-related heavy vehicle movements per shift into and out of the construction sites, and provide guidelines for limiting impacts on traffic using the road network.</p>		
TR-2	Impact to traffic from construction site access	<p>All access points to the construction site and site roads will:</p> <ul style="list-style-type: none"> Have safe intersection sight distance Accommodate the turning movements of the largest heavy vehicles Provide painted median treatments for vehicle delineation Provide suitable intersection layouts. 	Construction contractor	Construction
TR-3	Impact on access to bus stops during construction	Local bus operators will be consulted during detailed design regarding location and provision of access to bus stops during construction.	Roads and Maritime	Detailed design
TR-4	Building rail bridges during scheduled rail possessions	Roads and Maritime will consult with Port Botany and ARTC during detailed design to confirm that the proposal will avoid disturbance and impact on operations during construction where practicable.	Roads and Maritime	Detailed design
TR-5	Impact on access for emergency services	Consultation with emergency service authorities will be carried out during development of the detailed design including with NSW Fire Rescue.	Roads and Maritime	Detailed design
TR-6	Impact on pedestrian and cyclist access during construction	<p>Pedestrian and cyclist access will be maintained throughout construction.</p> <p>Appropriate signage communicating diversion routes to pedestrians and cyclists will be displayed during construction.</p> <p>Advance notification will be provided of any construction works that affect pedestrians and cyclists.</p>	Construction contractor	Construction
TR-7	Impact on property access	Vehicular property access will be maintained including at places of worship and to all commercial premises. Should property access be affected by the proposal, residents will be consulted before any work begins.	Construction contractor	Construction
TR-8	Impact on access to bus stops	The community will be provided with ongoing updates on locations and access to bus stops during the construction period to ensure that disruption is minimised.	Construction contractor/ Roads and Maritime	Construction

7.2 Airport operations

The extent and magnitude of potential impacts of the proposal on airport operations are assessed in the Review of Airport Operations Impact Report (Wilkinson Murray

2014a), which is provided in **Appendix L**. A summary of the assessment is presented in this section.

An Aviation Impact Study was carried out by The Airport Group in November 2014 to quantify any impacts to the OLS from the temporary use of the western rail bridge (The Airport Group, 2014). This section summarises these results.

7.2.1 Methodology

For this assessment, the term ‘airport operations’ was defined to be the movement of planes to and from Sydney Airport. It also involves the obstacle limitation surfaces (OLS), which define the protected space to facilitate plane movement to and from Sydney Airport. Specifically, the purpose of the assessment was to:

- Quantify the magnitude of change to runway use from the proposal and associated noise impacts
- Determine if the impacts on airport operations would be considered to be significant under the EPBC Act.

The methodology involved:

- Reviewing runway usage records at Sydney Airport for the proposed months of closure (March and October for 2012 and 2013). The data were considered sufficient for the study as they represent the typically busiest airport periods
- Reallocating runway usage from the east–west runway to the north–south runways for the proposed closure times. In the infrequent event where the north–south runways were not used during the proposed closure times for the proposal, meteorological data were used to determine runway direction allocation
- Analysing historical operational data and predicted operational data to produce:
 - A chart comparing jet flight path movements
 - A chart comparing jet respite periods
 - A list of operational changes by runway.

The impact to access to the airport and associated facilities has been considered in **Section 7.1.3**, while the impact of construction noise on airport facilities has been considered in **Section 7.3**.

7.2.2 Existing environment

Obstacle limitation surface

Airspace in the vicinity of Sydney Airport is protected under the Airports (Protection of Airspace) Regulations 1996 (refer to **Sections 2.3.7** and **5.2.1**). The OLS comprises a series of surfaces in the airspace surrounding the airport, which define the airspace to be protected for aircraft operating during the take-off and landing stages of flight, or manoeuvring in the vicinity of the airport (SACL, 2014). The OLS includes take off and approach surface gradients of two per cent at each end of each runway, as well as flat horizontal surfaces at varying heights (SACL, 2014).

The OLS in the vicinity of the proposal is shown on **Figure 4-9**.

Sydney Airport runways

Sydney Airport has three runways. One runway is oriented east–west and two are oriented north–south. These runways are shown in **Figure 7-3**. As shown, each

runway has alternative designations that are used to indicate which direction the aircraft is heading. For example:

- The main north–south runway is either 34L or 16R
- The second north–south runway is either 34R or 16L
- The east-west runway is either 07 or 25.

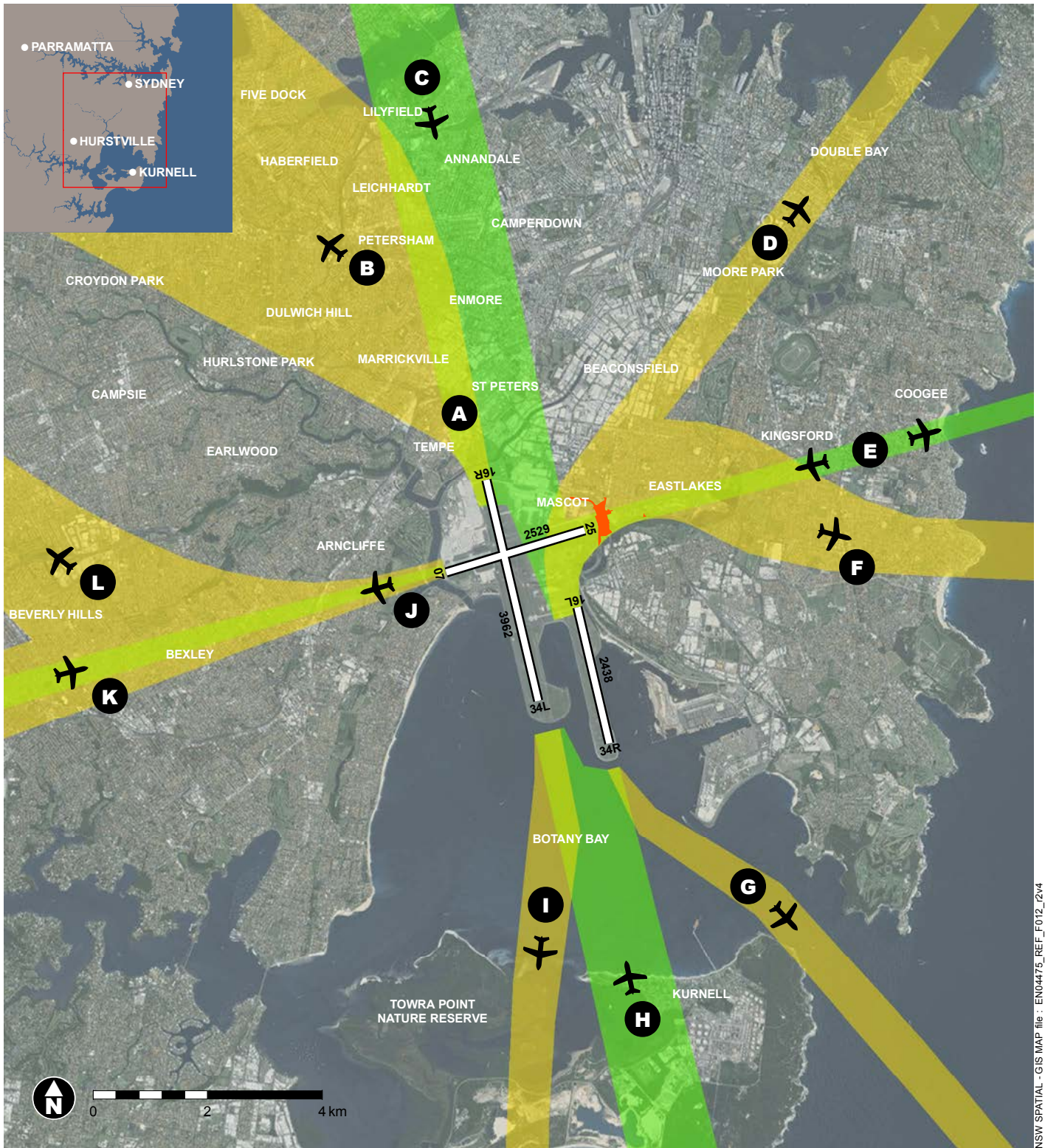
The east–west runway is used infrequently in March and October due to prevailing weather conditions.

Noise sharing

As discussed in **Section 4.4.1**, Sydney Airport has a long term operating plan (LTOP) which is a program to manage aircraft noise from Sydney Airport. It aims to share aircraft noise across communities in Sydney. Twelve flight zones representing areas under the various aircraft flight paths are located around Sydney Airport. These zones, and noise-affected areas, are described in **Table 7-7** and shown on **Figure 7-3**.

Table 7-7 Flight zones and flight paths at Sydney Airport

Flight zone	Flight paths	Affected suburbs/areas
Zone A	Areas where flights departing to the north-west overlap with flights arriving from the north	Lilyfield (west), Leichhardt, Petersham, Marrickville and east Tempe
Zone B	Flights departing to the north-west	Marrickville, Dulwich Hill, Hurlstone Park, Haberfield, Five Dock, Croydon Park and Strathfield
Zone C	Flights arriving from the north	Drummoyne, Lilyfield, Leichhardt, Annandale, Camperdown, Enmore and St Peters
Zone D	Flights departing to the north-east	Mascot, Beaconsfield, Moore Park, Double Bay and Watsons Bay
Zone E	Flights arriving and departing to and from the east	Eastlakes, south Kingsford and Coogee
Zone F	Flights departing to the north-east	Roseberry, Eastlakes, Kingsford, Daceyville, Maroubra and South Coogee
Zone G	Flights departing to the south-east	Botany Bay and its entrance
Zone H	Flights arriving from the south	East Kurnell, and over Botany Bay
Zone I	Flights departing to the south	Botany Bay and Towra Point Nature Reserve
Zone J	Flights departing to the west	Arncliffe, Bexley and Beverly Hills
Zone K	Flights arriving from the west	Arncliffe, Bexley and Beverly Hills
Zone L	Flights departing from the west	Arncliffe, Earlwood and Campsie.



NSW SPATIAL - GIS MAP file : EN04475_REF_F012_r2v4

Figure 7-3 Sydney Airport runways and flight zones

Legend

- Proposal area
- H Inbound flight zone
- F Outbound flight zone
- Runway

Roads and Maritime Services 2014
 LPI 2014
 Imagery Source: Esri, DigitalGlobe, GeoEye, i-cubed,
 USDA, USGS, AEX, Getmapping, Aerogrid, IGN,
 IGP, swisstopo, and the GIS User Community

7.2.3 Potential impacts

Impacts to airport operations are limited to the construction phase of the proposal only, as discussed below.

Impact on east–west runway

The proposal would require the use of small and large piling rigs to build the Wentworth Avenue underpass and railway bridges. The large piling rigs would extend into the OLS and require the east–west runway to be partially closed for two periods of one to two weeks in March and October 2016. The partial closures would restrict aircraft operations on the east–west runway, with the exception of departures on runway 25, where aircraft would continue to be able to take off to the west.

Table 7-8 outlines the average aircraft movements per day per runway in March and October for normal runway operations and with the east–west runway partially closed to allow construction of the proposal.

Table 7-8 Average aircraft movements per day by runway in March and October

Operation	Scenario	Runways (mean movements per day)					
		East–west		North–south left		North–south right	
March		07	25	16R	34L	16L	34R
Arrival	Current usage	6	8	77	137	43	53
	Proposal	-	-	85	136	47	53
Departure	Current usage	1	2	95	71	47	105
	Proposal	-	2	95	72	47	105
October		07	25	16R	34L	16L	34R
Arrival	Current usage	11	10	85	125	47	53
	Proposal	-	-	96	131	51	54
Departure	Current usage	2	7	108	67	49	98
	Proposal	-	7	109	68	49	98

Note: Average movements per day have been rounded to the nearest whole number to improve legibility

For March, it was found that:

- The proposal would increase daily arrivals by four at runway 16L, eight at runway 16R, none at runway 34L, and none at runway 34R
- The number of departures from runway 07 is so small that the impact of redistributing these operations to the north–south runways would be negligible.

For October, it was found that:

- The proposal would increase daily arrivals by four at runway 16L, 11 at runway 16R and six at runway 34L, and one at runway 34R
- The number of departures from runway 07 is so small that the impact of redistributing these operations to the north–south runways would be negligible.

The greatest impact was quantified to be:

- A five per cent increase in aircraft movements on runway 16R for the proposed construction period in March
- A six per cent increase in aircraft movements on runway 16R for the proposed construction period in October.

Impact on noise respite periods

Redistribution of aircraft movements as a result of the proposal would result in a change in the noise respite available (that is, an increase or decrease in noise exposure) for each flight zone. The average daily aircraft movements and respite in March and October for flight zones are listed in **Table 7-9**.

Table 7-9 Mean daily aircraft movements and respite in March and October for flight zones

Flight zone	Mean daily aircraft movements			Respite		
	Existing	Proposal	Difference	Existing	Proposal	Difference
March						
Zone A	192	204	12	2%	0%	-2%
Zone B	71	72	1	40%	40%	0%
Zone C	120	132	12	59%	57%	-2%
Zone D	48	48	0	47%	47%	0%
Zone E	9	0	-9	95%	100%	5%
Zone F	58	58	0	46%	46%	0%
Zone G	47	47	0	56%	56%	0%
Zone H	188	190	2	40%	40%	0%
Zone I	95	95	0	56%	56%	0%
Zone J	8	2	-6	93%	98%	5%
Zone K	2	2	0	100%	100%	0%
October						
Zone A	200	216	16	2%	0%	-2%
Zone B	67	68	1	44%	44%	0%
Zone C	133	147	14	56%	53%	-3%
Zone D	45	5	0	52%	52%	0%
Zone E	12	0	-12	92%	100%	8%
Zone F	53	53	0	51%	51%	0%
Zone G	49	49	0	50%	50%	0%
Zone H	179	185	6	45%	43%	-2%
Zone I	108	109	1	52%	52%	0%
Zone J	18	7	-11	90%	96%	6%
Zone K	7	7	0	100%	100%	0%

Note: No data provided for flight zone L.

The redistribution of aircraft operations in March and October would also have an impact on respite time available for flight zones around Sydney Airport. The following reductions in respite are expected to the north and south of Sydney Airport as a result of the proposal in both March and October:

- In March, the proposal would have the greatest negative impact on respite in flight zones A and C, where a reduction of two per cent is predicted. In zones to the east and west of Sydney Airport (K, E and L), an increase in respite is predicted. No change in respite is predicted at other flight zones
- In October, the proposal would have the greatest negative impact on respite in flight zones A, C and H, where reductions of two and three per cent are predicted. In zones east and west of Sydney Airport (K, E and L), an increase in respite up to eight per cent is predicted. In areas to the east and west of Sydney Airport (K, E and L), an increase in respite is predicted. No change in respite is predicted in other zones.

The most noticeable aircraft noise exposure and impact would be associated with a three per cent increase in movements in flight zone A in October, to the north of Sydney Airport. This change would be unlikely to be perceived by most people within the flight zone, due to the short periods of proposed runway closure, and the likelihood that the predicted number and pattern of operations is often variable due to weather conditions. Furthermore, the curfew at Sydney Airport limits aircraft-related noise impacts to daytime hours.

Use of western rail bridge during construction

During construction, the western rail bridge over the Wentworth Avenue underpass would be used by freight trains for about 30 weeks while the eastern rail bridge is being built (refer to **Section 4.3.1**). Due to the closer distance of the western rail bridge to Sydney Airport, trains using this bridge would protrude into the OLS by up to 0.25 metres more than freight rail on the existing railway bridge. The Aviation Impact Study concluded that this component of the proposal would have a minor impact to the OLS given the intermittent rail traffic, and the temporary duration of the protrusion.

Therefore, the impact on airport operations from the proposal is not considered notable or significant in the meaning of the EPBC Act, nor would the impacts trigger a major development plan under the Airports Act.

7.2.4 Safeguards and mitigation measures

Table 7-10 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal construction on airport operations.

Table 7-10 Mitigation measures for airport operation impacts

ID	Impact	Environmental safeguards	Responsibility	Timing
AO-1	General impacts on airport operations	Roads and Maritime will continue to consult with SACL and Air Services Australia before and during construction of the project regarding any potential impacts on airport operations.	Roads and Maritime	Detailed design

ID	Impact	Environmental safeguards	Responsibility	Timing
AO-2	Construction impacts on airport operations	<p>The CEMP will include an Airport Operations Management Plan to ensure that airport operations are not affected by construction of the proposal. This plan will include (as a minimum):</p> <ul style="list-style-type: none"> • Maps indicating areas of permitted disturbance within Sydney Airport land • Communication protocol with Sydney Airport and representatives, outlining frequency and content of updates • Complaints procedure. 	Roads and Maritime/ Construction contractor	Pre-construction

7.3 Noise and vibration

The extent and magnitude of potential impacts of the proposal in terms of noise and vibration are assessed in the Construction Noise and Vibration Impact Assessment (CNVIA) (Wilkinson Murray, 2014a) and Operational Noise Impact Assessment (ONIA) (Wilkinson Murray, 2014b), which are provided in **Appendix H**. A summary of the assessment is provided in this section. The assessment of noise impacts specifically relates to the road network. **Section 7.2** considers noise implications associated with impacts of the proposal on the operation of the nearby Sydney Airport and aircraft movements.

7.3.1 Policies and guidelines

The assessment of noise for the proposal is separated into construction and operational impacts, with each of these further classified into airborne noise and ground borne vibration. Each of these impacts requires the identification of different parameters to determine an appropriate level of influence at a receiver location.

In consideration of these different types of impact, the noise and vibration assessment was prepared in accordance with the following policies and guidelines:

- NSW Road Noise Policy (RNP) (DECCW, 2011)
- NSW Interim Construction Noise Guideline (ICNG) (DECC, 2009)
- Environmental Noise Management Manual (ENMM) (RTA, 2001)
- NSW Environmental Criteria for Road Traffic Noise, (EPA, 1999)
- Assessing Vibration: A Technical Guideline (DEC, 2006)
- German Standard DIN 4150, Part 3: Structural Vibration in Buildings: Effects on Structures
- Noise assessment advice (WestConnex, Airport East) – Roads and Maritime, September 2014).

The RNP, ICNG and ENMM are the primary documents which were used to determine the level of impact from airborne noise for construction and operational components of the proposal. The Assessing Vibration guideline and the DIN standard were used to identify acceptable levels of vibration generated by construction activities.

The proposal was assessed in accordance with the RNP criteria for operational traffic noise, which prescribes a methodology and framework for this process. Traffic volumes for current/future scenarios and 'build'/'no build' options were used to account for any changes in noise that may result from implementation of the proposal. These changes in traffic noise levels form the basis of the assessment.

The proposal forms part of the broader strategy for the Sydney road network that aims to maintain capacity for future scenarios. On this basis, Roads and Maritime provided a specific policy advice in September 2014 for the assessment of the proposal against the requirements of the RNP. **Section 7.3.3** presents the criteria for determining the operational impact of this phase of the proposal.

Further detail on the methodology for the construction and operational noise and vibration assessments is provided in **Section 7.3.4** and **Section 7.3.5**.

7.3.2 Existing environment

The noise environment in the local area is dominated by road traffic, rail traffic and aircraft movements. Nearby arterial road routes include General Holmes Drive, Botany Road and Wentworth Avenue. The Port Botany rail line and Sydney Airport contribute to the noise environment, which may be described as an urban industrial interface. To further characterise the ambient noise environment, noise monitoring was carried out at representative receiver locations for a nominal one week period at each location.

Table 7-11 presents the details of each monitoring location including a description of its position relative to the nearest major noise source(s). These monitoring locations are shown on **Figure 7-4**.

Table 7-11 Construction and operational noise monitoring locations

ID	Monitoring location	Description
Construction		
R13	36 Baxter Road	Located within the northern section of the study area, near the proposed closure of the rail level crossing and construction of a cul-de-sac. This receiver is located near Joyce Drive, Port Botany Rail Line and O’Riordan Street.
R38	3 Wentworth Avenue	Located in the north-eastern section of the study area, near the proposed Botany Road and Wentworth Avenue intersection upgrade.
R117	59 McBurney Avenue	Located in the south-eastern section of the study area. This receiver is less than 100 m from Botany Road, The port botany freight line and Southern Cross Drive.
Operational		
R104	54 Wentworth Avenue	Located within the eastern section of the study area, near the proposed shared pedestrian and cycle path extension adjacent to Wentworth Avenue.
R13*	36 Baxter Road	Located within the northern section of the study area, near the proposed closure of the rail level crossing and construction of a cul-de-sac. This receiver is located near Joyce Drive, Port Botany Rail Line and O’Riordan Street.

*Note: Noise monitoring identified 36 Baxter Road to have a high degree of non-traffic noise sources (such as aircraft operations and rail movements). As such, data from this location has not been considered in the operational assessment.

The information collected for each of these monitoring locations was used to establish the relevant noise goals for the project for both the operational and construction noise impacts. Construction noise assessments refer to existing background noise levels when identifying appropriate construction noise goals for a

proposal. Operational noise assessments refer to existing traffic noise levels when identifying noise goals for road projects.

The equivalent continuous sound level (L_{Aeq}) is the average energy of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise. The assessment background level (ABL) is the background level representing each assessment period (daytime, evening or night time) for each day. The rating background level (RBL) is the median of the ABL for the period over which the days were measured. The RBL is derived from the L_{A90} noise descriptor and is used to provide a Noise Management Level (NML) for construction noise assessments (see **Section 7.3.2**). The RBL for each monitoring location for the day, evening, and night time periods is given in **Table 7-12**.

Table 7-12 Rating background levels

Monitoring location	Measured RBL (dB(A))		
	Day (7am to 6pm)	Evening (6pm to 10pm)	Night time (10pm to 7am)
R13 (36 Baxter Road)	56	56	43
R38 (3 Wentworth Avenue)	55	51	41
R117 (59 McBurney Avenue)	53	54	46
R104 (54 Wentworth Avenue)	58	50	41

The operational noise impact assessment considered the existing traffic noise for the validation of the noise model. The noise indicators for road traffic are separated into day and night time periods only, where the daytime incorporates the evening period identified for the RBL. The road traffic noise descriptors are derived from the L_{Aeq} parameter and confirmed the validity of the locations used in the assessment of traffic noise impacts (refer to **Table 7-13**).

Table 7-13 Road traffic noise levels

Monitoring location	Measured L_{Aeq} (dB(A))	
	Day (7am to 10pm)	Night (10pm to 7pm)
R104 (54 Wentworth Avenue)	58	50

The area containing receivers assessed for the proposal and monitoring locations are shown in **Figure 7-4**. Detailed maps showing the location of sensitive receivers are provided in **Appendix H**.



Figure 7-4 Noise monitoring locations and sensitive receivers

NSW SPATIAL - GIS MAP file : EN04475_REF_F027_12v1

7.3.3 Assessment criteria

Construction noise

Construction noise for the proposal was assessed in accordance with the Interim Construction Noise Guideline (DECC, 2009). The guideline was developed to help manage noise impacts and provide recommendations for noise goals for construction activities.

The Interim Construction Noise Guideline identifies NMLs, which are the project-specific noise criterion used to help manage noise impacts across all receiver locations. The noise management level is therefore categorised for both residential and non-residential receivers, with recommended noise criteria for both standard construction hours and for work to be carried out outside of standard hours (or outside standard hours 'OSH' work).

As detailed in **Section 4.3.3**, most construction would occur during night-time hours to minimise disruptions to the existing road network.

Residential receivers

Construction noise management levels for residential receivers, and how they are applied to the proposal, are outlined in **Table 7-14**. The table identifies daytime noise goals, outside standard hours, and a category of 'highly noise affected' receivers that may be affected by significant noise levels at any time during the project.

Table 7-14 Construction noise and noise management levels and working hours

Hours	Noise management level	Description
Recommended standard hours Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL* + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of work to be carried out, the expected noise levels and duration, and contact details of relevant project personnel.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: Times identified by the community when they are less sensitive to noise, such as before and after school (for work near schools), or mid-morning or mid-afternoon (for work near residences) If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	A strong justification would typically be required for work outside the recommended standard hours. If out-of-hours work is required, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.

Hours	Noise management level	Description
		Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should then begin negotiations with the community. For guidance on negotiating agreements, refer to Section 7.2.2 of the Interim Construction Noise Guideline (DECC, 2009).

* RBL: Rating background level

Construction noise management levels for residential receivers within the study area were determined against the background noise levels identified during the noise monitoring survey. Construction noise management levels that are applicable during, and outside, standard construction hours are calculated in accordance with the ICNG requirements outlined in **Table 7-14**.

Table 7-15 presents the NML for the receiver locations identified for the proposal.

Table 7-15 Noise management levels during, and outside, standard construction hours

Receiver locations	Standard construction hours		Outside standard construction hours	
	Noise affected level $L_{Aeq, 15min}$ dB(A)	Highly noise affected level $L_{Aeq, 15min}$ dB(A)	Noise affected level $L_{Aeq, 15min}$ dB(A)	Highly noise affected level $L_{Aeq, 15min}$ dB(A)
R1-R32	66	75	48	n/a
R33-R115	65	75	46	n/a
R116-R121	63	75	51	n/a
Beckenham Memorial Church	45 (internal)	n/a	45 (internal)	n/a
C1-C26	70	n/a	70	n/a

Non-residential receivers

For non-residential land uses within the proposal area, the following noise criteria from the ICNG would apply:

- Industrial premises: external L_{Aeq} (15min) 75 dB(A)
- Offices, retail outlets: external L_{Aeq} (15min) 70 dB(A)
- Classrooms: internal L_{Aeq} (15min) 45 dB(A)
- Places of worship: internal L_{Aeq} (15min) 45 dB(A)
- Passive recreational areas: external L_{Aeq} (15min) 60 dB(A)

Sleep disturbance

Where out of hours work extends into the night time period, consideration of sleep disturbance for residential receivers is necessary. Factors which could influence sleep disturbance as a result of the proposal include how frequently noisy activities occur, the duration of the noisy activity, and whether there is a distinct change in the surrounding noise environment.

While these factors cannot be reasonably assumed at this time, a simplified screening assessment that considers the maximum noise emissions from construction activities against the existing background noise levels is used. The general assessment criterion for sleep disturbance for the proposal is derived from the Environmental Criteria for Road Traffic Noise (ECRTN) (EPA,1999):

$$L_{A1 \text{ construction}} = \text{RBL} + 15 \text{ dB(A)}$$

In addition to these criteria, the RNP provides the following guidance:

'From the research on sleep disturbance to date it can be concluded that: maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.'

Levels below these values are unlikely to cause an awakening. It is generally accepted that internal noise levels in a dwelling, with the windows open, are about 10 dB lower than external noise levels. As such, an external noise level of 60–65 dB(A) is not anticipated to cause sleep disturbance.

Table 7-16 outlines the sleep disturbance screening criteria (external to dwellings) for all identified receiver locations using the RBL plus 15 dB(A) calculation method outlined above.

Table 7-16 Sleep disturbance screening criteria (external to dwellings)

Receiver	Night-time RBL (10pm–7am)	$L_{A1,1min}$ screening criteria (10pm–7am)
R1-R32	43	58
R33-R115	41	56
R116-R121	46	61

Vibration

Human comfort

Vibration from construction activities must comply with Assessing Vibration – A Technical Guideline and British Standard BS 6472-1992, Evaluation of Human Exposure to Vibration in Buildings (1-80Hz). Vibration can have a continuous, impulsive or intermittent character, defined as follows:

- Continuous: Where vibration occurs uninterrupted for a defined period. This can include sources such as machinery and steady road traffic
- Impulsive: Where vibration occurs over a short duration (typically less than two seconds) and occurs less than three times during the assessment period, which is not defined. This may include activities such as occasional dropping of heavy equipment or loading/unloading activities
- Intermittent: Where continuous vibration activities are regularly interrupted, or where impulsive activities recur. This may include activities such as rock hammering, drilling, pile driving, heavy vehicle traffic or trains.

Construction activities are generally considered to be an intermittent source of vibration. Intermittent vibration is assessed using vibration dose values. However, a

peak particle velocity goal was used for this assessment due to its simplicity. Preferred and maximum values for continuous and impulsive vibration are defined in **Table 7-17**.

Table 7-17 Human comfort vibration goals – peak particle velocity (mm/s)

Location	Daytime (7am to 10pm)		Night-time (10pm to 7am)	
	Preferred values	Maximum values	Preferred values	Maximum values
Residences	0.28 (8.6)	0.56 (17.0)	0.20 (2.8)	0.40 (5.6)
Offices, places of worship	0.56 (18.0)	1.1 (36.0)	0.56 (18.0)	1.1 (36.0)
Workshops	1.1 (18.0)	2.2 (36.0)	1.1 (18.0)	2.2 (36.0)

Impulsive goals are shown in brackets. These are most relevant to activities that create up to three distinct vibration events in an assessment period, such as occasional dropping of heavy equipment, occasional loading and unloading. The 'offices, places of worship' criteria only apply when the premises are occupied.

Structural damage

The British Standard BS 7385:1993, Part 2: Evaluation and Measurement of Vibration in Buildings and the DIN provide guidance on assessing the potential for structural damage due to vibration.

The DIN was used for the assessment of the proposal as it identifies more stringent vibration levels for building damage and includes a category specifically for heritage buildings.

This standard recommends frequency-dependent values for peak particle velocity against different building categories as shown in **Table 7-18**.

Table 7-18 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on structures (DIN4150-3:1999)

Type of structure	Guideline values for velocity PVV (mm/s)		
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20
Structures that, because of their particular sensitivity to vibration, and great intrinsic value, cannot be classified under either of the other classifications	3	3 to 8	8 to 10

Operational noise

Operational noise is assessed in accordance with the RNP and ENMM. The RNP classifies road developments as either a 'new road' or a 'redevelopment of an existing road.' The two road classifications have base criteria for both daytime and night-time assessment periods. The base criteria for both types of development are presented in **Table 7-19**.

Table 7-19 Road traffic noise base criteria - residential

Road category	Type of proposal/land use	Noise criteria	
		Day 7:00am - 10:00pm	Night 10:00pm - 7:00am
Freeway/arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	L _{Aeq} (15hour) 55 dB (A)	L _{Aeq} (9hour) 50 dB (A)
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads	L _{Aeq} (15hour) 60 dB (A)	L _{Aeq} (9hour) 55 dB (A)

Due to its location and nature, the proposal was defined as a road redevelopment for the purposes of the assessment.

In addition to the base criteria, where receivers experience noise levels that are greater than or equal to L_{Aeq} (15hour) 65dB(A) and L_{Aeq} (9hour) 60 dB(A), as a result of existing or future road traffic noise, they would be classed as 'acute'. In these instances a detailed assessment of noise mitigation would be further considered.

Non-residential receivers are assessed against different criteria that reflect the specific use of the space. The Beckenham Memorial Church is located in the study area in the east of the proposal area. **Table 7-20** identifies the internal noise levels to be met for this receiver.

Table 7-20 Road traffic noise base criteria - non residential

Existing sensitive land use	Noise criteria	
	Day 7:00am - 10:00pm	Night 10:00pm - 7:00am
Place of worship	L _{Aeq} (15hour) 55 dB (A)	L _{Aeq} (9hour) 50 dB (A)

These criteria were applied to the 2018 design year noise levels for the purposes of this assessment. The proposal also considers areas where existing noise levels already exceed these base criteria in accordance with Practice Note (iv) of the ENMM as follows:

- New noise levels are not to exceed existing noise levels by more than 2 dB(A)
- New noise levels will not be acute.

Where these additional requirements cannot be met, noise mitigation would be considered.

Maximum noise levels

The RNP and the ENMM recognise the need to identify maximum noise level events for road projects when there is potential for sleep disturbance from traffic noise. These disturbances are identified as a noise event that substantially exceeds the continuous ambient noise environment. If substantially greater than the ambient noise in an area, these noise events may wake people and generate annoyance within a community. Once identified as an event, the number and associated levels of all events are compared to the current guidelines for these impacts to identify the

potential for the above constraints to be exceeded. The ENMM gives the following guidance:

Maximum internal noise levels below 50–55 dB(A) are unlikely to cause awakening reactions.

One or two noise events per night with maximum noise levels of 65–70 dB(A) are not likely to significantly affect health and well-being.

At locations where road traffic is continuous rather than intermittent, the $L_{eq(9hr)}$ (night) target noise levels should sufficiently account for sleep disturbance impacts.

For the purpose of the assessment, maximum noise levels external to dwellings should not exceed L_{Amax} 65 dB(A) (ie internal levels of L_{Amax} 50–55 dB(A) attenuation that is typically achieved through partially open windows). In addition, maximum noise levels external to dwellings should not exceed the $L_{Aeq, 9hr}$ (or $L_{Aeq, 1hr}$) noise level by more than 15 dB(A).

7.3.4 Construction noise and vibration assessment

Methodology

The potential construction noise impacts from the proposal were modelled using SoundPLAN (version 7.1) noise prediction software. The noise modelling addressed:

- Location of, and noise level emissions from, construction equipment
- Screening from structures
- Receiver locations
- Topography
- Noise attenuation due to geometric spreading
- Ground absorption
- Atmospheric absorption
- Meteorological conditions that may influence noise levels.

A schedule of construction equipment and staging detail is outlined in the Construction Method Statement for the proposal, and summarised in **Section 4.3**. Appendix B of the CNVIA provides a detailed program of equipment, noise levels, staging, and duration of the proposal in accordance with the Construction Method Statement outline. This table forms the basis of assessment for noise impacts associated with the proposal.

For the purpose of the assessment, the predicted noise levels were based on the assumption that at least one of each type of machine or plant identified for the stage works would be operational at any given time during the 15 minute assessment period.

These assumptions are expected to be the worst case scenario as they assume all plant to be operating simultaneously, which would typically not be the case. Therefore in reality noise level predictions would range from the predicted levels to lower values, depending on the quantity of plant operating and the duration of activities.

A summary of the predicted construction noise impacts for the proposal is presented below. Appendices C1-C5 (individual noise predictions) of the CNVIA and maps of

exceedances contained in **Appendix H** of this document provide a complete listing of modelled noise results.

Potential impacts summary

Construction activities associated with Stage 1 are linear works that would move through the study area as work progresses. These activities have been separated from other staged works that would be located in one area during the construction phase of the proposal.

The Stage 1 works would be likely to exceed construction noise management levels at the closest sensitive receivers (where construction would be within about 35 metres of sensitive receivers) (refer to **Table 7-21**). However, work for Stage 1 would not be stationary for an extended period of time and noise impacts are not expected to occur for more than one week at any single location.

Table 7-21 Predicted noise levels from Stage 1 of the proposal

Activity	Worst-case predicted level – $L_{Aeq, 15min}$ dB(A)
Excavation	71 (at 15 m) 67 (at 25 m) 64 (at 35 m)
Oxycutting	66 (at 15 m) 62 (at 25 m) 59 (at 35 m)
Shearing	63 (at 15 m) 59 (at 25 m) 56 (at 35 m)
Truck movements	66 (at 15 m) 62 (at 25 m) 59 (at 35 m)
Total (worst case)	75 (at 15 m) 71 (at 25 m) 68 (at 35 m)

The predicted construction noise levels for Stages 2 to 7 have been taken from the tables in Appendices C1-C5 of the CNVIA, and have been summarised in this section, showing the potential exceedances for each stage for both standard and out of hours works (refer to **Table 7-22**).

- No exceedances of the 75 dB(A) highly affected noise management level would occur for Stages 2, 3, 5 and 7 of the proposal
- Exceedances of the 75 dB(A) highly affected noise management level for receivers R37, R38, R39 and R67 during Stages 4 and 6 of the proposal.

Table 7-22 Construction noise impacts for Stage 2 to Stage 7 of the proposal

Stage	Residents affected during standard construction hours	Residents affected outside construction hours	Impacts on non-residential receivers
Joyce Drive widening Stage 2:	Marginal exceedances at: R7-R13 R20-R27	Up to 23 dB(A) over at: R7-R13, R35-R38, R20-R27 Over 10 dB(A) at:	4 dB(A): commercial receivers on Baxter Street

Stage	Residents affected during standard construction hours	Residents affected outside construction hours	Impacts on non-residential receivers
	R34-R38	Majority of receivers considered, excluding those on McBurney Avenue	
General Holmes Drive widening Stage 3:	Marginal exceedances at: R34-R38 R65-R67 R120-R121	Over 23 dB(A) at: R33-38 Over 10 dB(A) at: Majority of receivers considered	-
Botany Road and Wentworth Avenue intersection upgrade Stages 4 and 6:	Over 14 dB(A) at: R37, R38, R67 Over 10 dB(A) at: R33-R36, R39-R42, R51-R79, R110-R114, R116-R121	Over 30 dB(A) at: R37, R38 Between 20–30 dB(A) at: R33-R36, R39-R42, R52-R79, R110-R114 Between 10–20 dB(A) at: R1, R2, R12-R29, R43-R51, R80-R109, R115-R121	Exceedances at: Beckenham Memorial Church, C16, C17, C20, C21, C23, C25, C26
Rail bridges Stage 5:	Marginal exceedances at: R34-R39 R68	Over 30 dB(A) at: R37 Over 20 dB(A) at: R34-R36, R38-R39 Between 10–20 dB(A) at: R1, R10-R13, R33, R40-R45, R59-R67, R69-R76, R81, R105-R115	Exceedances at: Beckenham Memorial Church, C16, C17 and C21
Finalisation work Stage 7:	Marginal exceedances at: R11-R13, R33-R38, R57-R67, R116-R121	Over 20 dB(A) at: R11-R13, R33-R38, R57-R67 Between 10–20 dB(A) at: R1, R8-R10, R14-R32, R39-R56, R68-R121	1 dB(A): C13-C15

Sleep disturbance assessment

The majority of construction would occur during night-time hours to minimise impacts on traffic and airport operations. Works outside standard hours may be acceptable to the community where noise levels are below the respective background level. However the noise of some construction activities is likely to be above background levels and the proposal NMLs during the night time period cannot be easily mitigated.

Where out of hours work extends into the night time period, consideration of sleep disturbance for residential receivers is necessary. This is assessed by considering the maximum noise emissions from construction activities against the existing background noise levels for a given location (refer to **Section 7.3.3**).

Potential $L_{A1, 1min}$ noise levels were calculated for each stage of the proposal based on the proposal stages. A large portion of the works during the Stage 3 (General Holmes Drive widening) may need to be carried out during east-west runway closures at night. Additionally, it is understood that a substantial proportion of the finalisation work (Stage 7) and Botany Road and Wentworth Avenue intersection

(Stages 4 and 6) work may generally be carried out at night to minimise impacts on traffic.

The assessment determined that all identified sensitive receivers would potentially be impacted by sleep disturbance during construction of the proposal.

The sleep disturbance assessment found that all receivers may be potentially affected throughout the works. The $L_{A1,1min}$ noise levels should be reevaluated during detailed design, once the construction methodology and equipment requirements are more certain. Details of the predicted levels at all receiver locations are provided in **Appendix H**.

Construction vibration assessment

Potential construction vibration impacts were assessed based on equipment types and the distance of the sensitive receivers or structures from the nearest works. At the Botany Road and Wentworth Avenue intersection a substantial increase to the footprint of the existing intersection and a realignment of Wentworth Avenue would be required. These works would be carried out within about 10 metres of the closest residential receivers.

The highest levels of vibration would most likely occur at the Botany Road and Wentworth Avenue intersection during Stages 4 and 6, which would involve the use of pneumatic hammers and vibratory rollers and possible piling activities. No material risk of structural damage was identified in the CNVIA, however there is potential for exceedance of the human comfort criteria at this time.

To identify and minimise any potential vibration impacts it is recommended that pre-construction vibration trials are carried out to confirm that the use of vibratory equipment can comply with the maximum level of 0.56 millimetres per second at the closest dwellings. To assist in achieving an acceptable vibration level, all or any of the following considerations may be implemented.

- Reduction of the size of equipment
- Reduction of the vibratory roller settings
- Reduction of periods of continuous operation.

7.3.5 Operational noise and vibration assessment

Operational traffic noise predictions are based on forecast traffic volumes provided by Roads and Maritime. The traffic data was supplied for the following scenarios for the assessment of traffic noise levels:

- Opening year – 2013, 'no build' option, daytime and night-time periods
- Design year – 2018, 'build' option, daytime and night-time periods.

These scenarios provide a comparison of noise impacts for the proposal for a five year horizon and the 'do nothing' option based on current traffic noise levels. The assessment does not consider the effects of noise mitigation that may be implemented as a result of construction of the proposal.

Potential impacts

In accordance with advice from Roads and Maritime, the modelling procedures for daytime and night time traffic noise levels for the year 2013 and design year 2018 have been predicted at the identified receiver locations shown in **Figure 7-4** of the Operational Noise Impact Assessment (ONIA) in **Appendix H**.

The assessment of operational noise impacts typically indicates only marginal changes in traffic noise levels between 2013 and 2018. These minor changes in noise levels reflect the anticipated vehicle volume increases in this period. In addition, the proposed network re-alignment would not be in close vicinity to most of the receivers affected.

Predicted noise levels

Predicted noise levels produced by the noise model are presented in **Table 7-23** of the ONIA in **Appendix H**. The key finding of the assessment is that predicted changes in traffic noise levels between the 'build' and 'no build' scenarios would be less than 2 dB(A) for most receivers. However, there is also potential for the proposal to:

- Increase noise levels between the design year 'no build' and 'build' options by more than 2 dB(A) for receivers R38 and R67 due to the removal of properties on the northern side of Wentworth Avenue
- Increase noise levels between the design year 'no build' and 'build' options by more than 2 dB(A) for the Beckenham Memorial Church during the day and less than 2 dB(A) during the night due to the removal of properties on the southern side of Wentworth Avenue. However, it is expected that the internal noise criterion would be met while the church doors are closed.

Noise modelling results indicate that a number of receivers currently experience exceedances of the RNP base criteria, most of which are acutely affected. In accordance with the provisions of the ENMM (and Direction No. 24), these receivers would be considered for noise mitigation during detailed design.

A number of properties to the south of Wentworth Avenue were treated under the Aircraft Noise Insulation Program and therefore have already been potentially treated, and this would also be considered during detailed design.

Table 7-23 presents the receiver locations likely to experience exceedances of the operational noise criteria and that have been identified for consideration of noise mitigation. These locations are illustrated in **Appendix H**.

Table 7-23 Predicted noise levels for receivers identified for consideration of mitigation

Receiver ID	Receiver	L _{Aeq, Period} (dBA) Year 2013 No build		L _{Aeq, Period} (dBA) Year 2018 Build		RNP base assessment criteria		RNP Base criteria exceeded? (2018 Build)		Change noise levels 2018 - 2013		RNP acute criteria exceeded? (2018 Build)		Consider mitigation
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	
R33	1247 Botany Rd	73	66	73	66	60	55	Yes	Yes	0.2	-0.1	Yes	Yes	Yes
R34	1273 Botany Rd	72	66	73	66	60	55	Yes	Yes	1.2	0.7	Yes	Yes	Yes
R35	1275 Botany Rd	73	67	74	67	60	55	Yes	Yes	1.1	0.5	Yes	Yes	Yes
R36	1277 Botany Rd	73	67	74	67	60	55	Yes	Yes	1.2	0.6	Yes	Yes	Yes
R37	1285 Botany Rd	73	67	74	67	60	55	Yes	Yes	1.2	0.7	Yes	Yes	Yes
R38	86 Hardie St	64	58	67	60	60	55	Yes	Yes	2.4	1.4	Yes	No	Yes
R39	87 Hardie St	71	65	72	64	60	55	Yes	Yes	0.4	-0.8	Yes	Yes	Yes
R40	90 Johnson St	71	65	72	64	60	55	Yes	Yes	0.6	-0.7	Yes	Yes	Yes
R41	69 Johnson St	71	64	71	63	60	55	Yes	Yes	0.1	-1.2	Yes	Yes	Yes
R42	5 Johnson Lane	71	65	71	63	60	55	Yes	Yes	0.1	-1.2	Yes	Yes	Yes
R43	80 Alfred St	71	65	72	64	60	55	Yes	Yes	0.4	-0.9	Yes	Yes	Yes
R44	77 Alfred St	71	64	71	64	60	55	Yes	Yes	0.3	-0.9	Yes	Yes	Yes
R45	71 Frogmore St	71	65	72	64	60	55	Yes	Yes	0.2	-1.1	Yes	Yes	Yes
R46	66 Frogmore St	71	65	72	64	60	55	Yes	Yes	0.6	-0.7	Yes	Yes	Yes
R47	184 Sutherland St	67	61	67	60	60	55	Yes	Yes	0.4	-0.9	Yes	No	Yes
R67	84 Hardie St	61	55	63	56	60	55	Yes	Yes	2.1	1.3	No	No	Yes
R68	85 Hardie St	63	57	65	58	60	55	Yes	Yes	1.4	0.4	Yes	No	Yes
R72	88 Johnson St	65	59	65	57	60	55	Yes	Yes	-0.6	-1.8	Yes	No	Yes
R80	78 Alfred St	66	60	66	58	60	55	Yes	Yes	0.3	-1.1	Yes	No	Yes

Receiver ID	Receiver	L _{Aeq, Period} (dBA) Year 2013 No build		L _{Aeq, Period} (dBA) Year 2018 Build		RNP base assessment criteria		RNP Base criteria exceeded? (2018 Build)		Change noise levels 2018 - 2013		RNP acute criteria exceeded? (2018 Build)		Consider mitigation
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	
R83	75A Alfred St	68	61	68	60	60	55	Yes	Yes	0	-1.2	Yes	No	Yes
R87	69 Frogmore St	67	61	67	60	60	55	Yes	Yes	-0.2	-1.4	Yes	No	Yes
R91	64 Frogmore St	61	54	61	53	60	55	Yes	Yes	-0.1	-1.4	Yes	No	Yes
R98	68 Wentworth Ave	69	63	70	62	60	55	Yes	Yes	0.3	-1	Yes	Yes	Yes
R99	66 Wentworth Ave	70	64	71	63	60	55	Yes	Yes	0.5	-0.8	Yes	Yes	Yes
R100	64 Wentworth Ave	70	63	70	62	60	55	Yes	Yes	0.4	-0.9	Yes	Yes	Yes
R101	62 Wentworth Ave	67	61	68	60	60	55	Yes	Yes	0.5	-0.9	Yes	No	Yes
R102	60 Wentworth Ave	70	64	71	63	60	55	Yes	Yes	0.4	-0.9	Yes	Yes	Yes
R103	56 Wentworth Ave	72	65	72	64	60	55	Yes	Yes	0.4	-1	Yes	Yes	Yes
R104	54 Wentworth Ave	71	64	71	63	60	55	Yes	Yes	0.4	-1	Yes	Yes	Yes
R105	52 Wentworth Ave	72	65	72	64	60	55	Yes	Yes	0.4	-0.9	Yes	Yes	Yes
R106	50 Wentworth Ave	71	64	71	63	60	55	Yes	Yes	0.1	-1.3	Yes	Yes	Yes
R107	48 Wentworth Ave	70	64	71	63	60	55	Yes	Yes	0.5	-0.8	Yes	Yes	Yes
R108	46 Wentworth Ave	72	65	72	64	60	55	Yes	Yes	0.2	-1.1	Yes	Yes	Yes
R109	44 Wentworth Ave	71	64	71	63	60	55	Yes	Yes	0.3	-1.1	Yes	Yes	Yes
R110	42 Wentworth Ave	71	65	72	64	60	55	Yes	Yes	0.2	-1.2	Yes	Yes	Yes
R111	40 Wentworth Ave	71	64	71	63	60	55	Yes	Yes	-0.1	-1.5	Yes	Yes	Yes
R112	38 Wentworth Ave	71	65	72	64	60	55	Yes	Yes	0.1	-1.3	Yes	Yes	Yes
R113	36 Wentworth Ave	71	64	71	63	60	55	Yes	Yes	0.5	-0.8	Yes	Yes	Yes
Church	1293-1295 Botany Rd	69	63	71	64	70	70	Yes	No	2	1.4	n/a	n/a	No

Maximum noise level

It is not expected that the proposal would result in an increase in maximum noise levels during operation. As the Botany Road and Wentworth Avenue intersection upgrade would move away from the closest sensitive receivers on the northern side of Wentworth Avenue, maximum noise levels would potentially be slightly reduced. Although the intersection would be located closer to the Beckenham Memorial Church and commercial receivers after construction, the maximum noise level assessment would not apply as there would be no residential receivers.

7.3.6 Safeguards and management measures

Table 7-24 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on noise and vibration.

Table 7-24 Mitigation measures for noise and vibration

ID	Impact	Environmental safeguards	Responsibility	Timing
NV-1	Noise and vibration impacts on sensitive receivers	During the detailed design stage of the proposal, further investigations of potential noise impacts and all feasible and reasonable mitigation options will be carried out for affected receivers in accordance with the Road Noise Policy (DECCW 2011) and Roads and Maritime's Environmental Noise Management Manual Practice Note 4 (RTA 2001).	Roads and Maritime	Detailed design
NV-2	Noise and vibration impacts on sensitive receivers during construction	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared as part of the CEMP. The CNVMP will include (as a minimum): <ul style="list-style-type: none"> • A map indicating the locations of sensitive receivers • A quantitative noise assessment in accordance with the EPA Interim Construction Noise Guidelines (DECCW, 2009) • Management measures to minimise potential noise impacts • A risk assessment to determine construction activities likely to affect sensitive receivers • Mitigation measures to avoid noise and vibration impacts during construction activities • A process for assessing the performance of mitigation measures • A process for documenting and resolving issues and complaints • A construction staging program incorporating noise and vibration monitoring for sensitive receivers • Identification in toolbox talks where noise and vibration management is required. 	Construction contractor	Pre-construction
NV-3	General vibration during construction	Building condition surveys will be carried out for buildings identified in the CNVMP. A copy of the report will be sent to the landholder.	Construction contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
NV-4	General vibration during construction	A vibration assessment will be prepared and included in the NVMP. The vibration assessment will include (as a minimum): <ul style="list-style-type: none"> • Identification of potentially affected properties/receivers • A risk assessment to determine the potential for discrete work activities to affect receivers • A map indicating the locations considered likely to be impacted and those requiring building condition surveys • A monitoring program • A process for assessing mitigation measures • A process for resolving issues and conflicts, including additional noise and vibration monitoring where required. 	Construction contractor	Pre-construction
NV-5	Noise impacts on sensitive receivers from operation of stockpile and compound sites	Construction compound layout will be arranged so that primary noise sources are at a maximum distance from sensitive receivers (primarily residential receivers), with solid structures (sheds and containers) placed between sensitive receivers and noise sources (and as close to the noise sources as is practical).	Construction contractor	Pre-construction Construction
NV-6	Noise impacts from construction machinery	Compressors, generators, pumps and any other fixed plant will not be located near residences where possible	Construction contractor	Construction
NV-7	Noise and vibration induction	An environmental induction program will be developed to include specific noise and vibration awareness training.	Construction contractor	Construction

7.4 Non-Aboriginal heritage

The extent and magnitude of potential impacts of the proposal on non-Aboriginal heritage are assessed in the Statement of Heritage Impact (Stedinger Associates, 2014), which is provided in **Appendix I**. A summary of the assessment is presented in this section.

7.4.1 Methodology

Register searches and review of existing literature

A search of the following non-Aboriginal heritage registers was carried out in June 2014 to identify heritage places within or near the proposal. The following data registers and databases were searched:

- NSW State Heritage Register
- Botany Bay Local Environmental Plan 2013
- Heritage Conservation Development Control Plan No.37
- Roads and Maritime s170 Register
- Sydney Water s170 Register
- RailCorp s170 Register

- NSW Fire Brigades s170 Register
- Ausgrid s170 Register
- National Heritage List
- Commonwealth Heritage List
- Register of the National Estate
- National Trust Register (NSW).

The Statement of Heritage Impact (Stedinger Associates, 2014) was also reviewed against the Sydney Airport Heritage Management Plan (June, 2009) in October 2014.

Site surveys

Site surveys of the study area were carried out in March and May 2014 to verify any previously recorded historical heritage items and associated heritage curtilages identified during the register searches. The site surveys also aimed to identify any previously unrecorded historical heritage items and archaeological sites, and to assess the potential occurrence of archaeological resources on site.

7.4.2 Existing environment

History of the study area

Botany Bay was originally inhabited by people of the Dharawal nation who camped on the shore, and along the banks and wetlands of the Cooks River, to hunt and gather food. In 1770, Lieutenant James Cook, Joseph Banks and Dr Daniel Solander landed at Kurnell, marking the first encounter between Europeans and the traditional owners of the land. The British Government originally decided to establish a penal settlement at Botany Bay, but a lack of fresh water supply and inadequate shelter for ships resulted in the First Fleet finding a more suitable location for settlement at Sydney Cove.

In 1809, Governor Lachlan Macquarie issued the first land grants in the Botany area with Edward Redmond, Andrew Byrne and Mary Lewin among the earliest settlers. Redmond established a farm known as 'Mudbank', which would later become the site of Mascot and Sydney Airport. Byrne and Lewin owned nearby land to the west where they farmed and burnt oyster shells to extract lime for sale.

In 1812, Simeon Lord acquired 61 hectares of land in the Botany area. In 1815, Lord engaged convicts to build his house, 'Banks House', a dam (now known as Mill Pond) and a water wheel driven mill on the banks of the stream for the scouring and milling of woollen cloth.

Other entrepreneurs introduced new industries to Botany Bay including a flour mill, paper mill, leather works, fellmonger yards, and slaughter house. From the 1830s, the Botany area became known for market gardening, and buildings began to emerge along Botany Road.

In 1859, water supply work was completed in Botany, becoming Sydney's third main water supply system. After the opening of the tramline in 1882, the Botany Road Trust paved and kerbed the route, with sandstone kerbs and alignment pins a common feature.

In 1947, land from the Ascot Racecourse was resumed for an extension to Sydney Kingsford Smith Airport. The extension required the diversion of the Cooks River, substantial filling of Engine Pond and Mill Pond, the diversion of the Water Board's two main sewers, and the diversion of General Holmes Drive.

In 1963, land was reclaimed in Botany Bay for the extension of Sydney Airport's main runway. This occurred again in 1972 to allow Concorde, DC10 and Boeing 747s to operate from Sydney Airport. In 1994, a third runway was completed on reclaimed land.

Heritage items within the proposal area

There are six listed heritage items and three unlisted heritage items located within the proposal area (refer to **Figure 7-5** and **Table 7-25**). These are described below.

House (1289 Botany Road)

This Georgian style house dates from the 1880s Victorian period and is listed on the Botany Bay LEP as an item of local heritage significance (refer to **Photo 7-1**). Occupying almost the entire width of its narrow allotment, the house is a single-storey face brick building, in terraced style, with a corrugated iron gable end roof.

This house has heritage significance as it is an important example of early modest residential housing built along Botany Road and indicates the type of housing available to workers during the Victorian period. While much of the original form and fabric remain, the surrounding context and associations have been removed.



Photo 7-1 Georgian style house at 1289 Botany Road

House (1291 Botany Road)

This Queen Anne style house dates from the early 1900s Federation period and is listed on the Botany Bay LEP as an item of local heritage significance (refer to **Photo 7-2**). Occupying the northern portion of the allotment, the house is a single-storey weatherboard building with a steeply pitched terracotta tiled hipped roof.

The house is in very good condition but has retained very little original fabric. While the roof shape indicates the original structural frame, the original cladding has been replaced with modern terracotta roof tiles. The weatherboard of the house also

appears to have been replaced. The house has heritage significance as it is an important example of early 20th century housing built along Botany Road.



Photo 7-2 Federation period house at 1921 Botany Road

Beckenham Church School Hall (1293 Botany Road)

The Beckenham Church School Hall was built in 1914 and is listed on the Botany Bay LEP as an item of local heritage significance (refer to **Photo 7-3**). The hall is a long and narrow timber frame building situated on low face brick walls. The building is asbestos cement clad and has a modern corrugated iron roof with gable ends, which rests in decorative turned timber columns on its west side. The entrance door is made of plain timber and the hall windows are made of timber with 10 panes. A small brick boundary wall forms the end of the property towards Botany Road.

The hall has social and religious value within the community, but much of its original fabric appears to have been replaced.

Beckenham Memorial Church (1295 Botany Road)

The Beckenham Memorial Church was built in 1933 and is listed on the Botany Bay LEP as an item of local heritage significance (refer to **Photo 7-3**). The church was built in the Romanesque form with Gothic characteristics, with a large decorative brick front gable with buttresses, arched windows and a rosette window in the centre. The gable wall forms a parapet, and two side gables, also with parapets, are located on the northern and southern sides of the roof. Both entrance doors are made of timber with decorative hinges and handles.

The church has heritage significance as it provided a place of worship for the growing Congregational Church during the 1930s.



Photo 7-3 Beckenham Church School Hall (left) and Beckenham Memorial Church (right)

Mascot (Botany Road) Underbridge

The Mascot (Botany Road) Underbridge was built between 1924 and 1925 and is listed on the Botany Bay LEP and the RailCorp s170 Register as an item of local heritage significance (refer to **Photo 7-4**). It functions as a rail bridge over Botany Road, and is a single track riveted steel girder bridge with an unusual 'skewed' nature due to the use of short girders during construction. As a result, brick arched piers were built at the roadside and short reinforced concrete slabs were added at each end between the piers and abutments.

The bridge is historically significant as the extension allowed industry and shipping at Botany to be connected to the main rail network. The bridge also has aesthetic appeal as a landmark structure over Botany Road, demonstrating fine workmanship.



Photo 7-4 Mascot (Botany Road) Underbridge

Sydney Kingsford Smith Airport Group

The Sydney (Kingsford Smith) Airport Group is listed on the Botany Bay LEP as an item of local heritage significance. Individual items in the Sydney (Kingsford Smith) Airport Group are also listed on the State Heritage Register, Roads and Maritime s170 Register, and the Register of the National Estate. The Sydney (Kingsford Smith) Airport is registered as an 'indicative place' on the Australian Heritage database. As such, it has not yet been listed as an item of Commonwealth heritage significance.

There are several heritage items located within the group boundary on Sydney Airport and/or Commonwealth land (Stedinger Associates, 2014). These include:

- The Botany Water Pumping Station ruins
- Mill Ponds (including Engine Pond, Mill Pond and Mill Stream, which are remnants of the original waterways)
- Potential subsurface archaeological remains of Simeon Lord's mills, dams and house
- Sewage Pumping Station No. 38 and an adjacent inspection hall and substation
- The Alexandra Canal, built in the 1880s to serve the growing industries along its course
- The Southern and Western Suburbs Ocean Outfall Sewers (SWSOOS) Nos. 1 and 2 built in 1916 and 1941
- The former Lauriston Park subdivision, represented by Ross Smith Avenue
- The Civil Aviation Terminal and Control Tower (Building 60), built in 1939–40
- Various simple utilitarian light industrial buildings erected in the 1930s and 1940s
- Various hangars built in the 1940s and 1950s
- Fourth Control Tower, Operations Centre and Services Building, built between 1968 and 1972

- Control Tower (Building 239), completed in 1969
- Sydney Airport Control Tower (Fifth Control Tower) (Building 496), completed in 1994
- The east–west and north–south runways
- Landscape plantings, including mature fig trees associated with the former Ascot Racecourse.

The Sydney Airport Heritage Management Plan (June, 2009) also lists buildings, areas and elements that contribute to the identified Commonwealth heritage values within Sydney Airport.

Sandstone kerb and alignment pin between Bronte Avenue and Mascot (Botany Road) Underbridge

Sandstone kerbs and an alignment pin on Botany Road are unlisted heritage items. Dating from the early 1880s, the sandstone kerbs occur for 70 metres between Bronti Street and the Mascot (Botany Road) Underbridge (refer to **Photo 7-5** for an example of sandstone kerbs in the proposal area). An alignment pin is located in the centre of McBurney Lane Avenue at Botany Road; it is a broad arrow carved into retained sandstone and a cast iron broad arrow nearby (refer to **Photo 7-6**).

These heritage items are significant as they represent the formalisation of the boundary of Botany Road following the opening of the Botany tramway in 1882. It is also uncommon for sandstone kerbs of such length with an alignment pin to remain relatively intact.



Photo 7-5 Example of sandstone kerb along Botany Road near McBurney Avenue



Photo 7-6 Alignment pin on sandstone kerb at McBurney Avenue and Botany Road

Sandstone kerb near Wentworth Avenue

The sandstone kerb along the eastern side of Botany Road, near Wentworth Avenue, is an unlisted heritage item (refer to **Photo 7-5** for an example). Dating from the early 1880s, the sandstone kerb runs for 20 metres from 1291 to 1295 Botany Road.

This heritage item is significant as it represents the formalisation of the boundary of Botany Road following the opening of the Botany tramway in 1882. This item also contributes to the amenity and character of the area and provides evidence of Botany Road improvements following the opening of the tramway.

Botany Road tram track

The tram track beneath the road surface on Botany Road between Mascot (Botany Road) Underbridge and Baxter Street is an unlisted heritage item within the proposal area. Built in 1882, this heritage item is significant as it forms part of the transport history of the proposal area.

Listed heritage items near the proposal area

Eight registered heritage items near the proposal area were also considered (refer to **Appendix I**). These are:

- Botany Water Reserve (which includes Mill Ponds)
- Mascot (O’Riordan Street) Underbridge
- Electricity Substation 163, at 34 Wentworth Avenue
- Commercial Building Group, 1209–1223 Botany Road
- Single Storey Terrace Group, 1239–1245 Botany Road
- House (1901–1914), 71 Frogmore Street

- House 'Verandale' (1901–1918), 87 Hardie Street
- House 'Yarrowonga' (1918–1939), 90 Johnson Street.

Other heritage items near the proposal area were not included in the assessment as it was determined they would not be impacted by the proposal. These items are shown in **Figure 7-5**.

Archaeological potential

Figure 7-6 shows areas of archaeological potential within and near the proposal area. Areas of archaeological potential were identified at Mill Pond, Engine Pond, Botany Water Reserves, and Sydney Airport. The assessment indicated that there was potential for some roads within and near the proposal area to contain intact heritage items. These include the remains of earlier roadways in less disturbed areas, as well as the tram tracks and sandstone kerbs along Botany Road. As much of the proposal would be located within the existing road corridor, building footings or intact subfloor deposits, associated outbuildings, privies, wells or rubbish pits and artefact scatters are not anticipated to be unearthed during construction. However, heritage items are likely to exist within the study area outside the road corridor. These items would potentially be associated with earlier site use of the two heritage listed houses and the Beckenham Church School Hall (refer to **Figure 7-6**).

Table 7-25 Listed heritage items within and near the proposal area

Item				
House (1289 Botany Road, Mascot)	Botany Bay LEP Item No. 50	Local	c1880	Within the proposal area
House (1291 Botany Road, Mascot)	Botany Bay LEP Item No. 51	Local	c1910	Within the proposal area
Beckenham Church School Hall (1293 Botany Road, Mascot)	Botany Bay LEP Item No. 52	Local	1914	Within the proposal area
Beckenham Memorial Church (1295 Botany Road, Botany)	Botany Bay LEP Item No. 52	Local	1933	Partially within proposal area
Mascot (Botany Road) Underbridge (Botany Road, Mascot)	Botany Bay LEP Item No. 153 RailCorp s170 Register Item No. 4800248/ 4801848	Local	1924-1925	Within the proposal area
Sandstone kerbing and alignment pin (between Bronte Avenue and Mascot (Botany Road) Underbridge)	Not listed	Local	c1882-c1993	Within the proposal area
Sandstone kerb (near Wentworth Avenue)	Not listed	Local	c1882-c1883	Within the proposal area
Botany Road tram track	Not listed	Local	1882	Within the proposal area

Item	Register listing(s)	Significance	Date	Relationship to the proposal
Sydney (Kingsford Smith) Airport Group	Botany Bay LEP Item No. 170 Register of the National Estate Indicative place on Commonwealth Heritage List	Local/ National*	1921-ongoing	Partially within the proposal area
Botany Water Reserve	State Heritage Register Botany Bay LEP 2013 Sydney Water s170 Register Register of the National Estate National Trust Register	State	1815-1878	Near the proposal area
Mascot (O'Riordan Street) Underbridge	RailCorps170 Register	Local	1924-1925	Near the proposal area
Electricity Substation 163 (34 Wentworth Avenue)	Ausgrid s170 Register	Local	1924	Near the proposal area
Commercial Building Group (1209-1223 Botany Road)	Botany Bay LEP 2013	Local	1920-1939	Near the proposal area
Single Storey Terrace Group (1239-1245 Botany Road)	Botany Bay LEP 2013	Local	c1887	Near the proposal area
House (71 Frogmore Street)	Botany Bay LEP 2013	Local	1901-1914	Near the proposal area
House 'Verandale' (87 Hardie Street)	Botany Bay LEP 2013	Local	1901-1918	Near the proposal area
House 'Yarrowonga' (90 Johnson Street)	Botany Bay LEP 2013	Local	1918-1939	Near the proposal area

* This item has been assessed in the SoHI as being of national significance.



NSW SPATIAL - GIS MAP file - EN04475_REF_F007_73v3

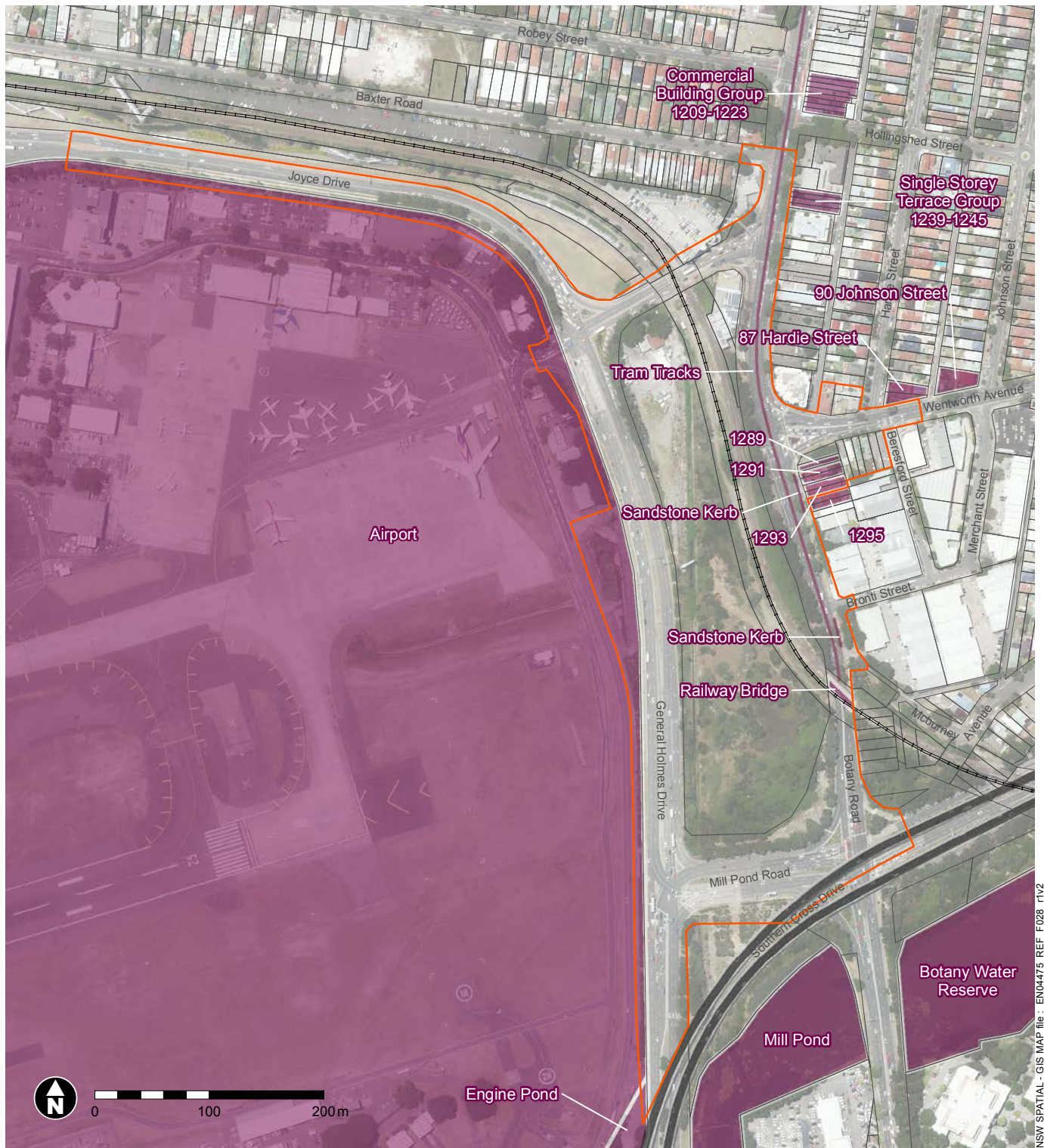
Figure 7-5 Heritage items within and near the proposal area

Legend

- Proposal area boundary
- Motorway
- Railway
- Botany Bay Local Environmental Plan 2013 heritage item
- State Heritage Register curtilage
- Commonwealth heritage listed item
- Unlisted heritage item

Sydney (Kingsford Smith) Airport Group comprises many individual items. Refer to Section 7.4 for further detail

Ref_Design7D.dwg
 Roads and Maritime Services 2014
 NSW Planning and Infrastructure 2014
 AUSIMAGE 2014
 LPI 2014



NSW SPATIAL - GIS MAP file - EN04475_REF_F028_r1v2

Figure 7-6 Areas of archaeological potential

Legend

- Proposal area boundary
- Areas of archaeological potential
- Motorway
- Railway

Ref_Design7D.dwg
 Roads and Maritime Services 2014
 Stedinger Associates 2014
 AUSIMAGE 2014
 LPI 2014

7.4.3 Potential impacts

An assessment of heritage significance and statement of heritage impacts was carried out for the heritage items within and close to the proposal area.

Construction

Potential impacts associated with construction are discussed below.

Direct impacts

The proposal would require:

- Full property acquisition of four lots containing local heritage items listed on the Botany Bay LEP (the house at 1289 Botany Road, the house at 1291 Botany Road and the Beckenham Church School Hall) (refer to **Table 7-26**). The statement of heritage impact indicates that their removal is not considered to be significant (refer to **Table 7-27**).
- Partial property acquisition of three lots containing local heritage items listed on the Botany Bay LEP (Beckenham Memorial Church and Sydney Airport curtilage) (refer to **Table 7-26**).
- Removal of the Botany Road tram track, which is an unlisted heritage item (refer to **Section 7.4.2**). The tram tracks are not considered to have high research potential and are not a rare archaeological resource. Therefore, removal of these tracks are not considered to have a significant heritage impact.
- Removal of about 20 metres of sandstone kerb from 1291 to 1295 Botany Road (near Wentworth Avenue), which is an unlisted heritage item.

Table 7-26 Property acquisition of listed heritage items

Item)	acquisition
House (1289 Botany Road)	Local	13	DP135940	237	Full
House (1291 Botany Road)	Local	14	DP135940	246	Full
		5	DP251	251	Full
Beckenham Church School Hall	Local	6	DP3280	251	Full
Beckenham Memorial Church	Local	8	DP3280	6	Partial
		7	DP3280	37	Partial
Sydney (Kingsford Smith) Airport Group	Local/ National*	8	DP1050923	4620	Partial

* This item has been assessed in the SoHI as being of national significance.

Construction would encroach inside the heritage-listed curtilage of the Sydney (Kingsford Smith) Airport Group including a distance of about eight metres on the southern side of Joyce Drive, and a distance of about two metres along a section of General Holmes Drive to Mill Pond Road. The exact distance that the proposal would encroach into heritage-listed curtilage would be determined during detailed design. Construction is not anticipated to have a physical or visual impact on any heritage items of the Sydney (Kingsford Smith) Airport Group.

Other potential impacts

Construction activities could also have potential impacts, including:

- Indirect impacts from vibration-generating activities near heritage items. Safeguards to reduce the risk of damage to these items are outlined in **Section 7.4.4**.
- Exposure of unexpected subsurface remains and other potential heritage items. In particular, construction would disturb potential artefact bearing deposits associated with the two heritage listed houses and the Beckenham Church School Hall. These impacts would be managed through the application of relevant safeguards (refer to **Table 7-28**).

Table 7-27 provides a summary of the assessment findings, potential impacts and significance of the potential impacts. Provided that all relevant safeguards and management measures are implemented (refer to **Table 7-28**), heritage items and associated curtilages near the proposal are not anticipated to be negatively impacted during construction.

Table 7-27 Heritage items and impacts associated with the proposal

Item name	Significance	Potential impact
House (1289 Botany Road)	Local	<p>The house (and its curtilage) would be demolished as it is within the proposed westbound carriageway for Wentworth Avenue and a shared-use path.</p> <p>Demolition and construction activities would be likely to disturb other late 19th century heritage items which have the potential to occur at this site.</p> <p>This impact is not considered to be significant as this example of house can be found in many places in Sydney and NSW.</p>
House (1291 Botany Road)	Local	<p>The house (and its curtilage) would be demolished as it is within the proposed westbound carriageway for Wentworth Avenue and a shared-use path.</p> <p>Demolition and construction activities would be likely to disturb other late 19th century heritage items which have the potential to occur at this site.</p> <p>This impact is not considered to be significant as this example of house can be found in many places in Sydney and NSW.</p>
Beckenham Church School Hall	Local	<p>The hall (and its curtilage) would be demolished as it is within the proposed westbound carriageway for Wentworth Avenue and a shared-use path.</p> <p>Demolition and construction activities would be likely to disturb other heritage items which have the potential to occur at this site.</p> <p>This hall type is not unique in the Sydney area. Furthermore, a considerable amount of its original fabric has been removed.</p>
Beckenham Memorial Church	Local	<p>The church building would not be physically impacted by the proposal. The front property boundary would be adjusted to accommodate the proposal area. At the south-east corner, the proposed boundary would be set between 0.5 metres and one metre into the front yard. At the south-west corner, it would be set about three metres into the fronting brick fence.</p> <p>Landscaping following construction would be sympathetic to the heritage character of the building and new shade trees would be replanted in the road reserve, which would be visually connected to the church.</p>

Item name	Significance	Potential impact
Sydney (Kingsford Smith) Airport Group	Local/National*	The road widening would encroach inside the heritage curtilage of the Sydney (Kingsford Smith) Airport Group. The extent of this is to a depth of about eight metres on the south side of Joyce Drive. Along General Holmes Drive to Mill Pond Road a section of the proposed road widening extends for about two metres into the heritage curtilage of Sydney Airport group. The exact distance that the proposal would encroach into heritage-listed curtilage would be determined during detailed design.
Mascot (Botany Road) Underbridge	Local	Provided that care is taken and appropriate protective measures are applied in this location during construction, this heritage item is not expected to be affected by the proposal.
Sandstone kerb along Botany Road, near McBurney Avenue	Local	Provided that care is taken and appropriate protective measures are applied in this location during construction, this heritage item is not expected to be affected by the proposal.
Sandstone kerb along Botany Road, near Wentworth Avenue	Local	The sandstone kerbs along Botany Road near Wentworth Avenue would be removed, resulting in a loss of historic fabric. The kerb extends for 20 m and is broken at intervals.
Tram track along Botany Road	Local	Stage 4 of the proposal would involve the removal of the tram track along Botany Road (refer to Table 4-5).
Botany Water Reserve	State	Construction activities have the potential to indirectly impact on water quality at Mill Pond and Engine Pond (refer to Section 7.8.3). The water quality impacts of the proposal are not expected to have an impact on the heritage significance of Botany Water Reserve. Due to the distance between Botany Water Reserve and vibration causing activities, vibration is not expected to cause damage to the water reserve and therefore would not have an impact on its heritage significance.

*SoHI assessed this item as being of national significance.

Operation

Direct impacts

The proposal would potentially have a positive impact on the Beckenham Memorial Church. Landscaping after construction would allow the church to be more visually exposed, while providing a visual connection with Dr Darragh Reserve.

Heritage items and associated curtilages near the proposal are not anticipated to be negatively impacted during operation, provided that all relevant safeguards and management measures are addressed (refer to **Table 7-28**).

7.4.4 Safeguards and management measures

Table 7-28 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on non-Aboriginal heritage. Management strategies will also be applied to mitigate vibration impacts on heritage items. These are outlined in **Section 7.3.6**.

Table 7-28 Mitigation measures for non-Aboriginal heritage

ID	Impact	Environmental safeguards	Responsibility	Timing
NA-1	Landscaping to improve visual amenity of Beckenham Memorial Church	Landscaping surrounding the Beckenham Memorial Church will be investigated during detailed design in consultation with church owners and heritage officers from Botany Bay City Council.	Roads and Maritime	Detailed design
NA-2	Removal of heritage relics	An exception under Section 139 of the Heritage Act will be obtained for impacts to identified relics within the proposal area, if required.	Roads and Maritime	Pre-construction
NA-3	Impact to heritage items	A condition survey will be carried out before the start of work by a qualified contractor and a building condition report prepared for nearby heritage items which may experience indirect impact from construction, including Beckenham Memorial Church.	Roads and Maritime	Pre-construction
NA-4	General impact to heritage	<p>A Non-Aboriginal Heritage Management Plan will be prepared and included in the CEMP. The plan will include but not limited to:</p> <ul style="list-style-type: none"> • A map identifying locations of heritage items (including curtilages) which are to be protected and those which are to be destroyed • Identification of potential impacts to heritage items due to construction • Implementation of mitigation measures to protect identified heritage items • A stop works procedure in the event of actual or suspected potential harm to a heritage item • Requirement to comply with Roads and Maritime Standard Management Procedure - Unexpected Archaeological Finds, 2012. 	Roads and Maritime	Pre-construction
NA-5	Disturbance, removal or demolition of non-Aboriginal heritage items	<p>A photographic archival recording will be made of the following items before any disturbance or demolition, in accordance with OEH guidelines:</p> <ul style="list-style-type: none"> • House (house and allotment), 1289 Botany Road • House (house and allotment), 1291 Botany Road • Beckenham Memorial Church School Hall (hall and allotment), 1293 Botany Road • Beckenham Memorial Church (church frontage only), 1295 Botany Road • Mascot (Botany Road) Underpass (bridge and its approaches) • Sandstone kerb along Botany Road near Wentworth Avenue • Botany Road tram tracks. 	Roads and Maritime	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
NA-6	Non-Aboriginal heritage awareness training	Non-Aboriginal heritage awareness training will be provided for all contractors and personnel before the start of construction to make aware of retained heritage items within the vicinity of the works and required management measures and to ensure understanding of the procedure required to be carried out in the event of discovery of non-Aboriginal heritage materials, features or deposits, or the discovery of human remains.	Construction contractor	Pre-construction
NA-7	Protection of non-Aboriginal heritage items from inadvertent damage	The following items will be temporarily fenced and appropriate signage displayed and/or noted on a plan as a heritage item to avoid indirect impacts or encroachment, where necessary: <ul style="list-style-type: none"> • Mascot (Botany Road) Underbridge • Sandstone kerb and alignment pin at Botany Road, near McBurney Avenue • Botany Water Reserve • Mascot (O’Riordan Street) Underbridge • Electricity Substation 163, at 42 Wentworth Avenue • Commercial Building Group, 1209–1223 Botany Road • Single Storey Terrace Group, 1239–1245 Botany Road • House, 71 Frogmore Street • House, 87 Hardie Street • House, 90 Johnson Street. 	Roads and Maritime Construction contractor	Pre-construction Construction
NA-8	Discovery of non-Aboriginal heritage features or deposits	If at any time during construction of the project, non-Aboriginal heritage materials, features and/or deposits are found and are not covered by an issued approval (generally s139 excavation permit, exception or s60 approval or exemption) then the Roads and Maritime Standard Management Procedure: Unexpected Heritage Items (Roads and Maritime 2013) will be followed.	Construction contractor	Construction
NA-10	Discovery of tram tracks and additional road fabric	A photographic archival recording will be made of additional road fabric or other unanticipated finds if found during construction. This will be carried out in accordance with Roads and Maritime’s Standard Management Procedure: Unexpected Archaeological Finds (2012).	Construction contractor	Construction
NA-11	Rebuilding of Beckenham Memorial Church fence	The front boundary wall of Beckenham Memorial Church will be rebuilt in the same style and with similar materials as the existing wall, in consultation with church owners and heritage officers from Botany Bay City Council.	Construction contractor	Construction

7.5 Biodiversity

The extent and magnitude of potential impacts of the proposal on biodiversity are assessed in the Biodiversity Assessment (SMEC, 2014), which is provided in **Appendix J**. A summary of the assessment is presented in this section.

Potential impacts of the proposal on aquatic ecology were assessed via a desktop analysis, and are documented in this section.

7.5.1 Methodology

Study area

This assessment uses the following terms:

- The 'study locality' – This is the area within 10 kilometres of the study area
- The 'proposal area' and 'study area' – These terms are defined in **Section 1.1** of this REF
- The 'construction footprint' – This is the area that would be cleared as part of the proposal. This includes all areas that would be disturbed during construction, including ancillary sites and construction tracks. This is generally the same extent as the proposal area
- The Mill Ponds – This refers to the series of ponds to the east and south of the proposal, which includes (from west to east) the Mill Pond, Engine Pond and Mill Stream. These are also collectively known as the Sydney Airport Wetlands (Sydney Water Corporation, 2010). The Mill Ponds makes up part of the larger Botany Wetlands, which are a series of 11 interconnected ponds, stretching between Gardeners Road, Mascot, to the northern shore of Botany Bay.

Review of literature, mapping and government database

A desktop review was carried out of background reports, databases and mapping pertaining to the biodiversity of the bioregion and the study locality. These included:

- Preliminary Ecological Investigation for Mill Pond Road, Botany (Lesryk, 2013)
- NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife Database within a 10 kilometres radius of the site
- EPBC Act Protected Matters Search Tool
- NSW Flora Online Search – Rare or Threatened Australian Plants (ROTAP) species
- The Native Vegetation of the Sydney Metropolitan Area (OEH, 2013)
- Rapid Fauna Habitat Assessment of the Sydney Metropolitan Catchment Management Authority Area (DECC, 2008b)
- Threatened and Protected Species, City of Botany Bay LGA (DPI, 2013a)
- NSW Department of Primary Industries Noxious Weeds List (DPI, 2013b).

Likelihood of occurrence within the proposal area was assessed for each State and nationally listed threatened species. The definitions for likelihood categories are provided in **Table 7-29**.

Table 7-29 Likelihood of occurrence

Likelihood of occurrence	Criteria
Unlikely	<ul style="list-style-type: none">• Species highly restricted to certain geographical areas not within the proposal area• Specific habitat requirements are not present in the study area.

Likelihood of occurrence	Criteria
Low	Species not recorded during field surveys and fit one or more of the following criteria: <ul style="list-style-type: none"> • Have not been recorded previously in the study area/surrounds and for which the study area is beyond the current distribution range • Use specific habitats or resources not present in the study area • Are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
Moderate	Species not recorded during the field surveys that fit one or more of the following criteria: <ul style="list-style-type: none"> • Have infrequently been recorded previously in the study area/surrounds • Use specific habitats or resources present in the study area but in a poor or modified condition • Are unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration • Are cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
High	Species recorded during the field surveys or species not recorded that fit one or more of the following criteria: <ul style="list-style-type: none"> • Have frequently been recorded previously in the study area/surrounds • Use habitat types or resources that are present in the study area that are abundance and/or in good condition within the study area • Are known or likely to maintain resident populations surrounding the study area • Are known or likely to visit the site during regular seasonal movements or migration.

Field investigations

Survey methods for the field survey were developed in accordance with the Threatened Species Survey and Assessment: Guidelines for Developments and Activities (DEC 2005).

A terrestrial flora and fauna habitat assessment was conducted on 9 and 10 December 2013. This field survey updated and added to the previous surveys carried out for portions of the proposal area by Lesryk Environmental Consultants. Methods used for the assessment include flora surveys, fauna habitat assessment and the random meander technique (refer to **Appendix J**).

An additional survey for the Green and Golden Bell Frog was carried out on 9 and 10 December 2013. This survey involved diurnal (day time) habitat searches on two consecutive days within the wetland, edges of wetland and traverses within the wetland. It also involved nocturnal (night time) surveys on two consecutive nights, starting from dusk. The nocturnal survey process involved listening for calls, playing back recorded calls of the target species and spotlight searching. This method was repeated twice.

Aquatic ecology

A desktop analysis of aquatic ecology was carried out by Jacobs in November 2014. It included a review of database searches, reports and other publicly available information, including:

- NSW Office of Environment and Heritage (OEH): Atlas of NSW Wildlife BioNet Database (10 kilometre by 10 kilometre area for vegetation community searches, and a two kilometres buffer for threatened species searches) and Threatened Species Profile Searches

- NSW Government Primary Industries Noxious Weed declarations for the Council of the City of Botany Bay
- EPBC Protected Matters Report with a two kilometres buffer from the projected area
- Sydney Airport (2010) Fact Sheet – Sydney Airport Wetlands
- Sydney Airport (2013) Environmental Strategy Report 2013 – 2018
- Sydney Water Corporation (2010) Implementation of Botany Wetlands Plan for Management - Annual Summary Report
- Weeds of National Significance (Department of the Environment (DoE) (2012)
- Publicly available reports of aquatic flora and fauna in the study area.

7.5.2 Existing environment

The study area is located in the Sydney Basin Bioregion, Pittwater subregion, entirely within the Sydney Metropolitan Catchment. The topography is level to gently undulating coastal flats with elevations ranging between two metres and 10 metres.

Although the majority of the study area is heavily urbanised, it fringes the Botany wetland complex. This complex is regarded as one of the areas of highest fauna habitat value for migratory shorebirds and other waterbirds within the Sydney Metropolitan Catchment (DECC, 2008b).

Vegetation communities

The terrestrial ecology desktop searches identified six threatened ecological communities (TEC) as occurring or potentially occurring within the study locality. These are:

- Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Eastern Suburbs Banksia Scrub of the Sydney Region
- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Western Sydney Dry Rainforest and Moist Shale Woodland on Shale.

The aquatic ecology desktop searches identified an additional two threatened ecological communities (TEC) as occurring or potentially occurring within the study locality. These are:

- Coastal Upland Swamps in the Sydney Basin Bioregion
- Sydney Freshwater Wetlands in the Sydney Basin Bioregion.

Of the eight TEC identified during the desktop search for the locality, only one native vegetation community was identified in the study area during field investigations. The native vegetation community in the study area is a patch of Coastal Freshwater Wetland which is about 0.45 hectares in size (refer to **Figure 7-7**). It meets the definition of Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions Threatened Ecological Community (the Freshwater Wetland TEC) listed as endangered under the NSW *Threatened Species Conservation Act 1995* (TSC Act). While the wetland is degraded and is moderately to heavily weed-infested, it still contains positive diagnostic native species that enable identification of the TEC.



Figure 7-7 Vegetation communities

This vegetation community is also equivalent to the NSW Plant Community Type 781: Coastal Freshwater Lagoons of the Sydney Basin and South East Corner in the NSW Vegetation Types Database (OEH 2013). It is not listed under the Commonwealth EPBC Act.

Disturbed landscapes mapped by OEH (2013) and confirmed during field investigations include:

- Weeds and exotics, with the majority of the study area dominated by weeds. Weed-dominated areas cover about five hectares, on disturbed and landscaped sites, including disturbed areas between General Holmes Drive and Botany Road, and within the rail corridor. Weeds identified in the study area are discussed in this section
- Urban native and exotic cover, including linear roadside planting of native and exotic species
- Street plantings, including roadside trees and shrubs in the pavement.

Groundwater-dependent ecosystems

The Coastal Freshwater Wetland as discussed above, is considered to be a groundwater-dependent ecosystem (refer to **Section 7.6.2**).

Fauna habitats

Habitats in the study area are generally highly modified and their capacity to support threatened and migratory fauna is low. The main habitat features are described in **Table 7-30** and shown on **Figure 7-8**. No habitat trees were identified during field investigations within the proposal area.

Table 7-30 Fauna habitats in the study area

Fauna habitat	Habitat description	Association with vegetation community
Freshwater wetland	This habitat is limited to a small area (0.45 hectares) of densely vegetated freshwater wetland. A small wetland dominated by Bullrush (<i>Typha</i> sp.) is present within an area of highly disturbed vegetation. Despite past records in the study locality, it is unlikely that this wetland is now used by the Green and Golden Bell Frog (<i>Litoria aurea</i>) (as discussed in further detail below). Two aerial insectivores, the Fork-tailed Swift (<i>Apus pacificus</i>) and the White-throated Needletail (<i>Hirundapus caudacutus</i>), may occasionally forage over the study area.	Coastal Freshwater Wetland (TEC)
Exotic grasslands	The study area contains small patches of exotic grassland. The Oriental Plover (<i>Charadrius veredus</i>) and Little Curlew (<i>Numenius minutus</i>) sometimes use exotic grasslands for foraging. However, the study area includes a network of roads with heavy traffic, which is likely to curtail their use. The White-bellied Sea-eagle (<i>Haliaeetus leucogaster</i>) is a highly mobile raptor that is likely to fly over the study area and may, on rare occasions, take prey there. The Eastern Bent-wing Bat (<i>Miniopterus schreibersii oceanensis</i>) and Southern Myotis (<i>Myotis macropus</i>) are insectivorous bats that may fly over or forage over the site occasionally, but are unlikely to shelter there during the day.	Weeds and exotics
Street trees,	The study area may provide some limited foraging habitat for	Urban and native

Fauna habitat	Habitat description	Association with vegetation community
nectar-producing trees and other patches of vegetation with trees	<p>highly mobile birds and micro-bats. While specific habitat types or shelter sites are absent, it is possible that these species may use the study area on very rare occasions.</p> <p>Nectar-producing trees are also available in the study area, including winter-flowering species. Such trees provide food resources for the Swift Parrot (<i>Lathamus discolor</i>) and Regent Honeyeater (<i>Anthochaera phrygia</i>), but they are unlikely to use the area due to the impact of existing development.</p> <p>One species, the Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>), was observed in the study area during the nocturnal Green and Golden Bell Frog surveys. A number of nectar-producing tree species are present, but they do not constitute significant resources. Most are tree species that have been planted along the edges of busy roads. A small number of Coast Banksias (<i>Banksia integrifolia</i>) are also present to the west of the railway line. There was only very limited nectar availability at the time of the survey (eg Bangalay (<i>Eucalyptus botryoides</i>) was heavily in bud, but only a small number of flowers were open). Moderate use of the study area is likely when nectar is more available.</p> <p>There are no suitable roost sites in or close to the study area.</p>	groundcover Street plantings

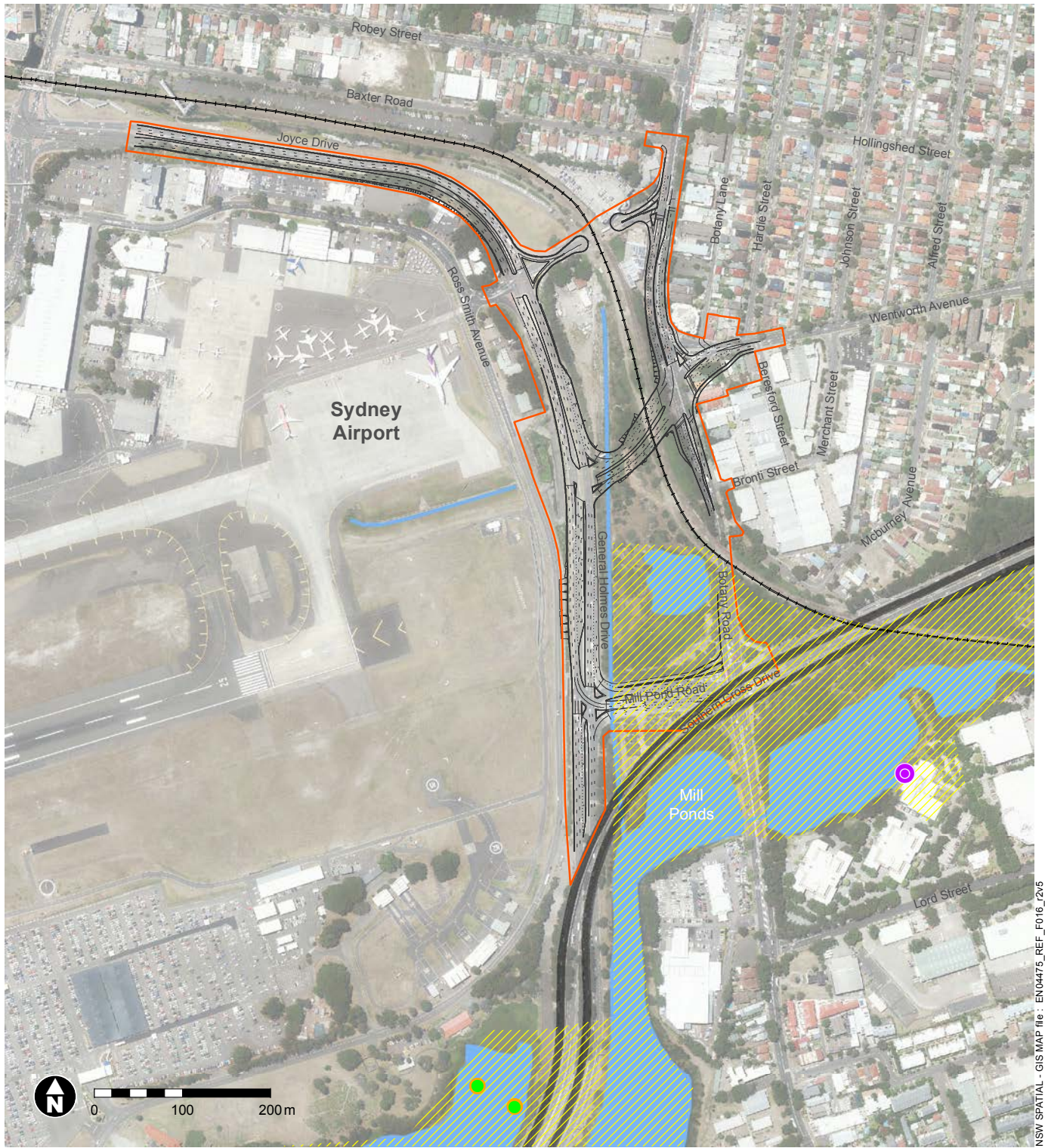
Green and Golden Bell Frog habitat

The study area is within the expected range of the Green and Golden Bell Frog (*Litoria aurea*). A number of contemporary records exist within the study locality and records for the Green and Golden Bell Frog 650 to 2500 metres from the study area exist from the 1960s and the 1990s.

Literature regarding presence of the Green and Golden Bell Frog remains unclear. Recent studies by the DoE (2014) suggests that the species is extinct in the study area, however, the OEH (DEC 2005) references possible reintroductions in this area. Diurnal (daytime) and nocturnal field surveys carried out on 9 and 10 December 2013 for the proposal identified no Green and Golden Bell Frogs in the proposal area.

About 0.45 hectares of habitat suitable for the species is located within the Coastal Freshwater Wetland vegetation community and TEC. It is separated from other habitat areas by high-density urban development, industrial areas and major road and rail infrastructure, and has tenuous links with surrounding habitat. No habitat features such as rocks or logs are present in this area. Vegetation in the wetland is dominated by Bullrush (*Typha* sp.) while the vegetation surrounding the wetland is dominated by weeds and other exotic species. The wetland is ephemeral and does not contain Gambusia or other predatory fish.

Given the small area of wetland, the lack of suitable fringing habitat and its relative isolation from neighbouring habitat, it is reasonably unlikely that the Green and Golden Bell Frog would be present in the proposal area. This conclusion was supported by the findings of the limited Green and Golden Bell Frog habitat assessment (refer to **Appendix J**).



NSW SPATIAL - GIS MAP file - EN04475_REF_F016_12v5

Figure 7-8 Threatened fauna and habitat

Legend

- Proposal area boundary
- Motorway
- Railway
- Waterway
- Green and Golden Bell Frog record
- Fauna habitat assessment site
- ▨ Fauna habitat assessment area

Ref_Design7D.dwg
 OEH 2014
 SMEC 2014
 Roads and Maritime Services 2014
 AUSIMAGE 2014
 LPI 2014

Threatened flora

A search of threatened flora database records for the study locality in June 2014 identified records for 23 threatened flora species and one threatened flora population within 10 kilometres of the study area. Of these, seven species have a medium to high likelihood of occurrence within the study area (refer to **Table 7-29** for definitions of likelihood of occurrence), on the basis of available potential habitat. No threatened flora species were identified during field investigations for the proposal. Threatened flora species with a medium to high likelihood of occurrence are listed in **Table 7-31**.

Table 7-31 Threatened flora with a moderate or high likelihood of occurring within the study area

Scientific name	Common name	TSC status	EPBC status	Habitat requirements	Likelihood of occurring in the study area
<i>Acacia terminalis</i> subsp. <i>terminalis</i>	Sunshine Wattle	E	E	Coastal scrub and dry sclerophyll woodland	High
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	Variety of habitats including coastal districts, heathlands, heathy woodlands, sedgeland, forests and Spear Grass-tree (<i>Xanthorrhoea resinosa</i>) plains	Medium
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	Dry sclerophyll open forest, woodland and heath	Medium
<i>Pterostylis</i> sp. <i>Botany Bay</i>	Botany Bay Bearded Orchid	E	E	Moist level sites on skeletal sandy soils	Medium
<i>Senecio spathulatus</i>	Coast Groundsel	E	-	Frontal dunes	Medium
<i>Tetradlea juncea</i>	Black-eyed Susan	V	V	Low open forest/woodland with a mixed shrub understory and grassy groundcover.	Medium
<i>Thelymitra atronitida</i>	Black-hooded Sun Orchid	CE	-	Coastal heath and open forest	Medium

V: Vulnerable, E: Endangered, CE: Critically endangered

Threatened fauna

A search of threatened fauna species records for the study locality on June 2014 identified records for 31 threatened fauna species. Of these, two threatened fauna species have a medium to high likelihood of occurrence within the study area (refer to **Table 7-29** for definitions of likelihood of occurrence) on the basis of suitable habitat and availability of resources. These threatened fauna species are listed in **Table 7-32**.

Several Grey-headed Flying foxes (*Pteropus poliocephalus*) were observed flying over the freshwater wetland during nocturnal survey. This species is thought to forage intermittently throughout the study area when nectar producing tree species are flowering, although no roosting habitat is available in the study area.

Table 7-32 Threatened fauna with a moderate or high likelihood of occurring within the study area

Scientific name	Common name	TSC status	EPBC status	Habitat requirements	Likelihood of occurring in the study area
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Forests with fruiting or flowering trees, roosts in forest near water (including mangroves)	High Observed flying over the study area
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	Freshwater wetlands with bulrush (<i>Typha sp.</i>) with nearby grassy areas and diurnal sheltering sites	Medium

V: Vulnerable, E: Endangered

Aquatic fauna

A search of the EPBC Act Protected Matters Search Tool identified 14 aquatic fauna species that potentially occur within the study area (excluding frogs and birds). Two of these aquatic species were considered relevant to the study area, including:

- Black Rockcod (*Epinephelus daemeli*): The Black Rockcod is listed as vulnerable under the EPBC Act and FM Act. It is considered unlikely to occur within the study area
- Australian Grayling (*Prototroctes maraena*): The Australian Grayling is listed as vulnerable under the EPBC Act. It is found in fresh to marine waters and could potentially occur within the study area.

In addition, 12 native fish are known to inhabit the Botany Wetlands (Sydney Water Corporation, 2010; Sydney Airport, 2013).

Aquatic flora

One threatened aquatic plant species has been recorded in the broader Pittwater sub-region (OEH, 2014a). This is *Zannichellia palustris* which is listed as endangered under the TSC Act. However, a search of the Atlas of NSW Wildlife did not identify any known records of *Zannichellia palustris* within the study area. A search of the EPBC Act Protected Matters Search Tool in November 2014 did not identify any threatened aquatic flora within the study area.

Migratory species

Thirty-four migratory fauna species were identified as potentially occurring in the study locality. Of these, two species have a medium potential for occurring in the study area:

- Fork-tailed Swift (*Apus pacificus*)
- White-throated Needletail (*Hirundapus caudacutus*).

Both species breed in the northern hemisphere and migrate to Australia during the southern summer. They feed in the aerial space over a variety of habitat types and occasionally occur in urban areas. Given the proximity of vegetated habitats in the locality and the high mobility of these species, it is possible they may occasionally feed over the study area during the summer. Both species appear to track low

pressure systems where they feed on rising insects. As such, their appearance over the study area would be intermittent and difficult to predict.

Wildlife connectivity corridors

The study area is located to the north of the Botany Wetlands complex that forms a corridor downstream from Gardeners Road, including adjacent remnant vegetation in Eastlake and The Lakes Golf Courses; Sir Joseph Banks Park; around the Botany foreshore and vegetation backing onto the boundary of Sydney Airport to the eastern side of Penrhyn Bay (DECC, 2008). The corridor includes extensive wetlands, patches of native vegetation cover, intertidal flats, sandy beaches and open water. The area is important for migratory shorebirds, other waterbirds and flying mammals (Lesryk, 2013). The Botany Wetlands are nationally important wetlands due to their habitat for wetland birds (Commonwealth Government).

Coastal Heathland and Freshwater Wetland vegetation communities are classified as priority fauna habitats (DECC, 2008) for their importance in conserving vertebrate fauna, particularly threatened species. The examples of these habitats within the study area have experienced moderate to high disturbance and weed infestation. However, because of the built-up nature of the Sydney metropolitan area, small and degraded wetlands, stands of original trees and ornamental gardens can have significant value for individual species and groups of species (DECC, 2008).

Weeds

Weeds are prevalent within the study area. Class 3 and 4 noxious weeds listed in the Botany Bay City LGA were recorded in the study area from field investigations. Three of these weed species identified in the study area were class 3 noxious weeds (class 3 plants must be fully and continuously suppressed and destroyed):

- Bitou Bush (*Chrysanthemoides monolifera*)
- Gorse (*Ulex europaeus*)
- Green Cestrum (*Cestrum parqui*).

Five weed species were class 4 noxious weeds (class 4 plants must not be sold, propagated or knowingly distributed):

- Bridal Creeper (*Asparagus asparagoides*)
- Prickly Pear (*Opuntia stricta*)
- Castor Oil Plant (*Ricinus communis*)
- Large-leaved Privet (*Ligustrum lucidum*)
- Lantana (*Lantana camara*).

Aquatic weeds

The EPBC Act Protected Matters Search Tool identified four aquatic Weeds of National Significance (WoNS) within the study area. These weeds are also listed as noxious weeds under the TSC Act and include:

- Alligator Weed (*Alternanthera philoxeroides*). This is also listed as a class 3 noxious weed for the Botany Bay LGA
- Fanwort (*Cabomba caroliniana*)
- Water Hyacinth (*Eichhornia crassipes*). This is also listed as a class 2 noxious weed for the Botany Bay LGA
- Salvinia (*Salvinia molesta*). This is also listed as a class 2 noxious weed for the Botany Bay LGA.

A search of the Atlas of NSW Wildlife identified *Hygrophila* (*Hygrophila costata*) to also occur within the study area.

Pests and pathogens

The study area did not appear to be obviously affected by dieback. However, the study area is potentially contaminated with *Phytophthora cinnamomi* – which results in native plant dieback – as there is evidence of *P. cinnamomi* induced die-back in several similar vegetation classes in areas of coastal heaths and woodlands.

The study area is also likely to provide habitat for pest animals such as the black rat (*Rattus rattus*), European rabbit (*Oryctolagus cuniculus*) and European red fox (*Vulpes vulpes*), which are likely to occur in the study area.

Three introduced fish species have been recorded in the Botany Wetlands (Sydney Water Corporation, 2010). These include European Carp (*Cyprinus carpio*), Gambusia (*Gambusia holbrooki*) and Goldfish (*Carassius auratus*). Site investigations identified no Gambusia or other predatory fish within the wetland area.

7.5.3 Potential impacts

Construction

Construction of the proposal would result in a number of actual and potential impacts on native flora and fauna. These impacts are presented below.

Loss of vegetation and habitat

The construction footprint of the proposal would require a total of up to 3.3 hectares of vegetation to be cleared, comprising weeds and exotics, urban planted native and exotic cover and street plantings on SACL and non-SACL land (refer to **Table 7-33**).

Table 7-33 Clearing for the proposal

Vegetation community	TSC Act	EPBC Act	Area to be cleared within SACL land (ha)	Area to be cleared outside of SACL land (ha)
Weeds and exotics	-	-	0.78	0.04
Urban planted native and exotic cover	-	-	1.40	0.92
Street plantings	-	-	-	0.20
Sub-total			2.18	1.16
Total			3.3	

The proposal would not remove any good quality native vegetation, threatened ecological communities or threatened species. Vegetation clearing for the proposal does not meet the criteria required to consider offsets as outlined in the Guideline for Biodiversity Offsets (Roads and Maritime, 2011). While offsetting is not required for the proposal, revegetation and rehabilitation would occur in the areas between General Holmes Drive, Wentworth Avenue and Port Botany Freight Rail Line after construction (refer to **Section 4.2.3**).

Vegetation clearing would result in the loss or degradation of habitat including:

- Loss of nectar-producing trees as part of the removal of street plantings, including some planted Coast Banksias. This would remove a small amount of potential foraging habitat for the Grey-headed Flying Fox. However, this is not considered a significant impact as the amount of habitat to be cleared is minor
- Potential indirect impacts on wetland plant communities with local, regional and State conservation significance, including the Freshwater Wetland TEC from reduced water quality, due to mobilisation of sediment during clearing activities. Potential impacts on the TEC would be managed by the identification and protection of a vegetated buffer (refer to **Section 7.5.4**) and implementing sediment and erosion controls
- Minor loss of foraging habitat for the migratory Fork-tailed Swift and White-throated Needletail as part of the removal of planted street trees. However, statements of significance completed for the Biodiversity Assessment conclude that the proposal would not have a significant impact on the Fork-tailed Swift and White-throated Needletail (refer to **Appendix J**)
- Minor loss of structural diversity within the degraded land between General Holmes Drive and Port Botany Freight Rail Line, which may currently provide shelter and nutritional resources for fauna.

Impacts to regional connectivity from the proposal are not expected to be significant, due to heavily urbanised character of the regional area. The proposal is unlikely to significantly increase the barrier effect of the existing road network if indirect impacts are managed, including edge effects from weed intrusion, water quality and erosion.

Injury and mortality

Vegetation clearing has the potential to result in the injury or death of fauna, particularly those species that take refuge in trees, are ground-dwelling or are less mobile. These include microbats, possums, reptiles, birds (particularly fledglings) and frogs. More mobile species such as larger reptiles and adult birds may also be harmed during vegetation clearing when fauna are forced to move close to roads, such as General Holmes Drive and Mill Pond Road. This may result in a short-term increase in individuals being injured or killed by cars, until habitat is reestablished.

Weeds

Given the already disturbed and weedy nature of the proposal area, the proposal is not likely to increase the presence or distribution of weeds within the study area.

Pests and pathogens

The proposal is not likely to increase the invasion of pest species, such as the black rat (*Rattus rattus*), European rabbit (*Oryctolagus cuniculus*) and European red fox (*Vulpes vulpes*) or to lead to an increase in their numbers.

However, there is potential for impact from the pathogen root rot, *Phytophthora cinnamomi*. This is most likely when construction vehicles inadvertently transfer soil from locally affected areas thereby spreading the disease. This impact is considered to be minimal when managed with a weed management strategy that would be developed as part of the CEMP.

In addition, development activities associated with the proposal have the potential to introduce or spread disease to the study area, which could impact the Green and Golden Bell Frog, which is susceptible to the amphibian chytrid fungus

Batrachochytrium dendrobatidis. To reduce this potential, management measures would be implemented (refer to **Section 7.5.4**).

Hydrology, drainage, water quality

Landscaping works and earthworks to reshape the landform in the proposal area are unlikely to result in any changes to surface hydrology and drainage that would affect the Coastal Freshwater Wetland and TEC as discussed in **Section 7.6**.

Construction activities may temporarily impact on groundwater levels in the proposal area. These activities would be controlled to ensure that any drawdown does not adversely affect the TEC, Mill Ponds or Botany Wetlands (refer to **Section 7.6.3**).

Construction activities such as excavation, site preparation, vegetation removal and earthworks have the potential to mobilise sediment into receiving waterways, reducing water quality. If unmitigated, the following impacts as a result of reduced water quality may occur downstream at Mill Ponds:

- Smothered aquatic habitat, flora and fauna due to sedimentation
- Restricted photosynthesis from increased turbidity
- Increased nutrients, metals and other pollutants (including chemicals, heavy metals, oil and grease, petroleum hydrocarbon and litter) smothering native vegetation and fauna or encourage weed and algal spread and growth
- Spread of riparian and aquatic weeds, which have the potential to smother native vegetation and water bodies.

The proposed stockpile site on the corner of Wentworth Avenue and Dransfield Avenue is upstream of Mill Pond, and has the potential to impact on its water quality and aquatic health, as discussed in **Section 7.8**. To avoid indirect impact the water quality of this area and downstream TECs, sedimentation and erosion control measures would be implemented during construction (refer to **Section 7.5.4**).

Noise, vibration and light

Construction of the proposal is unlikely to result in changes to existing levels of noise, vibration and light that would have a significant impact on native fauna species. This is due to the highly disturbed nature of the existing environment.

During construction, resident and visiting native fauna may temporarily avoid habitats next to construction areas. Bat species would be particularly sensitive to changes in lighting, as most construction work would be at night.

Aquatic ecology

Section 7.8 discusses potential impacts of the proposal's construction on water quality. Changes to water quality from construction activities have the potential to impact aquatic ecology downstream from the proposal as Mill Ponds and Botany Wetlands. Direct impacts from increased sedimentation include reduced light penetration (limiting photosynthesis and aquatic plant growth), alteration of bed substrate and aquatic habitat availability, and reduced visibility for fish. Increased sedimentation can also smother benthic organisms and clog fish gills.

Indirect impacts of increased sedimentation can occur over the longer term and include the accumulation and release of attached pollutants, such as nutrients and heavy metals in the water columns and bed substrates of Mill Ponds and Botany Wetlands.

Operation

Injury and mortality

The increase in traffic associated with the proposal could increase the likelihood of vehicle strike. This is particularly likely at the Wentworth Avenue underpass, which has the potential to trap fauna. The increase in fauna injury and mortality from the proposal is not expected to be significant. This is due to the low condition of fauna habitat in the study area and therefore the scarcity of ground-moving fauna in the proposal area as well as fencing proposed around the Wentworth Avenue extension.

Weeds

After construction of the proposal, landscaping would provide the opportunity to control weeds and enhance habitat. This would be carried out in accordance with the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (RTA, 2011).

Hydrology and drainage

The proposal is not expected to result in a significant adverse impact on surface flows and flooding behaviour within the study area (refer to **Section 7.6**). Impacts to the freshwater wetland TEC from the proposed changes to surface flows and flooding behaviour are not expected as the TEC is groundwater-dependent.

Wildlife connectivity and habitat fragmentation

The heavily urbanised study area presents a substantial barrier to most fauna movement, with the exception of highly mobile species such as birds and bats. Accordingly, the proposal is unlikely to significantly increase this effect with the implementation of mitigation measures (refer to **Section 7.5.4**).

In addition, the proposal would retain existing culverts and drainage channels likely to provide movement and breeding opportunities for reptiles, frogs and small mammals. However, the increase in traffic intensity and road widening may result in a minor reduction in dispersal opportunities for the Green and Golden Bell Frog, if it exists within the study area.

Aquatic ecology

Section 7.8 discusses potential impacts of the proposal's operation on water quality. Water quality impacts during operation may result in reduced light penetration (limiting photosynthesis and aquatic plant growth), increased algal growth, and the death of aquatic organisms. Safeguards to reduce the impact of the proposal on water quality and associated aquatic ecology are outlined in **Section 7.8.4**.

7.5.4 Safeguards and management measures

Table 7-34 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on biodiversity. The management of potential erosion and sediment impacts is discussed in **Section 7.6.4**, while the management of potential water quality impacts are discussed in **Section 7.8.4**.

Table 7-34 Mitigation measures for biodiversity

ID	Impact	Environmental safeguards	Responsibility	Timing
BI-1	Potential impact to	<ul style="list-style-type: none">A buffer zone of 5 m will be established around the wetland to avoid physical impact	Construction contractor	Pre-construction,

ID	Impact	Environmental safeguards	Responsibility	Timing
	Coastal Freshwater Wetland TEC during construction	<ul style="list-style-type: none"> • The area within the wetland buffer area will be rehabilitated as part of the proposal area, including weed control, landscaping and site rehabilitation works with locally indigenous species • Relocate woody debris recovered from the construction footprint to the wetland buffer to provide shelter sites for the Green and Golden Bell Frog. 		construction
BI-2	Vegetation and habitat removal	<p>Pre-clearance surveys will be carried out by an experienced ecologist to:</p> <ul style="list-style-type: none"> • Identify and mark fauna habitat features and roosting sites (if any exist) to be protected during construction • Confirm the presence of the Green and Golden Bell Frog and the level of management commitment required during construction • Identify nearby habitats within the proposal area that are suitable for the release of fauna that may be encountered during the pre-clearing process or habitat removal • Select appropriate locations for construction access tracks, ancillary facilities and construction areas in previously cleared and disturbed areas, wherever possible. 	Construction contractor	Pre-construction
BI-3	Vegetation and habitat removal	<p>A Biodiversity Management Plan (BMP) will be included in the CEMP. It will include:</p> <ul style="list-style-type: none"> • Procedures for a site walk with appropriate site personnel including Roads and Maritime representatives to confirm clearing boundaries and sensitive locations before work begins • The exclusion zones to be installed before clearing, to avoid damage to native vegetation and fauna habitats and prevent the distribution of pests, weeds and disease. Temporary fencing, flagging tape or other appropriate method will be installed to indicate the limits of the exclusion fencing. The location of exclusion fencing will be identified on plans in the CEMP and the function and importance of the exclusion zones communicated to construction personnel • Maps showing vegetation clearing boundaries, identifying drainage areas that run towards the Coastal Freshwater Wetland TEC • A procedure to manage stormwater in the proposal to ensure that hydrology of the Coastal Freshwater Wetland TEC is maintained, including periodic drying to prevent 	Construction contractor	Pre-construction, construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<p>colonisation by <i>Gambusia</i> (<i>Gambusia holbrooki</i>)</p> <ul style="list-style-type: none"> • The establishment of a 5 m buffer area/ exclusion zone around the Freshwater Wetland TEC to avoid construction impacts on the TEC, as discussed in BI-1 • A detailed clearing process in accordance with the Roads and Maritime Biodiversity Guidelines (Roads and Maritime, 2011) including requirements of Guide 1, 2 4 and 9 • An unexpected threatened species finds procedure, as outlined in the Biodiversity Guidelines (RTA, 2011a) • Specific details for the re-establishment and rehabilitation of native vegetation on cut faces, batters, the wetland buffer and other areas disturbed during construction • Guidance for the relocation of woody debris from the construction footprint to the wetland buffer to provide shelter for the Green and Golden Bell Frog, if required. 		
BI-4	Spread of weeds	<p>A weed management plan will be developed as part of the BMP and incorporated into the CEMP. The plan will detail:</p> <ul style="list-style-type: none"> • Weed management priorities and objectives • Identification of weeds on the construction site • Sensitive environmental areas within and next to the proposal area, such as the wetland to the south of the Wentworth Avenue underpass • Location of weed infested areas • Mechanical weed control methods such as slashing or mowing, as well as a range of herbicides to avoid the development of herbicide resistance • Procedures to control the use of pesticides, particularly near waterways and immediately before or during wet weather • Measures to prevent the spread of weeds • Procedures for the appropriate disposal of weed-infested materials and soils • Monitoring program to measure the success of weed management • Communication protocol with Botany Bay City Council noxious weed representative. 	Construction contractor	Pre-construction
BI-5	Introduction or spread of pests and disease	<p>Measures to confirm the presence of pathogens and disease-causing agents will be carried out before construction. Should pathogens or disease-causing agents be found, measures will be</p>	Construction contractor	Pre-construction, construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<p>implemented to prevent their introduction and/or spread to the proposal area. These measures are provided in the Biodiversity Guidelines and will include, where appropriate:</p> <ul style="list-style-type: none"> • The provision of vehicle and boot wash-down facilities to ensure vehicles and footwear are free of soil before entering or exiting the site • Procedures to ensure that the risk of spreading pathogens and the mitigation measures required on site are regularly communicated to staff and contractors during inductions and toolbox talks • The programming of construction activities so they move from uninfected areas to any known infected areas • The restriction of vehicles to designated roadsides and parking areas • Specific measures for treating <i>Phytophthora cinnamomi</i> and chytrid fungus. 		
BI-5	Potential impact on the Green and Golden Bell Frog	Further pre-construction surveys will be carried out under suitable weather conditions to determine the level of management commitment required and whether a monitoring program is required for the Green and Golden Bell Frog. These additional surveys will be for a duration of at least 2 days and nights to complement surveys already carried out for the Biodiversity Assessment.	Roads and Maritime	Detailed design

7.6 Hydrology

The extent and magnitude of potential impacts of the proposal on surface hydrology are assessed in the Hydrologic and Hydraulic Assessment Report (J. Wyndham Prince, 2014), which is provided in **Appendix K**. A summary of the assessment is presented in this section. A desktop assessment was also carried out by Jacobs to describe the hydrogeological environment and identify and assess the expected impacts to groundwater levels and flows as a result of the proposal.

7.6.1 Methodology

Surface hydrology

The primary purpose of the assessment was to establish peak flows for a range of storm events on the stormwater channel alongside General Holmes Drive and carry out flood modelling to determine the appropriate culvert size for the proposed Wentworth Avenue crossing over the stormwater channel. The assessment involved:

- Developing hydrologic and hydraulic models representing:
 - The upstream catchment under existing conditions and determining peak flows for use in the model. The software package, CatchmentSIM, and

- field investigations were used to delineate catchment areas in the proposal area. These delineations were used as input to the hydrologic analysis process. The hydrologic analysis was carried out using the flood routing software XP-RAFTS. The modelling was performed to determine peak flow hydrographs for input to the hydraulic modelling
- Changed landforms associated with the proposal, including the proposed Wentworth Avenue underpass.
 - Identifying flood levels within the proposal area using hydraulic modelling. The hydraulic modelling was undertaken using a two-dimensional flood model of the proposal area and surrounds using the TUFLOW software package. Flood modelling for the existing case and the proposal was carried out to determine the impact of the proposal on the flood levels within the stormwater channel and surrounding areas
 - Assessing multiple culvert options for the crossing of the stormwater channel to determine the impact of the proposal on neighbouring properties
 - Investigating the drainage and pump-out requirements for the Wentworth Avenue underpass during 10 per cent annual exceedance probability (AEP) storm events.

At the time of developing the model, limited road drainage information was available and of the existing stormwater system was not considered in the assessment. Accordingly, the outcomes of the flood modelling are conservative, as they do not consider the benefits provided by existing stormwater systems that drain to the stormwater channel.

The following details of existing infrastructure were provided or assumed to be entering or contained within the proposal area:

- 1800 millimetre diameter pipe entering northern boundary of proposal area under General Holmes Drive, west of railway line, containing flows from the catchments to the north west of the proposal area
- 2400 millimetre by 1800 millimetre box culvert entering northern boundary of proposal area south of General Holmes Drive containing flows from catchments to the north east of the proposal area
- Two 2700 millimetre by 1500 millimetre box culverts that combine the flows from the above infrastructure
- 8.14 metres wide, 1.35 metres deep trapezoidal channel that generally runs the length of the proposal area to the east of General Holmes Drive, taking the flow from the two box culverts through to the bridge over Mill Pond Road at the southern boundary of the proposal area
- 750 millimetre diameter pipe on the western boundary of the proposal area immediately north of Wentworth Avenue that joins into the channel and conveys flows from the catchments within Sydney Airport
- 450 millimetre diameter pipe on the eastern boundary of the proposal area immediately south of Wentworth Avenue that joins into the channel and conveys flows from the local catchments east of the proposal area.

Groundwater

A desktop groundwater assessment was carried out by Jacobs to establish the existing groundwater conditions, levels, quality and potential impacts associated with the proposal. Inputs to the assessment included:

- Geotechnical Investigation Program (Roads and Maritime, 2014b)
- Phase 1 and 2 Environmental Site Investigation (JBS&G, 2014, **Appendix M**).

Preliminary cross-sectional groundwater modelling was carried out by Roads and Maritime (2014b) as part of the Geotechnical Investigation. This modelling would be updated during detailed design. The target impacts to level, flow and quality provided in this section are presented based on the conceptual hydrogeological model, which was constructed from the 25 boreholes and 23 cone penetrometer tests undertaken during the geotechnical and environmental site investigation.

7.6.2 Existing environment

Regional setting

The proposal is located within the 'Direct to Botany Bay' subcatchment of the larger Botany Bay catchment. The Botany Bay catchment covers about 1165 km² and is bounded by the Parramatta River and Sydney Harbour Catchment in the north, the Hawkesbury-Nepean catchment in the west and the Hacking River catchment in the south.

Major waterways and water bodies near the proposal include Sheas Creek/Alexandra Canal to the north-west, the Mill Ponds (comprising the Mill Pond, east and west Engine Pond and Mill Stream) and Botany Bay to the south-west. The proposal area is drained by the kerb-and-gutter stormwater system through the road system. A stormwater channel on the eastern side of General Holmes Drive discharges to the Mill Ponds. These waterways and water bodies are shown in **Figure 7-9**.

Climate

Sydney Airport has an average annual rainfall of 1083 millimetres and an average annual evaporation of about 1400 millimetres. The highest rainfall occurs between January and June, while the highest evaporation occurs in December and January.

Surface flooding and hydrology

Local catchments and drainage flows

The local catchment upstream of the proposal area is about 300 hectares and includes the suburbs of Mascot, Rosebery and Eastlakes. The catchment is fully urbanised with constructed stormwater systems to provide drainage. Existing flooding within the proposal area is caused by main catchment flows being piped into the existing stormwater channel and localised runoff from adjacent land uses. The proposal area itself covers about four hectares and receives overland flows from upstream and local catchments, as shown on **Figure 7-9**.

In general, the drainage of the proposal area is fed from large upstream catchments to the north of the proposal. These flows drain to a low point east of Botany Road, north of Wentworth Avenue. The stormwater channel in the proposal area is fed from these overland flows and from piped flows from the north and from Sydney Airport. Water generally flows south in the stormwater channel or along Botany Road. However, overflows from this area discharge to the west of Botany Road, or south of Wentworth Avenue, contributing to local flooding.

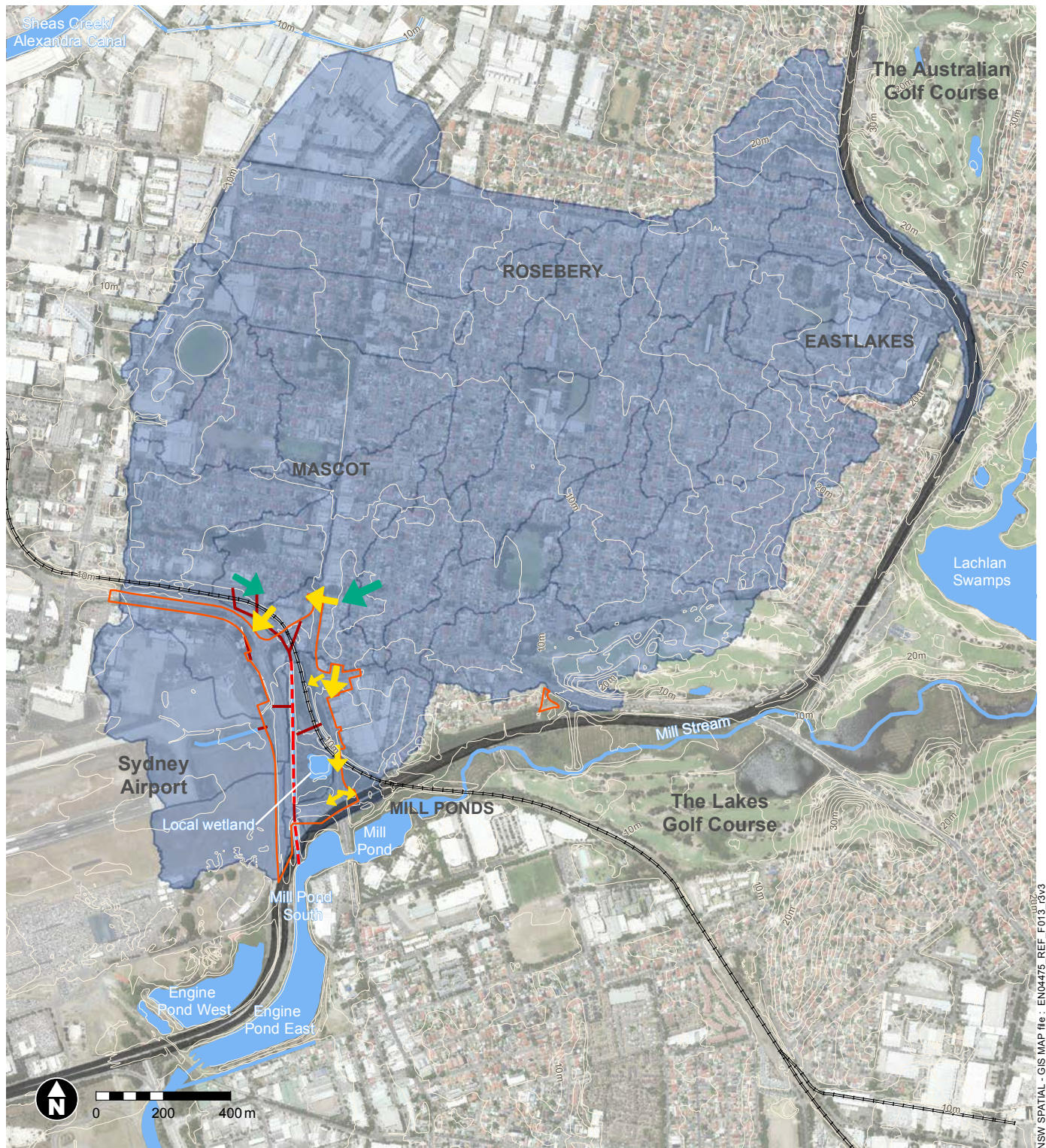


Figure 7-9 Hydrological features, catchment and overland flow path schematic

Legend

- | | | |
|------------------------|--|---------------------------------|
| Proposal area boundary | Catchment to stormwater channel | Stormwater channel |
| Motorway | Overland flow direction around the proposal area | Known existing stormwater pipes |
| Railway | Overland flow direction from upstream catchment | 2 m contours |
| Waterway | | |
| Water body | | |

Ref_Design7D.dwg
 Roads and Maritime Services 2014
 AUSIMAGE 2014
 LPI 2014

Hydraulic modelling and hydrologic analyses

Modelling identified that current drainage infrastructure under the Port Botany Freight Rail Line restricts substantial upstream flows from entering the stormwater channel. This results in flows breaching the railway embankment north of the study area and flow onto Joyce Drive in the 10 per cent AEP event. These flows are directed onto neighbouring Sydney Airport land, and do not enter the stormwater channel.

About 20 per cent of the overflows are also directed south, along Botany Road towards Mill Pond Road. Some of these flows enter the proposal area through the Horse Bridge, under the freight rail line. These flows result in substantial flooding in Baxter Street and Botany Road near the General Holmes Drive intersection.

Flood modelling also indicated that there is substantial flood storage within the existing residential development area to the north of the proposal which would appear to be attenuating flood flows.

The modelling for the one per cent AEP flood event within the proposal area showed that there are obstructions to upstream flood flows (such as the Port Botany Freight Rail Line) that limit the amount of water that can reach the stormwater channel and proposal area. Some localised flooding occurs from overland flows entering the proposal area from the eastern boundary. Flooding along Wentworth Avenue through Horse Bridge causes flood depths of up to 0.5 metres for 50 metres upstream and 100 metres downstream of the road. This overland flow is captured by the stormwater channel.

Overland flows that are not diverted through Horse Bridge into the proposal area continue south along Botany Road to where a proportion of the flow enters the site near the Mascot (Botany Road) Underbridge on the eastern edge of the proposal area (the flow not entering the proposal area continues southwards towards Mill Pond Road). Flows enter the site and fill the local wetland to a depth of up to three metres before overtopping and being captured by the channel.

There is also a local low point on Botany Road between the Horse Bridge and the Mascot (Botany Road) Underbridge. The flood depths and levels for the proposal area for the one per cent AEP flood are shown on **Figure 7-10**.

Groundwater

Groundwater users and extraction

The proposal is located within Botany Management Zone 1 of the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources. Groundwater use for domestic purposes is currently banned within this zone.

A proportion of the Botany Sand Beds Aquifer is known to be contaminated from industries operating in the Botany area (Office of Water, 2014). To manage the contamination through groundwater, the NSW Government has divided the area into four management zones, including the pre-existing Orica exclusion area (Zone 1) and three other management zones (Zones 2 to 4). In Zone 1, the use of groundwater is banned, while domestic groundwater is banned in Zones 2 to 4. The NSW Government has operated an embargo on the acceptance of new licence applications to extract groundwater since August 2003, and extended the embargo to the entire Botany Sands aquifer in June 2007. As such, no new licences are expected within the proposal area.

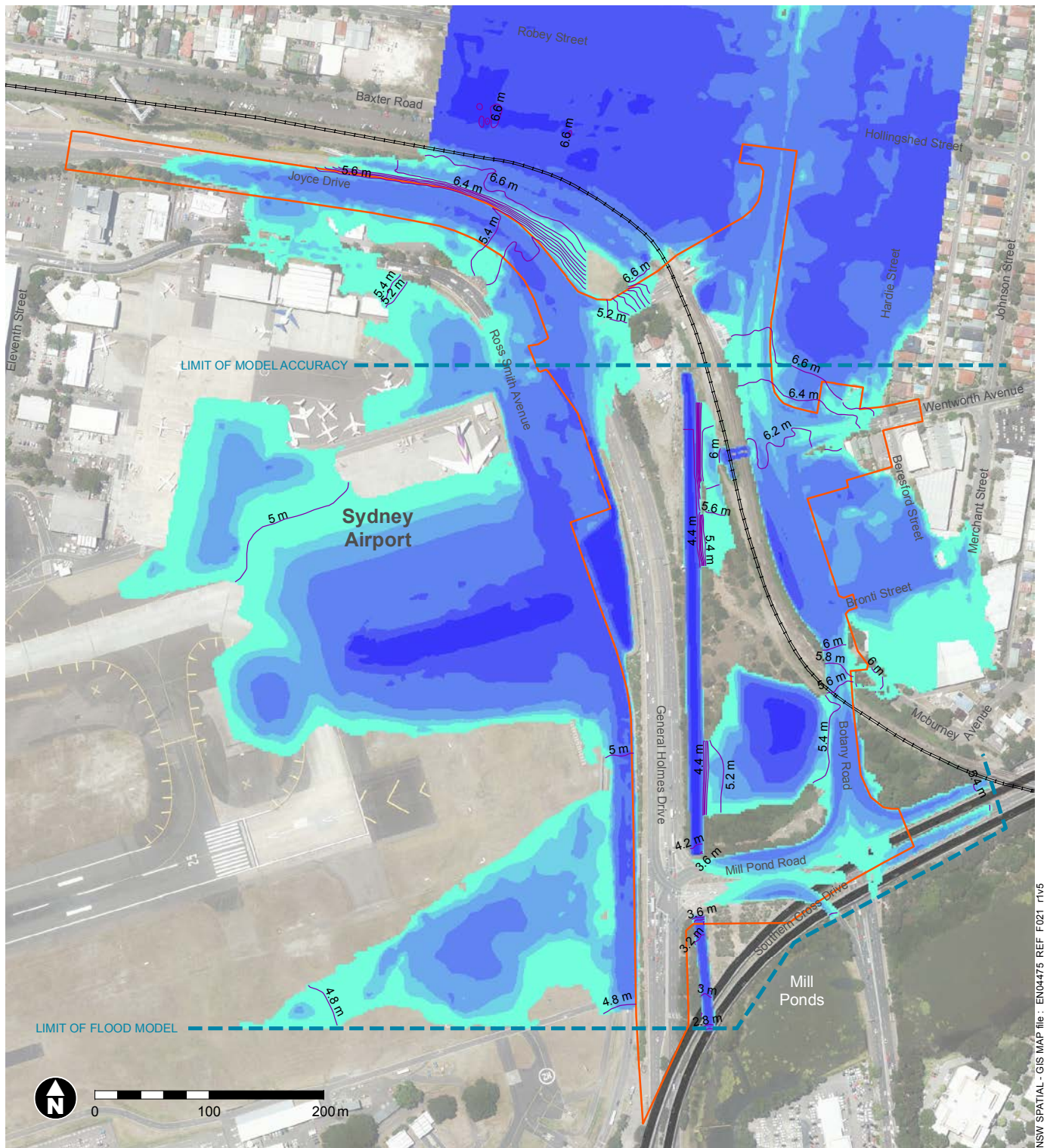


Figure 7-10 Flood depth and levels 1% AEP - existing conditions

Legend

- Proposal area boundary
- Motorway
- = Railway
- Flood depth (m)**
 - 0.0 to 0.2
 - 0.2 to 0.3
 - 0.3 to 0.5
 - 0.5 to 1.0
 - 1.0 to 2.0
 - 2.0 to 3.0
 - 3.0 +
- 0.2 m flood height contours

J.Wyndham Prince 2014
 Roads and Maritime Services 2014
 AUSIMAGE 2014
 LPI 2014

The proposal is located in Zone 3 with regards to groundwater contamination and Zone 1 of the Water Sharing Plan. While domestic groundwater use is currently banned, industrial groundwater use is still conditionally permitted. A search of registered groundwater users was carried out using the NSW Office of Water database of groundwater works, PINNEENA, V3.2. Two industrial use groundwater works (GW017344 and GW040222) were identified to the east and one general use groundwater works (GW025994) to the north of the proposal. These works are shown on **Figure 7-11**, and further detail on these works is provided in **Table 7-35**.

Table 7-35 Registered groundwater works in the vicinity of the proposal area

ID	Comment	Easting	Northing	Ground/ TOC	Depth	Screen	Structure / material
GW017344	Installed 02/1955 for industrial use at Botany Road. Unknown status.	333179	6243543	unknown, 5.65 mAHD	13.8 mBGL unknown, -8.1 mAHD	~4m length	Sand
GW025994	Installed 03/1966 for general use at Beresford Street. Unknown status.	333039	6243705	unknown, 6.60 mAHD	13.2 mBGL unknown, -6.6 mAHD	8.8 to 13.3 mBGL unknown, -2.2 to -6.7 mAHD	Gravel
GW040222	Installed at an unknown date for industrial use at Merchant Street. Unknown status.	333252	6243604	unknown, 7.35 mAHD	7.0 mBGL unknown, 0.35 mAHD	unknown	?, sand

mAHD: Metres, Australian Height Datum; mBGL: Metres below ground level

Groundwater extraction is not currently being carried out within the proposal area. However, geotechnical investigations carried out for the proposal indicate that the fill and sand hydrostratigraphic unit would be high yielding (Roads and Maritime, 2014). As outlined in **Table 7-35**, the operational status of the groundwater works to the east and north of the proposal is currently unknown. Nevertheless, the contours interpreted from piezometer data do not indicate any discernible effect from these groundwater works (refer to **Figure 7-11**).

Groundwater dependent ecosystems

The Botany Wetlands are listed in the Schedule of the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011 as a high priority groundwater dependent ecosystem. In accordance with the Water Sharing Plan, the Botany Wetlands comprise Lachlan Swamps, Mill Pond, Mill Stream and Engine Ponds and geographically are described as estuarine wetlands located on the northern shore of Botany Bay, from Gardners Road, Mascot to the bay; elevation 0 – 12 metres above sea level (refer to **Figure 7-9**).

The Botany Wetlands are partly administered by Sydney Water under a Water Supply Works Approval from the NSW Office of Water (NSW Office of Water, 2013).

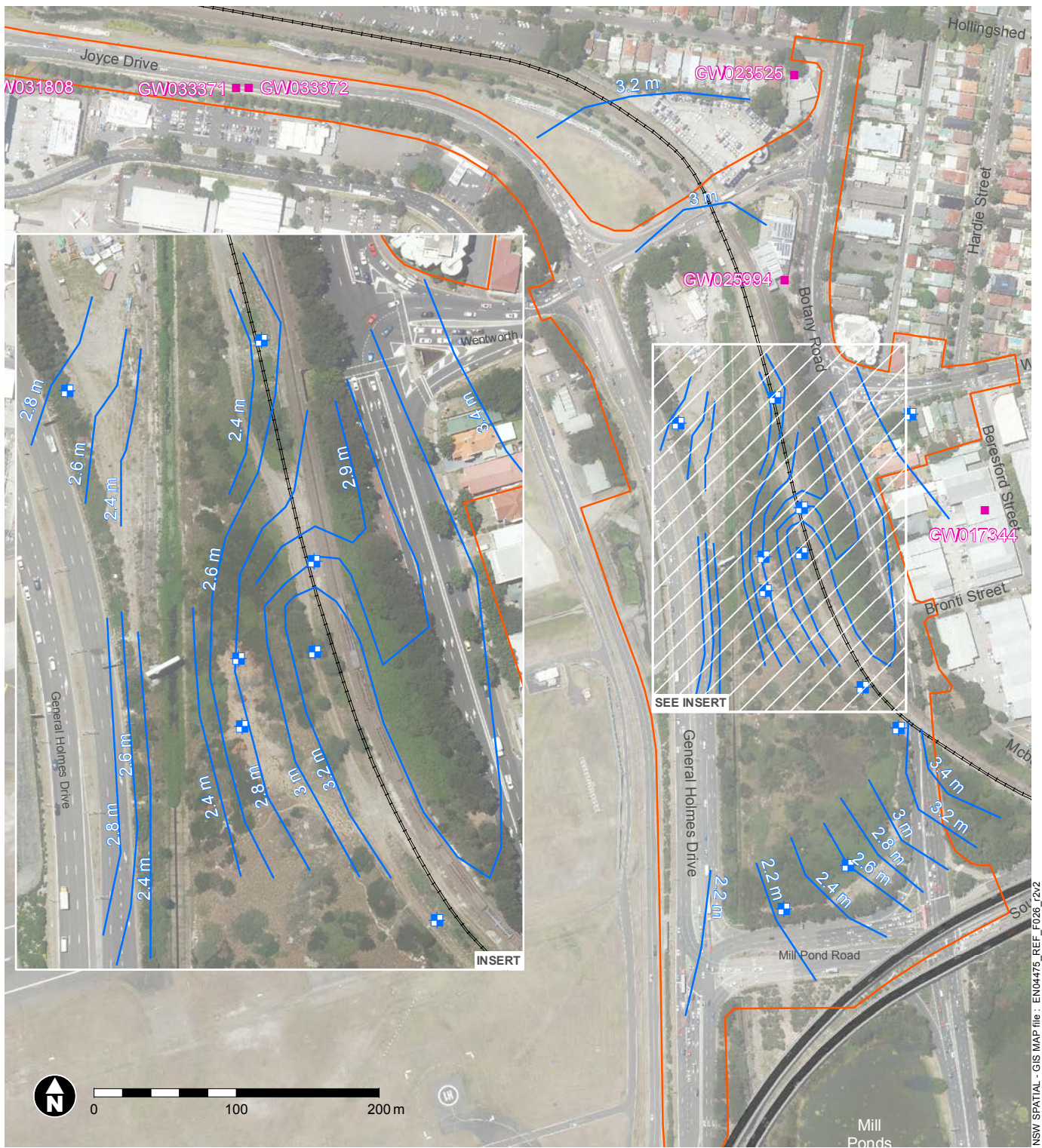


Figure 7-11 Groundwater

Legend

- Proposal area boundary
- Motorway
- Railway
- Registered groundwater works
- ⊕ Standpipe piezometer
- Water table elevation (m AHD)

Sydney Water is responsible for Mill Pond upstream of the concrete weir (3.6 mAHD, weir height derived from a flood study by SMEC (1992)) through to Gardeners Road, Mascot. Sydney Airport manages the section of the Botany Wetlands known as Mill Pond, Engine Pond (east and west) and the Mill Stream. These wetlands are collectively known as the Mill Ponds or Sydney Airport Wetlands.

A local wetland lies to the south of the proposed underpass (refer to **Figure 7-9**). This wetland is not listed in the Schedule of the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011. Interpretation of the water table levels at the proposal area implies that the wetland is dependent on groundwater. Further detail on the designation of groundwater dependence has been provided in the Biodiversity Assessment (refer to **Section 7.5** and **Appendix J**).

Groundwater levels

Piezometers installed in the proposal area between 2008 and 2014 provided an indication of the standing water level within the proposal area. Water table elevation in the vicinity of the proposal is relatively shallow, ranging between 2.3 and 3.8 mAHD, with a mean of about 2.9 mAHD. The groundwater table is recharged by rainfall at the ground surface.

The regional horizontal hydraulic gradient is from east to west and north to south towards Botany Bay. The contours mapped from available standpipe piezometers (refer to **Figure 7-11**) suggest that the stormwater channel has a potential local influence on groundwater and that the stormwater detention basin to the west of General Holmes Drive is also expected to receive some groundwater input.

7.6.3 Potential impacts

Construction

Flooding behaviour

During construction, the flows within the stormwater channel would be maintained. A temporary crossing of the stormwater channel would be installed to enable construction vehicle access across the channel. No upstream flooding impacts are expected as a result of the temporary crossing.

The existing overland flow paths from the Horse Bridge to below the proposed stockpile and compound area would need to be maintained as part of the safeguards to ensure that downstream infrastructure is not blocked or silted up and the construction site does not experience flooding. The likelihood of these overland flows paths being compromised is low, with the safeguards outlined in **Section 7.2.4**. The flooding impacts of the proposal during construction are therefore expected to be minor.

Groundwater flows and levels

Excavation for the proposed road underpass would require construction below the water table.

Options to manage groundwater levels and flows during construction are currently being explored as discussed in **Section 4.3.2**, and would be confirmed during detailed design. Potential impacts associated with these options are discussed below.

Conventional dewatering during excavation of the underpass would require a substantial amount of dewatering, as the Botany Sands Aquifer is expected to have a

high yield. Initial estimates of groundwater dewatering are between 45.7 megalitres per year and 183 megalitres per year. These rates substantially exceed the minimum threshold for licensing of dewatering of three megalitres per year. This may also result in substantial drawdown of groundwater, which may have a structural impact on buildings along Botany Road and the Port Botany Freight Rail Line. Impacts associated with drawdown would be avoided by reinfiltrating groundwater as close as possible to the dewatering area, together with a groundwater monitoring strategy.

A cut-off wall installed partially into the Botany Sands Aquifer is likely to reduce the amount of groundwater inflow into the underpass excavation, when compared to conventional dewatering. The geotechnical report estimates that with a four to six metre deep cut-off wall in place, dewatering rates would be reduced (the reduced rate of dewatering would be confirmed during detailed design), although dewatering would still be required to maintain the water table at 2.5 mAHD. Drawdown associated with a cut-off wall would be within the range of the natural groundwater level fluctuations (between 0.15 metres and 0.2 metres lowering of the water table at the nearest residence).

Installation of a cut-off wall to the estuarine clays (more than 10 metres in depth) would result in a groundwater dewatering rate of less than three megalitres per year during construction. This would result in a negligible impact to off-site areas, and no impact on the stormwater channel or wetland area south of the underpass, as outlined below. A cut-off wall installed to the full depth of the Botany Sands Aquifer during construction would result in minor levels of drawdown (no more than 0.1 metres) directly around the Wentworth Avenue underpass, surrounding residential, commercial, rail and airport land uses, surrounding groundwater-dependent ecosystems (local wetland, Mill Ponds and Botany Wetlands) and surrounding groundwater users. Surrounding receivers and land uses sensitive to changes in drawdown are not expected to experience any discernible drawdown (notionally defined as 0.05 metres) if a full depth cut-off wall is installed.

As discussed in **Section 4.3.2**, there is currently insufficient geotechnical information available to conclusively identify the methodology to minimise groundwater drawdown. Groundwater management and impacts would be confirmed with 3D groundwater modelling which would be carried out during detailed design.

Groundwater quality

Potential groundwater quality impacts associated with the proposal are discussed in **Section 7.8.3**.

Operation

Flooding

Flood modelling was carried out for two 4200 millimetre by 3000 millimetre box culverts over the stormwater channel. It should be noted that the design has now proposed a bridge over the stormwater channel instead of culverts. Accordingly, the flood impacts of a bridge would be lower than the impacts described below. The change in impervious area from the proposal is less than one per cent of the overall catchment area (300 hectares) and accordingly would have a negligible impact on the peak flows within the system.

Flood modelling for the one per cent AEP event (100 year average recurrence interval event) indicated that the proposal would:

- Result in little to no increase in flooding levels within Sydney Airport

- Result in negligible impact (less than 0.01 metres) on the upstream catchment to the north and north-west of the proposal area
- Reduce the flood risk to existing development along Botany Road by reducing flood levels by up to 0.21 metres in this area, as well as a large region that would become flood free, as indicated in **Figure 7-12**
- Increase flood areas between the stormwater channel and Port Botany Freight Rail Line, to the north and south of the underpass. This is a result of the underpass being able to take additional flows (providing a relief point) from Botany Road. The increase is up to 0.19 metres
- Increase flood levels in the stormwater channel increasing by up to 0.21 metres
- Decrease flood water reaching the wetland by about 0.2 metres and also the flood levels along Mill Pond Road. This is a result of reducing flood levels along Botany Road.

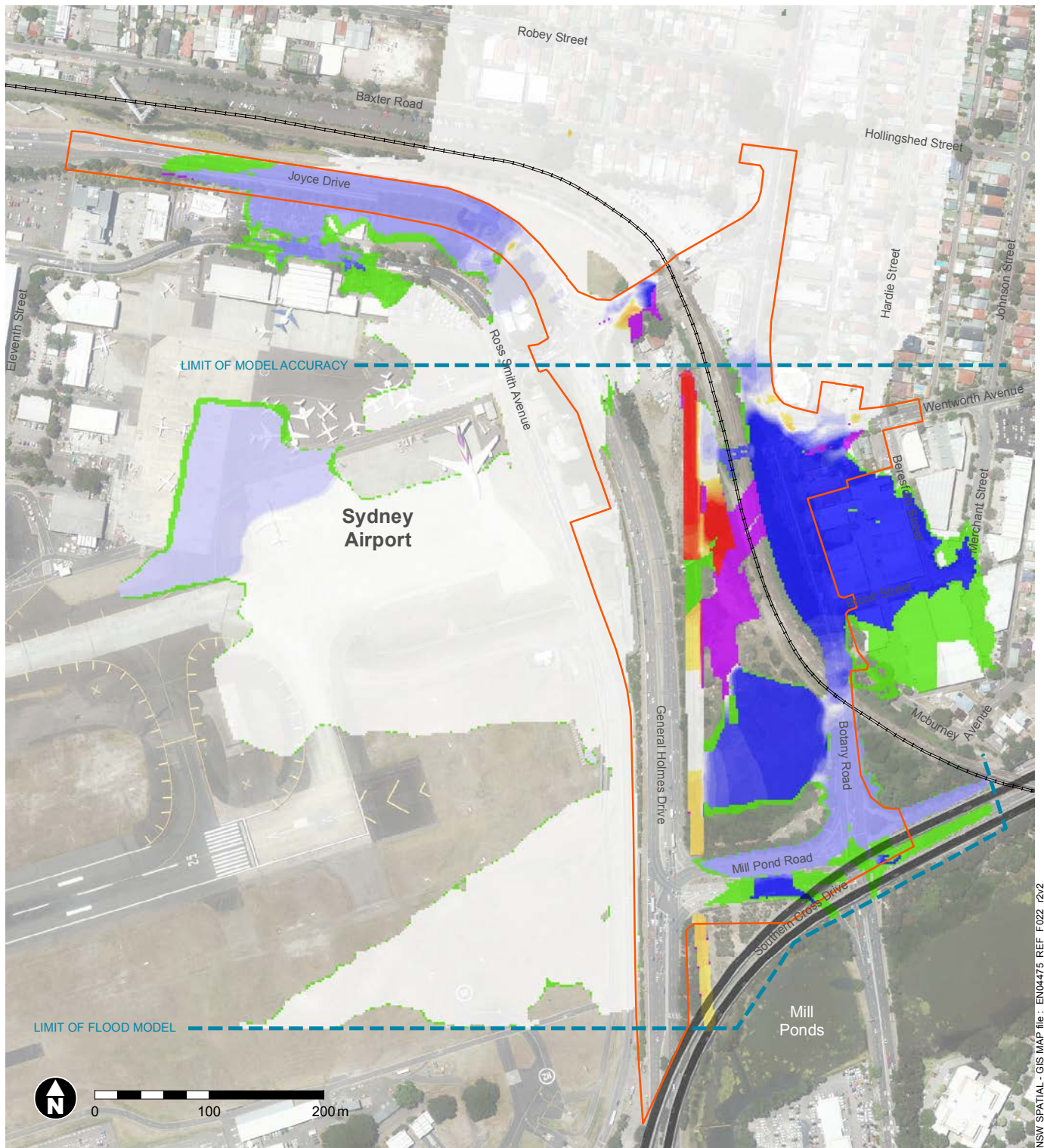
The proposal would result in flood depths within the underpass of up to 2.5 metres during the one per cent AEP event as it forms a local low point. To manage this, the proposal includes drainage and pumping infrastructure within the underpass to allow the underpass to remain open to traffic during 10 per cent AEP storm events (refer to **Section 4.2.3**).

The results presented below are a conservative estimate of the impact on flooding from the proposal. This is because the Hydrologic and Hydraulic Assessment Report assumed culverts for the crossing of the stormwater channel, whereas the current design includes a bridge structure, which has a lower risk of blockage (refer to **Section 4.2.3**). Further investigations during detailed design would be carried out to confirm flooding impacts.

The flooding impacts from the proposal are shown in **Figure 7-12**.

Groundwater levels

As the underpass would be a watertight structure when completed, there would be no inflow of groundwater into the underpass and no impact on groundwater levels. Other water management measures to protect the underpass from groundwater inflow during operation would be implemented as part of the proposal (refer to **Section 4.2.3**). There may be opportunities to incorporate the cut-off wall required during the construction period into the final design. With inclusion of the aforementioned water management measures or equivalent, groundwater levels are not expected to change during operation. Further, the operation of the proposal would have a negligible impact on the Botany Wetlands and Mill Ponds via drawdown, and as such, would not result in any impact to the groundwater dependent ecosystem.



NSW SPATIAL - GIS MAP file - EN04475_REF_F022_12v2

Figure 7-12 Impacts on flooding from the proposal (1% AEP)

Legend

- Proposal area boundary
- Motorway
- = Railway

Increase in flood level (m)

-0.20 +	0.02 to 0.04
-0.20 to -0.18	0.04 to 0.06
-0.18 to -0.16	0.06 to 0.08
-0.16 to -0.14	0.08 to 0.1
-0.14 to -0.12	0.10 to 0.12
-0.12 to -0.10	0.12 to 0.14
-0.10 to -0.08	0.14 to 0.16
-0.08 to -0.06	0.16 to 0.18
-0.06 to -0.04	0.18 to 0.20
-0.04 to -0.02	0.20 +
-0.02 to 0.02	

- Areas now flood free in modelled event
- Areas now flood affected in modelled event

J.Wyndham Prince 2014
 Roads and Maritime Services 2014
 AUSIMAGE 2014
 LPI 2014

7.6.4 Safeguards and management measures

Table 7-36 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on hydrology.

Table 7-36 Mitigation measures for hydrology

ID	Impact	Environmental safeguards	Responsibility	Timing
HY-1	Flood impacts on adjacent properties due to altered flood behaviour	Further flood modelling, including a detailed afflux assessment, will be carried out during detailed design to confirm impacts on surrounding land uses.	Roads and Maritime/ Detailed design contractor	Detailed design
HY-2	Licensing for dewatering	The NSW Office of Water will be consulted during detailed design to confirm licensing requirements for the various stages of the proposal.	Roads and Maritime	Detailed design
HY-3	Impact to groundwater levels	Roads and Maritime, in consultation with NSW Office of Water, will carry out a bore census to confirm the status of the groundwater works identified as part of the groundwater assessment.	Roads and Maritime	Detailed design
HY-4	Dewatering	<p>A procedure will be prepared for any dewatering activities to be included as part of the SWMP. The dewatering procedure is to comply with Roads and Maritime Technical Guideline – Environmental Management of Construction Site Dewatering. The procedure will include at a minimum:</p> <ul style="list-style-type: none"> • A map showing areas of the proposal that will require dewatering • Detailed description and justification of all selected dewatering methods • Description of onsite water reuse requirements • A map showing proposed discharge locations for any offsite discharge • Design requirements for each offsite discharge location to prevent erosion at the discharge location or in the receiving environment • Water quality objectives relevant to the type of dewatering activity • Description of the water quality treatment techniques to be used • Water sampling and testing regime to validate water quality prior to and (if required) during dewatering, including to establish appropriate waste disposal methods • Description of the method for dewatering • Requirements to manage encounters with groundwater or contaminated water. 	Roads and Maritime	Pre-construction
HY-5	Flooding of construction site	<p>A contingency plan will be prepared to manage a potential flood event during construction and will outline:</p> <ul style="list-style-type: none"> • Procedure for communication and notification associated with 	Roads and Maritime	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		contingency plan <ul style="list-style-type: none"> Procedures to reduce risk including removal of all plant/equipment, stabilising exposed areas and maintaining existing flood flow paths through the site Evaluation of what flood event will trigger the plan Evacuation procedures A map indicating the area that is flood prone and the locations where to evacuate. 		
HY-6	Impact to groundwater levels and quality	A Groundwater Monitoring and Management Plan will be prepared to accompany the Soil and Water Management Plan for the proposal. It will include: <ul style="list-style-type: none"> Measures to manage groundwater during construction Location of piezometers Monitoring and sampling frequency for groundwater levels and groundwater quality Evaluate any drawdown during construction Reporting frequency Timing of activities associated with monitoring. For instance, monitoring of flow, level and quality will continue for 12 months after the project is complete. 	Construction contractor	Construction
HY-7	Higher than expected inflow volumes	The NSW Office of Water will be advised if the expected inflow volume is observed, or deemed likely to exceed 3 ML/y. Measures to rectify drawdown may include installation of a second, outer containment structure, or reinjection, down-gradient on the other side of containment.	Construction contractor/ Roads and Maritime	Construction
HY-8	Operational impact on capacity of Sydney Airport detention basin	The capacity of the Sydney Airport detention basin will be further investigated in detailed design.	Roads and Maritime	Detailed design
HY-9	Impacts on groundwater	An assessment will be carried out to confirm the potential groundwater impacts due to the proposed option/s chosen to manage groundwater for the new underpass. The following will be considered for the assessment: <ul style="list-style-type: none"> The potential impacts due to the proposal on the groundwater level. The potential impacts due to the proposal on Mill Ponds Management methods of groundwater during construction Management methods of groundwater during operation 	Roads and Maritime	Detailed design

7.7 Landscape character and visual amenity

The extent and magnitude of potential impacts of the proposal on landscape character and visual amenity are assessed in the Landscape Character and Visual Impact Assessment (Corkery Consulting and Studio Colin Polwarth, 2014), which is provided in **Appendix F**. A summary of the assessment is presented in this section.

7.7.1 Methodology

The Landscape Character and Visual Impact Assessment was prepared in accordance with Roads and Maritime's Environmental Impact Assessment Practice Note EIA-N04 – Guidelines for Landscape Character and Visual Impact Assessment (2013).

For the assessment, the study area was divided into six landscape character zones (refer to **Table 7-38**). Each zone was classified based on existing landform, vegetation, buildings and infrastructure. Sixteen key representative viewpoints from where the proposal could potentially be visible, were used to determine the proposal's visual impact (refer to **Figure 7-14**).

The proposal's overall level of impact on landscape character was determined by considering the landscape's sensitivity to visual change and the magnitude of the proposal. Similarly, the proposal's overall predicted level of visual impact was determined by considering the visual sensitivity of key representative viewpoints and the magnitude of the proposed work.

Visual sensitivity and magnitude are broadly defined as follows:

- Sensitivity refers to the qualities of the area and how sensitive the existing landscape character is to the proposed change
- Magnitude refers to the nature and scale of the proposal in relation to the landscape setting.

Using the impact assessment rating matrix presented in **Table 7-37**, an overall landscape character and visual impact rating was determined for each landscape character zone and key representative viewpoint.

Table 7-37 Impact assessment rating matrix

	Magnitude			
	High	Moderate	Low	Negligible
High	High	High-Moderate	Moderate	Negligible
Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
Low	Moderate	Moderate-Low	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Source: Roads and Maritime, 2013

7.7.2 Existing environment

Landform, land use and typography

The local context is dominated by Sydney Airport due primarily to its size, the flat nature of the landscape, and the constant movement of vehicles and planes. The proposal area is located at the interface between Sydney Airport and the urban area of Mascot. The part of the road network that is the subject of this proposal can be defined as a high use transport corridor. The railway line to Port Botany is elevated on an embankment and separates the urban area from Sydney Airport, both physically and visually.


Open spaces, parklands and golf courses near the proposal are of significant recreation and scenic value. They include Sir Joseph Banks Park, bordering Foreshore Drive and Botany Bay, a 28 hectares park containing the Sir Joseph Banks Pleasure Gardens. There is also extensive open space and a golf course adjoining the Cooks River and Alexandra Canal, west of Sydney Airport (refer to **Figure 1-1** and **Figure 7-18**).




Residential development in the suburbs of Mascot and Botany is characterised by low-density housing in the form of post-war detached cottages and houses. Some new infill of medium–high density residential development has taken place. The urban character of these suburbs strongly contrasts with that of Sydney Airport, which is characterised by large-scale buildings, infrastructure and extensive flat and visually open areas occupied by runways and aprons.



Landscape character

The study area was divided into six landscape character zones (refer to **Figure 7-13**). Each zone was classified based on landform, vegetation, buildings and infrastructure. A description of each landscape character zone is provided in **Table 7-38**.

Table 7-38 Landscape character zones

Landscape character zone	Commonwealth land leased to SACL		Description
	Within	Outside	
Landscape character zone 1: General Holmes Drive/Joyce Drive streetscape 	✓	✓	This is a visually enclosed, busy road corridor connecting to Sydney Airport and Port Botany Freight Rail Line. Mature trees are located along Sydney Airport side of Joyce Drive, and a variety of commercial buildings and structures that are partly visible to motorists. The corridor also includes exotic and indigenous plantings, large billboards and grassed areas.

Landscape character zone	Commonwealth land leased to SACL		Description
	Within	Outside	
Landscape character zone 2: General Holmes Drive corridor 		✓	<p>The northern portion of the road corridor is visually enclosed by roadside trees.</p> <p>Views from the southern portion of the road corridor are more open and extend across the flat landform of Sydney Airport runway and aprons. Along the eastern edge of the roadway, shrubs and weeds obstruct views that would otherwise extend over low-lying landscape and wetland area to the railway embankment.</p> <p>A large-scale billboard and hedges obstruct potential long distance views from this zone across the Sydney Airport runways and aprons.</p>
Landscape character zone 3: Landscape area east of General Holmes Drive 	✓	✓	<p>The zone between General Holmes Drive and the railway embankment south of the level crossing is characterised by extensive regrading for construction of a major concrete-lined stormwater channel and weed growth.</p> <p>The landform has been highly disturbed by earthworks and placement of fill material over many decades. Vegetation is dominated by weed species such as Lantana and Bitou Bush.</p> <p>The area is visually enclosed by planted shrubs along the roadside as well as invasive weed trees and shrubs.</p> <p>The zone includes an area of wetland, a light industrial facility, a residential building and an advertising structure.</p>
Landscape character zone 4: Coastal Sydney Freshwater Wetlands 	✓	✓	<p>The wetlands consist of a series of ponds – including Mill Pond – that include areas of open water and are surrounded by macrophyte plants. In many places, the wetlands are bordered by stands of indigenous trees such as <i>Casuarina</i> and <i>Melaleuca</i>.</p>

Landscape character zone	Commonwealth land leased to SACL		Description
	Within	Outside	
Landscape character zone 5: Urban development of Mascot and Botany 		✓	Botany Road is visually dominated by commercial and industrial buildings. The built form includes larger scale structures including industrial buildings south of the Wentworth Avenue intersection and adjoining the rail level crossing at General Holmes Drive, and smaller post-war detached cottages along Robey Street and Baxter Road. Between Botany Road and O’Riordan Street, urban development is mainly residential. Baxter Street includes a large surface car park, large buildings and residential development. Street trees commonly form part of the visual character.
Landscape character zone 6: Sydney Airport 	✓		The northern portion of Sydney Airport is dominated by large-scale buildings and structures with extensive paved areas for aircraft use. The southern portion has a distinct visual character resulting from the flat landform, extensive areas of paved runways and taxiways with grassed aprons allowing long distance views. Views to the west from the adjoining section of General Holmes Drive extend to the western edge of Sydney Airport. A key component of the visual character is the movement of large aircraft on the ground and in the air as they take off and land.

7.7.3 Potential impacts

Construction

Construction activities would result in temporary moderate to high visual impacts to residents and motorists. The proposal would require construction near sensitive receivers, such as residential receivers located in landscape character zone 5 (refer to **Figure 7-13**). Stockpile sites would comprise material such as spoil, stripped topsoil, excavated rock and building materials. Other construction facilities would also comprise laydown facilities, equipment storage, maintenance sheds, and stores of chemicals and fuels. Temporary fencing, construction machinery, signage, and the generation of wastes would also result in short-term visual impacts during construction. These impacts would be mitigated through the implementation of safeguards outlined in **Table 7-41**.

As the majority of construction work would be carried out during night-time hours, light spill from the use of portable lighting may also impact on the visual amenity of surrounding residential areas (for example landscape character zone 5). Lighting for night-time work would comply with relevant Australian Standards, including AS4282-1997 (Control of the obtrusive effects of outdoor lighting) (refer to **Table 7-41**).

The construction footprint associated with the proposal would require about 3.3 hectares of vegetation to be cleared. This would have the highest visual impact within the area of the proposed underpass, which would also require substantial earthworks during construction. The visual impact of the underpass would be limited as it involves excavation only. No other areas within the proposal area would experience substantial earthworks, with most cut/fill areas limited to two metres in height.

Most equipment required for long periods of time would be stored at the compound site, visible only from the upper floors of Park and Fly and through established vegetation to vehicles travelling along General Holmes Drive.

Operation

Landscape character assessment

The potential impacts of the completed proposal on landscape character were assessed for each landscape character zone in terms of the zone's sensitivity to change and the magnitude of the proposed changes in that zone. The overall impact on landscape character is a combination of sensitivity and magnitude, as outlined in **Table 7-37**.

The proposal would impact on four landscape character zones (1, 2, 3 and 5). Impacts would stem from the removal of trees, the widening of roads, increase in paved areas, intersection upgrades, and the railway bridges over Wentworth Avenue (and the associated underpass). The greatest impacts would occur in the areas where there is moderate sensitivity and the scale of the proposal is considered to be more substantial, such as landscape character zone 5. These impacts are summarised in **Table 7-39**.

Table 7-39 Potential impacts on landscape character zones

Landscape character zone	Sensitivity	Magnitude	Impact
1. General Holmes Drive/Joyce Drive streetscape	<u>Low</u> Visually dominant large advertising signs, commercial development and large number of vehicles moving along corridor road.	<u>High</u> Proposed widening would remove existing roadside trees and increase the paved area of the roadway.	Moderate
2. General Holmes Drive corridor	<u>Moderate</u> Generally undeveloped character of the precinct and views across Sydney Airport.	<u>Low</u> Proposed widening would not involve the removal of street trees but would include new landscape work.	Moderate–Low
3. Landscape area east of General Holmes Drive	<u>Low</u> Low landscape character and general lack of public access to the area.	<u>High</u> Proposed roadwork would involve construction of a new section of Wentworth Avenue including railway bridge and underpass.	Moderate
4. Coastal Sydney Freshwater Wetlands	<u>High</u> Natural landscape character.	<u>Negligible</u> No roadwork is proposed in this zone.	No change

Landscape character zone	Sensitivity	Magnitude	Impact
5. Urban development of Mascot and Botany	<u>Moderate</u> Existing dominance of traffic and buildings but moderate sensitivity for adjoining residents.	<u>High</u> A large-scale intersection is proposed at Wentworth Avenue and Botany Road together with two new rail bridges over the Wentworth Avenue underpass. The loss of trees would result in high visual impacts for Botany Road and Wentworth Avenue.	Moderate–High
6. Sydney Airport	<u>Low</u> Dominance of built form and traffic.	<u>Negligible</u> No roadwork is proposed in this zone.	No change

Landscape character change

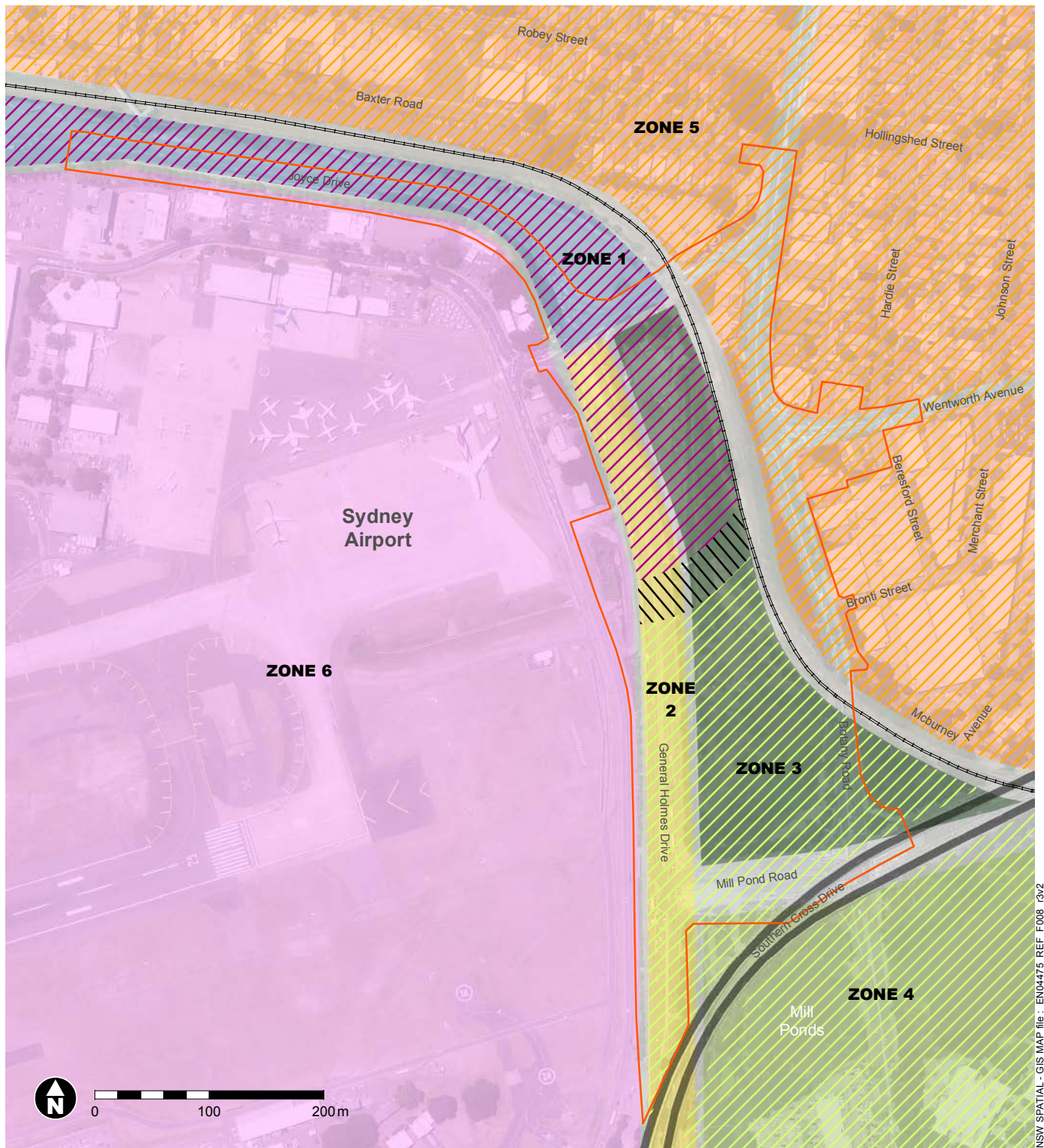
Landscaping for the proposal would change the existing landscape character of the area in accordance with the landscape strategy. **Figure 7-13** compares existing landscape character zones with the proposal’s design strategy. Landscape character zones 2, 3 and 4 would be replaced with the Coastal Sydney Freshwater Wetlands (zone 4). This zone would include remnant wetlands, restoration of the existing environment, and landscaping to enhance the visual experience of road users. The General Holmes Drive/Joyce Drive streetscape (zone 1) would be replaced by Sydney Airport Ring Road corridor, which would include sculptural landforms, public art, advertising and indigenous plant species, and would be extended to the proposed Wentworth Avenue underpass. The strategy would not substantially alter landscape character zones 5 or 6. During detailed design, the urban design strategy would be further developed in consultation with SACL, where impacts to SACL land would occur.

Visual impact

The potential impact of the proposal on visual amenity was assessed for 16 key representative viewpoints. These impacts are summarised in **Table 7-40**. Landscape and urban design safeguards and strategies have been developed from the outcomes of the landscape character and visual amenity impacts and have been included in the Urban Design, Landscape and Visual Impact Assessment (Corkery Consulting and Studio Colin Polwarth, 2014).

Overall, it was found that the visual impact of the proposal would be moderate. While the proposal is mostly located in established road corridors, it would impact on most of the viewpoints as follows:

- Two viewpoints would have a high visual impact
- Four viewpoints would have a moderate to high visual impact
- Seven viewpoints would have a moderate visual impact
- Two viewpoints would have a moderate to low visual impact
- One viewpoint would have a negligible visual impact.



NSW SPATIAL - GIS MAP file - EN04475_REF_F008_13v2

Figure 7-13 Landscape character zones

Legend

<ul style="list-style-type: none"> Proposal area boundary Motorway Railway 	<p>Landscape character zones</p> <ul style="list-style-type: none"> Zone 1 - Joyce Drive Zone 2 - General Holmes Drive corridor Zone 3 - Landscape east of General Holmes Drive Zone 4 - Coastal Sydney Freshwater Wetlands Zone 5 - Urban development of Mascot and Botany Zone 6 - Sydney Airport 	<p>Landscape character strategy</p> <ul style="list-style-type: none"> General Holmes Drive/Joyce Drive Corridor The Gateway Coastal Sydney Urban Sydney
--	--	---

Ref_Design7D.dwg
Roads and Maritime Services 2014
AUSIMAGE 2014
LPI 2014

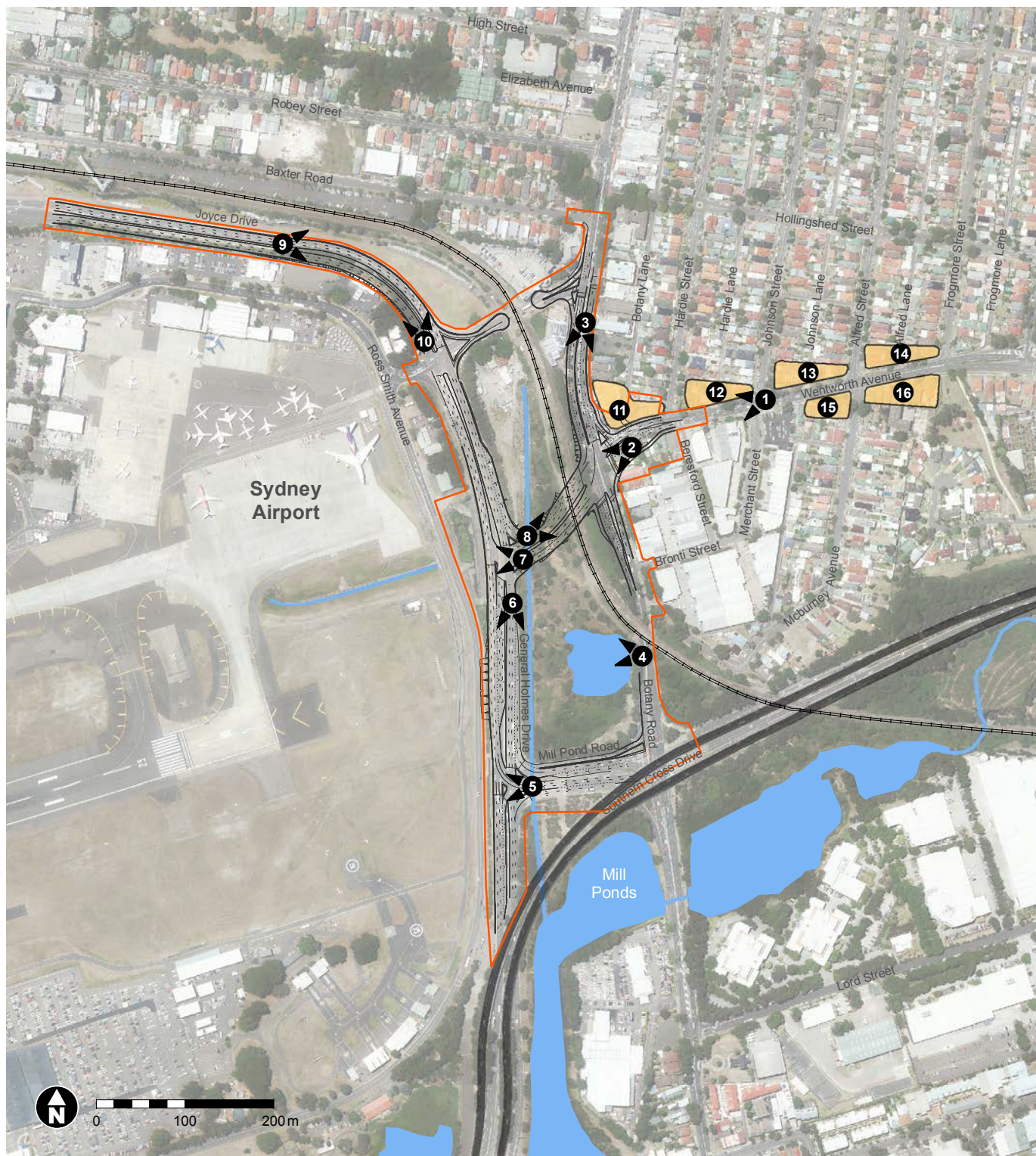


Figure 7-14 Key representative viewpoints and areas

Legend

- Proposal area boundary
- Motorway
- Railway
- Waterway
- 1 Viewpoints
- Key viewpoint areas

Ratings of 'high' to 'moderate to high' impacts would occur where the magnitude of the proposal is greatest, such as the construction of the rail bridges and Wentworth Avenue underpass, expansion of the Botany Bay and Wentworth Avenue intersection, and tree removal. It also occurs where the sensitivity is high, such as at viewpoint 11 (which is visible to residences adjoining the Wentworth Avenue and Botany Road intersection) and viewpoint 15 (which is visible to residences adjoining the southern side of Wentworth Avenue, about 250 metres west of the Wentworth Avenue and Botany Road intersection).

Landscape and urban design safeguards and strategies have been developed from the outcomes of the landscaper character and visual amenity impacts and have been included in the Urban Design, Landscape and Visual Impact Assessment (Corkery Consulting and Studio Colin Polwarth, 2014).

Table 7-40 Visual impact assessment

Key viewpoints	Sensitivity	Magnitude	Visual impact	Proposal impact visible from viewpoint
1. Wentworth Avenue travelling west	Moderate	Moderate	Moderate	The proposal would involve road widening for the new intersection, and the removal of trees. Overhead powerlines would be relocated underground and Dr Darragh Reserve would be relocated and enlarged next to Beckenham Memorial Church. Tree planting and landscape features would be consistent with those for the vegetated area on the north east corner of the Botany Road and Wentworth Avenue intersection.
2. Wentworth Avenue at Botany Road intersection	Moderate	High	Moderate–High	The proposal would involve the construction of new rail bridges and underpass. Existing trees and the railway embankment would be removed and the intersection expanded. New vegetated spaces and landscaping would be provided as part of the proposal to reduce the visual impacts associated with the rail bridges and underpass.
3. Botany Road travelling south	Moderate	Moderate	Moderate	The proposal would involve road widening and the construction of a shared-use path. Street trees would be removed.
4. Botany Road adjoining wetland	Moderate	Low	Moderate–Low	The proposal would involve regrading of landform and landscaping. Views across the wetland would be opened up by weed removal and low planting.
5. Mill Pond Road at General Holmes Drive intersection	Moderate	Low	Moderate–Low	The view of Sydney Airport could be opened up if advertising signs are relocated. The intersection layout would be modified.
6. General Holmes Drive travelling south	Moderate	Moderate	Moderate	The proposal would require road widening. Views to Sydney Airport would be maintained and views to the wetland in the landscaped area would be opened up.

Key viewpoints	Sensitivity	Magnitude	Visual impact	Proposal impact visible from viewpoint
7. Wentworth Avenue extension/General Holmes Drive intersection (looking west)	Moderate	Moderate	Moderate	The new intersection would have a view of Sydney Airport.
8. Wentworth Avenue extension/ General Holmes Drive intersection (looking east)	Moderate	High	Moderate–High	The proposal would involve the construction of a new intersection and road extension with a rail bridge over Wentworth Avenue. The existing vegetation and railway embankment would be removed. There would be major reshaping of the landform at this viewpoint.
9. Joyce Drive travelling west	Moderate	High	Moderate–High	The proposal would involve road widening. Views would be maintained to Sydney Airport and to the new landscaped area along the eastern and southern sides of the road. Visual screening of buildings would be provided.
10. General Holmes Drive at intersection	Moderate	Moderate	Moderate	The proposal would involve road widening and the removal of trees and a path. A new median would be installed.
11. Residences adjoining Wentworth Avenue at Botany Road intersection	High	High	High	The proposal would involve the construction of a new rail bridge and underpass and the expansion of the intersection. Existing trees and the railway embankment would be removed.
12. Residences adjoining northern side of Wentworth Avenue about 100 m west of Wentworth Avenue/ Botany Road intersection	High	Negligible	Negligible	A few trees would be removed on the opposite side of Wentworth Avenue. The proposal would be screened by street trees and boundary walls along the northern side of the road.
13. Residences adjoining northern side of Wentworth Avenue, about 200 m west of Wentworth Avenue/ Botany Road intersection	High	Low	Moderate	Trees would be removed along the southern side of Wentworth Avenue to allow for construction of the shared path. The proposal would be mostly screened by street trees and boundary walls along the northern side of road.
14. Residences adjoining northern side of Wentworth Avenue about 300 m west of Wentworth Avenue/ Botany Road intersection	High	Low	Moderate	Trees would be removed along the southern side of Wentworth Avenue to allow for construction of the shared path. The proposal would be mostly screened by street trees and boundary walls along the northern side of road.

Key viewpoints	Sensitivity	Magnitude	Visual impact	Proposal impact visible from viewpoint
15. Residences adjoining southern side of Wentworth Avenue about 250 m west of Wentworth Avenue/ Botany Road intersection	High	High	High	Trees would be removed along the residential frontage to the southern side of Wentworth Avenue to allow for construction of the shared path.
16. Residences adjoining southern side of Wentworth Avenue about 300 m west of Wentworth Avenue/ Botany Road intersection	High	Moderate	Moderate–High	Street trees would be removed along the residential frontage to the southern side of Wentworth Avenue to allow for construction of the shared path.

While the magnitude of some changes would represent adverse impacts, some enhancements would improve visual amenity in the long term. These enhancements include:

- Planting of vegetation to screen views, new trees and other landscaping along sections of Joyce Drive and General Holmes Drive
- The redevelopment of Dr Darragh Reserve, on the south-east corner of the Botany Road/Wentworth Avenue intersection (refer to **Section 4.2.3**). This reserve would be consistent with planting and landscape treatments at the north-east corner of the Botany Road and Wentworth Avenue intersection.
- The relocation of overhead powerlines to below ground
- Landscaping in the area south of the extension of Wentworth Avenue. This would include removing weeds to open up views across the wetland, creating new landforms, and establishing indigenous shrub and grass vegetation
- Landscaping on both sides of General Holmes Drive north of the Wentworth Avenue extension
- Planting of vegetation to screen the level crossing to the east and west of General Holmes Drive and landscaping at the closed railway level crossing.

Artist's impressions of various views within the proposal area were prepared to illustrate potential visual changes of the proposal (refer to **Photo 7-7** and **Photo 7-8**).



Photo 7-7 Artist's impression of the new rail bridges over Wentworth Avenue



Photo 7-8 Artist's impression of the corner of Wentworth Avenue and Botany Road

7.7.4 Safeguards and management measures

Table 7-41 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on landscape character and visual amenity.

Table 7-41 Mitigation measures for landscape character and visual amenity

ID	Impact	Environmental safeguards	Responsibility	Timing
LC-1	General	The detailed design will incorporate the landscape and urban design strategy and objectives described in Section 3 of the Landscape Character and Visual Impact Assessment (Corkery Consulting + Studio Colin Polwarth, 2014). The landscape and urban design strategy for detailed design will be prepared in consultation with SACL. Roads and Maritime will also liaise with Botany Bay City Council and owners of the Beckenham Memorial Church regarding landscaping on their property.	Roads and Maritime	Detailed design
LC-2	Landscape design	During detailed design, the landscape design principles and streetscape (planting) will be reviewed to ensure that they are consistent with the outcomes of the biodiversity assessment. This will be done in consultation with Roads and Maritime environment and urban design staff.	Roads and Maritime	Detailed design
LC-3	Visual impacts of construction activities	To reduce the potential visual impact of construction activities: <ul style="list-style-type: none"> • Work sites will be left tidy at the end of each work day • Where appropriate, fencing with material attached (eg shade cloth) will be provided around the construction compound to screen views from adjoining properties • Lighting for night-time work will comply with relevant Australian Standards, including AS4282-1997 (Control of the obtrusive effects of outdoor lighting). 	Construction contractor	Construction
LC-4	Visual impacts of compound, stockpile and storage areas	Following construction, temporary compound, stockpile and storage areas will be removed, cleared of all rubbish and materials, and rehabilitated.	Construction contractor	Post-construction

7.8 Topography, geology, soils and water quality

The extent and magnitude of potential impacts of the proposal on topography, geology, soils and water quality are presented in this section, together with safeguards and management measures to manage any negative impacts.

7.8.1 Methodology

Topography, geology and soils

A desktop analysis of the topography, geology and soils of the proposal area was carried out based on topographic and geological maps, database searches and other publicly available information. The Phase 1 and 2 Environmental Site Assessment (JBS&G, 2014), which is provided in **Appendix M**, and the documentation from the Geotechnical Investigation Program (Roads and Maritime, 2014b) was also used to complete this assessment.

A series of acid sulphate potential tests were carried out in December 2013 and January 2014 as part of the geotechnical investigations for 17 sampling locations within the proposal area. These tests included:

- Field screening
- Suspension Peroxide Oxidation Combined Acidity (SPOCAS)
- Chromium Reducible Sulphur (SCR).

Water quality

The desktop assessment of potential impacts of the proposal on surface and groundwater water quality was carried out to establish existing water quality and potential impacts on water quality from the proposal.

7.8.2 Existing environment

Topography

The proposal area is relatively flat, sloping gently to the south (refer to **Figure 7-15**). Regional topographic data indicates the proposal area is located at four mAHD.

Geology

Geotechnical investigations carried out for the proposal (Roads and Maritime, 2014) identified the following stratigraphic units within the proposal area:

- Fill and sand comprising medium and fine sand, with clayey silt and occasional thin layers of organic silt and clays, categorised as being part of the Botany Sand Bed. This unit is located between five to seven mAHD and -10 mAHD. Lower layers of this unit tested positive for the presence of acid sulphate soil-generating sulphides
- Estuarine clays comprising medium and high plastic clay with consistency ranging from stiff to very stiff and positive tests for the presence of acid sulfate soil-generating sulphides. This unit is located between -10 mAHD and -22 mAHD
- Bedrock sandstone comprising sandstone and siltstone, moderately weathered to fresh, with medium to high strength, categorised as Hawkesbury Sandstone. This unit is located below about -22 mAHD.

Of these stratigraphic units, the fill and sand unit is the most permeable, followed by bedrock sandstone and estuarine clays as the least permeable.

Acid sulfate soils

Acid sulfate soils (ASS) are soils and sediments containing iron sulphides that, when exposed to oxygen, generate sulphuric acid and potentially toxic quantities of aluminium and other heavy metals. The sulfuric acid and heavy metals are produced in forms that can be readily released and absorbed into the environment, with potential adverse effects on the natural and built environment and human health.

The proposal area is mapped within the Botany Bay LEP as being within an area where ASS may occur. The Acid Sulfate Soil Risk Map 2nd Edition (Department of Land and Water Conservation, 1997) also indicates the proposal area to have a high potential for ASS.

Based on a comparison with the Roads and Maritime Guidelines for the Management of Acid Sulfate Materials (RTA, 2005), the geotechnical investigation found potential acid sulfate soils (PASS) were present at two locations, both located in the vicinity of

the Wentworth Avenue underpass. Four geotechnical units, comprising one sand and three clay units ranging between about -6 mAHD and -18.4 mAHD in depth were identified to have PASS.

Surface water quality

Waterbodies located within the proposal are discussed in **Section 7.7.2**.

There is a lack of existing water quality data for water bodies within the study area. In 2003, the water quality of Mill Ponds was assessed for the proposed expansion of the Container Port Facilities in Botany Bay (Lawson and Trelour, 2003). The assessment found:

- Low dissolved oxygen concentrations, below the Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ) and the Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) guidelines
- High nutrient levels
- High biochemical oxygen demand
- High petroleum hydrocarbon levels, exceeding ARMCANZ and ANZECC (2000) guidelines
- High faecal coliform levels, exceeding ARMCANZ and ANZECC (2000) guidelines for secondary recreational contact (Lawson and Trelour, 2003).

The water quality of Mill Ponds is currently affected by runoff from the surrounding urbanised area, sewer overflows, groundwater inflow from the Botany Sands Aquifer and land uses (such as golf courses in the upper catchment areas of Botany Wetlands). Other issues impacting water quality include aquatic weeds and the European Carp (refer to **Section 7.5.2**).

High nitrogen and phosphorus levels and the low flow of water through the waterway in dry weather have previously resulted in algal blooms in the Mill Ponds. Although the frequency of algal blooms has been decreasing over the past 10 years due to the implementation of a comprehensive management plan (Sydney Water, 2011), water quality remains relatively poor.

Groundwater quality

As discussed in **Section 7.6.2**, groundwater in the region is known to have some contamination originating from industries operating in Botany and the pre-existing Orca exclusion zone.

Limited groundwater sampling of the local groundwater monitoring network, however, has been carried out to date. A single sample was obtained by JBS&G (2014) on 16 December 2013 from standpipe piezometer MW01. MW01 is located at the proposed Wentworth Avenue underpass. Groundwater within the proposal area was found to be near neutral pH with low salinity. Concentrations of contaminants of concern within groundwater were found to be below relevant water quality assessment criteria (refer to **Table 7-42**).

Table 7-42 Groundwater analytical results

Groundwater contaminant	Comment
Metals	The concentrations of heavy metals (arsenic, cadmium, chromium, copper, palladium, mercury, nickel and zinc) in groundwater samples were less than the adopted site criteria.

Groundwater contaminant	Comment
TPH/BTEX	There was no TPH/BTEX reported above the adopted site criteria in any groundwater samples collected from the site.
PAH	All total PAH concentrations were below the adopted site assessment criteria.

7.8.3 Potential impacts

Construction

Soils

The potential impacts on soils, topography and geology would be primarily due to the erosion of exposed soils and stockpiles, and associated sedimentation of surrounding land, waterways and water bodies.

During construction, there would be exposed soil during site preparation, vegetation removal, earthworks, excavation and other construction activities. Large areas of exposed soil, including stockpile sites, have the potential to be eroded by wind and water, which would lead to the transportation of sediments into nearby waterways. Mobilisation of sediments into waterways has the potential to affect aquatic health and water quality, as discussed further in this section and in **Section 7.5.3**.

The Wentworth Avenue underpass is the main area of excavation within the proposal. Apart from the underpass, there are no areas of large cut or fill in the proposal area, with cut/fill batters generally below two metres in height. While the underpass would be up to six metres deep, it poses a minimal risk to erosion as water would collect in the low point of the excavation pit, rather than being dispersed across the construction site.

Dewatering at the Wentworth Avenue underpass excavation may draw down the groundwater table to expose PASS to oxidation, allowing for the release of sulphides and metals into any seepage. Any ponded water would be dewatered into sediment basins before reinfiltration or discharge into the stormwater, and is not expected to pose an impact to the water quality of receiving waterways, as discussed further in this section.

There is potential for soils from the lower sands and estuarine clay units to be brought up to ground surface during piling works. Should this occur, sulphides exposed to air could lead to the generation of localised acidic condition and subsequent leaching of heavy metals from soils, which could further contaminate receiving water bodies such as the stormwater channel and the Mill Ponds. Groundwater from these units could also be acidic, so water collected during dewatering may need to be treated in sediment basins before it is released. A contingency measure to address this potential issue has been incorporated as a safeguard (refer **Section 7.8.4**).

Surface water quality

The construction phase of the proposal presents a risk to downstream water quality if management measures are not implemented, monitored and maintained throughout the construction process. If unmitigated, the highest risk to water quality would occur through the following construction activities:

- General earthworks, including stripping of topsoil and excavation, particularly the larger excavation at the Wentworth Avenue underpass

- Construction activities near the stormwater channel which may result in excavated spoil, fill and other erodible material entering the stormwater channel. This channel discharges directly into the Mill Ponds, which forms part of the Botany Wetland which is a Nationally Important Wetland
- Excavation of the grassed swale during construction of pipe and pit drainage infrastructure which may result in the mobilisation of sediments directly into the Sydney Airport detention basin, which discharges into the stormwater channel
- Stockpiling of topsoil and vegetation, particularly in floodprone areas where soils and vegetation are likely to become mobilised in surface water flows
- Movement of heavy vehicles across exposed earth
- Accidental spills or leaks of fuels, oils or other potentially harmful substances during construction could also result in localised contamination of soils and pollution of downstream waterways. However, the risk of this impact would be minor as the proposal would not involve the storage of large quantities of fuels, oils or other potentially harmful substances on site
- Disposal of water from dewatering of underpass excavation, where water is not reinjected or infiltrated into the aquifer.

The potential impact of unmitigated construction activities on receiving surface waters include:

- Increased sedimentation due to earthwork and/or exposed soil during site disturbance and movement of construction vehicles, particularly following rainfall events. This has the potential to smother aquatic habitat, flora and fauna as discussed in **Section 7.5.3**
- Increased turbidity from sedimentation within water bodies, reducing clarity of water and restricting light and photosynthesis
- Increased levels of nutrients, metals and other pollutants, transported via sediment to the Mill Ponds and eventually Botany Bay
- Chemical, heavy metal, oil and grease, and petroleum hydrocarbon spills from construction machinery directly contaminating the Mill Ponds and eventually Botany Bay
- Increased acidity within surface waters from the release of acid sulphates from PASS material
- Increased levels of litter from construction activities polluting the Mill Ponds and eventually Botany Bay.

In addition to other site specific measures proposed for construction of the proposal, the banks of the stormwater channel would be bunded to the north and south of the temporary crossing to avoid mixing of site water with off-site water. Site water would be directed to two temporary sediment basins to manage water quality impacts during construction (refer to **Section 4.6**). The basins would be located on the corner of General Holmes Drive and Wentworth Avenue and would collect a high proportion of sediment-laden runoff from disturbed areas of the construction site, as well as any accidental spillages which may occur during construction. Basin sizes and locations would be confirmed during detailed design.

Groundwater quality

Interception of groundwater during excavation would be highly likely during construction of the Wentworth Avenue underpass. To reduce the risk of uncontrolled discharge of groundwater, the aquifer may need to be dewatered during construction (refer to **Section 4.3.1**). Water extracted during dewatering activities may be contaminated from spills or erosion and sedimentation and accordingly may pose a

risk to surface water quality. Moreover, during dewatering activities there is a risk of introducing contaminants (through spills or sedimentation) into the aquifer. The likelihood of this occurring is minimal given that groundwater extracted for dewatering would be managed such that there would be minimal interaction with construction areas. This would avoid contamination through entrainment of fine sediment, hydrocarbons (oil and grease) or other potential contaminants.

If PASS are exposed to oxygen, groundwater passing through PASS material may become more acidic. If this occurs, the dewatered groundwater may need to be treated before reinjection or reinfiltration into the aquifer. The need for this would be determined during detailed design (refer to **Section 7.8.4**).

The proposal would not change groundwater quality either at the construction site or downstream at the wetland and Mill Ponds provided that appropriate erosion and sediment control, spill management measures and groundwater treatments are applied where appropriate (refer to **Section 7.8.4**).

Operation

Soils

The proposal would not have an impact on soils after operation.

Water quality

Following construction, the roads would be sealed and the embankments vegetated and stabilised. It is assumed there would be no exposed topsoil remaining in the proposal area. During operation, contaminants from vehicles, maintenance activities and accidental spills would accumulate on impervious surfaces, median areas and roadside corridors. During wet weather, these contaminants could be washed into receiving waterways, and cause water pollution. Contaminants of most concern relating to road runoff include:

- Suspended sediment
- Heavy metals attracted to particles on the road surface
- Oil, grease and other hydrocarbon products
- Maintenance materials, including herbicides or fertilisers, road surface cleaning and preparation chemicals
- Nutrients from biological matter, including nitrogen and phosphorus.

These contaminants are already present in the receiving waterways due to the existing roads and developments in and surrounding the proposal area. Increased traffic may increase these contaminant loads, however, the predicted increase in traffic would occur on the existing road alignment even without the proposal.

It may be necessary to treat the runoff collected in the Wentworth Avenue underpass before discharge (the need for this has not yet been determined). If treatment is required, possible options include a gross pollutant trap, a water quality treatment basin or an infiltration pond. However, given the proximity of the east-west runway, any water quality management measures would need to be designed so as not to attract birds.

Provided that appropriate water quality management measures are implemented as discussed in **Section 4.6**, the operation of the proposal is not expected to have impacts on water quality additional to those already present. Potential operational impacts of the proposal on aquatic ecology are discussed in **Section 7.5.3**.

7.8.4 Safeguards and management measures

Table 7-43 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on soil and water quality.

Table 7-43 Mitigation measures for soil and water quality

ID	Impact	Environmental safeguards	Responsibility	Timing
SWQ -1	Pollution as a result of sediment entering waterways during construction and operation	Water management controls and an associated maintenance and inspection program will be investigated during detailed design in accordance with the water quality control strategy for the proposal, with specific focus on the Wentworth Avenue underpass. During detailed design, the following will be confirmed: <ul style="list-style-type: none"> • Requirement for water quality measures • Location and size of water quality measures • Capacity for spills in the sediment basin design volume. 	Design contractor	Detailed design
SWQ -2	Acid sulphate soils	During detailed design, an Acid Sulfate Soil Management Plan will be prepared. The plan will include as a minimum: <ul style="list-style-type: none"> • A summary of the available ASS information relevant to the proposal area • Confirm the process for identification of ASS/PASS throughout construction • Identify areas where ASS/PASS are expected during project activities • Indicate the management measures to be implemented if ASS/PASS is encountered during dewatering • Indicate the management measures to be implemented if ASS/PASS is excavated during piling activities • Outline the monitoring requirements for ASS/PASS to confirm the surrounding area is being protected • Confirm the treatment and disposal requirements for any ASS/PASS encountered • Detail the reporting requirements. 	Design contractor	Detailed design
SWQ -3	Soil and water quality	A Soil and Water Management Plan (SWMP) will be prepared as part of the CEMP in accordance with the requirements of RMS contract specification G38 prior to the commencement of construction. The SWMP will also address the following: <ul style="list-style-type: none"> • Roads and Maritime Code of Practice for Water Management, the Roads and Maritime Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 “the Blue Book” (Landcom, 2004) and Volume 2 (DECC, 2008) • Roads and Maritime Technical 	Roads and Maritime	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<p>Guideline: Temporary Stormwater Drainage for Road Construction, 2011</p> <ul style="list-style-type: none"> Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering, 2011. 		
SWQ -4	Soil and water quality	<p>The SWMP will detail the following as a minimum:</p> <ul style="list-style-type: none"> Identification of catchment and sub-catchment areas, high risk areas and sensitive areas Sizing of each of the above areas and catchment The likely volume of run-off from each road sub-catchment Direction of flow of on-site and off-site water Separation of on-site and off-site water The direction of run-off and drainage points during each stage of construction The locations and sizing of sediment traps such as sump or basin as well as associated drainage Dewatering plan which includes process for monitoring, flocculating and dewatering water from site (ie sediment basin and sumps) Identification of areas of PASS that may be encountered during the dewatering work and mitigation measures required if encountered The staging plans, location, sizing and details of creek alignment and realignment controls for scour protection and bank and bed stabilisation including those used during construction and long term. A mapped plan identifying the above Include progressive site specific Erosion and Sedimentation Control Plans (ESCPs). These plans are to be updated at least fortnightly A process to routinely monitor the BOM weather forecast Contingency for any acid sulphate soils or salinity found during construction Preparation of a wet weather (rain event) plan which includes a process for monitoring potential wet weather and identification of controls to be implemented in the event of wet weather. These controls are to be shown on the ESCPs Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls. 	Roads and Maritime	Pre-construction
SWQ -5	Contaminants entering	The following measures relating to the storage and management of plant,	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
	receiving environments during construction	<p>equipment, chemicals fuels and liquids will be implemented to minimise the risk of contaminants entering receiving environments (including soil, water and air):</p> <ul style="list-style-type: none"> • Designated exclusion zones will be identified for the storage and use of construction plant and equipment. These zones will delineate traffic areas and restrict entry and exit points to construction sites • All fuels, chemicals and liquids will be stored and disposed of in accordance with Storing and Handling Liquids: Environmental Protection Participants Manual (DECC, 2007) • Refuelling of plant and equipment will occur in bunded areas located a minimum of 40 m from drainage lines or waterways • Plant, equipment and vehicle washdown will occur in a designated bunded area away from waterways and drainage lines • All concrete washouts will occur into a sealed receptacle or bunded concrete washout area with an impermeable liner. The concrete washout area will be sized to be 120% of the estimated volume of the waste that will be received into the washout area at any one time • Any material transported onto pavement surfaces will be swept and removed at the end of each working day. 		
SWQ -6	Management of stockpile and compound sites	<p>Management measures for stockpile and compound sites will be incorporated in the SWMP and ESCPs and will include the following measures:</p> <ul style="list-style-type: none"> • Stockpile and compound sites will be located away from overland flow paths and areas of high topography with minimal upstream catchment • Stockpile and compound sites will be maintained in accordance with Roads and Maritime's Stockpile Site Management Procedures (Roads and Maritime, 2001) • The number and size of stockpile and compound sites will be minimised throughout the proposal • Runoff from stockpile and compound sites will be treated with a stockpile-specific sediment basin, which will be monitored • The base of stockpile and compound sites will be lined if they are to be located over a shallow water table, and will be covered with plastic sheets, where required • Identify areas where ASS or PASS will be encountered during 	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		excavation activities <ul style="list-style-type: none"> Indicate the stockpile management measures to be implemented if ASS or PASS are excavated during piling activities Vehicle movements will be restricted to designated pathways, where feasible. 		
SWQ-7	Accidental spills during construction, resulting in the release of contaminants into waterways and the soil	A site-specific Emergency Spill Plan will be developed as part of the SWMP. It will include spill management measures in accordance with the Code of Practice for Water Management and Bunding and Liquid Chemical Storage, Handling and Spill Management (DEC, 2005) and Roads and Maritime's Environmental Incident Classification and Reporting Procedures (Roads and Maritime, 2014) Should a spill occur during construction, the Emergency Spill Plan will be implemented. Emergency spill kits will be kept at areas identified as having the highest spill risk at all times.	Construction contractor	Construction

7.9 Contamination

The extent and magnitude of potential contamination impacts of the proposal are assessed in the Phase 1 and 2 Environmental Site Assessment (JBS&G, 2014), which is provided in **Appendix M**. A summary of the assessment is presented in this section.

7.9.1 Methodology

The contamination assessment was carried out in order to identify potentially contaminated soil and groundwater within the proposal area. The assessment involved a review of background studies and field investigations. The background reports consulted include:

- An assessment of contamination and potential acid sulfate soils at the north-eastern corner of General Holmes Drive and Mill Pond Drive (Douglas Partners, 2008): This assessment was prepared to examine contamination and potential acid sulfate soils (PASS) at the north-eastern corner of General Holmes Drive and Mill Pond Drive. The assessment included a desktop analysis and excavation of six test pits
- A Phase 1 Environmental Site Assessment (ESA) for the Botany Road Carriage Works (Parsons Brinckerhoff, 2011): This assessment was prepared to examine contamination for the 'Botany Road Carriage Works.' It involved a desktop analysis and a field investigation
- A preliminary environmental investigation to identify potential environmental opportunities, constraints and risks within the proposal area (Roads and Maritime, 2013): This assessment was prepared as a preliminary environmental investigation for the proposal and included a desktop analysis and an ecological field investigation.

Field investigations were carried out in December 2013 and include:

- Soil sampling: Soil samples were collected at 49 locations within the proposal area (43 hand auger locations and six soil bore locations) and an additional 10 locations within the rail corridor and wetland area (refer to **Figure 7-15**). Soil samples collected using hand auger tools were located in unsealed areas from the ground surface (0-0.1 metres) and subsurface (0.2-0.3 metres). In addition, six soil bores were installed using a drill rig to collect samples within the area of the proposed Wentworth Avenue underpass.
- Groundwater sampling: Groundwater samples were collected from one monitoring well located at the proposed Wentworth Avenue underpass (refer to **Figure 7-15**), extending about two metres below groundwater. The results of the groundwater sampling are discussed in **Section 7.8**.

7.9.2 Existing environment

The results of the background studies are presented in **Table 7-44**, which includes a listing of the location of sites of known contamination and potential contamination within the proposal area are listed in **Table 7-44**.

Table 7-44 Summary of findings from background studies

Background study	Results
Douglas Partners, 2008	Fill material was observed from 0.2 m to 2 m below ground surface (bgs), comprising silty sandy clay with some anthropogenic material, such as asphalt and road base. Fill material was underlain by natural material observed from 0.6 m to 2 m. No odours or staining was observed, but a black ash material was identified in one test pit. Concentrations of contaminants of potential concern (COPC) were not reported above the adopted site criteria for commercial and industrial land use.
Parsons Brinckerhoff, 2011	Shallow groundwater and Botany Sand Beds were found to be potential receptors of identified COPCs. There were several areas of potential contamination, including fill material, an offsite service station, a possible signal box transformer, a railway, a groundwater contamination plume in the Botany area, and stockpiled material.
Roads and Maritime, 2013	Four sites listed on the NSW EPA contaminated land record were identified within 1 km of the proposal area. These include: <ul style="list-style-type: none"> • Sokol Corporation, about 200 m north of Joyce Drive • The Telstra Exchange, about 400 m north of the rail crossing • Former Mascot Galvanising, about 400 m north of the western end of Joyce Drive • Roads and Maritime depot, about 200 m south-west of Mill Pond Drive. The assessment indicated the presence of known contamination within the Botany Sand Beds from the former Orica plant (that was located in the Botany area), as well as the potential impact of other industrial land uses. Asbestos-containing materials (ACM) were identified at the southern portion of the proposal area (Douglas, 2008), and at several other locations that were sourced from building rubble within stockpiled soils.

The results of the field investigations are outlined in **Table 7-45**. Sampling site locations, known contamination (soil exceedances) and areas of potential contamination within the proposal area are shown in **Figure 7-15**.

Table 7-45 Soil analytical results for the 49 soil samples analysed across the proposal area

Aspect	Comments
Observations	
Field observations	<ul style="list-style-type: none"> • Anthropogenic inclusions of asphaltic gravels, plastic, brick, bitumen and coal wash were observed • Fill material was observed to extend to 0.3 m below ground surface • Railway ballast gravels were observed within the wetland and railway corridor sample locations • Trace ash and slag gravels were observed in 10 boreholes • Natural soils were not observed due to the maximum investigation depth of 0.3 m below ground surface • Three stockpiles of material were observed within the wetland area and were not investigated further • No staining or odours were observed in any of the sample locations • No volatile organic compounds were recorded • Non-friable asbestos-containing material was observed in two locations towards the south of the proposal area. No friable asbestos was observed during intrusive works.
Analysis of soil results	
Metals	<ul style="list-style-type: none"> • Concentrations of heavy metals (arsenic, cadmium, chromium, copper, palladium, mercury, nickel and zinc) in the soil samples selected for analysis were less than the adopted health based criteria • With the exception of copper in two samples, nickel in one sample and zinc in 12 samples, the concentrations of heavy metals were below the ecological based criteria.
Total petroleum hydrocarbons (TPH)	<ul style="list-style-type: none"> • No soil samples collected and analysed exceeded the adopted health based screening level (HSL) criteria for TPH concentrations • Four samples contained concentrations of TPH C₁₆-C₃₄ above the adopted ecological screening level (ESL) criteria • No other samples contained concentrations of TPH C₁₀-C₄₀ above the ESL or HSL criteria.
Benzene, toluene, ethylbenzene and xylenes (BTEX)	<ul style="list-style-type: none"> • All concentrations of BTEX compounds were below the laboratory limit of reporting (LOR) for all analysed soil samples.
Polycyclic aromatic hydrocarbons (PAH)	<ul style="list-style-type: none"> • Seven samples contained concentrations of PAHs as benzo(a)pyrene (B(a)P) above the adopted health based investigation (HIL-C) site criteria • Sixteen samples contained concentrations of B(a)P above the adopted ESL/ESL criteria • Sample TP49 had a maximum B(a)P concentration of 13 mg/kg. This sample was located within a stockpile of material next to the rail corridor. The maximum concentration of B(a)P within the surface soils was 5.6 mg/kg from sample BH34, located in the road verge along Botany Road to the east of the railway.
Organochlorine pesticides (OPC) and polychlorinated biphenyls (PCB)	<ul style="list-style-type: none"> • There were no OCP or PCBs reported above the laboratory LOR in any soil sample collected and analysed.
Asbestos	<ul style="list-style-type: none"> • Non-friable asbestos consisting of asbestos-containing material fragments was identified in one soil sample. Asbestos Containing Material was observed on the surface at two sample locations near Mill Pond Road • Friable asbestos was not detected • No asbestos fibres, including respirable fibres, were detected.
Contaminants of potential concern (COPC)	<p>Results indicate that there would likely be three soil classifications for the fill material at the proposal site. These are:</p> <ul style="list-style-type: none"> • General solid waste (GSW) • Restricted solid waste (RSW) (due to PAHs) • Special waste (due to asbestos).

Aspect	Comments
Acid sulfate soils	<ul style="list-style-type: none"> Based on field investigations, acid sulfate soils are unlikely to be present within the proposal area at shallow depths. However, testing of the lower sands and estuarine clays units (present between about - 6 mAHD and about -22 mAHD) was carried out for two locations in the vicinity of the proposed Wentworth Avenue underpass. Test results were positive for the presence of sulphides that would generate acid sulphate soils if exposed to oxygen.

The contamination investigation identified the following:

- Concentrations above the adopted health investigation level for public open space such as parks, playgrounds, playing fields, secondary schools and footpaths (HIL-C) at seven locations for carcinogenic PAHs (hydrocarbons) as B(a)P. At 16 locations, B(a)P were above the criteria and at four locations TPH (C₁₀-C₃₆ less naphthalene) concentrations were above the adopted ecological criteria. These locations were mainly along Botany Road and the exceedances are likely to be associated with vehicle emissions and the road base material. Observations also indicated the presence of ash and slag materials within the road base material
- Non-friable asbestos-containing materials (ACM) at two locations in the surface soils of the southern portion of the site, along Mill Pond Road. ACM may potentially be located in stockpiled material within the wetland area to the south of the site, next to the rail corridor. This wetland area was unable to be fully investigated, as dense vegetation prevented access to the site during field work
- Concentrations of heavy metals in groundwater that are characteristic of background levels and not the result of a pollution source. The concentrations of all other contaminants of potential concern in the groundwater samples were below the adopted site criteria.

7.9.3 Potential impacts

Construction

The review of background of information and results from field investigations identified that there are minor exceedances for some contaminants within the proposal area. However, contamination represents a minor risk to human and environmental health and can be effectively managed through standard safeguards and management measures (refer to **Section 7.9.4**). The key risk is associated with mobilisation of contaminated material (ACM, TPH, PAH and B(a)P TEQ) into the air, surface water and groundwater via wind and water erosion when clearing vegetation and excavating. Particular areas of risk for contaminants with exceedances include:

- PAH within the Botany Road, General Holmes Drive and Wentworth Avenue road corridors (relevant to construction stages 1, 3, 4, 5, 6 and 7)
- TPH along Wentworth Avenue and the proposed extension (relevant to construction stages 1, 4, 5 and 6)
- B(a)P TEQ along Botany Road (relevant to construction stages 1, 4, 5 and 6)
- ACM at the corner of Mill Pond Road and Botany Road (relevant to construction stage 7).

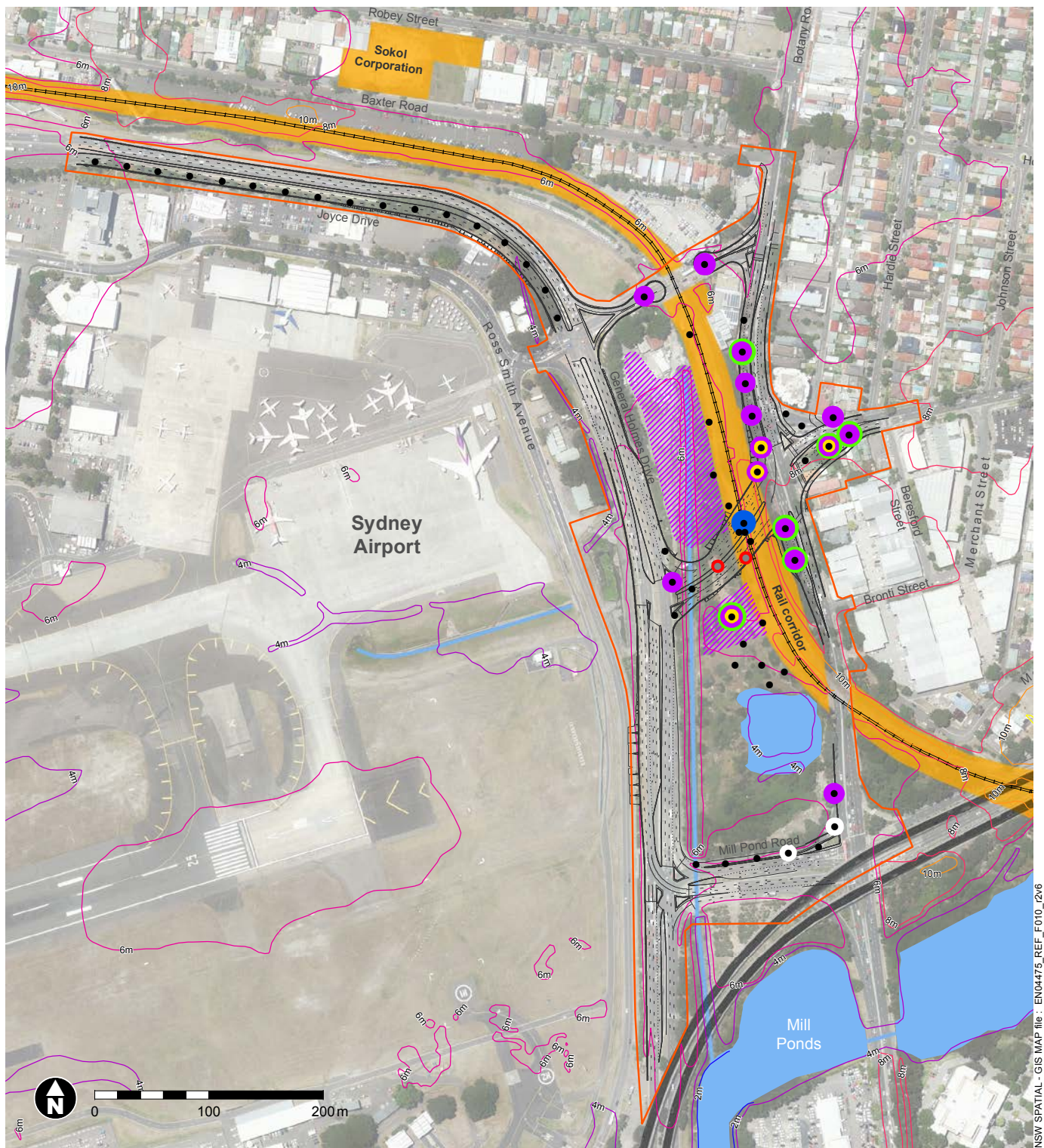


Figure 7-15 Topography and contamination

Legend

- Proposal area boundary
 - Motorway
 - Railway
 - Waterway
 - Geotechnical investigation borehole
 - Hand auger/soil bore location
 - Soil bore/monitoring well location
 - ACM exceedences
 - TPH exceedences
 - PAH exceedences
 - B(a)P TEQs exceedences
 - Potential acid sulfate soils
 - Potential stockpile site
 - Known potentially contaminated sites
- 2 m contours
- 2 m
12 m

Roads and Maritime Services 2014
 Environmental Protection Authority 2014
 AUSIMAGE 2014
 LPI 2014

During construction, there is also potential for the contamination of soils and waterways due to leaks and spills of potentially contaminating materials. Excavation for construction has the potential for surface contaminants to be released into groundwater, particularly during activities where the water table is breached. Movement of soil from one area of the construction site to another may also result in the movement of contaminants, such as non-friable ACM. Safeguards and management measures would be implemented to minimise any potential impacts relating to contamination (refer to **Table 7-46**).

Operation

Rehabilitation of contaminated areas as described in **Section 4.2.3** would result in reduction and removal of contamination within the proposal area.

During operation, the main contamination source for the proposal area would be runoff, which may be contaminated from normal vehicle operation (such as tyre wear, minor leaks of lubricants and fuels), maintenance practices, or spills and accidents. The operation of the proposal would not exacerbate these risks.

7.9.4 Safeguards and management measures

Table 7-46 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on contamination.

Table 7-46 Mitigation measures for contamination

ID	Impact	Environmental safeguards	Responsibility	Timing
CL-1	Identification and management of contaminated land	<p>A Contamination Management Plan (CMP) will be prepared in accordance with the <i>Contaminated Land Act 1997</i> and relevant EPA Guidelines. This plan will form part of the CEMP and will include at a minimum:</p> <ul style="list-style-type: none"> • Contaminated land legislation and guidelines including any relevant licences and approvals to be obtained • Identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated land within the construction footprint • Contamination management measures including waste classification and reuse procedures and unexpected finds procedures • Monitoring and sampling procedure for landfill seepage (leachate) • A procedure for dewatering and disposal of potentially contaminated liquid waste • In the event that indications of contamination are encountered (known and unexpected, including odorous or visual indicators), work in the area will immediately cease until a contamination assessment can be prepared to advise on the need for remediation or other action, as deemed appropriate • A process for reviewing and updating the plan. 	Construction contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
CL-2	Remedial Action Plan for contaminated areas	<p>A Remedial Action Plan (RAP) will be prepared and implemented in accordance with relevant regulatory requirements. The RAP will include:</p> <ul style="list-style-type: none"> • Relevant procedures to manage health and safety of construction staff during remediation • Validation of residual soils in any resulting excavations to demonstrate suitability of remaining materials to remain on site • Further assessment of the wetland area including an assessment of the stockpiled material within the wetland area and waste classification under the Waste Classification Guidelines (DECCW, 2009) for off-site removal. <p>The RAP and Validation Report will be provided to ARTC for review and comment.</p>	Construction contractor	Pre-construction
CL-3	Management of asbestos	<p>An asbestos management plan will be prepared as part of the CEMP and will be in accordance with NSW EPA guidelines (including waste guidelines) and relevant industry codes of practice. The asbestos management plan will include but not be limited to:</p> <ul style="list-style-type: none"> • Identification of potential asbestos on site • Procedures to manage and handle asbestos and avoid cross contamination • Outline the mitigation measures for encountering asbestos • Procedures for disposal of asbestos in accordance with NSW EPA guidelines (including the waste guidelines) and relevant industry codes of practice. 	Construction contractor	Pre-construction
CL-4	Classification and disposal of potential contaminants	<p>All potentially contaminated wastes generated during construction will be classified according to the Waste Classification Guidelines: Parts 1 and 2 (DECC, 2008). Wastes will be disposed to a licensed disposal facility or re-used in construction, as appropriate.</p>	Construction contractor	Construction
CL-5	Management of contamination on ARTC land	<p>Contaminated material located at the stockpile site on the southern side of the proposed Wentworth Avenue underpass (refer to Figure 7-15) will be legally disposed from ARTC land at an appropriately licensed facility.</p> <p>Fill material permanently located on ARTC land will be certified clean.</p>	Construction contractor	Construction

7.10 Air quality

Air quality issues can arise when emissions from an activity result in deterioration of local ambient air quality. An air quality assessment was completed to determine potential air quality impacts associated with construction and operation of the proposal.

7.10.1 Criteria

Construction

Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2005) prescribes criteria for managing dust and particulate matter emissions. Dust and particulate matter generated during vegetation clearing, excavation works and the handling and disturbance of soils and materials during construction would be subject to the criteria listed in **Table 7-47**.

Table 7-47 NSW EPA construction air quality criteria (DEC, 2005)

Pollutant	Averaging time	Criteria
Deposited dust	Annual	4 g/m ² /month
	Maximum increase	2 g/m ² /month
Total suspended solids (TSP)	Annual	90 µg/m ³
Particulate matter (PM ₁₀)	1 hour	50 µg/m ³
	Annual	30 µg/m ³

Operation

Potential air quality impacts relating to the operation of the proposed upgrade are generally associated with changes in motor vehicle traffic emissions. These emissions primarily include carbon monoxide (CO), nitrogen dioxide (NO₂) and particulate matter (PM₁₀).

Applicable criteria for these pollutants from Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2005) are summarised in **Table 7-48**.

Table 7-48 NSW EPA operational road air quality criteria (DEC, 2005)

Pollutant	Averaging time	Criteria
Particulate matter (PM ₁₀)	24 hours	50 µg/m ³
	Annual	30 µg/m ³
Carbon monoxide (CO)	1 hour	30 mg/m ³
	8 hours	10 mg/m ³
Nitrogen dioxide (NO ₂)	1 hour	246 µg/m ³
	Annual	62 µg/m ³

7.10.2 Existing environment

Nearby receivers

A mixture of commercial, aviation and residential receivers are located within the vicinity of the proposal. As shown in **Figure 7-18**, residential areas are located to the north and east of the proposal. The nearest residential receivers are located within 100 metres of the proposal, along Botany Road and Wentworth Avenue to the north and northeast of the proposal. Sydney Airport is located directly west of the proposal and may be sensitive during construction due to potential risks associated with dust impacts to visibility and aircraft safety.

Ambient air quality

No air quality monitoring was carried out specifically for this proposal, but the OEH operates a nearby ambient air quality monitoring station at Randwick. Randwick is about five kilometres to the north east and is the closest station to the proposal. The Randwick air quality monitoring station records ozone (O₃), sulphur dioxide (SO₂), nitrogen dioxide (NO₂), PM₁₀ and visibility (NEPH).

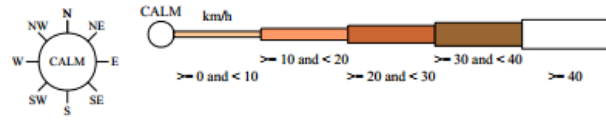
Data collected in 2012 from the Randwick station showed that there were no days when EPA operational road air quality criteria for O₃, SO₂, NO₂ and PM₁₀ were exceeded. Similarly, there were no days when the criteria for O₃, SO₂ or NO₂ were exceeded in 2013. However, the 24-hour average criterion for PM₁₀ (50 mg/m³) was exceeded on three days – one day in October 2013 and two days in November 2013.

Many OEH monitoring stations record that the PM₁₀ criteria is exceeded a few times each year. This is typically driven by unavoidable events, such as dust storms, bushfires and hazard reduction burns, though other emission sources may include industry, motor vehicles, and domestic activities such as solid fuel heaters.

Meteorology

Local meteorology is a key consideration for determining the potential for air quality impacts from an activity. Specifically, the meteorological conditions determine the direction and rate at which emissions from an activity will disperse. A review of the local wind patterns has been carried out to assess the likelihood of emissions from the project being transported towards the nearby residences.

Long-term wind patterns (April 1939 to September 2010) at 9am and 3pm from the nearest Bureau of Meteorology (BoM) weather station at Sydney Airport (Station no. 066037) are shown below in **Figure 7-16** and **Figure 7-17**.



9 am
25642 Total Observations

Calm 9%

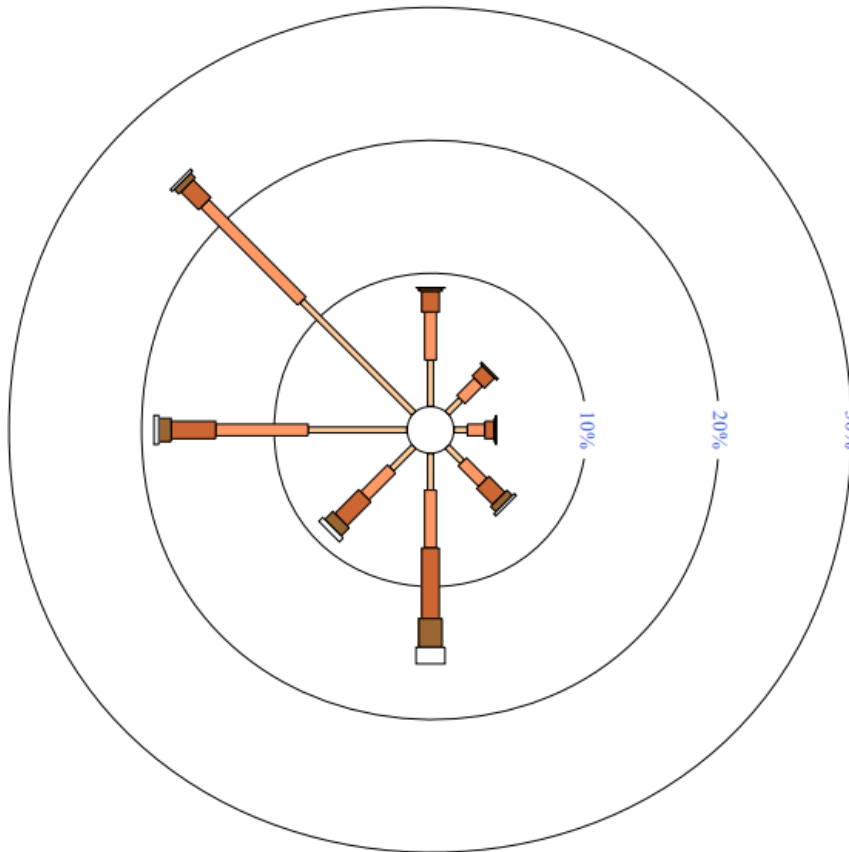
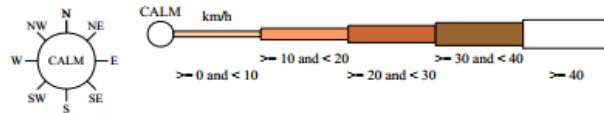


Figure 7-16 Sydney Airport long-term wind patterns, 9am (BoM, 2014)



3 pm
25719 Total Observations

Calm 2%

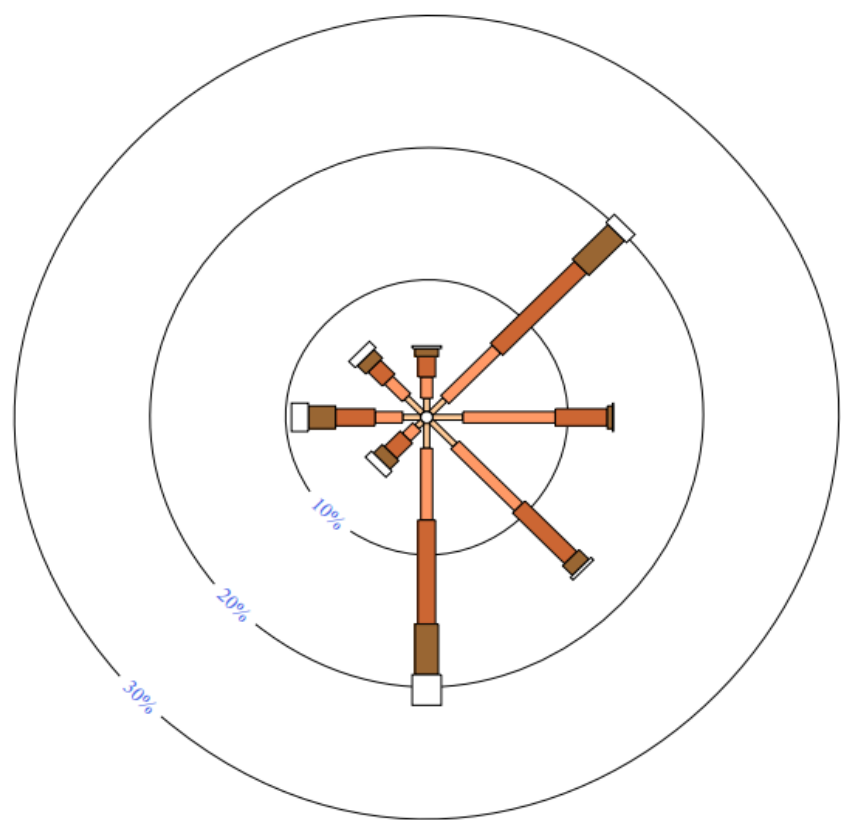


Figure 7-17 Sydney Airport long-term wind patterns, 3pm (BoM, 2014)

The wind rose presented in **Figure 7-17** indicates that morning winds typically blow from the northwest with winds from the west and south also common. Wind speeds above 10 kilometres per hour were also common with calm conditions only recorded nine per cent of the time. The 3pm wind rose shows that afternoon winds are most prevalent from the south and northeast, with winds from the east and southeast are also common (refer to **Figure 7-17**). Wind speeds greater than 20 kilometres per hour were common, with calm conditions only recorded two per cent of the time. Occasional afternoon winds were recorded with wind speeds greater than 40 kilometres per hour.

7.10.3 Potential impacts

Construction

During construction, air quality impacts would largely result from dust generated during earthworks and other engineering activities associated with road construction. The total amount of dust generated would depend on the silt and moisture content of the soil, the types of activities being carried out, the size of exposed areas, the frequency of water spraying and the speed of machinery.

Primary sources of emissions of airborne particulate matter associated with construction would include:

- Clearing of vegetation and topsoil by bulldozers and/or backhoes
- Excavation and levelling of soil by bulldozers, backhoes and/or excavators
- Movement of soil and fill by dump trucks and scrapers
- Wind erosion from unsealed surfaces and stockpiles
- Exhaust emissions from construction vehicles
- Wheel-generated dust from construction vehicles travelling on unsealed areas.

There is potential for dust to cause nuisance impacts if activities are located close to or in the direction towards sensitive receptors from which winds are blowing. As described in **Section 7.10.2**, the nearest receptors include residents located to the west and northwest of the proposal along Botany Road and Wentworth Avenue, as well as Sydney Airport, to the west of the proposal.

The following construction work and meteorological conditions present the highest potential air quality-related risks associated with the proposal:

- Construction activities along the portion of Botany Road north of Bronti Street, and along Wentworth Avenue
- Activities undertaken during winds blowing from the proposal towards residences along Botany Road and Wentworth Avenue (typically from the west and southwest)
- Activities with a high potential to generate dust (ie clearing and materials handling) undertaken during strong winds blowing from the east, owing to the sensitive nature of visibility requirements for Sydney Airport.

As displayed in **Figure 7-16** and **Figure 7-17**, winds from the west are common during mornings and winds from the east and southwest are relatively common during afternoons, so particular care to avoid dust impacts to sensitive receivers would be required under these conditions (refer to **Section 7.10.4**).

Operation

The proposal will result in reduced congestion, increased average traffic speeds and higher through-put. PM₁₀ and NO₂ data collected from the Randwick ambient air quality station suggest that background conditions are sufficiently low that any changes in road-side air quality associated with the proposal are not likely to result in the criteria presented in **Table 7-48** being exceeded.

7.10.4 Safeguards and management measures

The main focus of air quality management is to control dust emissions during construction to ensure the proposal does not result in air quality criteria being exceeded at sensitive receptors (the criteria for air quality management are outlined in **Section 7.10**).

The safeguards and management measures for construction activities are summarised in **Table 7-49**. No safeguards or management measures are required for during operation of the proposal.

Table 7-49 Mitigation measures for air quality

ID	Impact	Environmental safeguards	Responsibility	Timing
AQ-1	Air quality impact during construction	<p>An Air Quality Management Plan (AQMP) will be prepared as part of the CEMP. The plan will include but not be limited to:</p> <ul style="list-style-type: none"> • A map identifying locations of sensitive receivers • Identification of potential risks/impacts due to the work/activities as dust generation activities • Management measures to minimise risk including a progressive stabilisation plan • A process for monitoring dust on site and weather conditions • A process for altering management measures as required. <p>The management measures within the AQMP will include as a minimum:</p> <ul style="list-style-type: none"> • Vehicles transporting waste or other materials that have a potential to produce odours or dust are to be covered during transportation • Dust will be suppressed on stockpiles and unsealed or exposed areas using methods such as water trucks, temporary stabilisation methods, soil binders or other appropriate practices • Disturbed areas will be minimised in extent and rehabilitated progressively • Speed limits will be imposed on unsealed surfaces • Stockpiles will be located as far away as feasible from residences and other sensitive receivers • Works (including the spraying of paint and other materials) will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely • Plant, vehicles and equipment will be maintained in a proper and efficient manner and in accordance with manufacturer's specifications • Wind conditions will be monitored and activities scheduled where possible to avoid winds with a high potential (ie strong winds from the west or southwest) to avoid adverse impacts at nearest sensitive receivers. 	Roads and Maritime	Pre-construction Construction

7.11 Aboriginal heritage

The extent and magnitude of potential impacts of the proposal on Aboriginal heritage were assessed in accordance with Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). A clearance letter was issued by Roads and Maritime on 12 December 2013 to confirm that the proposal is

unlikely to have an impact on Aboriginal cultural heritage and is included in **Appendix N**. A summary of the assessment is presented in this section.

The Aboriginal heritage assessment was also reviewed against the Sydney Airport Environment Strategy 2010-2015 and the Sydney Airport Heritage Management Plan (June, 2009).

7.11.1 Existing environment

Landscape and geology

The proposal area is located on relatively flat land. The proposal area does not contain landscape features that indicate the presence of Aboriginal objects. **Section 7.8.2** outlines geological features of the study area.

History of the People

The proposal is located within the boundaries of the La Perouse Local Aboriginal Land Council and the Metropolitan Local Aboriginal Land Council. Botany Bay was traditionally inhabited by people of the Dharawal nation, who hunted and gathered food on the shores of the bay and along the banks and wetlands of the Cooks River. The Dharawal nation comprised the Kemeygal people, or Spear Clan, on the northern shore of Kamay, and the Gweagal people, or Fire Clan, on the southern shore of Botany Bay (Stedinger Associates, 2014).

Sites and places

There are no known Aboriginal heritage objects or places within the study area. This was confirmed by:

- An Aboriginal Heritage Information Management System (AHIMS) search in December 2013, which did not identify any known Aboriginal heritage objects or places within the study area
- A site inspection on 4 December 2013, which found that the proposal area would be unlikely to contain Aboriginal objects or places
- A further AHIMS search on 22 August 2014, which confirmed the absence of recorded Aboriginal heritage objects or places in the proposal
- A search of the NSW Atlas of Aboriginal Places on 22 August 2014, which found that the closest listed Aboriginal place is Towra Point Keeping Place, about 7.5 kilometres south of the proposal area.

Archaeological potential

The proposal area is within an urban area that has experienced a substantial degree of ground disturbance associated with past and present land use activities. As a result, the archaeological potential of the proposal area is considered to be low.

The Sydney Airport Environment Strategy 2010-2015 also indicated that there are no known Aboriginal archaeological sites or areas of potential Aboriginal archaeological sensitivity within the Sydney Airport boundary.

7.11.2 Potential impacts

Any potential for impacts on Aboriginal heritage would be to unexpected finds of Aboriginal heritage items (or suspected items) during the construction phase. Given the degree of previous ground disturbance that has occurred within the locality, the proposal area is considered unlikely to contain any items of Aboriginal heritage or Aboriginal archaeological remains.

The proposal is not expected to impact any Aboriginal heritage items or Aboriginal cultural heritage values, and no further archaeological survey or testing is proposed.

7.11.3 Safeguards and management measures

Table 7-50 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on Aboriginal heritage.

Table 7-50 Mitigation measures for Aboriginal heritage

ID	Impact	Environmental safeguards	Responsibility	Timing
AH-1	Unexpected find of Aboriginal heritage artefacts	In the event of an unexpected find of an Aboriginal heritage item (or suspected item): <ul style="list-style-type: none"> • Work will cease in the affected area • The Roads and Maritime's Environmental Officer, Sydney Region will be contacted for advice on how to proceed • The Unexpected Archaeological Finds Procedure (Roads and Maritime, 2012) will be followed. 	Construction contractor	Construction

7.12 Land use and property

The extent and magnitude of potential impacts of the proposal on land use and property are presented in this section, together with safeguards and management measures to manage any negative impacts.

7.12.1 Methodology

The assessment was based on a desktop assessment of land use zoning, aerial photography and property boundaries.

7.12.2 Existing environment

Land use

The proposal area is in Botany Bay LGA. Existing land uses are shown on **Figure 7-18** and include:

- Advertising corridor
- Airport infrastructure
- Road infrastructure
- Railway infrastructure
- Residential
- Mixed residential and commercial
- Commercial
- Light industrial
- Unused land.

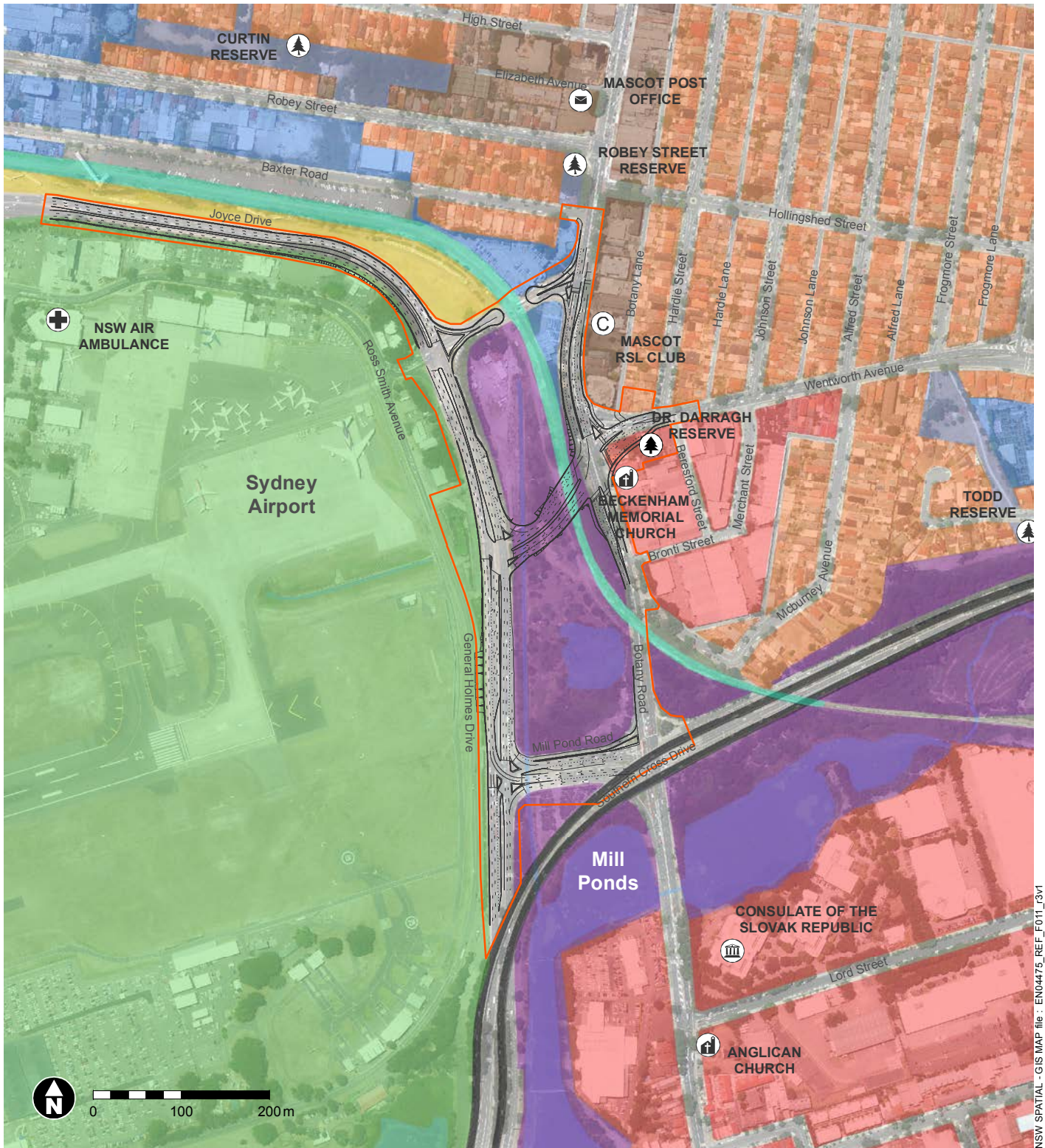


Figure 7-18 Land use and social infrastructure

Legend

- | | | | |
|------------------------|-------------------|----------------------------------|------------------------|
| Proposal area boundary | Ambulance Station | Advertising corridor | Public recreation |
| Motorway | Club | Airport infrastructure | Railway infrastructure |
| | Embassy | Commercial | Residential |
| | Park | Light industrial | Unused land |
| | Place Of Worship | Mixed residential and commercial | |
| | Post Office | | |

Property ownership

As outlined in **Section 4.8**, property within and near the proposal area is owned by Roads and Maritime, Sydney Water and Botany Bay City Council, ARTC, the NSW Department of Planning and Environment, Sydney Airport and the Commonwealth of Australia, and private owners of residential and commercial property (refer to **Figure 4-10**).

7.12.3 Potential impacts

A range of potential land use impacts would affect landowners, occupants and operators of properties near the proposal. These are presented below. The social and economic impacts of the proposal are presented in **Section 7.13**.

Construction

Property acquisition

The proposal would require full acquisition of about 14 properties (including 13 properties which are privately owned and one property which is owned by Roads and Maritime) and partial acquisition of about four properties (including two properties which are privately owned and two properties which are owned by SACL). **Section 4.8** provides a summary of the properties that would be impacted and describes the estimated area of acquisition. These property acquisitions would be confirmed during detailed design, when the number and extent of acquisitions may change.

All acquisitions of non-Commonwealth land would be subject to negotiation between each landholder and Roads and Maritime in accordance with Roads and Maritime's Land Acquisitions Policy Statement (Roads and Maritime, 2012) and the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991*.

The proposal would also require the temporary lease of land owned by SACL (Lot 14 DP787029) and land owned by the Department of Planning and Environment (Lot 5 DP775212 and Lot 6 DP776212) for use as an ancillary site during construction (refer to **Section 4.8**). As outlined in **Section 4.5**, the ancillary site is anticipated to be required for the duration of the construction period, for about 30 months. Land required for ancillary sites would be leased from the relevant land owner and will be managed by the construction contractor in accordance with the CEMP. The lease agreement would outline any specific land owner requirements. After the completion of construction, the ancillary site would be restored to its pre-construction condition.

As a result of the proposal, about 12 buildings would be demolished, including three heritage listed buildings. **Chapter 6** describes consultation carried out to date, including with affected landowners.

Property access

During construction, access to properties in the proposal area would be maintained, with temporary access provided to residences and businesses where required.

Operation

Change in land use due to property acquisitions

The main long-term impact on land use would be from the acquisition of property and the ensuing permanent change in land use – from open or vegetated space or residential use to road transport corridor. However, this is not anticipated to have a considerable impact because:

- The small areas to be acquired, and their location beside an existing major road corridor or within unused disturbed land, would have a negligible impact on the predominant land uses in the study area
- The proposal is not anticipated to have any direct impacts on the viability of land for future urban development.

Permanent changes to landscape character zones are discussed in **Section 7.7.3**.

7.12.4 Safeguards and management measures

Table 7-51 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on land use and property.

Table 7-51 Mitigation measures for land use and property

ID	Impact	Environmental safeguards	Responsibility	Timing
LU-1	Property acquisition	Roads and Maritime will consult with property owners impacted by the proposal. Property acquisition will be managed in accordance with the provisions of Roads and Maritime's Land Acquisition Policy (Roads and Maritime, 2012b) and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Roads and Maritime	Detailed design

7.13 Socio-economic

The extent and magnitude of potential socio-economic impacts of the proposal are presented in this section, together with safeguards and management measures to manage any negative impacts.

7.13.1 Methodology

The study area for the desktop socio-economic assessment focuses on the Mascot State Suburb, as defined by the Australian Bureau of Statistics (ABS). The study area includes those residents and businesses that are likely to be most affected by the proposal's construction and operation. As the proposal area comprises roads servicing Sydney Airport and Port Botany, and is an important transport route for residents, businesses and visitors in the wider region, the Botany State Suburb, Botany Bay LGA, and Greater Sydney were also considered.

The methodology for the socio-economic assessment was guided by the Draft Environmental Impact Assessment Practice Note: Socio-economic Assessment (EIA-N05) (Roads and Maritime, 2013c).

7.13.2 Existing environment

Population and growth

At the 2011 Census, Mascot had an estimated population of 10,179 people, while the Botany Bay LGA had an estimated population of 39,356 people (ABS, 2011a). According to the Department of Planning and Environment (2014), the population of Botany Bay LGA is projected to increase to 59,700 people by 2031, with an annual population growth of 1.8 per cent and a total growth of 43.2 per cent. This is substantially higher than the predicted increase for NSW, which is projected to experience an annual population growth of 1.2 per cent, and a total growth of 27.8 per cent by 2031.

Demographic characteristics

The demographic characteristics of Mascot are summarised in **Table 7-52**.

Table 7-52 ABS demographic characteristics in 2011

Characteristics	Mascot (State Suburb)*	Botany Bay (State Suburb)**	Botany Bay LGA^	Greater Sydney^^
Population (2011)				
Total population	10,179	8884	39,356	4,391,674
Median age (years)	35	37	37	36
14 years or below	15.9%	21.6%	18.1%	19.2%
65 years or over	12.1%	13.2%	14.4%	12.7%
Households and families (2011)				
Total families	2764	2316	10,371	1,152,548
Couple families with children	44.6%	52.7%	48.2%	48.9%
Couple families without children	36.6%	28.5%	31.3%	33.5%
One-parent families	14.9%	17.1%	17.6%	15.7%
Income and employment (2011)				
Median household income (\$ per week)	1483	1628	1245	1447
Labour force participation	89.5%	90.9%	88.9%	88.8%
Unemployed	4.7%	3.5%	5.3%	5.7%
Travel to work (2011)				
Car – as driver	47.1%	59.3%	51.5%	53.7%
Car – as passenger	5.3%	4.6%	5.4%	4.5%
Public transport	17.4%	13.2%	17.2%	14.3%
Average motor vehicles per dwelling	1.4	1.6	1.4	1.6

Source: *Adapted from the 2011 Census QuickStats (ABS, 2011b) ** Adapted from the 2011 Census QuickStats (ABS, 2011c) ^Adapted from the 2011 Census QuickStats (ABS, 2011a) ^^ Adapted from the 2011 Census QuickStats (ABS, 2011d)

Local and regional economy

Sydney Airport and Port Botany are two of Australia's most important international gateways and play a significant role in the local, regional and national economy. A study by Deloitte Access Economics identified that Sydney Airport, directly and indirectly, facilitated 283,700 jobs and contributed \$27.6 billion to the Australian economy in 2012 (Sydney Airport, 2013). These figures are predicted to increase to over 400,000 jobs and about \$42 billion contributed to the Australian economy by 2033 (Sydney Airport, 2013). Port Botany is Australia's second largest container port, generating over \$2.5 billion annually (Packer, 2012).

There are also a number of local businesses within and near the proposal area, including Sydney Airport services. A total of 4,452 businesses were registered in the Botany Bay LGA with the Business Register in 2013 (economy.id, undated).

Social infrastructure

Social infrastructure refers to community facilities, services and networks that help individuals, families, groups and communities meet their social needs, maximise their potential for development and enhance community wellbeing. The proposal area and its surrounds provide a range of facilities (refer to **Figure 7-18**). These include:

- Public transport, including:
 - Sydney Airport
 - Twelve bus routes and two bus stops within the study area (refer to **Section 7.1.2**)
 - Pedestrian facilities, such as informal and formal footpaths, zebra pedestrian crossings and traffic light crossings (refer to **Section 7.1.2**).
- Accommodation, including:
 - Sydney Airport Serviced Apartments
 - Quest Mascot
 - Stamford Plaza Sydney Airport
 - Ibis Budget Sydney Airport.
- Religious facilities, including Beckenham Memorial Church and Beckenham Church School Hall
- Open spaces and local parks, including:
 - Robey Street Reserve
 - Dr Darragh Reserve
 - Sparks Street Reserve
 - Dransfield Avenue Reserve
 - Todd Reserve
 - Curtin Reserve.
- Potential aesthetic attractions, including the Mill Ponds (comprising Mill Pond, Engine Pond and Mill Stream) (refer to **Figure 7-7**).

Community values

Community values are those elements considered to be important to quality of life and wellbeing. They include physical elements, such as parks, buildings and landscapes, and social elements, such as a sense of belonging and community identity. In the Mascot area, the community includes permanent residents, as well as those that work or visit the area on a daily or intermittent basis.

Community values likely to be important to local residents in the study area can be broadly categorised as:

- Local character and natural values of the area
- Local amenity and sense of place
- Employment and residential growth
- Community safety
- Liveability and access to social and community support
- Access and connectivity.

7.13.3 Potential impacts

Construction

The proposal has the potential to generate socio-economic impacts during the anticipated 30 months of construction, though it would be staged to minimise overall impacts on the community. The potential impacts are summarised below.

Property acquisition

Property acquisition required by the proposal is discussed in **Section 4.8.2**. All affected landholders would be consulted during the detailed design and construction stages of the proposal. Further discussion on consultation with affected landholders is discussed in **Section 6.6**.

Social infrastructure

The proposal would entail a number of potential impacts on social infrastructure, including:

- The Dr Darragh Reserve would be relocated by about 25 metres to the south-east of its current location to adjoin the Beckenham Memorial Church, to allow for the expansion of the Botany Road and Wentworth Avenue intersection (refer to **Section 4.2.3**). This would have a temporary negative impact on the local community as the existing reserve would be converted to road uses. This is not considered to be a significant impact due to the location of other reserves and parks within the area and since the reserve will be reinstated after construction
- A potential ancillary facility would be located near Dransfield Avenue and Wentworth Avenue (refer to **Section 4.5**). This would have a temporary negative impact to residents nearby and users of the Dransfield Avenue Reserve
- The northbound bus stop on Botany Road would be relocated about 70 metres south of its current location (refer to **Section 4.1**). This may cause minor disruptions for users of the bus stop during the construction phase of the proposal
- The proposal would require the use of large piling rigs to build the Wentworth Avenue underpass and railway bridges. These piling rigs would extend into Sydney Airport's Obstacle Limitation Surfaces (OLS) and require the east-west runway to be partially closed for one to two weeks in March 2016 and October 2016. **Section 7.2** discusses the impact of the proposal on airport operations in more detail.

Local businesses

In addition to direct impacts to some businesses, construction of the proposal would cause minor disruptions to airport operations and other local businesses within the study area. This would mostly be due to minor traffic delays (refer to **Section 7.1**) and noise impacts (refer to **Section 7.3**).

Signage

During construction, billboards along Joyce Drive and General Holmes Drive which would obstruct construction activities may need to be removed. These would be reinstated as close to their original locations as possible.

Other socio-economic factors

During construction, the proposal would also have some negative impacts on the following environmental factors:

- Transport, access and connectivity, this is addressed in **Section 7.1**
- Visual amenity, this is addressed in **Section 7.7**
- Noise and vibration, this is addressed in **Section 7.3**
- Air quality, this is addressed in **Section 7.10**.

Operation

Social infrastructure

The redevelopment of the Dr Darragh Reserve is anticipated to have a long-term positive impact. Larger parkland facilities, more shade trees and night time lighting would be provided at the redeveloped Dr Darragh Reserve in consultation with the community, agencies and other stakeholders.

As discussed in **Section 7.4.3**, the proposal would require full property acquisition of the Beckenham Church School Hall, which is listed to have local heritage significance on the Botany Bay LEP. The existing building would be demolished and part of the lot converted to the redeveloped Dr Darragh Reserve. Although this would reduce the availability of social infrastructure, in the proposal area, the impact would be partly ameliorated due to the proximity of other meeting places within the vicinity, such as Mascot Public School, JJ Cahill Memorial High School, and the City of Botany Bay Council chambers.

Other socio-economic factors

During operations the proposal would also have some positive and negative impacts on the following environmental factors:

- Transport, access and connectivity, this is addressed in **Section 7.1**
- Visual amenity, this is addressed in **Section 7.7**
- Noise and vibration, this is addressed in **Section 7.3**.

7.13.4 Safeguards and management measures

Measures to manage impacts associated with noise and vibration, visual amenity, land use and property, land transport and access, and air quality are outlined in the following sections:

- Transport, access and connectivity (refer to **Section 7.1**)
- Noise and vibration (refer to **Section 7.3**)
- Visual amenity (refer to **Section 7.7**)
- Land use and property (refer to **Section 7.12**)
- Air quality (refer to **Section 7.10**).

Additional measures to manage potential socio-economic impacts are summarised in **Table 7-53**.

Table 7-53 Mitigation measures for socio-economic impacts

ID	Impact	Environmental safeguards	Responsibility	Timing
SE-1	Community consultation	A Communication Plan will be prepared and included in the CEMP. The Communication Plan will include (as a	Construction contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		minimum): <ul style="list-style-type: none"> Requirements to provide details and timing of proposed activities to affected residents Contact name and number for complaints Procedure to notify adjacent land users for changed conditions during the construction period such as traffic, pedestrian or driveway access. The communications plan will be prepared in accordance with G36 requirements and Roads and Maritime's Community Engagement and Communications Manual (2012).		Construction
SE-2	Local goods and services	Goods and services will be sourced locally during construction wherever possible to support the local economy.	Construction contractor	Construction

7.14 Greenhouse gas and climate change

The extent and magnitude of potential impacts of the proposal on greenhouse gas and climate change are presented in this section, together with safeguards and management measures to manage any negative impacts.

7.14.1 Existing environment

Greenhouse gases include carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons. These gases have heat absorbing capacity or global warming potential. They absorb heat that is reflected from the earth, which results in warming of the air. This effect is known as the greenhouse effect. The primary human-produced greenhouse gas is carbon dioxide. Human activities, such as the combustion of carbon-based fuels, increase the amount of greenhouse gases in the atmosphere. This leads to an increase in atmospheric temperatures and is known as the enhanced greenhouse effect.

Climate change refers to the projected long-term changes to global climatic patterns as a result of increases in the concentration of greenhouse gases in the atmosphere. There is a need to understand these projected changes to future climatic conditions and the effect they could have on existing and potential projects and infrastructure. Moreover, it is important to understand how the proposal might influence these changes.

Climate change projections detailed in this assessment have utilised publicly available information. **Table 7-54** provides information on climate change forecasts for the Sydney/Central Coast region of NSW. The table provides details of the climatic change projections for the area surrounding the proposal to the year 2050, adapted from the NSW Climate Impact Profile (DECCW, 2010).

Table 7-54 Projected climatic change predictions for the Sydney/Central Coast region to 2050

Season	Seasonal rainfall	Temperature		Evaporation
		Minimum	Maximum	

Season	Seasonal rainfall	Temperature		Evaporation
		Minimum	Maximum	
Spring	↑ 10–20%	↑ 2.0–3.0°C	↑ 2.0–3.0°C	↑ 10–20%
Summer	↑ 20–50%	↑ 1.5–3.0°C	↑ 1.5–2.0°C	↑ 10–20%
Autumn	No change	↑ 1.5–3.0°C	↑ 1.5–3.0°C	No clear pattern
Winter	↓ 10–20%	↑ 1.5–3.0°C	↑ 2.0–3.0°C	No clear pattern

Source: Adapted from the NSW Climate Impact Profile (DECCW, 2010).

As shown in **Table 7-54**, the expected regional climatic changes for the Sydney/Central Coast region are:

- Increased average daily minimum and maximum temperatures
- Increased rainfall in spring and summer and decreased rainfall in winter
- Increased evaporation in spring and summer.

The NSW Climate Impact Profile (DECCW, 2010) also predicts increased intensity of extreme events (eg droughts, floods, and severe storms).

7.14.2 Potential impacts

Construction

Greenhouse gas emissions

Construction of the proposal is anticipated to be completed within 30 months. During this time, greenhouse gas emissions would be produced (due to the need to consume energy and resources, the proposal would not be able to completely avoid the generation of greenhouse gas emissions). These emissions would include:

- Carbon dioxide, methane and nitrous oxide generated from liquid fuel (eg diesel and petrol) used in plant and vehicles
- Embedded emissions associated with the manufacture and delivery of construction materials
- Methane generated from depositing carbon-based waste to landfill.

The volume of greenhouse gas emissions generated during construction would depend on the quantity of construction materials used and the types of construction plant and equipment operated on site. Areas of the site which would consume the most resources are likely to generate the most greenhouse gas emissions, such as the Wentworth Avenue underpass and rail bridges. The volume of emissions produced would be minimised through the application of standard mitigation measures, as outlined in **Table 7-55**.

Overall, however, construction related greenhouse gas emissions would be relatively minor and comparable with similar road upgrade projects.

Climate change risks

Climate change risks during construction would primarily be associated with the occurrence of severe weather events. For example, the increased frequency and severity of rainfall events would place increased pressure on erosion and sediment control measures and/or flooding of work sites.

However, climate change risks are generally considered to be minor and would be readily manageable through the application of standard mitigation measures that

have been designed to respond to the potential for the increased frequency and severity of rainfall events.

Operation

Greenhouse gas emissions

Greenhouse gas emissions during the operation of the proposal would primarily be associated with maintenance activities and the operation of private motor vehicles on the road network. The volume of greenhouse gas emissions would depend on the frequency and intensity of maintenance activities and the volume of vehicles using the road network. These emissions are anticipated to be comparable with those emissions already occurring within the study area and would not be expected to change significantly as a result of the proposal. Furthermore, traffic volumes are expected to increase in the future with or without the proposal (refer to **Section 7.1**).

Climate change risks

Climate change risks during the operation of the proposal would primarily be associated with:

- Increased average temperatures and heatwaves, which could affect the integrity of the road surface and other construction materials. Direct impacts could include more rapid deterioration of infrastructure, which could result in higher operational and maintenance costs. Indirectly, evaporative changes could result in changes to soil moisture content and soil instability, which could impact foundations of structures, cause cracking and/or softening of pavements and road rutting
- Increased frequency and severity of rainfall events, which would place increased pressure on drainage infrastructure and/or result in flooding of the study area.

However, it is unlikely that the infrastructure provided for the proposal would be more susceptible to climate change risks than the existing road network.

7.14.3 Safeguards and management measures

Table 7-55 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on greenhouse gas emissions, and the potential effects of climate change on the proposal.

Table 7-55 Mitigation measures for greenhouse gas and climate change

ID	Impact	Environmental safeguards	Responsibility	Timing
GG-1	Impacts on climate change from construction activities	<p>During construction, the following measures will be considered and implemented where possible:</p> <ul style="list-style-type: none"> • Plant and equipment will be switched off when not in use • Vehicles, plant and construction equipment will be appropriately sized for the task and properly maintained so as to achieve optimum fuel efficiency • Materials will be delivered with full loads and will come from local suppliers, where possible • Energy efficiency and related carbon emissions will be 	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<p>considered when selecting vehicles and equipment</p> <ul style="list-style-type: none"> Vegetation clearing will be reduced as much as feasible, and re-established in suitable areas when construction is completed Waste will be reduced and recycled as a preference before disposing to landfill. 		
GG-2	Climate change risks to construction	Environmental safeguards and management measures in the CEMP will be designed to accommodate and respond to the increased frequency and severity of rainfall events.	Construction contractor	Pre-construction

7.15 Waste and resource management

The extent and magnitude of potential impacts of the proposal on waste and resource management are presented in this section, together with safeguards and management measures to manage any negative impacts.

7.15.1 Policy setting

The NSW Government released the NSW Waste Avoidance and Resource Recovery Strategy 2007 (WARR Strategy) to minimise waste generated across all government sectors and improve the efficient use of resources. This reflects the community's view that waste should be treated as a resource. The WARR Strategy identifies the following waste avoidance and resource recovery goals and targets:

- Prevent and avoid waste
- Increase recovery and use of secondary materials
- Reduce toxicity in products and materials
- Reduce litter and illegal dumping.

7.15.2 Existing environment

The road network in the proposal area generates minimal waste. Waste sources are limited to roadside litter, some waste material from clearing roadside drainage, and green waste associated with the maintenance of roadside vegetation.

7.15.3 Potential impacts

Construction

Waste

Construction would generate waste streams typical of road construction, including:

- Green waste from cleared vegetation
- Road and other infrastructure materials to be removed and/or replaced (eg signposts, guard rails, telecommunications conduits, electricity transmission poles and water mains)
- Oil, grease and other liquid wastes from the maintenance of construction plant and equipment
- General wastes and sewage from site compound offices
- Packaging materials from items delivered to site, such as pallets, crates, cartons, plastics and wrapping materials

- Potential contaminated material unearthed during construction (refer to **Section 7.8**).

During detailed design, the quantities of the above waste streams would be estimated, taking into account excess cut material that would be suitable for reuse, asphaltic concrete which would be suitable for reuse, and whether the workforce would use portable toilet facilities or sewer connections. Volumes of waste generated by the proposal would be readily managed through the application of standard mitigation measures.

Resource use

Construction of the proposal would require the use of various construction materials, including diesel and petrol fuel, electricity, pavement sealant, asphalt, road base, topsoil, concrete, steel and water (refer to **Section 4.3.6**).

The proposal would not create any significant demand on these resources, such that they would become in short supply.

Operation

Operation of the proposal would not increase the amount or change the type of waste generated within the proposal area.

7.15.4 Safeguards and management measures

Table 7-56 identifies safeguards and management measures that will be implemented to address potential impacts of the proposal on waste and resource management.

Table 7-56 Mitigation measures for waste and resource management

ID	Impact	Environmental safeguards	Responsibility	Timing
WR-1	Generation of construction waste	<p>The following resource management hierarchy principles will be followed through the project life cycle:</p> <ul style="list-style-type: none"> • Unnecessary resource consumption will be avoided as a priority • Where avoidance is not possible, waste will be processed for resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Where resource recovery is not possible, waste will be disposed as a last resort at an appropriately licensed waste facility – in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i> and the EPA waste classification guidelines • Procurement will endeavour to use materials and products with a recycled content, provided that material or product is cost-effective and performance-effective. 	Construction contractor	Detailed design, pre-construction, construction
WR-2	Generation of construction waste	A Resource and Waste Management Plan (RWMP) will be prepared and include the following (as a minimum):	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • The type, classification and volume of all materials to be generated and used on site including identification of recyclable and non-recyclable waste in accordance with EPA Waste Classification Guidelines • Quantity and classification of excavated material generated as a result of the proposal (refer to Roads and Maritime's Waste Management Fact sheets 1-6, 2012) • Interface strategies for cut and fill on site to ensure re-use where possible • Strategies to 'avoid', 'reduce', 'reuse' and 'recycle' materials. • Classification and disposal strategies for each type of material • Destinations for each resource/waste type either for on-site reuse or recycling, offsite reuse or recycling, or disposal at a licensed waste facility • Details of how material will be stored and treated on-site. • Identification of available recycling facilities on and off site • Identification of suitable methods and routes to transport waste. • Procedures and disposal arrangements for unsuitable excavated material or contaminated material • Site clean-up for each construction stage. 		
WR-3	Classification of waste	All waste will be classified according to the Waste Classification Guidelines Part 1: Classifying Waste (DECCW, 2009).	Construction contractor	Construction
WR-4	Generation of construction waste	Appropriate garbage and recycling receptacles will be provided. Waste which cannot be recycled or reused will be disposed regularly at a licensed waste facility.	Construction contractor	Construction

7.16 Cumulative environmental impacts

Cumulative impacts have the potential to arise from the interaction of individual elements of the proposal and the additive effects of the proposal with other external projects. Under Clause 228 (2) of the EP&A Act, Roads and Maritime is required to take into account potential cumulative impacts as a result of the proposal.

7.16.1 Methodology

Other locally occurring developments that could interact with the proposal were identified through a desktop review of publically available information on the Department of Planning and Environment's major project register and the City of

Botany Bay's online development application tracker. The desktop search was carried out on 27 August 2014 for the Botany Bay LGA. (Minor developments, such as minor alterations to dwellings, were not included due to the limited nature and extent of those developments and, therefore, the minimal interaction with the current proposal.

The assessment of the significance of potential cumulative impacts considered the location and timing of the potential developments. Where the timing of a development was not known at the time of writing this REF, the assessment assumed a worst-case scenario in that the proposal would coincide with that development.

Potentially occurring developments

Construction of the proposal would begin in 2015 and take about 30 months to complete. The developments have the potential to interact with the proposal are presented below.

Sydney Airport – T2/T3 Ground Access Solutions and Hotel project

The Sydney Airport – T2/T3 Ground Access Solutions and Hotel project comprises six projects including the extension of Seventh Street, connection of the P2 and P3 car parks, construction of the multi-level Ground Transport Interchange, reconfiguration of Sir Reginald Ansett Drive and Shiers Avenue, reconfiguration of Qantas Drive and construction of a hotel. Construction of this project is anticipated to commence in 2015 and take about 36 months to complete. The construction footprint would be directly next to the north-eastern corner of the proposal area. Cumulative effects could occur due to the construction timing of this project, which is likely to overlap with the proposal.

WestConnex Motorway project

The WestConnex Motorway project aims to improve access and connectivity for the wider Sydney Metropolitan region.

As discussed in **Section 1.1**, the WestConnex project includes upgrades to the M4 Motorway (Parramatta to Haberfield), the M5 East Motorway Airport Link (Beverly Hills to St Peters), and the M4 South Motorway (Haberfield to St Peters) to improve traffic flow and access to the future WestConnex Motorway. The closest part of the WestConnex Motorway project to the proposal is the M5 East Motorway Airport Link which extends from Beverly Hills to St Peters. The project is expected to begin in 2015 and be completed by 2019. This would overlap with the expected construction timeframe of the proposal.

Port Botany Expansion project

The Port Botany Expansion project, scheduled for completion in 2014, comprises an upgrade of the container port facilities to provide additional capacity at Port Botany to cater for long-term growth in freight. Although the Port Botany Expansion project is anticipated to be completed before the construction of the proposal, there would still be potential for cumulative impacts to occur due to prolonged construction within the locality which could result in construction fatigue for local residents, businesses and other road users.

Other local developments

A number of smaller local developments were identified near the proposal area that may require temporary lane closures on local streets.

In addition, Roads and Maritime is currently investigating a number of other roadwork projects within the proposal area, these include widening O’Riordan Street between Bourke Road and Qantas Drive (the details of these projects are yet to be confirmed). These projects also have the potential to produce cumulative impacts.

7.16.2 Potential impacts

Construction

Traffic and transport

As a result of multiple construction projects being carried out within the proposal area and within a similar time period, there is a potential for impacts on traffic and transport to be greater than those that were identified for the proposal in isolation. Impacts would primarily be a result of road or lane closures and construction traffic management. Potential cumulative impacts include:

- Increased travelling time on the road network
- Increased traffic volumes on alternative routes, resulting in congestion or gridlock
- Decreased traffic speed on the road network.

Noise, vibration and air quality

Noise, vibration and air quality impacts associated with the above proposals are expected to be identified and managed at the project level through appropriate noise, vibration and air quality mitigation measures.

Cumulative impacts are only expected where construction activities coincide at tie-in points. These cumulative impacts would be managed through coordination of the construction timetable, where possible.

Visual amenity

Multiple construction projects would have a cumulative impact on the visual amenity of the proposal due to the use of additional compounds, stockpile sites, construction machinery, and earthworks. These impacts would be managed at the project level through appropriate visual amenity mitigation measures. The staging of each project would also make sure that visual amenity impacts are reduced at the project level.

Operation

The proposal is not anticipated to have any long-term negative cumulative impacts during operation. These developments would improve access and connectivity for the wider Sydney Metropolitan region by reducing traffic congestion, reducing travelling times, and improving road safety.

7.16.3 Safeguards and management measures

The potential for adverse cumulative impacts is most effectively addressed by the application of individual safeguards recommended throughout **Chapter 7** of this REF and summarised in **Section 8.2**. An additional safeguard is recommended in **Table 7-57**.

Table 7-57 Mitigation measures for cumulative environmental impacts

ID	Impact	Environmental safeguards	Responsibility	Timing
CE-1	Cumulative traffic impacts	The CEMP will be updated as required to incorporate potential cumulative	Construction contractor	Detailed design

ID	Impact	Environmental safeguards	Responsibility	Timing
	from construction of multiple projects	impacts from surrounding development activities as they become known. This will include close liaison with the authorities carrying out the other projects, and a process to review and update mitigation measures as new work begins or if complaints are received.		Pre-construction Construction
CE-2	Cumulative construction impacts	A working group will be formed to manage cumulative construction impacts associated with the proposal and other Sydney Airport and Roads and Maritime projects. This group will also coordinate between the projects and the proposal.	Roads and Maritime	Detailed design

7.17 Conclusions

7.17.1 Summary of beneficial effects

The beneficial effects of the proposal would occur after the upgrade is completed. The benefits would include:

- Improved traffic flow and access for motorists travelling to Sydney Airport, Port Botany and the wider Sydney Metropolitan region
- Improved access and connectivity for pedestrians and cyclists through the provision of a shared-use path
- Improved safety for pedestrians and cyclists
- Improved visual amenity through landscaping, undergrounding of utilities and provision of social infrastructure
- Reduced flood risk to existing development along Botany Road
- Removal of weeds and habitat enhancement as part of the landscaping for the proposal.

7.17.2 Summary of adverse effects

The adverse effects of the proposal would be both temporary (during construction), and long-term.

Temporary construction impacts would include:

- Minor traffic disruptions
- Noise and vibration, dust, increased risk of spills and contamination, and erosion and sedimentation of local waterways
- Impacts on visual and local amenity from construction activity, clearing of vegetation, and generation of wastes
- Minor disruptions to airport operations and other local businesses.

The main long-term impacts would be:

- The removal of about 3.3 hectares of vegetation
- The partial acquisition of four properties and full acquisition of 14 properties
- Demolition of three items listed to have local heritage significance and two unlisted items, including about 20 metres of sandstone kerb and Botany Road tram tracks.

The next chapter presents the framework for managing potential impacts of the proposal, and a list of all site-specific environmental safeguards.

8 Environmental management

This chapter describes how the proposal would be managed to reduce potential environmental impacts throughout detailed design, construction and operation. It includes a framework for managing potential impacts, a summary of site-specific environmental safeguards, and a list of licences and/or approvals required prior to construction.

8.1 Environmental management plans (or system)

The proposal includes a number of safeguards and management measures to minimise adverse environmental and social impacts (refer to **Chapter 6**). Should the proposal proceed, these measures would be incorporated into the detailed design and applied during construction and operation.

These safeguards and management measures would be contained in a Project Environmental Management Plan (PEMP) and a Contractor's Environmental Management Plan (CEMP). These two plans would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The plans must be reviewed and certified by the Roads and Maritime Services Environmental Officer, Sydney Region, before any on-site works can begin. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP and PEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan) and the QA Specification G40 – Clearing and Grubbing.

8.2 Summary of safeguards and management measures

The safeguards and management measures listed throughout **Chapter 7** are presented in **Table 8-1**.

Table 8-1 Summary of site specific environmental safeguards

No.	Impact	Environmental safeguards	Responsibility	Timing
General				
1	General	All environmental safeguards will be incorporated in the following documents: <ul style="list-style-type: none"> • Project Environmental Management Plan • Detailed design • Contract specifications for the proposal • Contractor's Environmental Management Plan. 	Project manager	Pre-construction
2	General	A risk assessment will be carried out in accordance with the Roads and Maritime Audit Pack and Operations and Services Directorate (OSD) risk assessment procedures to determine an audit and inspection program for the project. The recommendations of the risk assessment will be implemented. A review of the risk assessment will be carried out after the initial audit or inspection to evaluate if the level of risk chosen for the project is appropriate. Any work for the proposal and covered by this REF may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.	Project manager and regional environmental staff	Pre-construction After first audit
3	General	The environmental contract specification G36 – Environmental Protection (Management System) will be forwarded to the Roads and Maritime Senior Environmental Officer for review at least 10 working days before the tender stage. A contractual hold point will be maintained until the CEMP is reviewed by the Roads and Maritime Senior Environmental Officer.	Project manager	Pre-construction
4	General	The Roads and Maritime Services Project Manager will notify the Roads and Maritime Services Environmental Officer, Sydney Region, at least 5 days before work begins.	Project manager	Pre-construction
5	General	All businesses and residences likely to be affected by the proposal will be notified at least 5 working days before the proposed activities begin.	Project manager	Pre-construction
6	General	The contractor will provide environmental awareness training to all field personnel and subcontractors.	Contractor	Pre-construction and during construction as required.
Transport				
TR-1	General traffic	A Traffic Management Plan (TMP) will be prepared as part of the Construction	Construction contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
	impacts	<p>Environmental Management Plan (CEMP). The TMP will be prepared in accordance with Roads and Maritime's Traffic Control at Work Sites (RTA, 2010), Australian Standard AS1742 and the worksite manual Roads and Maritime Specification G10. The TMP will outline:</p> <ul style="list-style-type: none"> • Traffic controls to regulate traffic movements and minimising traffic switching • Coordination of: <ul style="list-style-type: none"> – General traffic flows at major construction work areas, such as the tie-ins for the Wentworth Avenue extension – Delivery of construction materials and movement of construction plant and equipment to and from the site to limit traffic delays – Other Roads and Maritime roadwork and any work by other agencies that affect traffic flow – Schedules, abnormal loads and other specific aspects of transport with transport operators – Consultation with local councils to identify, evaluate and document alternative routes – Incident response with emergency services. • Maintenance of continuous, safe and efficient movement of traffic for both the public and construction crew • Haulage routes and access arrangements to minimise impacts on local routes • Construction traffic zones around work areas • Access provisions for local roads and properties • Maintenance of pedestrian access • Provision for appropriate warning and signposting • Requirements and methods to consult with and inform the local community of impacts on the local road network and traffic, as well as impacts on individual property access. <p>A Vehicle Movement Plan will be prepared as part of the overall TMP. The Vehicle Movement Plan will assess construction-related heavy vehicle movements per shift into and out of the construction sites, and provide guidelines for limiting impacts on traffic using the road network.</p>		<p>Pre-construction</p> <p>Pre-construction</p>
TR-2	Impact to traffic from construction site access	<p>All access points to the construction site and site roads will:</p> <ul style="list-style-type: none"> • Have safe intersection sight distance • Accommodate the turning movements of the largest heavy vehicles 	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Provide painted median treatments for vehicle delineation Provide suitable intersection layouts. 		
TR-3	Impact on access to bus stops during construction	Local bus operators will be consulted during detailed design regarding location and provision of access to bus stops during construction.	Roads and Maritime	Detailed design
TR-4	Building rail bridges during scheduled rail possessions	Roads and Maritime will consult with Port Botany and ARTC during detailed design to confirm that the proposal will avoid disturbance and impact on operations during construction where practicable.	Roads and Maritime	Detailed design
TR-5	Impact on access for emergency services	Consultation with emergency service authorities will be carried out during development of the detailed design including with NSW Fire Rescue.	Roads and Maritime	Detailed design
TR-6	Impact on pedestrian and cyclist access during construction	<p>Pedestrian and cyclist access will be maintained throughout construction. Appropriate signage communicating diversion routes to pedestrians and cyclists will be displayed during construction.</p> <p>Advance notification will be provided of any construction works that affect pedestrians and cyclists.</p>	Construction contractor	Construction
TR-7	Impact on property access	Vehicular property access will be maintained including at places of worship and to all commercial premises. Should property access be affected by the proposal, residents will be consulted before any work begins.	Construction contractor	Construction
TR-8	Impact on access to bus stops	The community will be provided with ongoing updates on locations and access to bus stops during the construction period to ensure that disruption is minimised.	Construction contractor/ Roads and Maritime	Construction
Airport operations				
AO-1	General impacts on airport operations	Roads and Maritime will continue to consult with SACL and Air Services Australia before and during construction of the project regarding any potential impacts on airport operations.	Roads and Maritime	Detailed design
AO-2	Construction impacts on airport operations	<p>The CEMP will include an Airport Operations Management Plan to ensure that airport operations are not affected by construction of the proposal. This plan will include (as a minimum):</p> <ul style="list-style-type: none"> Maps indicating areas of permitted disturbance within Sydney Airport land 	Roads and Maritime/ Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Communication protocol with Sydney Airport and representatives, outlining frequency and content of updates • Complaints procedure. 		
Noise and vibration				
NV-1	Noise and vibration impacts on sensitive receivers	During the detailed design stage of the proposal, further investigations of potential noise impacts and all feasible and reasonable mitigation options will be carried out for affected receivers in accordance with the Road Noise Policy (DECCW 2011) and Roads and Maritime's Environmental Noise Management Manual Practice Note 4 (RTA 2001).	Roads and Maritime	Detailed design
NV-2	Noise and vibration impacts on sensitive receivers during construction	<p>A Construction Noise and Vibration Management Plan (CNVMP) will be prepared as part of the CEMP. The CNVMP will include (as a minimum):</p> <ul style="list-style-type: none"> • A map indicating the locations of sensitive receivers • A quantitative noise assessment in accordance with the EPA Interim Construction Noise Guidelines (DECCW, 2009) • Management measures to minimise potential noise impacts • A risk assessment to determine construction activities likely to affect sensitive receivers • Mitigation measures to avoid noise and vibration impacts during construction activities • A process for assessing the performance of mitigation measures • A process for documenting and resolving issues and complaints • A construction staging program incorporating noise and vibration monitoring for sensitive receivers • Identification in toolbox talks where noise and vibration management is required. 	Construction contractor	Pre-construction
NV-3	General vibration during construction	Building condition surveys will be carried out for buildings identified in the CNVMP. A copy of the report will be sent to the landholder.	Construction contractor	Pre-construction
NV-4	General vibration during construction	<p>A vibration assessment will be prepared and included in the NVMP. The vibration assessment will include (as a minimum):</p> <ul style="list-style-type: none"> • Identification of potentially affected properties/receivers • A risk assessment to determine the potential for discrete work activities to affect receivers 	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • A map indicating the locations considered likely to be impacted and those requiring building condition surveys • A monitoring program • A process for assessing mitigation measures • A process for resolving issues and conflicts, including additional noise and vibration monitoring where required. 		
NV-5	Noise impacts on sensitive receivers from operation of stockpile and compound sites	Construction compound layout will be arranged so that primary noise sources are at a maximum distance from sensitive receivers (primarily residential receivers), with solid structures (sheds and containers) placed between sensitive receivers and noise sources (and as close to the noise sources as is practical).	Construction contractor	Pre-construction Construction
NV-6	Noise impacts from construction machinery	Compressors, generators, pumps and any other fixed plant will not be located near residences where possible	Construction contractor	Construction
NV-7	Noise and vibration induction	An environmental induction program will be developed to include specific noise and vibration awareness training.	Construction contractor	Construction
Non-Aboriginal heritage				
NA-1	Landscaping to improve visual amenity of Beckenham Memorial Church	Landscaping surrounding the Beckenham Memorial Church will be investigated during detailed design in consultation with church owners and heritage officers from Botany Bay City Council.	Roads and Maritime	Detailed design
NA-2	Removal of heritage relics	An exception under Section 139 of the Heritage Act will be obtained for impacts to identified relics within the proposal area, if required.	Roads and Maritime	Pre-construction
NA-3	Impact to heritage items	A condition survey will be carried out before the start of work by a qualified contractor and a building condition report prepared for nearby heritage items which may experience indirect impact from construction, including Beckenham Memorial Church.	Roads and Maritime	Pre-construction
NA-4	General impact to heritage	<p>A Non-Aboriginal Heritage Management Plan will be prepared and included in the CEMP. The plan will include but not limited to:</p> <ul style="list-style-type: none"> • A map identifying locations of heritage items (including curtilages) which are to be protected and those which are to be destroyed 	Roads and Maritime	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Identification of potential impacts to heritage items due to construction • Implementation of mitigation measures to protect identified heritage items • A stop works procedure in the event of actual or suspected potential harm to a heritage item • Requirement to comply with Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds (2012). 		
NA-5	Disturbance, removal or demolition of non-Aboriginal heritage items	<p>A photographic archival recording will be made of the following items before any disturbance or demolition, in accordance with OEH guidelines:</p> <ul style="list-style-type: none"> • House (house and allotment), 1289 Botany Road • House (house and allotment), 1291 Botany Road • Beckenham Memorial Church School Hall (hall and allotment), 1293 Botany Road • Beckenham Memorial Church (church frontage only), 1295 Botany Road • Mascot (Botany Road) Underpass (bridge and its approaches) • Sandstone kerb along Botany Road near Wentworth Avenue • Botany Road tram tracks. 	Roads and Maritime	Pre-construction
NA-6	Non-Aboriginal heritage awareness training	Non-Aboriginal heritage awareness training will be provided for all contractors and personnel before the start of construction to make aware of retained heritage items within the vicinity of the works and required management measures and to ensure understanding of the procedure required to be carried out in the event of discovery of non-Aboriginal heritage materials, features or deposits, or the discovery of human remains.	Construction contractor	Pre-construction
NA-7	Protection of non-Aboriginal heritage items from inadvertent damage	<p>The following items will be temporarily fenced and appropriate signage displayed and/or noted on a plan as a heritage item to avoid indirect impacts or encroachment, where necessary:</p> <ul style="list-style-type: none"> • Mascot (Botany Road) Underbridge • Sandstone kerb and alignment pin at Botany Road, near McBurney Avenue • Botany Water Reserve • Mascot (O’Riordan Street) Underbridge • Electricity Substation 163, at 42 Wentworth Avenue • Commercial Building Group, 1209–1223 Botany Road • Single Storey Terrace Group, 1239–1245 Botany Road • House, 71 Frogmore Street • House, 87 Hardie Street • House, 90 Johnson Street. 	<p>Roads and Maritime</p> <p>Construction contractor</p>	<p>Pre-construction</p> <p>Construction</p>

No.	Impact	Environmental safeguards	Responsibility	Timing
NA-8	Discovery of non-Aboriginal heritage features or deposits	If at any time during construction of the project, non-Aboriginal heritage materials, features and/or deposits are found and are not covered by an issued approval (generally s139 excavation permit, exception or s60 approval or exemption) then the Roads and Maritime Standard Management Procedure: Unexpected Heritage Items (Roads and Maritime 2013) will be followed.	Construction contractor	Construction
NA-10	Discovery of tram tracks and additional road fabric	A photographic archival recording will be made of additional road fabric or other unanticipated finds if found during construction. This will be carried out in accordance with Roads and Maritime's Standard Management Procedure: Unexpected Archaeological Finds (2012).	Construction contractor	Construction
NA-11	Rebuilding of Beckenham Memorial Church fence	The front boundary wall of Beckenham Memorial Church will be rebuilt in the same style and with similar materials as the existing wall, in consultation with church owners and heritage officers from Botany Bay City Council.	Construction contractor	Construction
Biodiversity				
BI-1	Potential impact to Coastal Freshwater Wetland TEC during construction	<ul style="list-style-type: none"> A buffer zone of 5 m will be established around the wetland to avoid physical impact The area within the wetland buffer area will be rehabilitated as part of the proposal area, including weed control, landscaping and site rehabilitation works with locally indigenous species Relocate woody debris recovered from the construction footprint to the wetland buffer to provide shelter sites for the Green and Golden Bell Frog. 	Construction contractor	Pre-construction, construction
BI-2	Vegetation and habitat removal	Pre-clearance surveys will be carried out by an experienced ecologist to: <ul style="list-style-type: none"> Identify and mark fauna habitat features and roosting sites (if any exist) to be protected during construction Confirm the presence of the Green and Golden Bell Frog and the level of management commitment required during construction Identify nearby habitats within the proposal area that are suitable for the release of fauna that may be encountered during the pre-clearing process or habitat removal Select appropriate locations for construction access tracks, ancillary facilities and construction areas in previously cleared and disturbed areas, wherever possible. 	Construction contractor	Pre-construction
BI-3	Vegetation and	A Biodiversity Management Plan (BMP) will be included in the CEMP. It will	Construction contractor	Pre-construction,

No.	Impact	Environmental safeguards	Responsibility	Timing
	habitat removal	<p>include:</p> <ul style="list-style-type: none"> • Procedures for a site walk with appropriate site personnel including Roads and Maritime representatives to confirm clearing boundaries and sensitive locations before work begins • The exclusion zones to be installed before clearing, to avoid damage to native vegetation and fauna habitats and prevent the distribution of pests, weeds and disease. Temporary fencing, flagging tape or other appropriate method will be installed to indicate the limits of the exclusion fencing. The location of exclusion fencing will be identified on plans in the CEMP and the function and importance of the exclusion zones communicated to construction personnel • Maps showing vegetation clearing boundaries, identifying drainage areas that run towards the Coastal Freshwater Wetland TEC • A procedure to manage stormwater in the proposal to ensure that hydrology of the Coastal Freshwater Wetland TEC is maintained, including periodic drying to prevent colonisation by <i>Gambusia</i> (<i>Gambusia holbrooki</i>) • The establishment of a 5 m buffer area/ exclusion zone around the Freshwater Wetland TEC to avoid construction impacts on the TEC, as discussed in BI-1 • A detailed clearing process in accordance with the Roads and Maritime Biodiversity Guidelines (Roads and Maritime, 2011) including requirements of Guide 1, 2 4 and 9 • An unexpected threatened species finds procedure, as outlined in the Biodiversity Guidelines (RTA, 2011a) • Specific details for the re-establishment and rehabilitation of native vegetation on cut faces, batters, the wetland buffer and other areas disturbed during construction • Guidance for the relocation of woody debris from the construction footprint to the wetland buffer to provide shelter for the Green and Golden Bell Frog, if required. 		construction
BI-4	Spread of weeds	<p>A weed management plan will be developed as part of the BMP and incorporated into the CEMP. The plan will detail:</p> <ul style="list-style-type: none"> • Weed management priorities and objectives • Identification of weeds on the construction site • Sensitive environmental areas within and next to the proposal area, such as the wetland to the south of the Wentworth Avenue underpass • Location of weed infested areas 	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Mechanical weed control methods such as slashing or mowing, as well as a range of herbicides to avoid the development of herbicide resistance Procedures to control the use of pesticides, particularly near waterways and immediately before or during wet weather Measures to prevent the spread of weeds Procedures for the appropriate disposal of weed-infested materials and soils Monitoring program to measure the success of weed management Communication protocol with Botany Bay City Council noxious weed representative. 		
BI-5	Introduction or spread of pests and disease	<p>Measures to confirm the presence of pathogens and disease-causing agents will be carried out before construction. Should pathogens or disease-causing agents be found, measures will be implemented to prevent their introduction and/or spread to the proposal area. These measures are provided in the Biodiversity Guidelines and will include, where appropriate:</p> <ul style="list-style-type: none"> The provision of vehicle and boot wash-down facilities to ensure vehicles and footwear are free of soil before entering or exiting the site Procedures to ensure that the risk of spreading pathogens and the mitigation measures required on site are regularly communicated to staff and contractors during inductions and toolbox talks The programming of construction activities so they move from uninfected areas to any known infected areas The restriction of vehicles to designated roadsides and parking areas Specific measures for treating <i>Phytophthora cinnamomi</i> and chytrid fungus. 	Construction contractor	Pre-construction, construction
Hydrology				
HY-1	Flood impacts on adjacent properties due to altered flood behaviour	Further flood modelling, including a detailed afflux assessment, will be carried out during detailed design to confirm impacts on surrounding land uses.	Roads and Maritime/ Detailed design contractor	Detailed design
HY-2	Licensing for dewatering	The NSW Office of Water will be consulted during detailed design to confirm licensing requirements for the various stages of the proposal.	Roads and Maritime	Detailed design
HY-3	Impact to groundwater levels	Roads and Maritime, in consultation with NSW Office of Water, will carry out a bore census to confirm the status of the groundwater works identified as part of the groundwater assessment.	Roads and Maritime	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
HY-4	Dewatering	<p>A procedure will be prepared for any dewatering activities to be included as part of the SWMP. The dewatering procedure is to comply with Roads and Maritime Technical Guideline – Environmental Management of Construction Site Dewatering. The procedure will include at a minimum:</p> <ul style="list-style-type: none"> • A map showing areas of the proposal that will require dewatering • Detailed description and justification of all selected dewatering methods • Description of onsite water reuse requirements • A map showing proposed discharge locations for any offsite discharge • Design requirements for each offsite discharge location to prevent erosion at the discharge location or in the receiving environment • Water quality objectives relevant to the type of dewatering activity • Description of the water quality treatment techniques to be used • Water sampling and testing regime to validate water quality prior to and (if required) during dewatering, including to establish appropriate waste disposal methods • Description of the method for dewatering • Requirements to manage encounters with groundwater or contaminated water. 	Roads and Maritime	Pre-construction
HY-5	Flooding of construction site	<p>A contingency plan will be prepared to manage a potential flood event during construction and will outline:</p> <ul style="list-style-type: none"> • Procedure for communication and notification associated with contingency plan • Procedures to reduce risk including removal of all plant/equipment, stabilising exposed areas and maintaining existing flood flow paths through the site • Evaluation of what flood event will trigger the plan • Evacuation procedures • A map indicating the area that is flood prone and the locations where to evacuate. 	Roads and Maritime	Pre-construction
HY-6	Impact to groundwater levels and quality	<p>A Groundwater Monitoring and Management Plan will be prepared to accompany the Soil and Water Management Plan for the proposal. It will include:</p> <ul style="list-style-type: none"> • Measures to manage groundwater during construction • Location of piezometers • Monitoring and sampling frequency for groundwater levels and groundwater quality 	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Evaluate any drawdown during construction Reporting frequency Timing of activities associated with monitoring. For instance, monitoring of flow, level and quality will continue for 12 months after the project is complete. 		
HY-7	Higher than expected inflow volumes	The NSW Office of Water will be advised if the expected inflow volume is observed, or deemed likely to exceed 3 ML/y. Measures to rectify drawdown may include installation of a second, outer containment structure, or reinjection, down-gradient on the other side of containment.	Construction contractor/ Roads and Maritime	Construction
HY-8	Operational impact on capacity of Sydney Airport detention basin	The capacity of the Sydney Airport detention basin will be further investigated in detailed design.	Roads and Maritime	Detailed design
HY-9	Impacts on groundwater	<p>An assessment will be carried out to confirm the potential groundwater impacts due to the proposed option/s chosen to manage groundwater for the new underpass. The following will be considered for the assessment:</p> <ul style="list-style-type: none"> The potential impacts due to the proposal on the groundwater level. The potential impacts due to the proposal on Mill Ponds Management methods of groundwater during construction Management methods of groundwater during operation. 	Roads and Maritime	Detailed design
Landscape character and visual amenity				
LC-1	General	The detailed design will incorporate the landscape and urban design strategy and objectives described in Section 3 of the Landscape Character and Visual Impact Assessment (Corkery Consulting + Studio Colin Polwarth, 2014). The landscape and urban design strategy for detailed design will be prepared in consultation with SACL. Roads and Maritime will also liaise with Botany Bay City Council and owners of the Beckenham Memorial Church regarding landscaping on their property.	Roads and Maritime	Detailed design
LC-2	Landscape design	During detailed design, the landscape design principles and streetscape (planting) will be reviewed to ensure that they are consistent with the outcomes of the biodiversity assessment. This will be done in consultation with Roads and Maritime environment and urban design staff.	Roads and Maritime	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
LC-3	Visual impacts of construction activities	To reduce the potential visual impact of construction activities: <ul style="list-style-type: none"> • Work sites will be left tidy at the end of each work day • Where appropriate, fencing with material attached (eg shade cloth) will be provided around the construction compound to screen views from adjoining properties • Lighting for night-time work will comply with relevant Australian Standards, including AS4282-1997 (Control of the obtrusive effects of outdoor lighting). 	Construction contractor	Construction
LC-4	Visual impacts of compound, stockpile and storage areas	Following construction, temporary compound, stockpile and storage areas will be removed, cleared of all rubbish and materials, and rehabilitated.	Construction contractor	Post-construction
Topography, geology, soils and water quality				
SWQ-1	Pollution as a result of sediment entering waterways during construction and operation	Water management controls and an associated maintenance and inspection program will be investigated during detailed design in accordance with the water quality control strategy for the proposal, with specific focus on the Wentworth Avenue underpass. During detailed design, the following will be confirmed: <ul style="list-style-type: none"> • Requirement for water quality measures • Location and size of water quality measures • Capacity for spills in the sediment basin design volume. 	Design contractor	Detailed design
SWQ-2	Acid sulphate soils	During detailed design, an Acid Sulfate Soil Management Plan will be prepared. The plan will include as a minimum: <ul style="list-style-type: none"> • A summary of the available ASS information relevant to the proposal area • Confirm the process for identification of ASS/PASS throughout construction • Identify areas where ASS/PASS are expected during project activities • Indicate the management measures to be implemented if ASS/PASS is encountered during dewatering • Indicate the management measures to be implemented if ASS/PASS is excavated during piling activities • Outline the monitoring requirements for ASS/PASS to confirm the surrounding area is being protected • Confirm the treatment and disposal requirements for any ASS/PASS encountered • Detail the reporting requirements. 	Design contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
SWQ-3	Soil and water quality	<p>A Soil and Water Management Plan (SWMP) will be prepared as part of the CEMP in accordance with the requirements of RMS contract specification G38 prior to the commencement of construction. The SWMP will also address the following:</p> <ul style="list-style-type: none"> • Roads and Maritime Code of Practice for Water Management, the Roads and Maritime Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 “the Blue Book” (Landcom, 2004) and Volume 2 (DECC, 2008) • Roads and Maritime Technical Guideline: Temporary Stormwater Drainage for Road Construction, 2011 • Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering, 2011. 	Roads and Maritime	Pre-construction
SWQ-4	Soil and water quality	<p>The SWMP will detail the following as a minimum:</p> <ul style="list-style-type: none"> • Identification of catchment and sub-catchment areas, high risk areas and sensitive areas • Sizing of each of the above areas and catchment • The likely volume of run-off from each road sub-catchment • Direction of flow of on-site and off-site water • Separation of on-site and off-site water • The direction of run-off and drainage points during each stage of construction • The locations and sizing of sediment traps such as sump or basin as well as associated drainage • Dewatering plan which includes process for monitoring, flocculating and dewatering water from site (ie sediment basin and sumps) • Identification of areas of PASS that may be encountered during the dewatering work and mitigation measures required if encountered • The staging plans, location, sizing and details of creek alignment and realignment controls for scour protection and bank and bed stabilisation including those used during construction and long term. • A mapped plan identifying the above • Include progressive site specific Erosion and Sedimentation Control Plans (ESCPs). These plans are to be updated at least fortnightly • A process to routinely monitor the BOM weather forecast • Contingency for any acid sulphate soils or salinity found during construction • Preparation of a wet weather (rain event) plan which includes a process for 	Roads and Maritime	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>monitoring potential wet weather and identification of controls to be implemented in the event of wet weather. These controls are to be shown on the ESCPs</p> <ul style="list-style-type: none"> Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls. 		
SWQ-5	Contaminants entering receiving environments during construction	<p>The following measures relating to the storage and management of plant, equipment, chemicals fuels and liquids will be implemented to minimise the risk of contaminants entering receiving environments (including soil, water and air):</p> <ul style="list-style-type: none"> Designated exclusion zones will be identified for the storage and use of construction plant and equipment. These zones will delineate traffic areas and restrict entry and exit points to construction sites All fuels, chemicals and liquids will be stored and disposed of in accordance with Storing and Handling Liquids: Environmental Protection Participants Manual (DECC, 2007) Refuelling of plant and equipment will occur in bunded areas located a minimum of 40 m from drainage lines or waterways Plant, equipment and vehicle washdown will occur in a designated bunded area away from waterways and drainage lines All concrete washouts will occur into a sealed receptacle or bunded concrete washout area with an impermeable liner. The concrete washout area will be sized to be 120% of the estimated volume of the waste that will be received into the washout area at any one time Any material transported onto pavement surfaces will be swept and removed at the end of each working day. 	Construction contractor	Construction
SWQ-6	Management of stockpile and compound sites	<p>Management measures for stockpile and compound sites will be incorporated in the SWMP and ESCPs and will include the following measures:</p> <ul style="list-style-type: none"> Stockpile and compound sites will be located away from overland flow paths and areas of high topography with minimal upstream catchment Stockpile and compound sites will be maintained in accordance with Roads and Maritime's Stockpile Site Management Procedures (Roads and Maritime, 2001) The number and size of stockpile and compound sites will be minimised throughout the proposal Runoff from stockpile and compound sites will be treated with a stockpile-specific sediment basin, which will be monitored 	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> The base of stockpile and compound sites will be lined if they are to be located over a shallow water table, and will be covered with plastic sheets, where required Identify areas where ASS or PASS will be encountered during excavation activities Indicate the stockpile management measures to be implemented if ASS or PASS are excavated during piling activities Vehicle movements will be restricted to designated pathways, where feasible. 		
SWQ-7	Accidental spills during construction, resulting in the release of contaminants into waterways and the soil	<p>A site-specific Emergency Spill Plan will be developed as part of the SWMP. It will include spill management measures in accordance with the Code of Practice for Water Management and Bunding and Liquid Chemical Storage, Handling and Spill Management (DEC, 2005) and Roads and Maritime's Environmental Incident Classification and Reporting Procedures (Roads and Maritime, 2014)</p> <p>Should a spill occur during construction, the Emergency Spill Plan will be implemented. Emergency spill kits will be kept at areas identified as having the highest spill risk at all times.</p>	Construction contractor	Construction
Contamination				
CL-1	Identification and management of contaminated land	<p>A Contamination Management Plan (CMP) will be prepared in accordance with the <i>Contaminated Land Act 1997</i> and relevant EPA Guidelines. This plan will form part of the CEMP and will include at a minimum:</p> <ul style="list-style-type: none"> Contaminated land legislation and guidelines including any relevant licences and approvals to be obtained Identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated land within the construction footprint Contamination management measures including waste classification and reuse procedures and unexpected finds procedures Monitoring and sampling procedure for landfill seepage (leachate) A procedure for dewatering and disposal of potentially contaminated liquid waste In the event that indications of contamination are encountered (known and unexpected, including odorous or visual indicators), work in the area will immediately cease until a contamination assessment can be prepared to advise on the need for remediation or other action, as deemed appropriate A process for reviewing and updating the plan. 	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
CL-2	Remedial Action Plan for contaminated areas	<p>A Remedial Action Plan (RAP) will be prepared and implemented in accordance with relevant regulatory requirements. The RAP will include:</p> <ul style="list-style-type: none"> • Relevant procedures to manage health and safety of construction staff during remediation • Validation of residual soils in any resulting excavations to demonstrate suitability of remaining materials to remain on site • Further assessment of the wetland area including an assessment of the stockpiled material within the wetland area and waste classification under the Waste Classification Guidelines (DECCW, 2009) for off-site removal. <p>The RAP and Validation Report will be provided to ARTC for review and comment.</p>	Construction contractor	Pre-construction
CL-3	Management of asbestos	<p>An asbestos management plan will be prepared as part of the CEMP and will be in accordance with NSW EPA guidelines (including waste guidelines) and relevant industry codes of practice. The asbestos management plan will include but not be limited to:</p> <ul style="list-style-type: none"> • Identification of potential asbestos on site • Procedures to manage and handle asbestos and avoid cross contamination • Outline the mitigation measures for encountering asbestos • Procedures for disposal of asbestos in accordance with NSW EPA guidelines (including the waste guidelines) and relevant industry codes of practice. 	Construction contractor	Pre-construction
CL-4	Classification and disposal of potential contaminants	<p>All potentially contaminated wastes generated during construction will be classified according to the Waste Classification Guidelines: Parts 1 and 2 (DECC, 2008). Wastes will be disposed to a licensed disposal facility or re-used in construction, as appropriate.</p>	Construction contractor	Construction
CL-5	Management of contamination on ARTC land	<p>Contaminated material located at the stockpile site on the southern side of the proposed Wentworth Avenue underpass (refer to Figure 7-15) will be legally disposed from ARTC land at an appropriately licensed facility.</p> <p>Fill material permanently located on ARTC land will be certified clean.</p>	Construction contractor	Construction
Air quality				
AQ-1	Air quality impact during construction	<p>An Air Quality Management Plan (AQMP) will be prepared as part of the CEMP. The plan will include but not be limited to:</p> <ul style="list-style-type: none"> • A map identifying locations of sensitive receivers • Identification of potential risks/impacts due to the work/activities as dust generation activities 	Roads and Maritime	Pre-construction Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Management measures to minimise risk including a progressive stabilisation plan A process for monitoring dust on site and weather conditions A process for altering management measures as required. <p>The management measures within the AQMP will include as a minimum:</p> <ul style="list-style-type: none"> Vehicles transporting waste or other materials that have a potential to produce odours or dust are to be covered during transportation Dust will be suppressed on stockpiles and unsealed or exposed areas using methods such as water trucks, temporary stabilisation methods, soil binders or other appropriate practices Disturbed areas will be minimised in extent and rehabilitated progressively Speed limits will be imposed on unsealed surfaces Stockpiles will be located as far away as feasible from residences and other sensitive receivers Works (including the spraying of paint and other materials) will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely Plant, vehicles and equipment will be maintained in a proper and efficient manner and in accordance with manufacturer's specifications Wind conditions will be monitored and activities scheduled where possible to avoid winds with a high potential (ie strong winds from the west or southwest) to avoid adverse impacts at nearest sensitive receivers. 		
Aboriginal heritage				
AH-1	Unexpected find of Aboriginal heritage artefacts	<p>In the event of an unexpected find of an Aboriginal heritage item (or suspected item):</p> <ul style="list-style-type: none"> Work will cease in the affected area The Roads and Maritime's Environmental Officer, Sydney Region will be contacted for advice on how to proceed The Unexpected Archaeological Finds Procedure (Roads and Maritime, 2012) will be followed. 	Construction contractor	Construction
Land use and property				
LU-1	Property acquisition	Roads and Maritime will consult with property owners impacted by the proposal. Property acquisition will be managed in accordance with the provisions of Roads and Maritime's Land Acquisition Policy (Roads and Maritime, 2012b) and the <i>Land</i>	Roads and Maritime	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		<i>Acquisition (Just Terms Compensation) Act 1991.</i>		
Socio-economic				
SE-1	Community consultation	<p>A Communication Plan will be prepared and included in the CEMP. The Communication Plan will include (as a minimum):</p> <ul style="list-style-type: none"> • Requirements to provide details and timing of proposed activities to affected residents • Contact name and number for complaints • Procedure to notify adjacent land users for changed conditions during the construction period such as traffic, pedestrian or driveway access. <p>The communications plan will be prepared in accordance with G36 requirements and Roads and Maritime's Community Engagement and Communications Manual (2012).</p>	Construction contractor	Pre-construction Construction
SE-2	Local goods and services	Goods and services will be sourced locally during construction wherever possible to support the local economy.	Construction contractor	Construction
Greenhouse gas and climate change				
GG-1	Impacts on climate change from construction activities	<p>During construction, the following measures will be considered and implemented where possible:</p> <ul style="list-style-type: none"> • Plant and equipment will be switched off when not in use • Vehicles, plant and construction equipment will be appropriately sized for the task and properly maintained so as to achieve optimum fuel efficiency • Materials will be delivered with full loads and will come from local suppliers, where possible • Energy efficiency and related carbon emissions will be considered when selecting vehicles and equipment • Vegetation clearing will be reduced as much as feasible, and re-established in suitable areas when construction is completed • Waste will be reduced and recycled as a preference before disposing to landfill. 	Construction contractor	Construction
GG-2	Climate change risks to construction	Environmental safeguards and management measures in the CEMP will be designed to accommodate and respond to the increased frequency and severity of rainfall events.	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
Waste and resource management				
WR-1	Generation of construction waste	<p>The following resource management hierarchy principles will be followed through the project life cycle:</p> <ul style="list-style-type: none"> • Unnecessary resource consumption will be avoided as a priority • Where avoidance is not possible, waste will be processed for resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Where resource recovery is not possible, waste will be disposed as a last resort at an appropriately licensed waste facility – in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i> and the EPA waste classification guidelines • Procurement will endeavour to use materials and products with a recycled content, provided that material or product is cost-effective and performance-effective. 	Construction contractor	Detailed design, pre-construction, construction
WR-2	Generation of construction waste	<p>A Resource and Waste Management Plan (RWMP) will be prepared and include the following (as a minimum):</p> <ul style="list-style-type: none"> • The type, classification and volume of all materials to be generated and used on site including identification of recyclable and non-recyclable waste in accordance with EPA Waste Classification Guidelines • Quantity and classification of excavated material generated as a result of the proposal (refer to Roads and Maritime's Waste Management Fact sheets 1-6, 2012) • Interface strategies for cut and fill on site to ensure re-use where possible • Strategies to 'avoid', 'reduce', 'reuse' and 'recycle' materials. • Classification and disposal strategies for each type of material • Destinations for each resource/waste type either for on-site reuse or recycling, offsite reuse or recycling, or disposal at a licensed waste facility • Details of how material will be stored and treated on-site. • Identification of available recycling facilities on and off site • Identification of suitable methods and routes to transport waste. • Procedures and disposal arrangements for unsuitable excavated material or contaminated material • Site clean-up for each construction stage. 	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
Cumulative environmental impacts				
CE-1	Cumulative traffic impacts from construction of multiple projects	The CEMP will be updated as required to incorporate potential cumulative impacts from surrounding development activities as they become known. This will include close liaison with the authorities carrying out the other projects, and a process to review and update mitigation measures as new work begins or if complaints are received.	Construction contractor	Detailed design Pre-construction Construction
CE-2	Cumulative construction impacts	A working group will be formed to manage cumulative construction impacts associated with the proposal and other Sydney Airport and Roads and Maritime projects. This group will also coordinate between the projects and the proposal.	Roads and Maritime	Detailed design

8.3 Licences and approvals

Licences and approvals required for the proposal are listed in **Table 8-2**.

Table 8-2 Summary of licences and approvals required

Requirement	Timing
Adjustment of the Sydney Airport Group curtilage would be sought from the Commonwealth Department of Environment in consultation with SACL	Before construction
Aquifer interference licence would be sought under the <i>Water Management Act 2000</i> from the NSW Office of Water	Before construction, if required
S140 approval to excavate would be sought from the NSW Heritage Council	Before construction
NSW Traffic Management Centre approval may be required for the closure of traffic lanes and the movement of over-sized vehicles on Wentworth Avenue and Southern Cross Drive	Before construction, if required

9 Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The chapter also considers the proposal in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

9.1 Justification

Sydney Airport and Port Botany are two of Australia's most important international gateways. However, the road network around Sydney Airport and Port Botany are becoming increasingly congested due to rising numbers of passenger and freight vehicles. This congestion will worsen if action is not taken to improve the road network.

The proposal would provide a feasible and cost-effective road network improvement that would address this worsening road congestion.

A key initiative would be to separate road and rail infrastructure. This would be achieved by closing General Holmes Drive where it crosses the Port Botany Freight Rail Line, and by extending the western end of Wentworth Avenue to link with General Holmes Drive, with an underpass below a two rail bridges. This would provide freight trains with an unobstructed journey and reduce traffic congestion.

The proposal would:

- Improve traffic flow and access to Sydney Airport, Port Botany, the future WestConnex Motorway, and the wider Sydney Metropolitan region
- Provide sufficient capacity to support increased taxi and bus traffic accessing the Sydney Airport precinct, and support public transport in general
- Allow for future duplication of the Port Botany Freight Rail Line
- Improve access and connectivity for pedestrians and cyclists
- Improve safety for pedestrians and cyclists.

9.2 Objects of the EP&A Act

Table 9-1 identifies the objects of the EP&A Act and their relevance to the project.

Table 9-1 Summary of Objects of the EP&A Act

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	<p>The proposed design, impact mitigation and safeguard measures detailed in this REF would allow for the proper management, development and conservation of natural and artificial resources. The main objective of the proposal is to improve the road network around Sydney Airport and Port Botany.</p> <p>Where possible, management and conservation of natural resources are incorporated in the design of the proposal. In addition, the need for vegetation removal was minimised as far as possible to reduce the potential impact on the natural environment.</p> <p>Social and economic impacts of the proposal were considered. Where property acquisition would be required, appropriate community consultation processes would be</p>

Object	Comment
	implemented.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The proposal would improve the road network around Sydney Airport and Port Botany. This would result in greater access and connectivity throughout the wider Sydney Metropolitan region for motorists, public transport travellers, pedestrians and cyclists. It would also help coordinate the orderly economic use and development of land in the region.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	Utilities affected by the proposal would be relocated, protected and maintained where required (refer to Section 4.7).
5(a)(iv) To encourage the provision of land for public purposes.	The proposal would be located on roads, footpaths and cyclist facilities, which would be used by the public.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The proposal would improve access and connectivity in both the local community and the wider Sydney Metropolitan region.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	The proposal has been designed to minimise impacts on the environment, including threatened species and populations, and ecological communities and their habitats. Additional measures would be developed to manage and offset impacts after construction.
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Section 9.2.1 to Section 9.2.4 .
5(a)(viii) To encourage the provision and maintenance of affordable housing.	This clause is not directly relevant to the proposal.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	This clause is not directly relevant to the proposal.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	Stakeholders and community members were consulted (refer to Chapter 6) during the planning process for this proposal. Consultation would continue during detailed design and construction. The proposal is being placed on public display for community comment and feedback, and this feedback will be considered.

9.2.1 The precautionary principle

The precautionary principle provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to avoid environmental degradation. This REF is consistent with the precautionary principle and with accepted scientific and assessment methodologies. This is because:

- It is based on detailed environmental investigations, which identified a range of potential impacts associated with the construction and operation of the proposal (refer to **Chapter 7**)
- The planning process for the proposal included the evaluation and assessment of alternative options that aimed to reduce the risk of serious and irreversible impacts on the environment as a result of the proposal
- The proposal has sought to take a precautionary approach to minimising environmental impacts. This was applied through the development of a range

of environmental safeguards, which are summarised in **Chapter 8**. These safeguards would be implemented during construction and operation of the proposal. No mitigation measures or safeguards have been postponed as a result of lack of scientific certainty. The selected construction contractor would be required to prepare a PEMP and CEMP before commencing construction.

9.2.2 Intergenerational equity

Intergenerational equity provides that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The proposal would benefit future generations by improving access and connectivity for the wider Sydney Metropolitan region by reducing traffic congestion, reducing travelling times, improving road safety and facilitating the future WestConnex Motorway project. The proposal would also provide for greater access, connectivity and safety for pedestrians and cyclists. Should the proposal not proceed, travelling times and traffic volumes would be expected to increase over time.

Implementation of the safeguards outlined in this REF would ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The proposal may have some adverse impacts on the current generation, but these are not considered to be of a nature or extent that would disadvantage future generations.

9.2.3 Conservation of biological diversity and ecological integrity

The conservation of biological diversity and ecological integrity must be maintained and improved to ensure their survival.

The proposal would require a total of about 3.3 hectares of vegetation to be removed, however, most of the vegetation is planted, exotic or in poor condition. This would result in the loss or degradation of habitat (including nectar-producing trees), potential indirect impacts on wetland plant communities, minor loss of foraging habitat for the migratory Fork-tailed Swift and White-throated Needletail, and minor loss of structural diversity. Other potential impacts include injury and mortality of fauna species from vegetation removal during construction and vehicle strikes during operation, and the dispersal of weed seeds.

Despite these impacts, the Biodiversity Assessment (refer to **Section 7.5** and **Appendix J**) found that the overall impact would not be significant. In particular:

- The proposal would not have a significant effect on any existing flora or fauna species, biodiversity communities or the overall biological integrity of the proposal area and areas nearby
- The potential impacts would be acceptable and minimised through the proposed safeguards (refer to **Chapter 8**).

9.2.4 Improved valuation, pricing and incentive mechanisms

Environmental and social issues were considered in the strategic planning and establishment of the need for the proposal, and in consideration of various proposal options. The value placed on environmental resources is evident in the extent of the planning and environmental investigations, and in the design of the proposed mitigation measures and safeguards.

Implementation of these mitigation measures and safeguards would result in an economic cost to Roads and Maritime, which would be included in both the capital and operating cost of the proposal.

9.3 Objects of the Airports Act

Table 9-1 identifies the objects of the Airports Act and their relevance to the project.

Table 9-2 Summary of Objects of the Airports Act

Object	Comment
To promote the sound development of civil aviation in Australia	This clause is not directly relevant to the proposal – the proposal does not involve development of civil aviation.
To establish a system for the regulation of airports that has due regard to the interests of the airport users and the general community	This REF has been prepared in accordance with the Sydney Airport Master Plan and Environmental Strategy (refer to Sections 5.6.1 and 5.6.2).
To promote the efficient and economic development and operation of airports	The proposal would not have a permanent negative impact on the efficient and economic development and operation of Sydney Airport. After construction, the proposal would facilitate an improved road network in the Airport east precinct, the improved travel times and distances also benefitting Sydney Airport-bound traffic.
To facilitate the comparison of airport performance in a transparent manner	This clause is not directly relevant to the proposal – the proposal does not involve comparison or facilitate comparison of airport performance.
To ensure majority Australian ownership of airports	This clause is not directly relevant to the proposal.
To limit the ownership of certain airports by airlines.	This clause is not directly relevant to the proposal.
To ensure diversity of ownership and control of certain major airports.	This clause is not directly relevant to the proposal.
To implement international obligations relating to airports.	This clause is not directly relevant to the proposal.

9.4 Conclusion

This REF finds that the WestConnex Enabling Works – Airport East Precinct (the proposal) would deliver a number of major benefits. In particular, it would:

- Cater for future economic and population growth in the Sydney Metropolitan area
- Improve access and connectivity to Sydney Airport, Port Botany and the wider Sydney area
- Improve traffic flow and reduce travelling times on the surrounding road network
- Improve safety for pedestrians and cyclists.

The proposal is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal. This has enabled Roads and Maritime to avoid or reduce a number of potential environmental impacts from the proposal during concept design development and options assessment.

Nevertheless, the proposal as described in the REF would still result in temporary impacts during construction. These would include disruptions to traffic flow and access, removal of vegetation, impacts on non-Aboriginal heritage items, noise and

vibration, and property acquisition. There is also potential for some negative cumulative impacts associated with the proposal and other proposed developments nearby. These impacts would be ameliorated or minimised by implementing the mitigation measures detailed in this REF.

This REF finds that the environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought for the proposal from the Minister for Planning and Environment under Part 5.1 of the EP&A Act. The proposal would also be unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. However, the proposal would require the acquisition of 9908 square metres of Commonwealth land, which would be converted to road reserve.

In conclusion, the longer-term community benefits of the proposal would outweigh the adverse impacts, and the proposal as described in the REF best meets the project objectives. On balance, the proposal is considered justified.

10 Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.



Vivira Cadungog

Environmental Planner

Jacobs

Date: 21 January 2015

I have examined this review of environmental factors and the certification by Vivira Cadungog, Jacobs, and accept the review of environmental factors on behalf of Roads and Maritime Services.



Liam Sheridan

Project Development Manager

Roads and Maritime Services

Date: 22/01/15

11 References

Australian Bureau of Statistics (ABS) 2011b, *Census QuickStats: Mascot (State Suburb)*, available from http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/SSC11487?opendocument&navpos=220.

Australian Bureau of Statistics (ABS) 2011c, *Census QuickStats: Botany Bay (State Suburb)*, available from http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/SSC10303?opendocument&navpos=220.

Australian Bureau of Statistics (ABS) 2011a, *Census QuickStats: Botany Bay (LGA)*, available from http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/LGA11100?opendocument&navpos=220.

Australian Bureau of Statistics (ABS) 2011d, *Census QuickStats: Greater Sydney*, available from http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/1GSYD?opendocument&navpos=220.

Austrroads 2009a, *Austrroads Guide to Road Design*.

Austrroads 2009b, *Austrroads Road Safety Audit Manual*.

Corkery Consulting and Studio Colin Polwarth, 2014, *WestConnex enabling works, Airport east precinct: Urban Design, Landscape Character and Visual Impact Assessment*, prepared for Roads and Maritime, July 2014.

DEC 2005, *Draft Recovery Plan for the Green and Golden Bell Frog (Litoria aurea)*. DEC NSW, Hurstville, NSW.

Department of Environment 2014, *Litoria aurea in Species Profile and Threats Database*, Department of the Environment, Canberra, available from: <http://www.environment.gov.au/sprat>.

Department of Environment and Conservation (DEC) 2005, *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*, August 2005.

Department of Environment and Climate Change (DECC) 2008a, *Soils and Construction – Managing Urban Stormwater*, Volume 2D, June 2008.

Department of Environment and Climate Change (DECC) 2008b, *Rapid Fauna Habitat Assessment of the Sydney Metropolitan Catchment Management Authority Area*.

Department of Environment, Climate Change and Water (DECCW) 2010, *NSW Wetlands Policy*, March 2010.

Department of Primary Industries (DPI), 2013a, *Fishing and Aquaculture: Threatened and Protected Species, City of Botany Bay LGA*, available from <http://www.dpi.nsw.gov.au/fisheries>.

- Department of Primary Industries (DPI), 2013a, *Agriculture. Noxious weeds declaration*, available from <http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed>.
- Department of Environment and Conservation (DEC) 2006, *Assessing Vibration: A Technical Guideline*, February 2006.
- Department of Environment and Conservation (DEC), 2005, *Draft Recovery Plan for the Green and Golden Bell Frog (Litoria aurea)*, February 2005.
- Department of Environment (DoE), 2014, *Litoria aurea in Species Profile and Threats Database*, Department of the Environment, Canberra. Available from <http://www.environment.gov.au/sprat>. Accessed 27 May 2014.
- Department of Environment and Climate Change (DECC) 2009, *Interim Construction Noise Guideline*, July 2009.
- Department of Environment, Climate Change and Water (DECCW) 2011, *NSW Road Noise Policy*, March 2011.
- Department of Environment, Climate Change and Water (DECCW) 2010, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*, September 2010.
- Department of Environment, Climate Change and Water (DECCW) 2010, *NSW Climate Impact Profile*, June 2010.
- Department of Infrastructure and Transport 2012, *Significant Impact on the Local or Regional Community Guide*, Australian Government, January 2012.
- Department of Planning 2008, *Central Coast Regional Strategy*, Prepared for the State Government of NSW.
- Department of Planning and Environment 2014, *2014 NSW Population Projections data*, available from <http://www.planning.nsw.gov.au/en-us/deliveringhomes/populationandhouseholdprojections/data.aspx>
- Department of Premier and Cabinet 2011, *NSW 2021: A Plan to Make NSW Number One*, September 2011, Sydney.
- Department of Premier and Cabinet 2012, *NSW Government State Infrastructure Strategy*, December 2012, Sydney.
- Douglas Partners 2008, *Phase 1 Contamination Assessment Preliminary (In Situ) Waste Classification and ASS Assessment, Corner of General Holmes Drive and Mill Pond Road, Botany*, January 2008.
- Environment Protection Authority (EPA) 1999, *NSW Environmental Criteria for Road Traffic Noise*, Chatswood, May 1999.
- Jacobs, 2014a, *Water Quality Assessment*, prepared for Roads and Maritime, November 2014.
- Jacobs, 2014b, *Traffic and Transport Working Paper*, prepared for Roads and Maritime, October 2014.

- Jacobs, 2014c, *Groundwater Assessment*, prepared for Roads and Maritime, November 2014.
- JBS&G, 2014, *WestConnex Enabling Works: Phase 1 and 2 Environmental Site Assessment*, prepared for Roads and Maritime, March 2014.
- J. Wyndham Prince, 2014, *WestConnex Enabling Works – Airport East Precinct: Hydrologic and Hydraulic Assessment Report*, May 2014.
- Landcom, 2004, *Soils and Construction – Managing Urban Stormwater*, Volume 1.
- Lawson and Trelour, 2003, *Proposed Expansion of Container Port Facilities in Botany Bay, NSW: Coastal Process and Water Resources Issues, Volume 2: Water Quality Investigations*.
- Lesryk Environmental Consultants, 2013, *Preliminary Ecological Investigation, Mill Pond Road, Botany*, Lesryk Environmental Consultants, Bundeena.
- MI Engineers 2014, *Construction Method Statement*, Prepared for Roads and Maritime Services, June 2014 (Volumes 1 and 2).
- Office of Environment and Heritage, 2014a, *NSW BioNet*. Accessed 18 November 2014, <http://www.bionet.nsw.gov.au/>.
- Office of Environment and Heritage (OEH), 2013, *The Native Vegetation of the Sydney Metropolitan Area*. Version 2. NSW Office of Environment and Heritage, Sydney.
- Office of Water, 2013. *Sydney Water Corporation Water Supply Works Approval – Botany Wetlands*. Reference No. 10WA117950, dated 31 May 2013.
- Packer, D 2012, *Port Botany Expansion Project: Australian Construction Achievement Award 2012 Technical Paper*, available from http://www.aaaa.net.au/pdf/2012_TP_PP/PORT-BOTANY-EXPANSION.pdf.
- Parsons Brinckerhoff 2011, *Phase 1 Environmental Site Assessment, Botany Road, General Homes Drive, Mill Pond Drive, Mascot*, February 2011.
- Roads and Maritime, undated, *Roads and Maritime Road Design Guide*.
- Roads and Maritime 2011a, *Roads and Maritime Services procedure for Aboriginal cultural heritage consultation and investigation*, November 2011.
- Roads and Maritime 2011b, *Stockpile Management Guidelines*.
- Roads and Maritime 2013a, *WestConnex Enabling Works Proposal Report*, Prepared by Sinclair Knight Merz for Roads and Maritime, November 2013.
- Roads and Maritime 2013b, *Environmental Impact Assessment Guidance Note: Guidelines for landscape character and visual impact assessment*.
- Roads and Maritime 2013c, *Draft Environmental Impact Assessment Practice Note: Socio-economic assessment (EIA-N05)*.
- Roads and Maritime 2013, *WestConnex Enabling Works Preliminary Environmental Investigation*, July 2013.

Roads and Maritime 2014a, *WestConnex Enabling Works – Airport east precinct: Preferred Proposal Report*, Prepared by Jacobs for Roads and Maritime, June 2014.

Roads and Maritime 2014b, *WestConnex Enabling Works – Airport east precinct: Community consultation report*, March 2014.

Roads and Traffic Authority 2010, *Traffic Control at Works Sites Manual*, June 2010.

Roads and Traffic Authority 2001, *Environmental Noise Management Manual*

SMEC 2014, *Biodiversity Assessment, WestConnex Enabling Works – Airport east precinct*, prepared for Roads and Maritime Services, June 2014.

Stedinger Associates, 2014, *WestConnex Enabling Works Airport East Precinct: Statement of Heritage Impact*, prepared for Roads and Maritime, June 2014.

Sydney Airport Corporation Limited (SACL), 2013, *Sydney Airport: A major employer and economic driver*, available from <http://www.sydneyairport.com.au/corporate/about-us/overview/fact-sheets/economic-impact.aspx>.

Sydney Airport Corporation Limited (SACL), 2010, *Airport Environment Strategy 2010 – 2015*.

Sydney Airport Corporation Limited (SACL), 2014, *Sydney Airport Master Plan 2033*.

The Airport Group, 2014, *Aviation Impact Study, WestConnex Enabling Works, Airport East Precinct*, November 2014.

Transport for NSW (TfNSW), 2013, *Sydney's Cycling Future*, available from <http://www.transport.nsw.gov.au/sydneys-cycling-future>.

Wilkinson Murray, 2014a, *WestConnex Enabling Works Airport East, Review of Airport Operations Impact*, August 2014.

Wilkinson Murray, 2014b, *Construction Noise and Vibration Impact Assessment, Draft*, August 2014.

Wilkinson Murray, 2014c, *Operational Noise Impact Statement, Draft*, August 2014.

12 Terms and acronyms used in this REF

Acronym/term	Definition
ABS	Australian Bureau of Statistics.
ACM	Asbestos containing material.
Acute noise levels	Road traffic noise levels received at private dwellings that are greater than 65 dB(A) Leq(15hr) (day) and 60 dB(A) Leq(9hr) (night), as presented in Practice Note IV, Step 3, part (2) of Roads and Maritime's Environmental Noise Management Manual (RTA, 2001).
AEP	Annual exceedance probability.
AHD	Australian height datum is the datum (adopted by the National Mapping Council of Australia) to which all vertical control mapping is to be referred.
AHIMS	Aboriginal Heritage Information Management System.
ANZECC	Australian and New Zealand Environment and Conservation Council.
AQMP	Air Quality Management Plan.
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand.
ARTC	Australian Rail Track Corporation.
B(a)P	Benzo(a)pyrene.
Batter	The slope of walls, embankments and cuttings, usually expressed as a ratio of horizontal distance unit to one vertical height unit. Eg 2H:1V.
BMP	Biodiversity Management Plan.
BTEX	Benzene, toluene, ethylbenzene and xylenes.
Carriageway	The portion of a roadway devoted to vehicular traffic generally delineated by kerbs, a verge or a median.
CASA	Civil Aviation Safety Authority.
CBD	Central business district.
CEMP	Construction environment management plan.
CNVMP	Construction Noise and Vibration Management Plan.
Construction footprint	The construction footprint refers to the area that would be affected by construction of the proposal, assumed to be an area with a five-metre buffer from all design elements and known ancillary facilities.
CO	Carbon monoxide
COPC	Contaminants of potential concern.
CTMP	Construction traffic management plan.
Critical habitat	The habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species.
Curtilage	The land immediately surrounding a house or dwelling, including any closely associated buildings and structures.
dB(A)	Decibels using the 'A' weighted scale, measured according to the frequency of the human ear.
DEC	NSW Department of Environment and Conservation.
DECC	NSW Department of Environment and Climate Change.
DECCW	NSW Department of Environment, Climate Change and Water.
DoE	Commonwealth Department of the Environment.

Acronym/term	Definition
DIRD	Department of Infrastructure and Regional Development.
DPI	Department of Primary Industries.
DSEWPac	Department of Sustainability, Environment, Water, Population and Communities (presently the Department of Environment)
DUAP	Department of Urban Affairs and Planning.
Earthwork	The process of extracting, moving and depositing earth during construction.
EB	Eastbound.
EIA	Environmental Impact Assessment.
EIS	Environmental Impact Statement.
Endangered ecological community	As defined under the Threatened Species Conservation Act 1995, an ecological community that is likely to become extinct or is in immediate danger of extinction.
EPA	NSW Environmental Protection Authority.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> . Provides the legislative framework for land use planning and development assessment in NSW.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
EPL	Environment Protection Licence.
ESA	Environmental site assessment.
ESCP	Erosion and sediment control plan.
ESD	Ecologically sustainable development.
ESL	Ecological screening level.
ENMM	Environmental Noise Management Manual
GSW	General solid waste.
Habitat	The place where an organism lives. Habitats are measurable and can be described by their flora and physical components.
HIL	Health based investigation level.
HSL	Health based screening level.
Hz	Hertz.
ICNG	Interim Construction Noise Guideline.
ISEPP	State Environmental Planning Policy (Infrastructure) 2007. The objective of this SEPP is to facilitate the effective delivery of infrastructure across the State.
kPa	Kilopascals.
kV	Kilovolts.
L _{A1}	The L _{A1} level is the noise level which is exceeded for one per cent of the sample period. During the sample period, the noise level is below the L _{A1} level for 99 per cent of the time.
L _{A10}	The L _{A10} level is the noise level that is exceeded for 10 per cent of the sample period. During the sample period, the noise level is below the L _{A10} level for 90 per cent of the time. The L _{A10} is a common noise descriptor for environmental noise and road traffic noise.
L _{A90}	The L _{A90} level is the noise level which is exceeded for 90 per cent of the sample period. During the sample period, the noise level is below the L _{A90} level for 10 per cent of the time. This measure is commonly referred to as

Acronym/term	Definition
	the background noise level.
L _{Aeq}	The equivalent continuous sound level (L _{Aeq}) is the average energy of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.
L _{Amax} (Maximum noise level)	The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.
LEP	Local Environment Plan.
LGA	Local government area.
LOR	Limit of reporting.
LoS	Level of service.
LTOP	Long term operating plan.
MAHD	Metres Australian Height Datum.
MBGL	Metres below ground level.
MDP	Major development plan.
NB	Northbound
NBN	National Broadband Network.
NEPH	Measurement for visibility collected using a nephelometer.
NES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
NML	Noise management levels
NO ₂	Nitrogen dioxide.
NO _x	Oxides of nitrogen.
NPW Act	<i>National Parks and Wildlife Act 1974</i> .
O ₃	Ozone.
OCP	Organochlorine pesticides.
OEH	Office of Environment and Heritage (formerly Department of Environment, Climate Change and Water).
OLS	Obstacle limitation service.
OPC	Organochlorine pesticides.
OSD	Operations and services directorate.
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation.
PAH	Polycyclic aromatic hydrocarbons.
PANS-OPS	Procedures for Air Navigational Services-Aircraft Operations.
PASS	Potential acid sulfate soils.
PCB	Polychlorinated biphenyls.
PEMP	Project environmental management plan.
PM ₁₀	Particulate matter with equivalent aerodynamic diameter less than or equal to 10 microns.
POEO Act	<i>Protection of the Environment Operations Act 1997</i> (NSW).
PPV	Peak particle velocity.
The Proposal	The proposal refers to the design, construction and operation of the road upgrade in the Sydney Airport east precinct.

Acronym/term	Definition
Proposal area	The proposal area refers to the area that would be directly impacted by the proposal. It encompasses the road, rail, batters, cuts and embankments. It also includes the total construction footprint, compound sites, stockpile sites and any other areas that would be temporarily disturbed (such as construction basins and access tracks).
RAFTS	Runoff and flow training simulation.
RAP	Remedial action plan.
RBL	Rating background level
REF	Review of Environmental Factors.
RNP	Road noise policy
ROTAP	Rare or threatened Australian plants.
RSW	Restricted solid waste.
RTA	Roads and Traffic Authority (now Roads and Maritime).
SACL	Sydney Airport Corporation Ltd.
SB	Southbound.
SEPP	State Environmental Planning Policy.
SIS	Species Impact Statement.
SO ₂	Sulphur dioxide.
SoHI	Statement of Heritage Impact.
Study area	The study area encompasses the proposal area and the area that may be indirectly impacted by the proposal.
SPOCAS	Suspension Peroxide Oxidation Combined Acidity and Sulfur.
SWMP	Soil and water management plan.
SWSOOS	South West Suburbs Ocean Outfall Sewer.
TCP	Traffic control plan.
TEC	Threatened ecological community.
TfNSW	Transport for New South Wales.
TMP	Traffic management plan.
TNIP	Traffic noise information package.
TPH	Total petroleum hydrocarbon.
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW).
TSP	Total suspended particulates.
TUFLOW	Two-dimensional unsteady flow.
VHT	Vehicle hours travelled.
VKT	Vehicle kilometres travelled.
VMS	Variable message signs.
WARR Strategy	NSW Waste Avoidance and Resource Recovery Strategy 2007.
WB	Westbound.
WoNS	Weeds of National Significance.
VDV	Vibration dose value.

Appendix A

Checklists

Appendix A1: Assessment on whether the proposal is a 'major airport development'

ASSESSMENT ON WHETHER THE PROPOSAL IS A 'MAJOR AIRPORT DEVELOPMENT'			
	Development type	Y/N/N R	Reason
Airports Act s.89(1) Meaning of major airport development For the purposes of this Act, a <i>major airport development</i> is a development that is carried out at an airport site and that consists of:			
(a)	constructing a new runway	No	The proposal does not involve constructing a new runway.
(b)	extending the length of a runway; or	No	The proposal would not extend the length of a runway.
(ba)	altering a runway (other than in the course of maintenance works) in any way that significantly changes: flight paths; or the patterns or levels of aircraft noise; or	No	The proposal would require two one-week restrictions of the east-west runway, about six months apart. This would temporarily affect flight paths and patterns of aircraft noise for the areas. The noise sharing assessment has concluded that the additional noise impacts associated with redistributed flights as a result of the restrictions of the east-west runway is minor (refer to Section 7.2). The assessment found that the noise impacts and the changes to flight paths would not be significant.
(c)	constructing a new building wholly or principally for use as a passenger terminal, where the building's gross floor space is greater than 500 square metres; or	No	The proposal does not involve construction of any buildings for use as a passenger terminal.
(d)	extending a building that is wholly or principally for use as a passenger terminal, where the extension increases the building's gross floor space by more than 10%; or	No	The proposal does not involve extension of any passenger terminals.
(e)	constructing a new building, where: (i) the building is not wholly or principally for use as a passenger terminal; and (ii) the cost of construction exceeds \$20 million or such higher amount as is prescribed; or	No	No new buildings would be constructed as part of the proposal.
(f)	constructing a new taxiway, where: (i) the construction significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and (ii) the cost of construction exceeds \$20 million or such higher amount as is prescribed; or	No	The proposal does not involve constructing a new taxiway.
(g)	extending a taxiway, where: (i) the extension significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and (ii) the cost of construction exceeds \$20 million or such higher amount as is prescribed; or	No	The proposal does not involve extending a taxiway.

ASSESSMENT ON WHETHER THE PROPOSAL IS A 'MAJOR AIRPORT DEVELOPMENT'			
	Development type	Y/N/N R	Reason
(h)	<p>constructing a new road or new vehicular access facility, where:</p> <p>(i) the construction significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and</p> <p>(ii) the cost of construction exceeds \$20 million or such higher amount as is prescribed; or</p>	No	<p>The proposal involves extending the Wentworth Avenue access road to form a new intersection with General Holmes Drive. The total cost of construction for the project would exceed \$20 million. However, the construction of this road would not significantly increase the capacity of the airport to handle movements of passengers, freight or aircraft; rather the proposal would only increase the capacity of the road network to meet predicted traffic volumes for 2018 (refer to Section 5.2.1 and 7.1).</p>
(j)	<p>extending a road or vehicular access facility, where:</p> <p>(i) the extension significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and</p> <p>(ii) the cost of construction exceeds \$20 million or such higher amount as is prescribed; or</p>	No	<p>The proposal would involve widening General Holmes Drive and Joyce Drive. The total cost of construction for the project would exceed \$20 million. However, construction of the proposal would not significantly increase the capacity of the airport to handle movements of passengers, freight or aircraft.</p> <p>The proposal has been designed to cater for the increase in general traffic to improve the level of service on these roads.</p>
(k)	<p>constructing a new railway or new rail handling facility, where:</p> <p>(i) the construction significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and</p> <p>(ii) the cost of construction exceeds \$20 million or such higher amount as is prescribed</p>	No	<p>The total cost of construction for the proposal would exceed \$20 million. However, the purpose of the new railway track that would be constructed as part of the proposal is to facilitate continued freight rail access from Port Botany through the proposal area during construction. Following construction, the railway track would be switched back to the original alignment. The construction of the railway track and railway bridges would not significantly increase the capacity of the airport to handle movements of passengers, freight or aircraft.</p>
(l)	<p>extending a railway or rail handling facility, where:</p> <p>(i) the extension significantly increases the capacity of the airport to handle movements of passengers, freight or aircraft; and</p> <p>(ii) the cost of construction exceeds \$20 million or such higher amount as is prescribed</p>	No	<p>The proposal does not involve extending a railway or a rail handling facility.</p>

ASSESSMENT ON WHETHER THE PROPOSAL IS A 'MAJOR AIRPORT DEVELOPMENT'			
	Development type	Y/N/N R	Reason
(m)	a development of a kind that is likely to have significant environmental or ecological impact; or	No	The environmental assessment carried out in the REF has confirmed that the proposal would not have a significant environmental or ecological impact during construction or operation (refer to Section 9.4).
(n)	a development which affects an area identified as environmentally significant in the environment strategy; or	No	The proposal would not affect any areas identified as environmentally significant. While the proposal discharges into the Mill Ponds (which is also known as the Sydney Airport Wetlands, and makes up part of the Botany Wetlands and Sydney Airport Wetlands) which is an environmentally significant area in the environment strategy, the effect to water quantity and quality has been determined to be negligible (refer to Section 7.6 and 7.8 of the REF). The non-Aboriginal heritage and biodiversity assessments have also confirmed that the proposal would not have an impact on the wetlands (refer to Section 7.4 and 7.5).
(na)	a development of a kind that is likely to have a significant impact on the local or regional community; or	No	Socio-economic impacts associated with the proposal have been assessed in Section 7.13 . The proposal would not have a significant impact on the local or regional community.
(nb)	a development in relation to which the Minister has given an approval under section 89A	No	The Minister has not given approval to the proposal under section 89A of the Airports Act.
(o)	a development of a kind specified in the regulations	No	This proposal is not a development of a kind specified in the regulations for which a major development plan would need to be prepared.

ASSESSMENT ON WHETHER THE PROPOSAL IS A 'MAJOR AIRPORT DEVELOPMENT'			
	Development type	Y/N/N R	Reason
Airports Act 1996 – Sect 89, item (4)			
(4)	Airports Act 1996 – Sect 9, item (4). The Minister may determine in writing that specified developments that are carried out at an airport site together constitute a major airport development if: Each individual development is : covered by subparagraph (1)(e)(i), (f)(i), (g)(i), (h)(i), (j)(i), (k)(i) or (l)(i); but not covered by subparagraph (1)(e)(ii), (f)(ii), (g)(ii),(h)(ii), (j)(ii), (k)(ii) or (l)(ii); and the developments are: consecutive or concurrent projects; or extensions to existing buildings.	No	The proposal does not involve multiple specified developments. Furthermore, the proposal does not meet criteria specified in (1)(e)(i), (f)(i), (g)(i), (h)(i), (j)(i), (k)(i) or (l)(i), as the proposal does not include constructing a new building, and its purpose is not to increase the capacity of the airport. Rather its purpose is to meet the projected demand in general traffic for the proposal area. The cost of construction for the proposal exceeds \$20 million.
	“Significant Impact on Local/ Regional Community” Guide - January 2012	Y/N/NR	In consideration of the significant impact guidelines and significant impact on local/regional community guide, there was found to be no significant impact (refer Chapter 7).
Potential impacts include:			
(a)	noise	No	The construction and operational noise assessment confirmed that the impact of the proposal is not significant (refer to Section 7.3).
(b)	odour	No	The proposal would not generate odour.
(c)	dust or other physical intrusions	No	The air quality impact assessment (refer to Section 7.10) and impact to airport operations assessment (Section 7.2) have found that the dust generated during construction of the proposal and the temporary physical intrusion into the protected airspace as a result of construction are not significant.

ASSESSMENT ON WHETHER THE PROPOSAL IS A 'MAJOR AIRPORT DEVELOPMENT'			
	Development type	Y/N/N R	Reason
(d)	noticeable traffic impacts such as increased traffic congestion at certain times or an increase in heavy vehicle traffic	No	The proposal would not have a significant impact to traffic flows during construction with the implementation of appropriate traffic control measures and by maintaining through traffic during peak periods. Furthermore, proposal operation would improve traffic flows, network performance and reduce travel times within the proposal area (refer to Section 7.1).
(e)	impacts on public transport linkages or services	No	The proposal would maintain public transport infrastructure within the proposal area. The improvement to the network performance, traffic flows and travel times is likely to have a positive flow-on effect to bus services that pass through the proposal area (refer to Section 7.1).
(f)	commercial impacts affecting the viability of business centres in the surrounding areas	No	The proposal would not reduce the viability of business centres in the surrounding areas (refer to Section 7.1).
(g)	lighting impacts on residential areas or other businesses	No	The proposal would not affect lighting on any residential areas or other businesses.
(h)	hazardous materials or dangerous goods	No	The proposal would not generate any hazardous materials or dangerous goods.
(i)	impacts on implementation of local and regional planning schemes, including land use and transport planning	No	The proposal has been reviewed against the Botany Bay Local Environmental Plan 2013 and Sydney Airport Master Plan objectives (refer to Section 5.4.1 and 5.6.1). The review has found that the proposal is consistent with the objectives of the zones that it is located within.
(j)	impacts on the safety, security or amenity of local communities	No	The proposal would have a beneficial impact on the safety of the local community, by removing the railway level crossing, which currently poses a risk to road users. The proposal would also improve the amenity of the local community as it would rehabilitate and restore the area of disused land between General Holmes Drive and the Port Botany Freight Rail Line.

ASSESSMENT ON WHETHER THE PROPOSAL IS A 'MAJOR AIRPORT DEVELOPMENT'			
	Development type	Y/N/N R	Reason
(k)	impediments to emergency planning and response access or services	No	Improvements to the road network such as reduced travel times and improved traffic flows would have positive flow-on benefits to access for emergency services through the proposal area.
Airports should ask themselves the following questions:			
(l)	Is the type of development proposed of known concern to the community or government?	No	Several years ago, Sydney Airport undertook a project to construct a runway end safety area (RESA) at the western end of the east-west runway. This resulted in the operation of that runway being affected for around 18 months which, in turn, resulted in a significant change to the distribution of aircraft noise around the airport. At the time, this concerned many in the community. However, as outlined in the reasons for section 89(1)(ba) above, with respect to this project, the additional noise impacts associated with this project are expected to be minor. This is because the period during which runway operations will be affected is significantly less than occurred for the RESA project. The Sydney Airport Community Forum was briefed about the project at its meeting on 21 November 2014. No concerns were raised by the forum.
(m)	Is the proposed development in conflict with planning schemes for the local and regional communities surrounding the airport?	No	Not applicable.
(n)	Have similar types of development raised substantial community concerns in the past?	No	See response to paragraph (l) above.
(o)	Are there any other potential community impacts	No	Other potential community impacts are addressed elsewhere in this table.
<p>Dealing with cumulative impacts</p> <p>Intermittent and cumulative effects need to be considered and if the proposed development is to be undertaken in stages over a period of time, the impacts of the development once completed need to be considered, even if the potential impacts will not be evident in the first instance.</p>			

ASSESSMENT ON WHETHER THE PROPOSAL IS A 'MAJOR AIRPORT DEVELOPMENT'			
	Development type	Y/N/N R	Reason
(p)	Will the development be undertaken in stages over a period of time?	No	

ASSESSMENT ON WHETHER THE PROPOSAL IS A 'MAJOR AIRPORT DEVELOPMENT'

Development type	Y/N/N R	Reason
<p>External consultation</p> <p>The Guidelines indicate that: <i>Airport lessee companies should undertake early consultation with their local consultation groups to allow a reasonable time for issues to be worked through and to avoid delays to development schedules. Effective consultation arrangements will be an important part of the process of identifying whether potential impacts are significant enough to warrant a major development plan process.</i></p> <p>For Sydney Airport, the following need to be consulted as part of the process of deciding whether or not the proposed development is of a kind that is likely to have a significant impact on the local or regional community:</p> <p>Sydney Airport Community Forum Planning Coordination Forum City of Sydney Council, City of Botany Bay Council, Marrickville Council; and Rockdale City Council Other people or bodies as appropriate.</p> <p>To enable the consultation to be meaningful, the following information will need to be provided to the stakeholder:</p> <p>A full description of the proposed development, where it is proposed to occur on the airport site and the expected timeframe. Maps, diagrams or a photo montage showing the proposal are recommended;</p> <p>A preliminary list of the anticipated environmental and/or community impacts associated with the development. Refer to paragraphs (a) to (o) above as a guide to what should be included. These should address impacts associated with construction and any impacts expected to occur once the development is operational; and</p> <p>Where negative impacts are anticipated, a description of what action(s) will be undertaken to ameliorate those impacts (both during construction and once operational).</p> <p>Stakeholders should be given a period of not less than two weeks in which to provide their comments (and preferably more). This will allow time to brief them directly if needed. The feedback received should be assessed to gauge the likely level of community concern about the proposed development.</p>		

Appendix A2: Considerations under the EPBC Act and administrative guidelines

Matters to be considered	Consideration
Environmental context	
a). What are the components or features of the environment in the area where the action will take place?	The proposal is located in an area that is heavily urbanised, with residential, commercial, transport infrastructure and light industrial land uses. Seventeen listed and unlisted heritage items are located next to or within the proposal area. Natural features directly within or adjacent to the proposal include undeveloped and weedy land between Botany Road and General Holmes Drive, and the Mill Pond wetlands, directly to the south. The proposal is located within the Botany Bay Catchment, which drains to Botany Bay.
b). Which components or features of the environment are likely to be impacted?	The local road network, the local visual and noise environment and Commonwealth land between General Holmes Drive and the Port Botany Freight Rail Line would be affected by the construction and operation of the proposal, as documented and assessed in this REF.
c). Is the environment which is likely to be impacted, or are elements of it, sensitive or vulnerable to impacts?	<p>The Freshwater Wetlands TEC, Mill Ponds and, ultimately, Botany Bay, are receiving environments for the proposal. These environments may be sensitive or vulnerable to impacts on water quality if construction activities are not managed appropriately (refer to Section 7.8).</p> <p>The majority of construction for proposal would occur at night, and may result in noise impacts on nearby sensitive receivers (refer to Section 7.3). Temporary and short-term road closures would result in some land traffic, transport and access impacts to road users and nearby landowners (refer to Section 7.1).</p> <p>In addition, the east–west runway of Sydney Airport would be closed for two non-consecutive weeks during construction, which may result in minor regional noise impacts from rerouted aircraft (refer to Section 7.2).</p>
Is the environment, or are components of it, rare, endemic, unusual, important or otherwise valuable.	The proposal is located in an area that is heavily urbanised, with residential, commercial, transport infrastructure and light industrial land uses. Natural features directly within or adjacent to the proposal include undeveloped and weedy land between Botany Road and General Holmes Drive, and the Mill Pond wetlands, directly to the south. The environment that the proposal is located within is not and does not contain components that are rare, endemic, unusual, important or otherwise valuable.
d). What is the history, current use and condition of the environment which is likely to be impacted?	The historical use of the proposal area has focused on transport (air, roads and rail), mixed residential and commercial use and some unused and degraded vegetated land. The current use of the proposal is consistent with its historical use. The condition of the environment which is likely to be impacted by the action is outlined in Section 2.3 and Chapter 7 .
Potential impacts	
a). What are the components of the action?	<p>As described in Chapter 4, the key elements of the proposal are to:</p> <ul style="list-style-type: none"> • Separate the road network from the Port Botany Freight Rail Line. This would involve: <ul style="list-style-type: none"> – Closing the section of General Holmes Drive where it crosses the Port Botany Freight Rail Line – Extending Wentworth Avenue beneath the Port Botany Freight Rail Line to link with General Holmes Drive. The Wentworth Avenue underpass would have nine lanes, with five lanes eastbound and four lanes westbound, and a minimum 4.7 m clearance – Building two rail bridges over the Wentworth Avenue underpass. • Provide a bridge over the stormwater channel and a protection slab over sewer and gas utilities on Wentworth Avenue • Provide a new intersection at General Holmes Drive and Wentworth Avenue • Upgrade or adjust the intersections at:

Matters to be considered	Consideration
	<ul style="list-style-type: none"> - Wentworth Avenue and Botany Road - General Holmes Drive and Mill Pond Road - Botany Road and Mill Pond Road - General Holmes Drive, Joyce Drive and Ross Smith Avenue - General Holmes Drive and Botany Road. • Widen Joyce Drive and General Holmes Drive between about 100 m east of O’Riordan Street and 175 m south of Mill Pond Road to three lanes in each direction • Adjust and locally relocate drainage infrastructure including: <ul style="list-style-type: none"> - Replacing grassed swale at Joyce Drive with a pipe and pit system - Installing a permanent pump at the low point of the Wentworth Avenue. • Landscaping and replanting within the proposal area, particularly on road verges and in the area of disused land between General Holmes Drive and the Port Botany Freight Rail Line • Provide new facilities – and relocate existing facilities – for pedestrians, cyclists and public transport, including: <ul style="list-style-type: none"> - A new shared-use path linking to the existing cycleway at Todd Reserve on Wentworth Avenue - A new shared path on Botany Road from the Botany Road and Wentworth Avenue intersection to Baxter Road - Removing the pedestrian path on the northern side of Joyce Drive - Relocating the northbound bus stop on Botany Road about 70 m to the south of its current location. • Provide temporary construction ancillary facilities, including construction compounds, stockpile sites and erosion and sedimentation control measures.
<p>b). What are the predicted adverse impacts associated with the action including indirect consequences</p>	<p>The construction and operation of the proposal would result in both positive and negative impacts within Commonwealth land, as outlined in Chapter 7.</p> <p>During construction, the unavoidable impacts of the proposal would relate to:</p> <ul style="list-style-type: none"> • Traffic – construction would generate additional traffic on roads within airport/Commonwealth land, which may delay access to Sydney Airport. Construction speed zones may also lengthen travel times • Ecology – clearing of native and exotic vegetation between General Holmes Drive and the Port Botany Freight Rail Line • Airport operations – the height of some construction equipment would require intermittent breaches of the OLS, and two periods of time where movements on and off east-west runway would need to be restricted <p>During construction, the potential impacts of the proposal would relate to:</p> <ul style="list-style-type: none"> • Soil and groundwater contamination – contamination from existing fill and building materials and construction activities and exposure of acid sulfate soils • Surface water and ground water quality – pollution of receiving waters from erosion and sedimentation and pollution of groundwater from construction activities, and potential pollution of groundwater from potential acid sulfate soils • Noise – exceedances of noise management levels at residences and non-residential properties as a result of night-time construction and/or runway closures • Air quality – potential generation of dust during initial site work and excavation • Ecology – clearing of exotic and native vegetation • Visual amenity – impacts on views from the local environment and wayfinding for airport users.

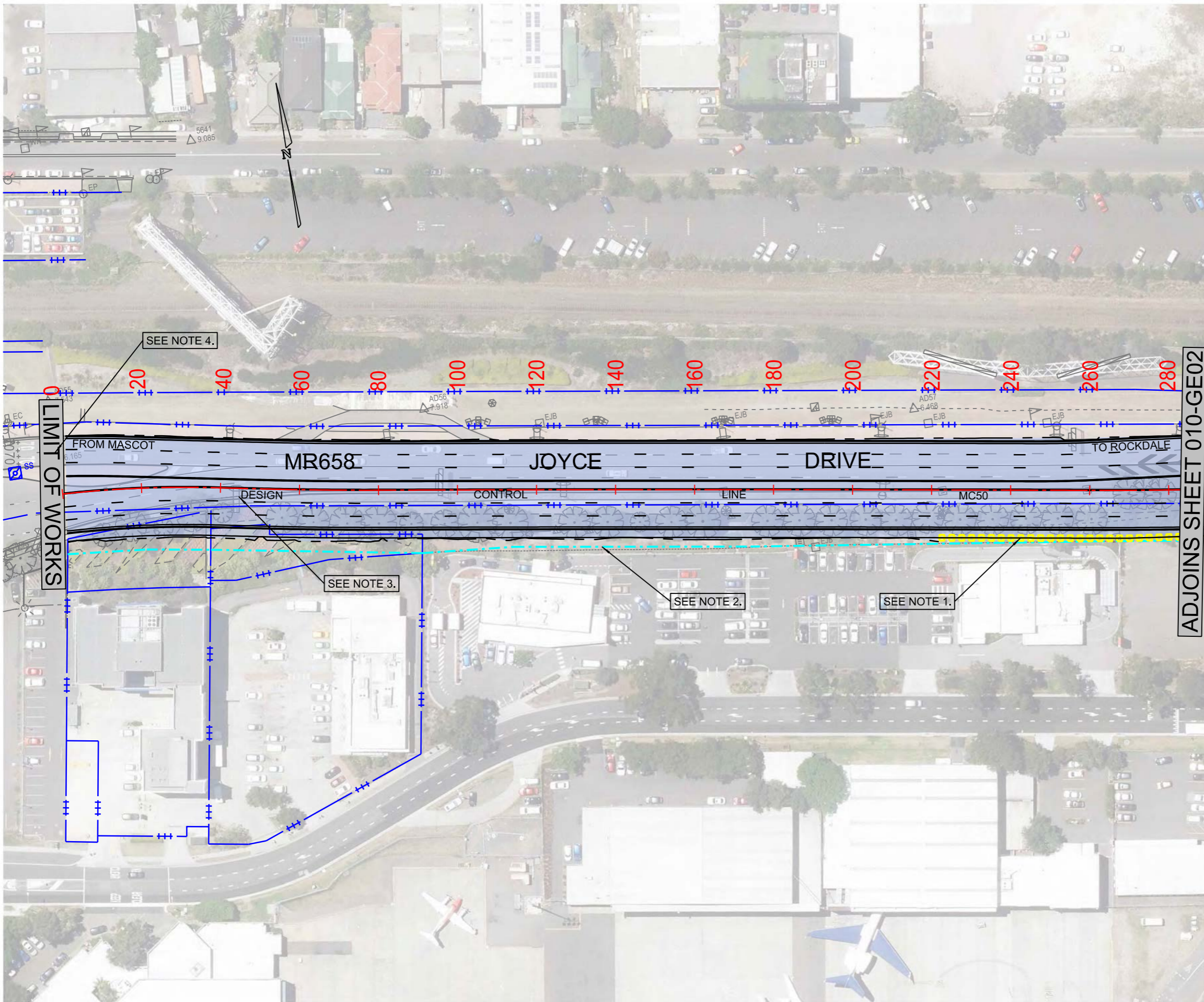
Matters to be considered	Consideration
	<p>During operation, the benefits of the proposal would include:</p> <ul style="list-style-type: none"> • Improved traffic flow and traffic capacity within the proposal area, which would improve access to Sydney Airport • Improved pedestrian and cyclist access within the proposal area, and improved connectivity to Sydney Airport • Improved visual environment, particularly in the vegetated area between General Holmes Drive and the Port Botany Freight Rail Line • Improved drainage in the area, which would reduce flooding frequency. <p>During operation, the potential impacts of the proposal would be:</p> <ul style="list-style-type: none"> • Soil and groundwater contamination from spills or leaks • Pollution of receiving waters by stormwater runoff • Impact on the groundwater aquifer as a result of pumping out of the Wentworth Avenue underpass.
c). How severe are the potential impacts	The potential impacts will be largely confined to the construction period, which is estimated to be about 30 months. Whether identified as avoidable or potential, all impacts are assessed to be low to moderate. All potential impacts would be able to be appropriately mitigated (refer to Chapter 8).
Impact avoidance and mitigation	
Will any measures to avoid or mitigate impacts ensure with a high degree of certainty that impacts are not significant?	<p>The options development and concept design development processes have sought to avoid adverse impacts through the design process. During detailed design, wherever possible, refinements would be made to the concept design to further reduce potential adverse impacts and to incorporate environmentally beneficial design features.</p> <p>This REF documents environmental management measures to mitigate remaining environmental impacts. These measures are listed in Chapter 8.</p> <p>With the implementation of management measures and avoiding a large number of potential impacts, the REF finds that the environmental impacts of the proposal are not likely to be significant.</p>
Are the impacts significant?	
Is the action likely to have a significant impact on the environment?	No. The proposal is not likely to have any significant impact on the environment of Commonwealth land. Accordingly, a referral to the Commonwealth Department of the Environment is not required.
Further, the following criteria are intended to provide general guidance on the types of actions likely to have a significant impact on the environment. If you answer “yes” to one or more of the questions below then it would be expected that your action is likely to have a significant impact on the environment.	The criteria listed below have been considered and potential impacts are outlined in Chapter 7 of the REF. With the implementation of mitigation measures outlined in Chapter 8 to avoid or minimise impacts, the proposal is unlikely to have any significant impacts on the environment.
Impact on landscapes and soils	No. The proposal would not have a significant impact on these environmental factors as discussed in Chapter 7 of the REF.
Impacts on coastal landscapes and processes	
Impacts on ocean forms, ocean processes and ocean life	
Impacts on water resources	

Matters to be considered	Consideration
Pollutants, chemicals, and toxic substances	
Impacts on plants	
Impacts on animals	
Impacts on people and communities	
Impacts on heritage	

Appendix B

Concept design

Appendix B1: Concept design



LEGEND

-  EXISTING PROPERTY BOUNDARY
-  PROPOSED PROPERTY BOUNDARY
-  FULL PROPERTY ACQUISITION
-  PROPOSED RETAINING WALL
-  PROPOSED W-BEAM SAFETY BARRIER
-  PROPERTY ADJUSTMENT
-  WETLANDS

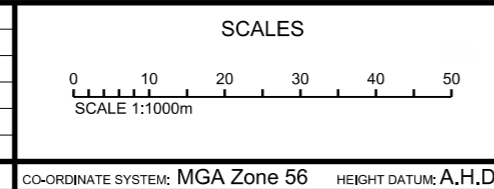
NOTES


1. TYPE AND STYLE OF RETAINING WALLS TO BE DETERMINED AS PART OF THE DETAILED DESIGN PHASE.
2. APPROPRIATE MAN PROOF FENCING TO BE RE-INSTATED ALONG THE PROPOSED PROPERTY LINE IN NEGOTIATION WITH PROPERTY OWNERS.
3. EXISTING STREET LIGHTING AFFECTED BY THE CIVIL WORKS TO BE REMOVED OR RELOCATED BASED ON PROPOSED LIGHTING SCHEME.
4. ADJOINS AIRPORT GATEWAY UPGRADE PROPOSAL.

NOT FOR CONSTRUCTION

REFER TO SHEET 023-UT01 TO 029-UT07 FOR PUBLIC UTILITY DETAILS

A3 ORIGINAL					
ISSUE	DATE	ISSUE / AMENDMENT DESCRIPTION			
This sheet may be prepared using colour and may be incomplete if copied					




Transport
 Roads & Maritime
 Services

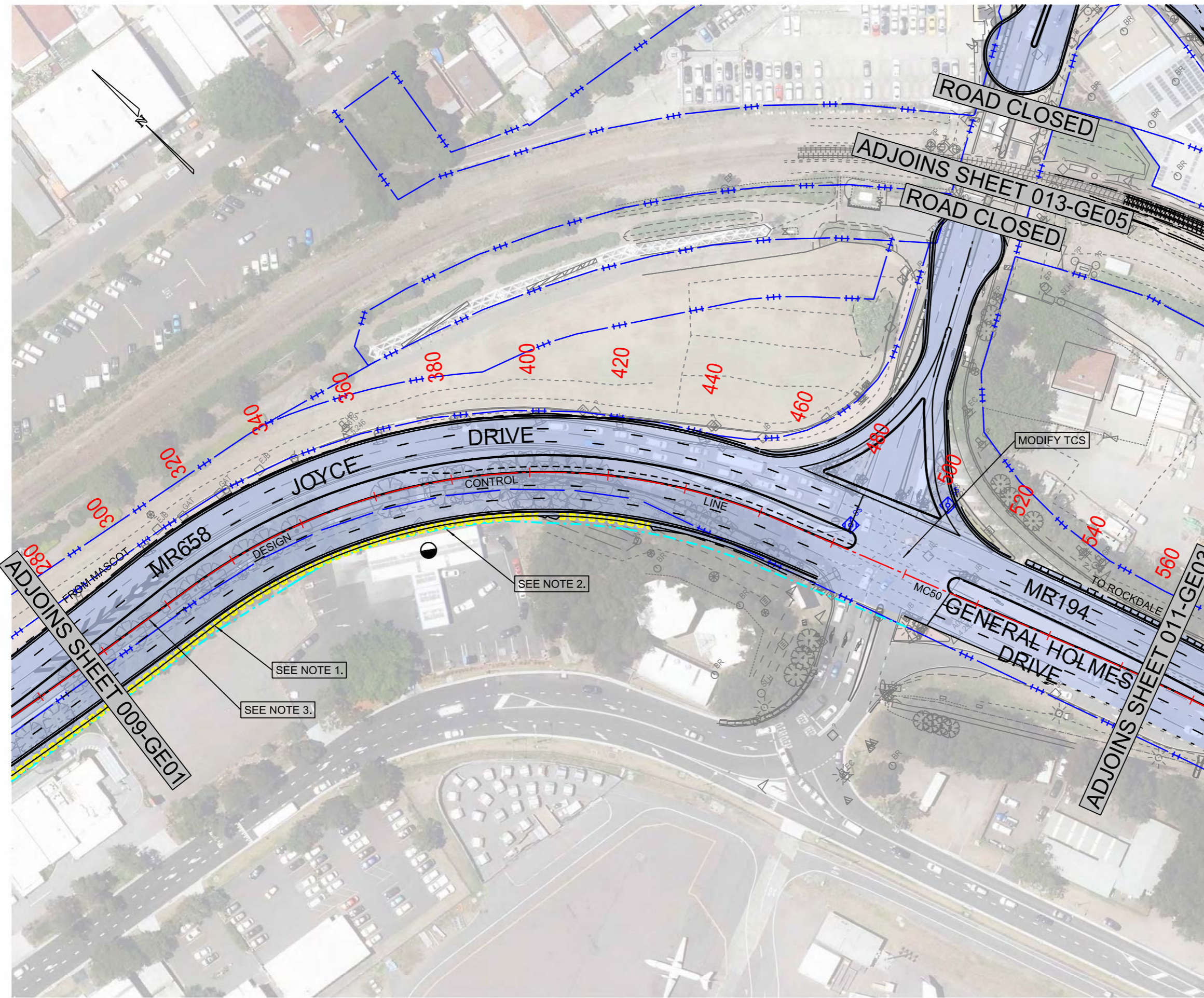
ENGINEERING TECHNOLOGY
 ROAD DESIGN ENGINEERING
 ROAD DESIGN

CO-ORDINATE SYSTEM: MGA Zone 56 HEIGHT DATUM: A.H.D. PRODUCED: 16/10/2014 10:08:08 AM

ROADS AND MARITIME SERVICES

BOTANY BAY COUNCIL AREA
 MR194 GENERAL HOLMES DRIVE, MR344 WENTWORTH AVENUE
 AND MR658 JOYCE DRIVE
 WESTCONNEX ENABLING WORKS - AIRPORT PRECINCT
 MASCOT
 GENERAL PLAN

DRAWING 009-GE01.dgn	STAGE 100% CONCEPT	PART 1	PART 1
REGISTRATION NUMBER DS2014/004979		SHEET No. 009-GE01	



LEGEND

	EXISTING PROPERTY BOUNDARY
	PROPOSED PROPERTY BOUNDARY
	FULL PROPERTY ACQUISITION
	PROPOSED RETAINING WALL
	PROPOSED W-BEAM SAFETY BARRIER
	PROPERTY ADJUSTMENT
	WETLANDS

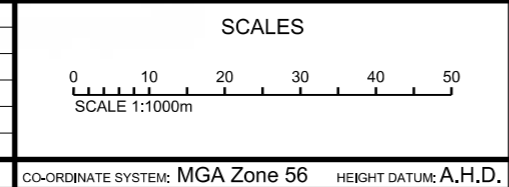
- NOTES**
1. TYPE AND STYLE OF RETAINING WALLS TO BE DETERMINED AS PART OF THE DETAILED DESIGN PHASE.
 2. APPROPRIATE MAN PROOF FENCING TO BE RE-INSTATED ALONG THE PROPOSED PROPERTY LINE IN NEGOTIATION WITH PROPERTY OWNERS.
 3. EXISTING STREET LIGHTING AFFECTED BY THE CIVIL WORKS TO BE REMOVED OR RELOCATED BASED ON PROPOSED LIGHTING SCHEME.

NOT FOR CONSTRUCTION

REFER TO SHEET 023-UT01 TO 029-UT07 FOR PUBLIC UTILITY DETAILS

PRODUCED: 16/10/2014 AT 10:08:18 AM USER: jecrituka
 FILE PATH: K:\Design\pds\10\airport_projects\WEMW - Concept Design\Drawings\Original\010-GE02.dgn
 PLOT DRIVER: c:\data\Bentley\WorkSpace\Standards\plotdrv\PDF-Full.plt
 PEN TABLE: c:\data\Bentley\WorkSpace\Standards\tablestest\TEXT - SUBSTITUTIONS_FOR_COLOUR.tbl

ISSUE	DATE	ISSUE / AMENDMENT DESCRIPTION



Transport
Roads & Maritime
Services

ENGINEERING TECHNOLOGY
ROAD DESIGN ENGINEERING
ROAD DESIGN

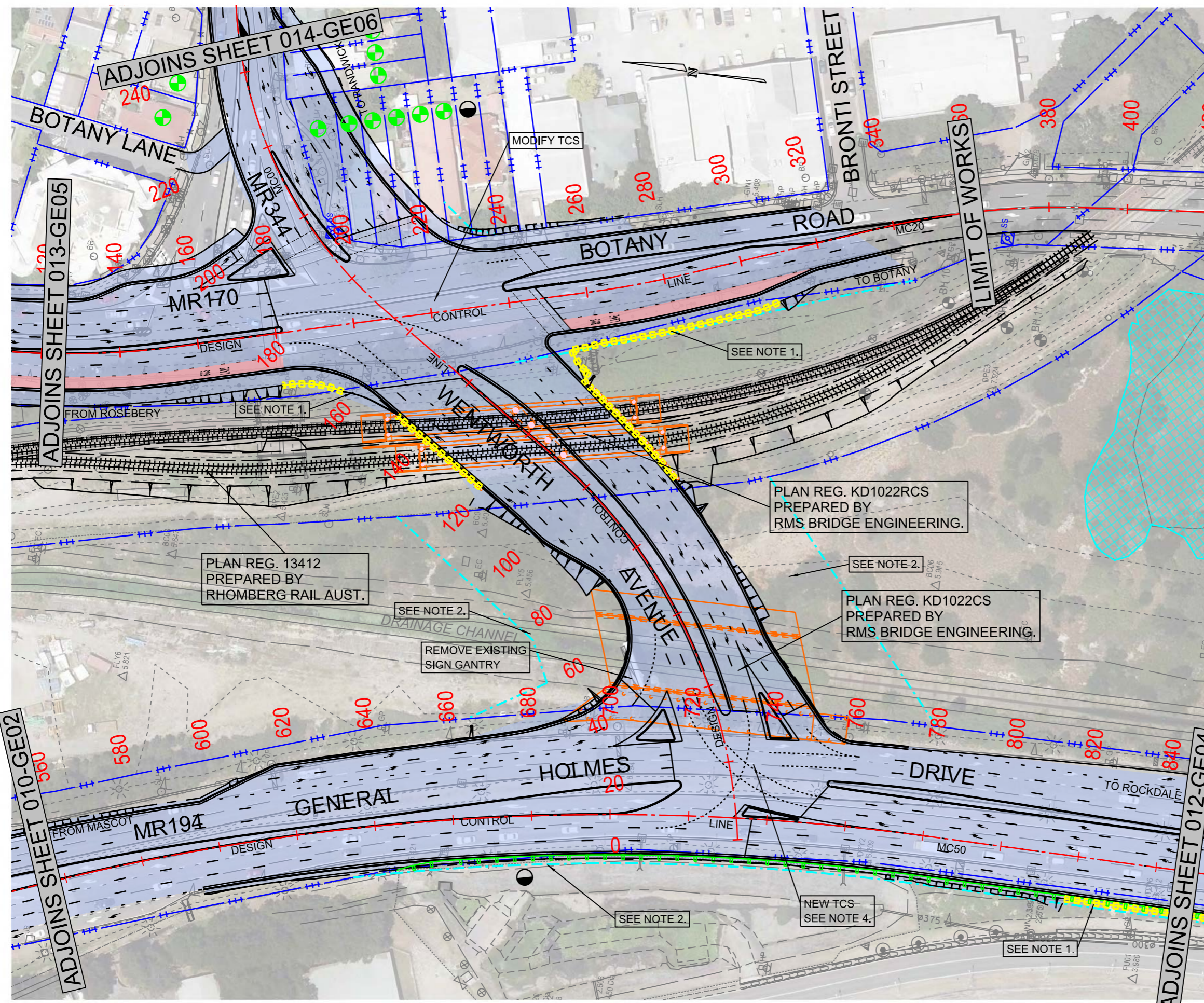
CO-ORDINATE SYSTEM: MGA Zone 56 HEIGHT DATUM: A.H.D. PRODUCED: 16/10/2014 10:08:18 AM

ROADS AND MARITIME SERVICES

BOTANY BAY COUNCIL AREA
MR194 GENERAL HOLMES DRIVE, MR344 WENTWORTH AVENUE
AND MR658 JOYCE DRIVE
WESTCONNEX ENABLING WORKS - AIRPORT PRECINCT
MASCOT
GENERAL PLAN

DRAWING 010-GE02.dgn	STAGE 100% CONCEPT	PART 1	PART 1
REGISTRATION NUMBER DS2014/004979		SHEET No. 010-GE02	

This sheet may be prepared using colour and may be incomplete if copied



LEGEND

- +—+ EXISTING PROPERTY BOUNDARY
- - - - PROPOSED PROPERTY BOUNDARY
- FULL PROPERTY ACQUISITION
- ▤▤▤▤ PROPOSED RETAINING WALL
- +—+ PROPOSED W-BEAM SAFETY BARRIER
- PROPERTY ADJUSTMENT
- ▤▤▤▤ WETLANDS

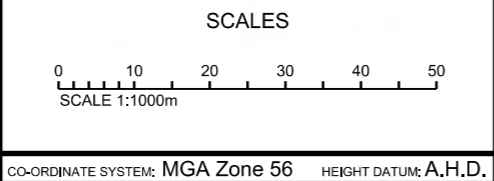
- ### NOTES
1. TYPE AND STYLE OF RETAINING WALLS TO BE DETERMINED AS PART OF THE DETAILED DESIGN PHASE.
 2. APPROPRIATE MAN PROOF FENCING TO BE RE-INSTATED ALONG THE PROPOSED PROPERTY LINE IN NEGOTIATION WITH PROPERTY OWNERS.
 3. EXISTING STREET LIGHTING AFFECTED BY THE CIVIL WORKS TO BE REMOVED OR RELOCATED BASED ON PROPOSED LIGHTING SCHEME.
 4. LOW HEIGHT TRAFFIC CONTROL SIGNAL POSTS TO BE USED IN THE VICINITY OF THE OBSTACLE LIMITATION SURFACE (OLS).
 5. FOR RAIL TRACK LAYOUT SEE PLAN REG No. 13412 PREPARED BY RHOMBERG RAIL AUST.
 6. FOR CONCEPT DESIGN OF RAIL UNDERPASS BRIDGE SEE RMS BRIDGE SECTION SKETCH KD 1022 RCS.
 7. FOR CONCEPT DESIGN OF BRIDGE OVER DRAINAGE CHANNEL SEE RMS BRIDGE SECTION SKETCH KD 1022 CS.

NOT FOR CONSTRUCTION

PRODUCED: 16/10/2014 AT 10:08:28 AM USER: jecnituka
 FILE PATH: K:\Design\pds\10\airport_projects\WEMW - Concept Design\Drawings\Original\011-GE03.dgn
 PLOT DRIVER: d:\data\Bentley\WorkSpace\Standards\plotdrv\F-ull.plt
 PEN TABLE: d:\data\Bentley\WorkSpace\Standards\tablest\pen1.txt

REFER TO SHEET 023-UT01 TO 029-UT07 FOR PUBLIC UTILITY DETAILS

ISSUE	DATE	ISSUE / AMENDMENT DESCRIPTION

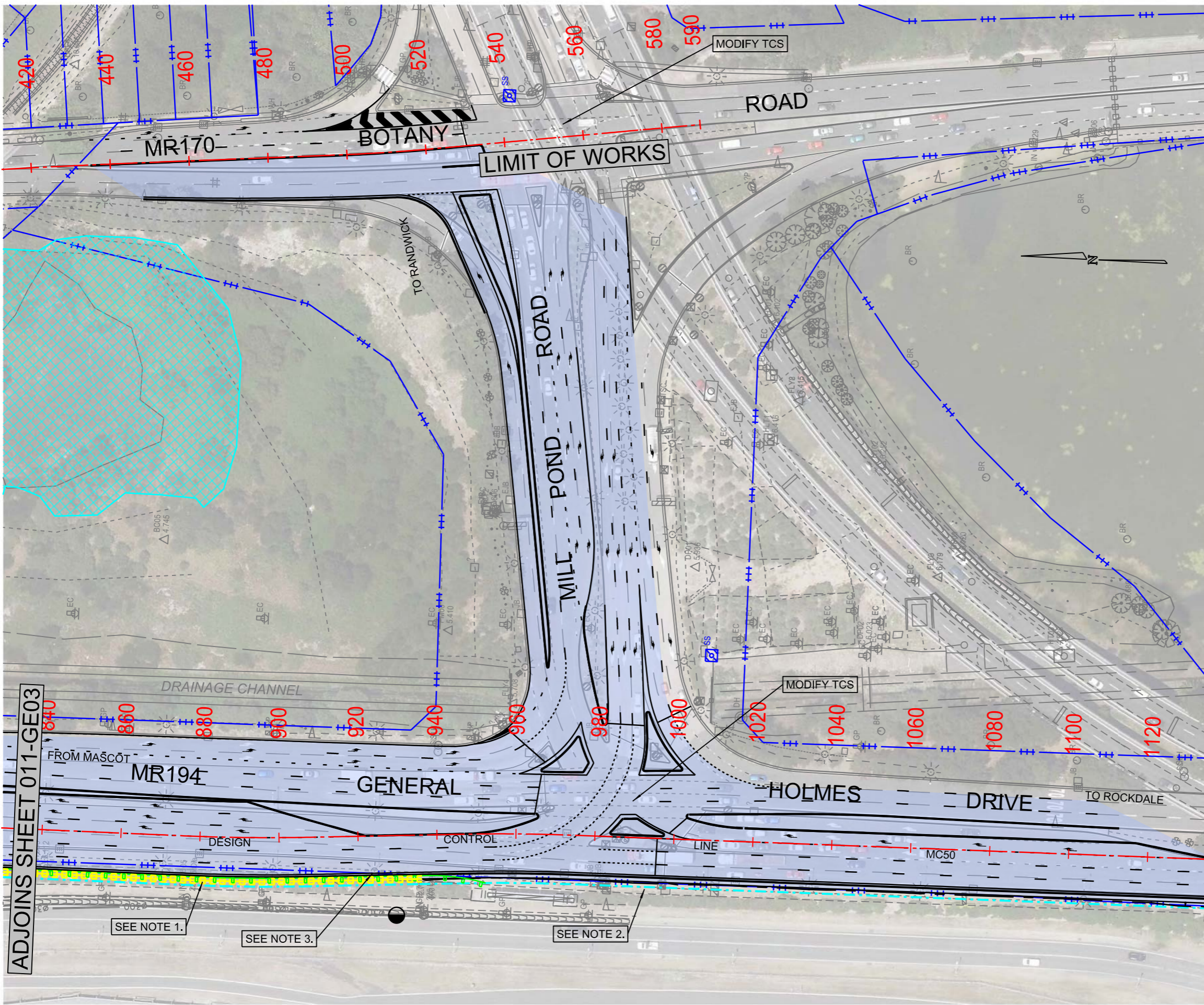


Transport
 Roads & Maritime
 Services
 ENGINEERING TECHNOLOGY
 ROAD DESIGN ENGINEERING
 ROAD DESIGN

ROADS AND MARITIME SERVICES

BOTANY BAY COUNCIL AREA
 MR194 GENERAL HOLMES DRIVE, MR344 WENTWORTH AVENUE
 AND MR658 JOYCE DRIVE
 WESTCONNEX ENABLING WORKS - AIRPORT PRECINCT
 MASCOT
 GENERAL PLAN

DRAWING 011-GE03.dgn	STAGE 100% CONCEPT	PART 1	PART 1
REGISTRATION NUMBER DS2014/004979		SHEET No. 011-GE03	



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED PROPERTY BOUNDARY
- FULL PROPERTY ACQUISITION
- PROPOSED RETAINING WALL
- PROPOSED W-BEAM SAFETY BARRIER
- PROPERTY ADJUSTMENT
- WETLANDS

- ### NOTES
1. TYPE AND STYLE OF RETAINING WALLS TO BE DETERMINED AS PART OF THE DETAILED DESIGN PHASE.
 2. APPROPRIATE MAN PROOF FENCING TO BE RE-INSTATED ALONG THE PROPOSED PROPERTY LINE IN NEGOTIATION WITH PROPERTY OWNERS.
 3. EXISTING STREET LIGHTING AFFECTED BY THE CIVIL WORKS TO BE REMOVED OR RELOCATED BASED ON PROPOSED LIGHTING SCHEME.

ADJOINS SHEET 011-GE03

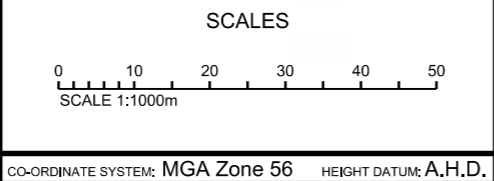
NOT FOR CONSTRUCTION

REFER TO SHEET 023-UT01 TO 029-UT07 FOR PUBLIC UTILITY DETAILS

PRODUCED: 16/10/2014 AT 10:08:39 AM USER: jecntuka
 FILE PATH: K:\Design\pds\10\airport_projects\WEW - Concept Design\Drawings\Original\012-GE04.dgn
 PLOT DRIVER: d:\data\Bentley\WorkSpace\Standards\plotdrv\F-ful.plt
 PEN TABLE: d:\data\Bentley\WorkSpace\Standards\tablestext\SUBSTITUTIONS_FOR_COLOUR.tbl
 A3 ORIGINAL

ISSUE	DATE	ISSUE / AMENDMENT DESCRIPTION

This sheet may be prepared using colour and may be incomplete if copied



Transport
Roads & Maritime
Services

ENGINEERING TECHNOLOGY
ROAD DESIGN ENGINEERING
ROAD DESIGN

PRODUCED: 16/10/2014 10:08:39 AM

ROADS AND MARITIME SERVICES

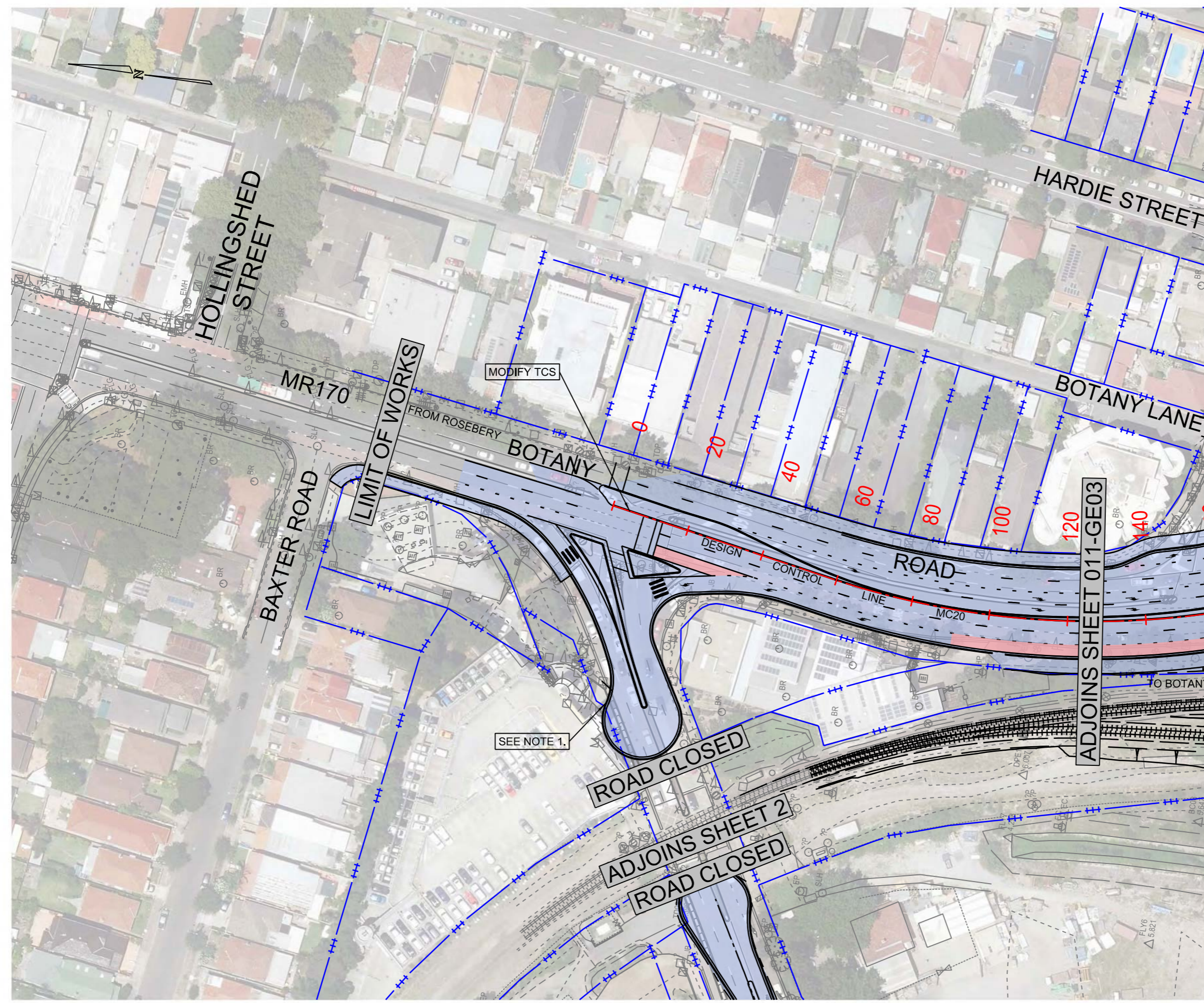
BOTANY BAY COUNCIL AREA

MR194 GENERAL HOLMES DRIVE, MR344 WENTWORTH AVENUE
AND MR658 JOYCE DRIVE

WESTCONNEX ENABLING WORKS - AIRPORT PRECINCT

MASCOT
GENERAL PLAN

DRAWING 012-GE04.dgn	STAGE 100% CONCEPT	PART 1	PART 1
REGISTRATION NUMBER DS2014/004979		SHEET No. 012-GE04	



LEGEND

	EXISTING PROPERTY BOUNDARY
	PROPOSED PROPERTY BOUNDARY
	FULL PROPERTY ACQUISITION
	PROPOSED RETAINING WALL
	PROPOSED W-BEAM SAFETY BARRIER
	PROPERTY ADJUSTMENT
	WETLANDS

- NOTES**
- ADJUSTMENT TO PARK AND FLY ACCESS TO BE NEGOTIATED DURING THE DETAILED DESIGN PHASE.
 - EXISTING STREET LIGHTING AFFECTED BY THE CIVIL WORKS TO BE REMOVED OR RELOCATED BASED ON PROPOSED LIGHTING SCHEME.

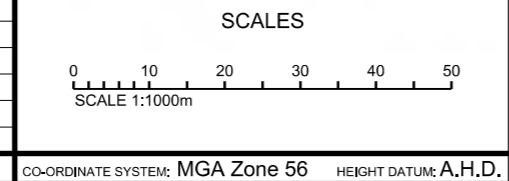
NOT FOR CONSTRUCTION

REFER TO SHEET 023-UT01 TO 029-UT07 FOR PUBLIC UTILITY DETAILS

PRODUCED: 16/10/2014 AT 10:08:48 AM USER: jecrituka
 FILE PATH: K:\Design\pds\10\airport_projects\WEW - Concept Design\Drawings\Original\013-GE05.dgn
 PLOT DRIVER: c:\data\Bentley\WorkSpace\Standards\plotdrv\F-ful.plt
 PEN TABLE: c:\data\Bentley\WorkSpace\Standards\tablestext\SUBSTITUTIONS_FOR_COLOUR.tbl
 A3 ORIGINAL

ISSUE	DATE	ISSUE / AMENDMENT DESCRIPTION

This sheet may be prepared using colour and may be incomplete if copied



Transport
Roads & Maritime Services

ENGINEERING TECHNOLOGY
ROAD DESIGN ENGINEERING
ROAD DESIGN

PRODUCED: 16/10/2014 10:08:48 AM

ROADS AND MARITIME SERVICES

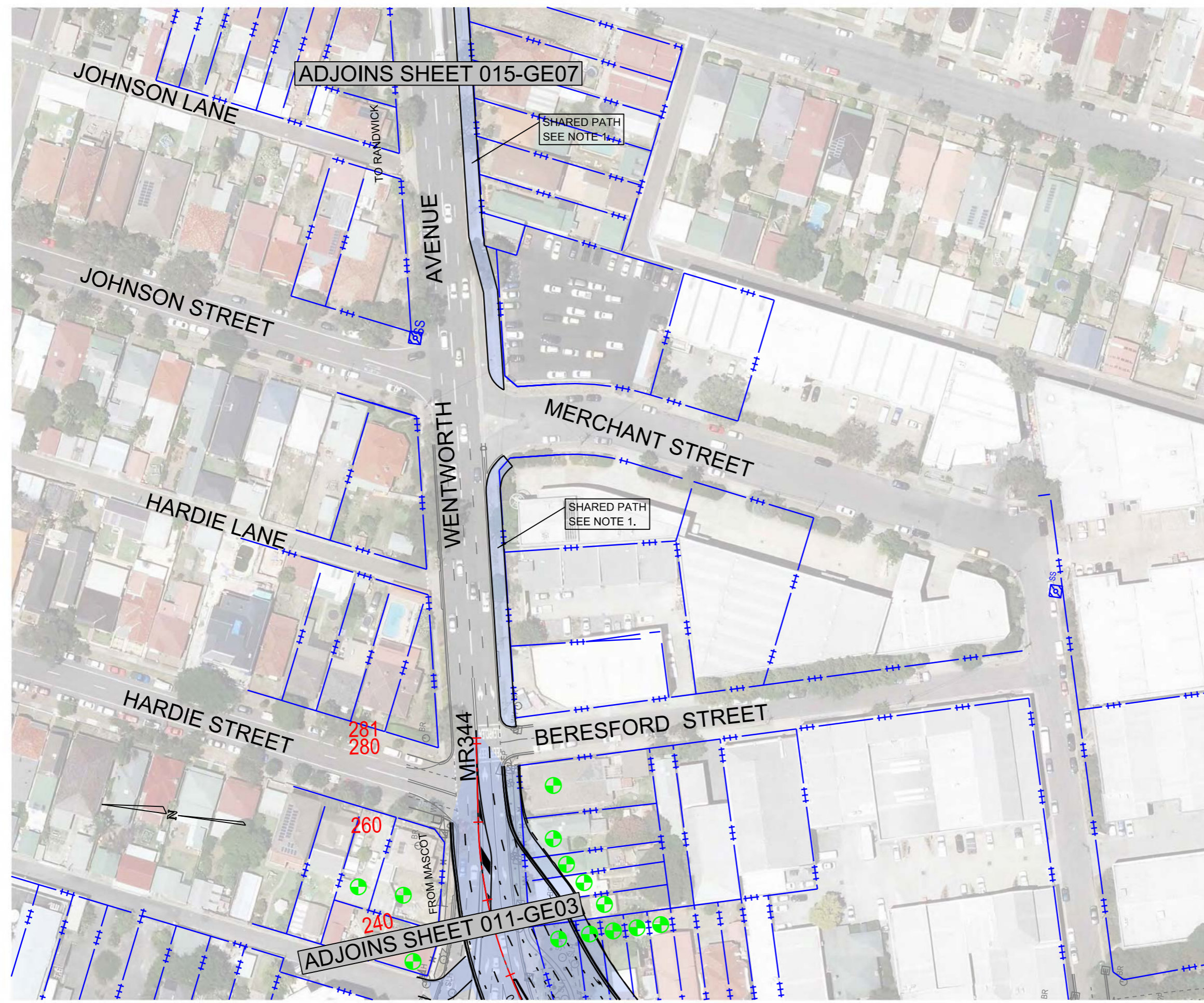
BOTANY BAY COUNCIL AREA

MR194 GENERAL HOLMES DRIVE, MR344 WENTWORTH AVENUE
AND MR658 JOYCE DRIVE

WESTCONNEX ENABLING WORKS - AIRPORT PRECINCT

MASCOT
GENERAL PLAN

DRAWING 013-GE05.dgn	STAGE 100% CONCEPT	PART 1	PART 1
REGISTRATION NUMBER DS2014/004979		SHEET No. 013-GE05	



LEGEND

- +—+ EXISTING PROPERTY BOUNDARY
- - - - PROPOSED PROPERTY BOUNDARY
- FULL PROPERTY ACQUISITION
- ▤▤▤▤ PROPOSED RETAINING WALL
- +—+ PROPOSED W-BEAM SAFETY BARRIER
- PROPERTY ADJUSTMENT
- ▤▤▤▤ WETLANDS

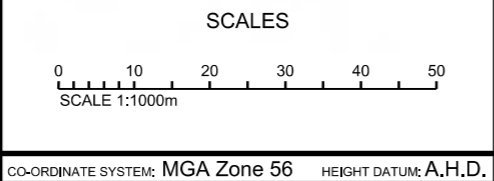
- ### NOTES
1. DRIVEWAYS TO BE ADJUSTED TO SUIT PROVISION OF SHARED PATH.
 2. EXISTING STREET LIGHTING AFFECTED BY THE CIVIL WORKS TO BE REMOVED OR RELOCATED BASED ON PROPOSED LIGHTING SCHEME.

NOT FOR CONSTRUCTION

PRODUCED: 16/10/2014 AT 10:08:57 AM USER: jecntuka
 FILE PATH: K:\Design\pds\10\airport_projects\WEW - Concept Design\Drawings\Original\014-GE06.dgn
 PLOT DRIVER: c:\data\Bentley\WorkSpace\Standards\plotdrv\PDF-Full.plt
 PEN TABLE: c:\data\Bentley\WorkSpace\Standards\table\TEXT - SUBSTITUTIONS_FOR_COLOUR.tbl
 A3 ORIGINAL

REFER TO SHEET 023-UT01 TO 029-UT07 FOR PUBLIC UTILITY DETAILS

ISSUE	DATE	ISSUE / AMENDMENT DESCRIPTION



Transport
 Roads & Maritime
 Services

ENGINEERING TECHNOLOGY
 ROAD DESIGN ENGINEERING
 ROAD DESIGN

ROADS AND MARITIME SERVICES
 BOTANY BAY COUNCIL AREA
 MR194 GENERAL HOLMES DRIVE, MR344 WENTWORTH AVENUE
 AND MR658 JOYCE DRIVE
 WESTCONNEX ENABLING WORKS - AIRPORT PRECINCT
 MASCOT
 GENERAL PLAN

DRAWING 014-GE06.dgn	STAGE 100% CONCEPT	PART 1	PART 1
REGISTRATION NUMBER DS2014/004979		SHEET No. 014-GE06	



LEGEND

-  EXISTING PROPERTY BOUNDARY
-  PROPOSED PROPERTY BOUNDARY
-  FULL PROPERTY ACQUISITION
-  PROPOSED RETAINING WALL
-  PROPOSED W-BEAM SAFETY BARRIER
-  PROPERTY ADJUSTMENT
-  WETLANDS

NOTES

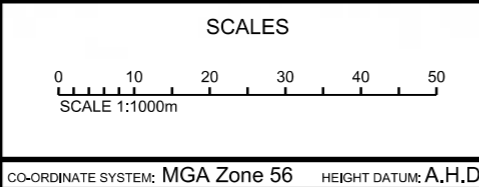
1. DRIVEWAYS TO BE ADJUSTED TO SUIT PROVISION OF SHARED PATH.


NOT FOR CONSTRUCTION

REFER TO SHEET 023-UT01 TO 029-UT07 FOR PUBLIC UTILITY DETAILS

PRODUCED: 16/10/2014 10:09:06 AM USER: jecntuka
 FILE PATH: K:\Design\pds\10\airport_projects\WEM - Concept Design\Drawings\Original\015-GE07.dgn
 PLOT DRIVER: d:\data\Bentley\WorkSpace\Standards\plotdrv\PDF-Full.plt
 PEN TABLE: d:\data\Bentley\WorkSpace\Standards\tablest\pen.tbl
 SUBSTITUTIONS FOR COLOUR:

ISSUE	DATE	ISSUE / AMENDMENT DESCRIPTION




Transport
 Roads & Maritime
 Services

ENGINEERING TECHNOLOGY
 ROAD DESIGN ENGINEERING
 ROAD DESIGN

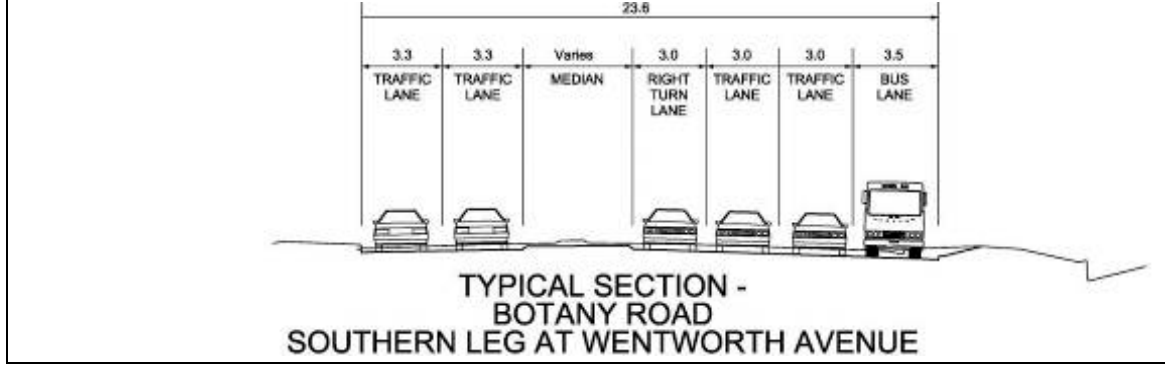
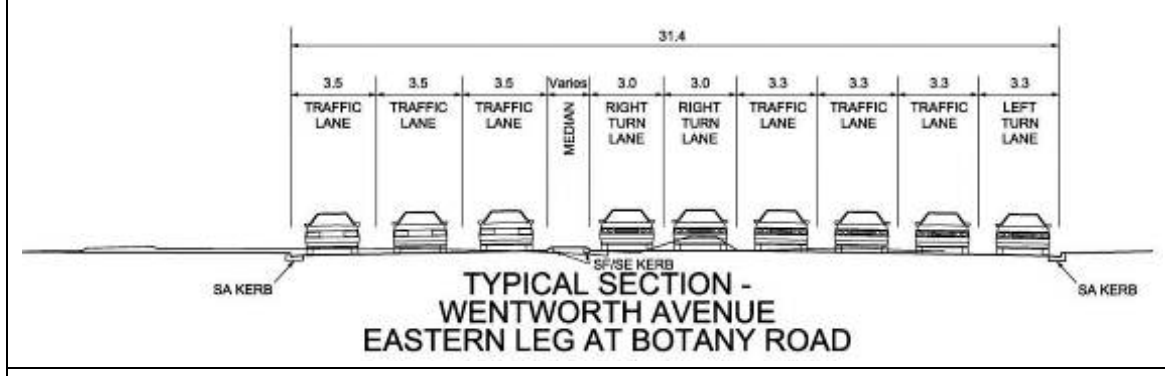
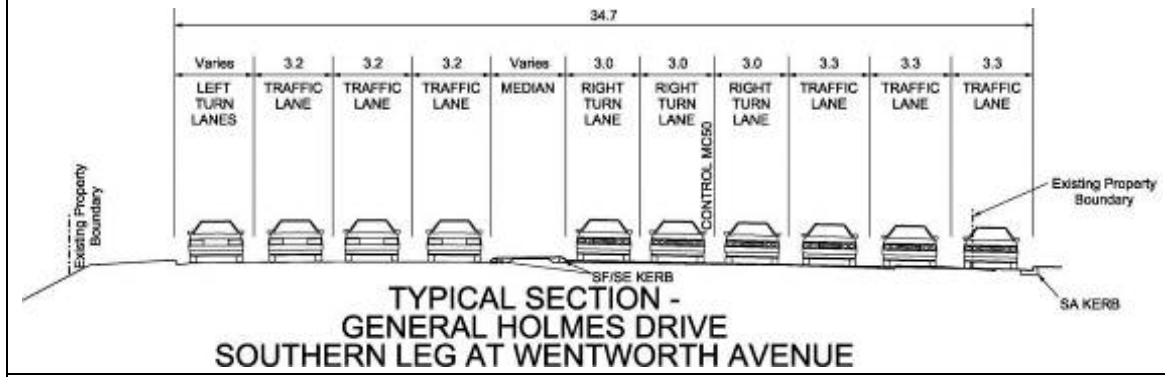
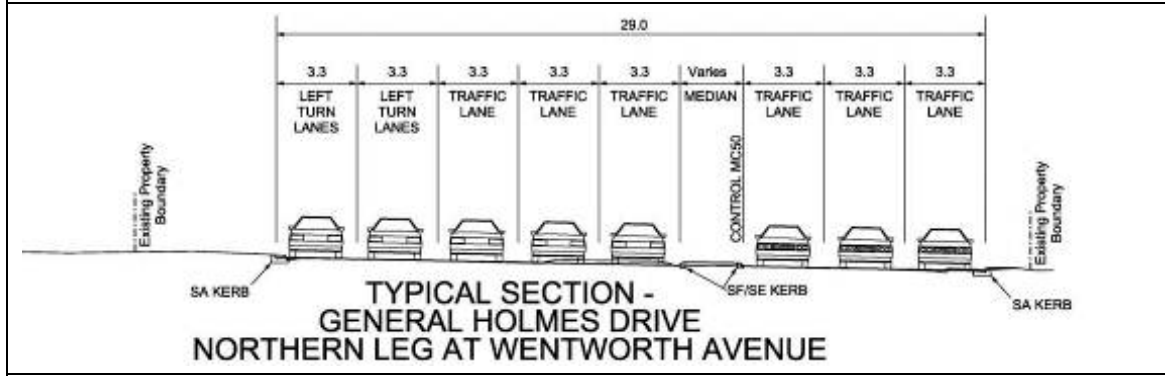
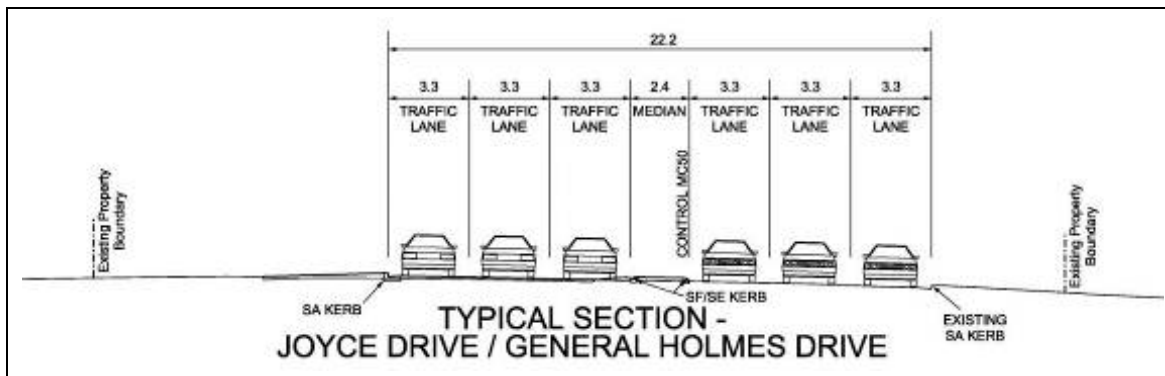
CO-ORDINATE SYSTEM: MGA Zone 56 HEIGHT DATUM: A.H.D. PRODUCED: 16/10/2014 10:09:06 AM

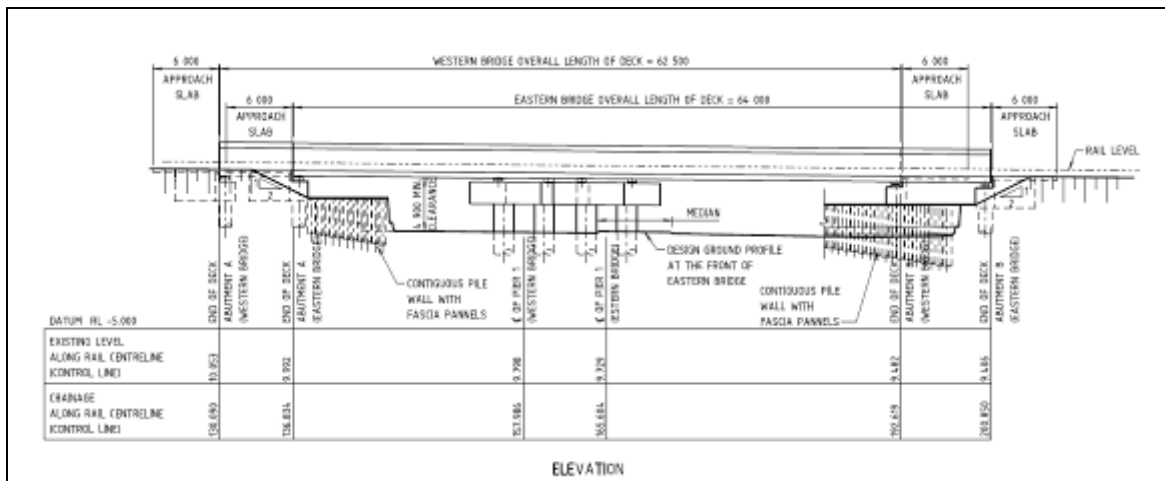
ROADS AND MARITIME SERVICES

BOTANY BAY COUNCIL AREA
 MR194 GENERAL HOLMES DRIVE, MR344 WENTWORTH AVENUE
 AND MR658 JOYCE DRIVE
 WESTCONNEX ENABLING WORKS - AIRPORT PRECINCT
 MASCOT
 GENERAL PLAN

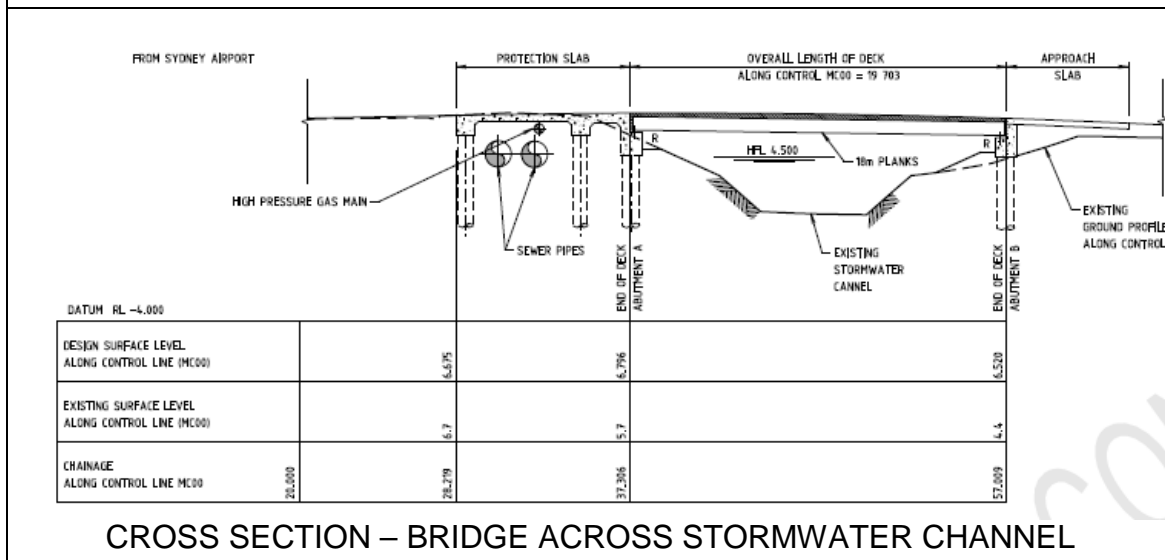
DRAWING 015-GE07.dgn	STAGE 100% CONCEPT	PART 1	PART 1
REGISTRATION NUMBER DS2014/004979		SHEET No. 015-GE07	

Appendix B2: Typical cross sections





ELEVATION
CROSS SECTION – RAIL BRIDGES



CROSS SECTION – BRIDGE ACROSS STORMWATER CHANNEL

Appendix C

Consideration of clause 228(2) factors and matters of national environmental significance

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline as detailed in the REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
<p>a) Any environmental impact on a community?</p> <p>Construction of the proposal would result in some short-term negative impacts, such as visual amenity impacts, traffic and access disruptions, in addition to potential noise and air emissions impacts. These issues could impact negatively on the local community as described in Section 7.3 (noise and vibration), Section 7.1 (land transport and access) and Section 7.10 (air quality).</p> <p>Operation of the proposal would increase noise by more than 2 dB(A) at two residential receivers north of Wentworth Avenue. A number of receivers currently experience exceedances of the Road Noise Policy base criteria, most of whom are acutely affected. These receivers would be considered for noise mitigation during detailed design.</p>	Short-term, minor, negative
<p>b) Any transformation of a locality?</p> <p>During construction, the proposal would result in temporary impacts on the existing locality, which would be predominantly through negative visual amenity impacts associated with construction machinery, temporary fencing, signage, light spill, vegetation clearing and the generation of wastes.</p>	Short-term, minor, negative
<p>In the longer term, the proposal would have an overall moderate visual impact on the area due to the construction of the new rail bridge and underpass, removal of existing trees, removal of railway embankment and intersection expansion. These visual impacts would be mitigated through the implementation of relevant safeguards outlined in Section 7.7.4.</p> <p>The proposal would also require the partial acquisition of about four properties and full acquisition of about 14 properties. All property acquisitions would be carried out in accordance with the <i>Land Acquisition (Just Terms Compensation) Act 1991</i>, the <i>Roads Act 1993</i> and Roads and Maritime's Land Acquisition Information Guide February 2012 (Roads and Maritime, 2012b).</p>	Long-term, moderate, negative
<p>c) Any environmental impact on the ecosystems of the locality?</p> <p>The construction footprint associated with the proposal would require a total of about 3.3 hectares of vegetation to be removed. The proposal would not remove any good quality native vegetation, threatened ecological communities or threatened species. Vegetation clearing for the proposal would not have any significant impact on the ecosystems of the locality, as the proposal would not impact habitat or viability of any species, including any threatened flora or fauna species. Biodiversity impacts are described further in Section 7.5.</p>	Long-term, minor, negative
<p>d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>During construction, the proposal would result in potential moderate to high visual impacts. The majority of visual impacts during construction would be caused by construction machinery, temporary fencing, signage, light spill and the generation of wastes.</p> <p>The construction footprint associated with the proposal would require about 3.3 hectares of vegetation to be removed. This would have the highest visual impact within the area of the proposed underpass, which would also require substantial earthworks during construction.</p> <p>Construction of the proposal would also affect the amenity of adjacent land uses due to noise and vibration and the generation of dust.</p>	Short-term, minor, negative

Factor	Impact
<p>The proposal would have an overall moderate visual impact on representative viewpoints. While the proposal is predominantly located within established road corridors, it is noted that two of the assessed viewpoints would experience a high visual impact, while an additional four viewpoints would experience a moderate to high visual impact due to the construction of the new rail bridge and underpass, removal of existing trees, removal of railway embankment and intersection expansion. These visual impacts would be mitigated through the implementation of relevant safeguards outlined in Section 7.7.4.</p>	<p>Long-term, moderate, negative</p>
<p>Notwithstanding the above visual impact of the proposal, some enhancements would improve the visual amenity for the area in the long term. These include:</p> <ul style="list-style-type: none"> • Screen planting, new trees and other landscaping along sections of Joyce Drive and General Holmes Drive • The redevelopment of Dr Darragh Reserve, on the south-east corner of the Botany Road/Wentworth Avenue intersection (refer to Section 4.2.3). This reserve would be consistent with planting and landscape treatments at the north-east corner of the Botany Road and Wentworth Avenue intersection. • The relocation of overhead powerlines to below ground • Landscaping in the area south of the extension of Wentworth Avenue. This would include removing weeds to open up views across the wetland, creating new landforms, and establishing indigenous shrub and grass vegetation • Landscaping on both sides of General Holmes Drive north of the Wentworth Avenue extension • Screen planting and landscaping at the closed railway level crossing. 	<p>Long-term, minor, positive</p>
<p>e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</p> <p>Three items of local heritage significance on the Botany Bay LEP would be demolished as a result of the proposal. These include the house at 1289 Botany Road, the house at 1291 Botany Road and the Beckenham Church School Hall. Tram tracks and about 20 metres of unlisted sandstone kerbing along Botany Road near Wentworth Avenue would also be removed. Four heritage-listed properties would be wholly acquired and three heritage-listed properties would be partially acquired as part of the proposal. The statement of heritage impact for each of these items indicates that their removal is not considered to be significant.</p> <p>Safeguards and management measures that would be implemented to minimise the proposal's heritage impact are outlined in Section 7.4.4.</p>	<p>Long-term, minor, negative</p>
<p>f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>The construction footprint associated with the proposal would require a total of about 3.3 hectares of vegetation to be removed. The proposal would not remove any good quality native vegetation, threatened ecological communities or threatened species. Vegetation clearing would result in the loss or degradation of habitat including minor loss of structural diversity, potentially affecting the availability of suitable shelter and nutritional resources for fauna. The removal of modified and exotic vegetation for the proposal would not result in a significant impact on the habitat of protected fauna. Measures proposed to minimise the proposal's biodiversity impact are outlined in Section 7.5.4.</p>	<p>Nil</p>

Factor	Impact
<p>g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>The proposal would not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air. The construction footprint associated with the proposal would require a total of about 3.3 hectares of vegetation to be removed.</p> <p>No native vegetation or threatened species would be removed as part of the proposal; however, potential foraging habitat for the Grey-headed Flying Fox, and the migratory Fork-tailed Swift and White-throated Needletail would be cleared. The proposal would not have a significant impact on these species.</p> <p>The proposal also has the potential to indirectly impact on wetland plant communities with local, regional and state conservation significance, including the Freshwater Wetland TEC. Potential impacts on the TEC would be managed by the identification and protection of a vegetated buffer (refer to Section 7.5.4).</p>	Nil
<p>h) Any long-term effects on the environment?</p> <p>The proposal would replace the existing rail level crossing on General Holmes Drive with an underpass at Wentworth Avenue. This would improve the movement of rail freight.</p> <p>The proposal would also improve traffic flow around Sydney Airport and to Port Botany, as well as support future growth and access to Sydney Airport through delivering improvements to the Mill Pond Road intersections with General Holmes Drive and Botany Road; and the widening of Joyce Drive and General Holmes Drive between O'Riordan Street and Mill Pond Road to three lanes in each direction.</p> <p>The safety of pedestrians and cyclists would be improved during the operation of the proposal. The proposal includes safe segregated new pedestrian and cyclist routes on Botany Road and Wentworth Avenue. The provision of a 2.5 metre shared-use path for pedestrian and cyclist routes on Botany Road and Wentworth Avenue would have a positive impact on user safety and connectivity.</p>	Long-term, moderate, positive
<p>i) Any degradation of the quality of the environment?</p> <p>The proposal has the potential to degrade the quality of the environment through accidental spills and erosion and sediment during construction. A Soil and Water Management Plan (SWMP) would be implemented to mitigate these impacts (refer to Section 7.8).</p>	Short-term, minor, negative
<p>j) Any risk to the safety of the environment?</p> <p>Construction of the proposal has the potential to temporarily decrease safety for other road users due to carrying out construction work adjacent to operating traffic lanes and the movement of construction vehicles to and from the site. This would be managed through the implementation of a Traffic Control Plan (TCP) (discussed further in Section 7.1.4).</p>	Short-term, minor, negative
<p>The safety of pedestrians and motorists would be improved during the operation of the proposal. The proposal includes safe segregated pedestrian and cyclist routes on Botany Road and Wentworth Avenue. The provision of a 2.5 metre shared-use path for pedestrian and cyclist routes on Botany Road and Wentworth Avenue would have a positive impact on user safety and connectivity.</p>	Long-term, minor, positive

Factor	Impact
<p>k) Any reduction in the range of beneficial uses of the environment?</p> <p>The proposal would require the full acquisition of about 14 privately owned properties (13 privately owned and one owned by Roads and Maritime) and the partial acquisition of about four properties (two privately owned and two owned by SACL). Some additional areas of land may also be required to be leased by Roads and Maritime during the construction period for use as compound and stockpile sites.</p> <p>While areas leased by Roads and Maritime during construction would be returned to the landholder after work is complete, other directly impacted land would be permanently acquired and, therefore, unable to be returned to its former land use.</p> <p>Roads and Maritime will consult with landholders impacted by the proposal. Property acquisition will be managed in accordance with the provisions of Roads and Maritime's Land Acquisition Policy (Roads and Maritime, 2012b) and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i>.</p>	<p>Long-term, moderate, negative</p>
<p>l) Any pollution of the environment?</p> <p>There is the potential for accidental spills of chemicals during construction which could affect the surrounding land, surface water and groundwater. There is the potential for air quality and noise amenity to be reduced during construction activities.</p>	<p>Short-term, minor, negative</p>
<p>m) Any environmental problems associated with the disposal of waste?</p> <p>The proposal area has been identified to contain non-friable asbestos north of Mill Pond Road; total petroleum hydrocarbons (TPH) and polycyclic aromatic compounds (PAH) within soils at various locations throughout the proposal area; and potentially contaminated stockpiled material located within a wetland area located north of Mill Pond Road. A remediation action plan would be prepared and implemented in accordance with SEPP 55 (refer to Section 6.9).</p> <p>Risks associated with the encountering of contaminated material (and its subsequent disposal) would be managed according to the safeguards outlined in Section 6.9. Contamination is discussed further in Section 6.8 of this REF; while discussion on the generation and disposal of waste is provided in Section 6.18.</p>	<p>Short-term, minor, negative</p>
<p>n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>The proposal would require resources such as concrete and asphalt, which are common construction materials. The proposal would not create any significant demand on these resources.</p> <p>All other required resources for the proposal are considered to be readily available and have not been identified as being short supply (refer to Section 7.15).</p>	<p>Nil</p>
<p>o) Any cumulative environmental effect with other existing or likely future activities?</p> <p>Construction of the proposal may overlap with other local development within the area. Given the nature of the proposal, cumulative impacts as a result of concurrent development is anticipated to be minor and would be managed according to safeguards outlined in Section 7.16.</p>	<p>Short-term, minor, negative</p>
<p>p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</p> <p>The proposal would not result in any impact on coastal processes and coastal hazards including those under projected climate change conditions.</p>	<p>Nil</p>

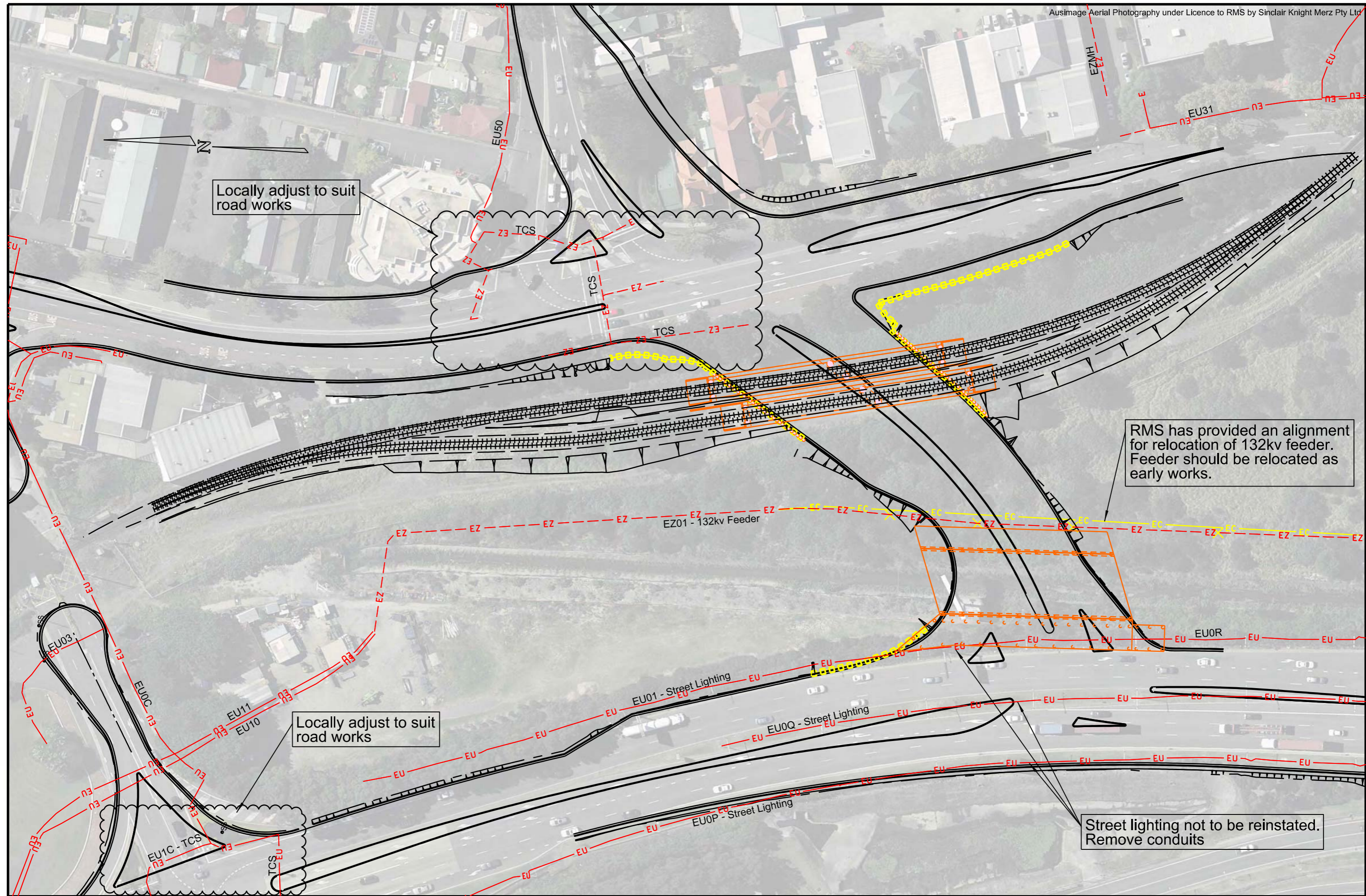
Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

Factor	Impact
<p>a) Any impact on a World Heritage property? The proposal would not impact on a World Heritage property.</p>	Nil
<p>b) Any impact on a National Heritage place? The Sydney Kingsford Smith Airport Group is an indicative place on the Commonwealth Heritage List, and is located to the west of the proposal. The road widening will encroach inside the heritage curtilage of the Sydney Kingsford Smith Airport Group. The extent of this is to a distance of about eight metres on the south side of Joyce Drive, and a distance of about two metres along a section of General Holmes Drive to Mill Pond Road. The exact distance that the proposal would encroach into heritage-listed curtilage would be determined during detailed design. The existing heritage curtilage of the Sydney Airport precinct will require adjustment. No known heritage items will be disturbed by the proposed widening of Joyce Drive and General Holmes Drive.</p>	Long-term, minor, negative
<p>c) Any impact on a wetland of international importance? The proposal would not directly impact on a wetland of international importance. The study area is located to the north of the Mill Ponds, which are part of the Botany Wetlands complex that forms a corridor downstream from Gardeners Road, including adjacent remnant vegetation in Eastlake and The Lakes Golf Courses; Sir Joseph Banks Park; around the Botany foreshore and vegetation backing onto the boundary of Sydney Airport to the east side of Penrhyn Bay (DECC, 2008). Sedimentation and erosion control measures to avoid indirect impact on the Mill Ponds and Botany Wetlands complex would be applied during construction (refer to Section 7.8.4).</p>	Nil
<p>d) Any impact on a listed threatened species or communities? The proposal would require the removal of about 0.20 hectares of potential foraging habitat for the Grey-headed Flying Fox (comprising Coast Banksias and nectar-producing street trees). This is not considered a significant impact as the amount of habitat to be cleared is minor.</p>	Nil
<p>e) Any impacts on listed migratory species? The proposal would require the removal of about 0.20 hectares of potential foraging habitat for the migratory Fork-tailed Swift and White-throated Needletail. Statements of significance completed for the Biodiversity Assessment conclude that the proposal would not have a significant impact on these species.</p>	Nil
<p>f) Any impact on a Commonwealth marine area? The proposal would not impact on a Commonwealth marine area.</p>	Nil
<p>g) Does the proposal involve a nuclear action (including uranium mining)? The proposal does not involve a nuclear action.</p>	Nil
<p>h) Water resource, in relation to coal seam gas development and large coal mining development? The proposal would not impact any water resource and does not involve a coal seam gas development or large coal mining development.</p>	Nil
<p>i) Additionally, any impact (direct or indirect) on Commonwealth land? About 9,908 m² of Commonwealth land would be acquired for the proposal and converted to road reserve. This process would be carried out in consultation with SACL.</p>	Long-term, minor, negative

Appendix D

Utility adjustments

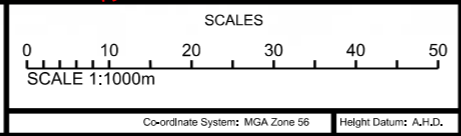


Locally adjust to suit road works

RMS has provided an alignment for relocation of 132kv feeder. Feeder should be relocated as early works.

Locally adjust to suit road works

Street lighting not to be reinstated. Remove conduits



PREPARED BY:
ROAD DESIGN ENGINEERING
ENGINEERING TECHNOLOGY
ASSET MAINTENANCE

Transport
Roads & Maritime
Services

DESIGNED: A. JEDNIUK
REVIEWED: A. JEDNIUK

ROADS AND MARITIME SERVICES

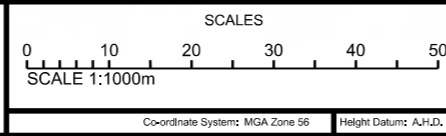
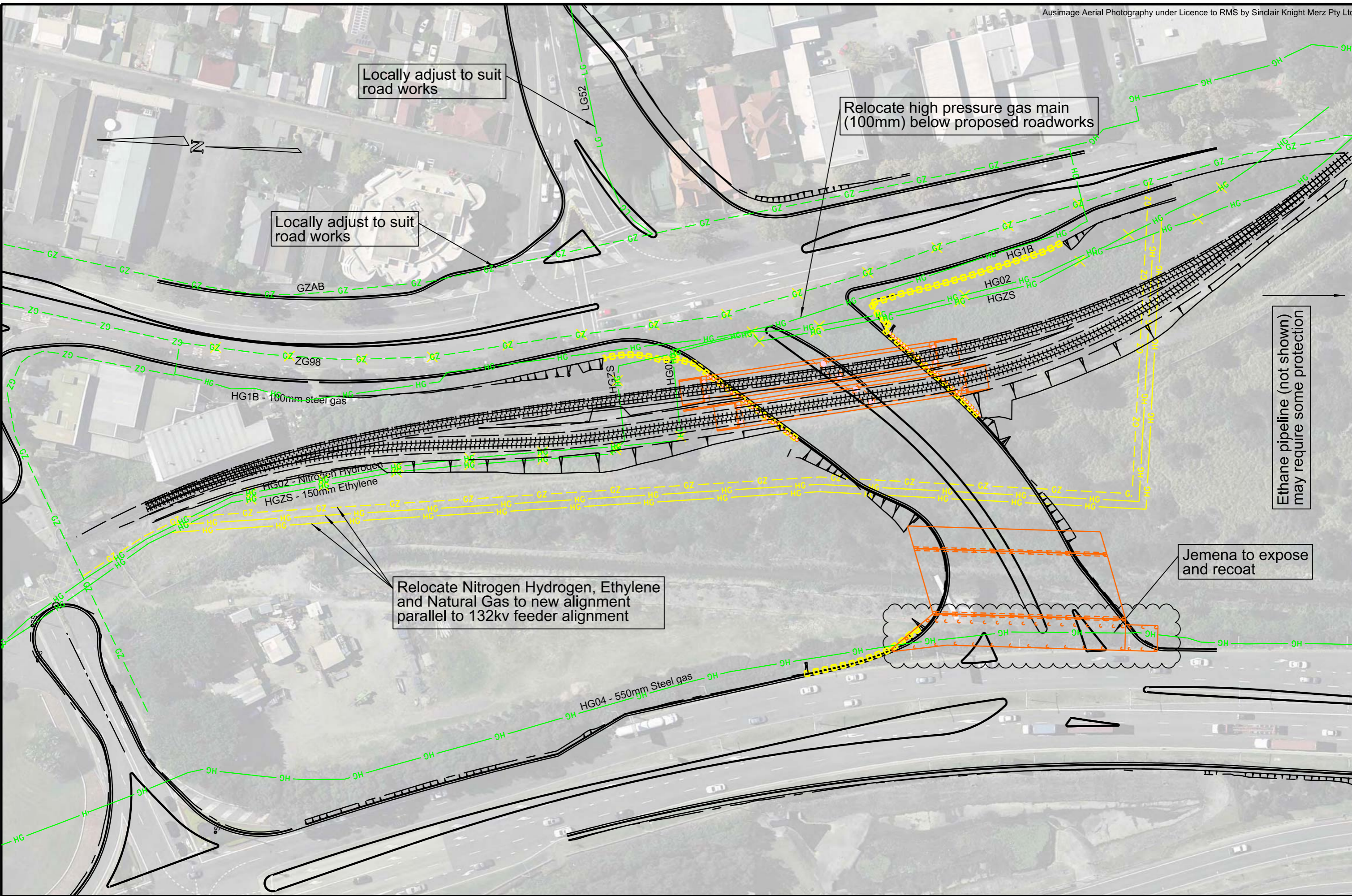
BOTANY BAY COUNCIL AREA
WESTCONNEX ENABLING WORKS
AIRPORT PRECINCT
MASCOT

NOT FOR CONSTRUCTION

UTILITIES RELOCATION-
ELECTRICITY

PRINTED DATE
26/06/2014

REVISION
1



PREPARED BY:
ROAD DESIGN ENGINEERING
ENGINEERING TECHNOLOGY
ASSET MAINTENANCE

NSW Government
Transport
Roads & Maritime
Services

DESIGNED: A. JEDNIUK
REVIEWED: A. JEDNIUK

ROADS AND MARITIME SERVICES

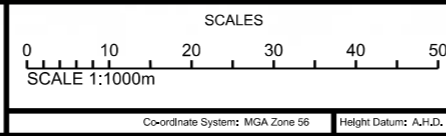
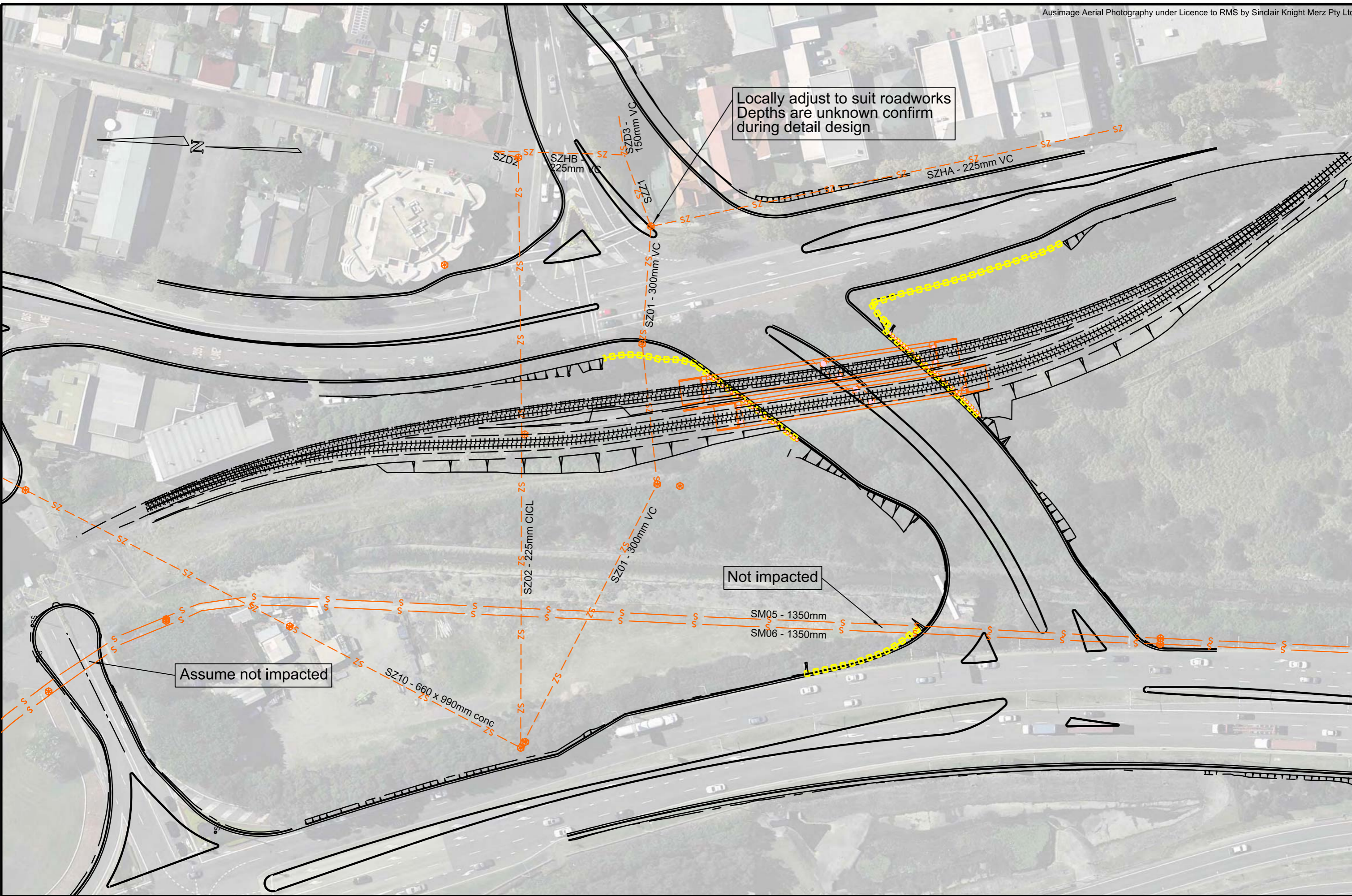
BOTANY BAY COUNCIL AREA
WESTCONNEX ENABLING WORKS
AIRPORT PRECINCT
MASCOT

NOT FOR CONSTRUCTION

UTILITIES RELOCATION-
GAS

PRINTED DATE
26/06/2014

REVISION
1



PREPARED BY:
 ROAD DESIGN ENGINEERING
 ENGINEERING TECHNOLOGY
 ASSET MAINTENANCE

NSW GOVERNMENT
 Transport
 Roads & Maritime
 Services

DESIGNED: A. JEDNIUK
 REVIEWED: A. JEDNIUK

ROADS AND MARITIME SERVICES

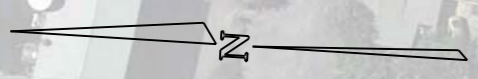
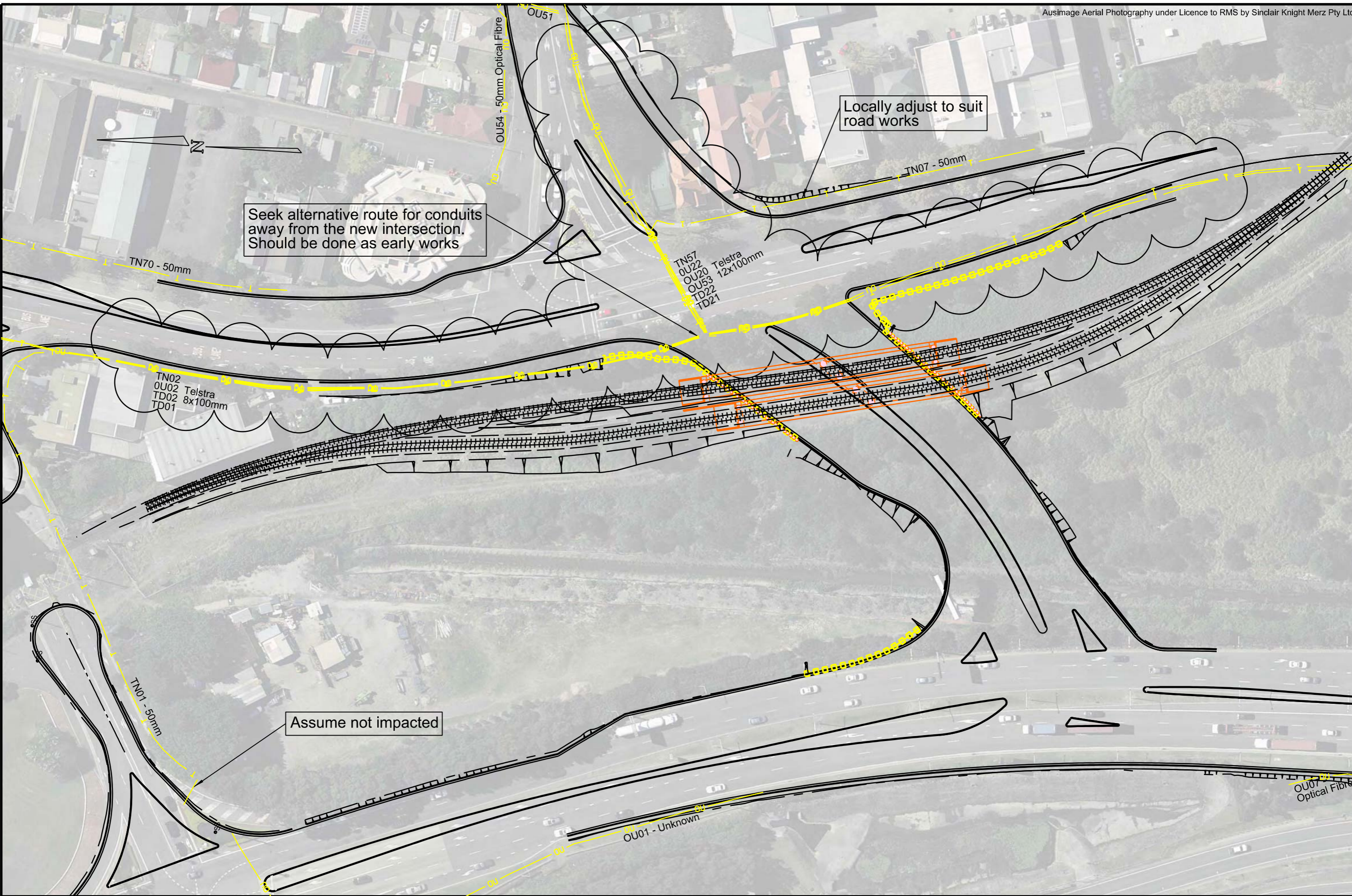
BOTANY BAY COUNCIL AREA
 WESTCONNEX ENABLING WORKS
 AIRPORT PRECINCT
 MASCOT

NOT FOR CONSTRUCTION

UTILITIES RELOCATION-
 SEWER

PRINTED DATE
 26/06/2014

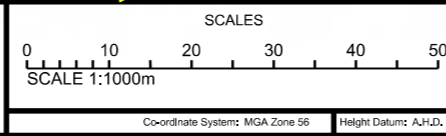
REVISION
 1



Seek alternative route for conduits away from the new intersection. Should be done as early works

Locally adjust to suit road works

Assume not impacted



PREPARED BY:
ROAD DESIGN ENGINEERING
ENGINEERING TECHNOLOGY
ASSET MAINTENANCE

Transport
Roads & Maritime
Services

DESIGNED, A. JEDNIUK
REVIEWED, A. JEDNIUK

ROADS AND MARITIME SERVICES

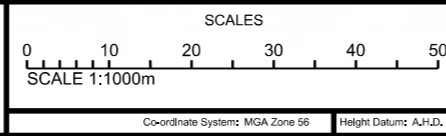
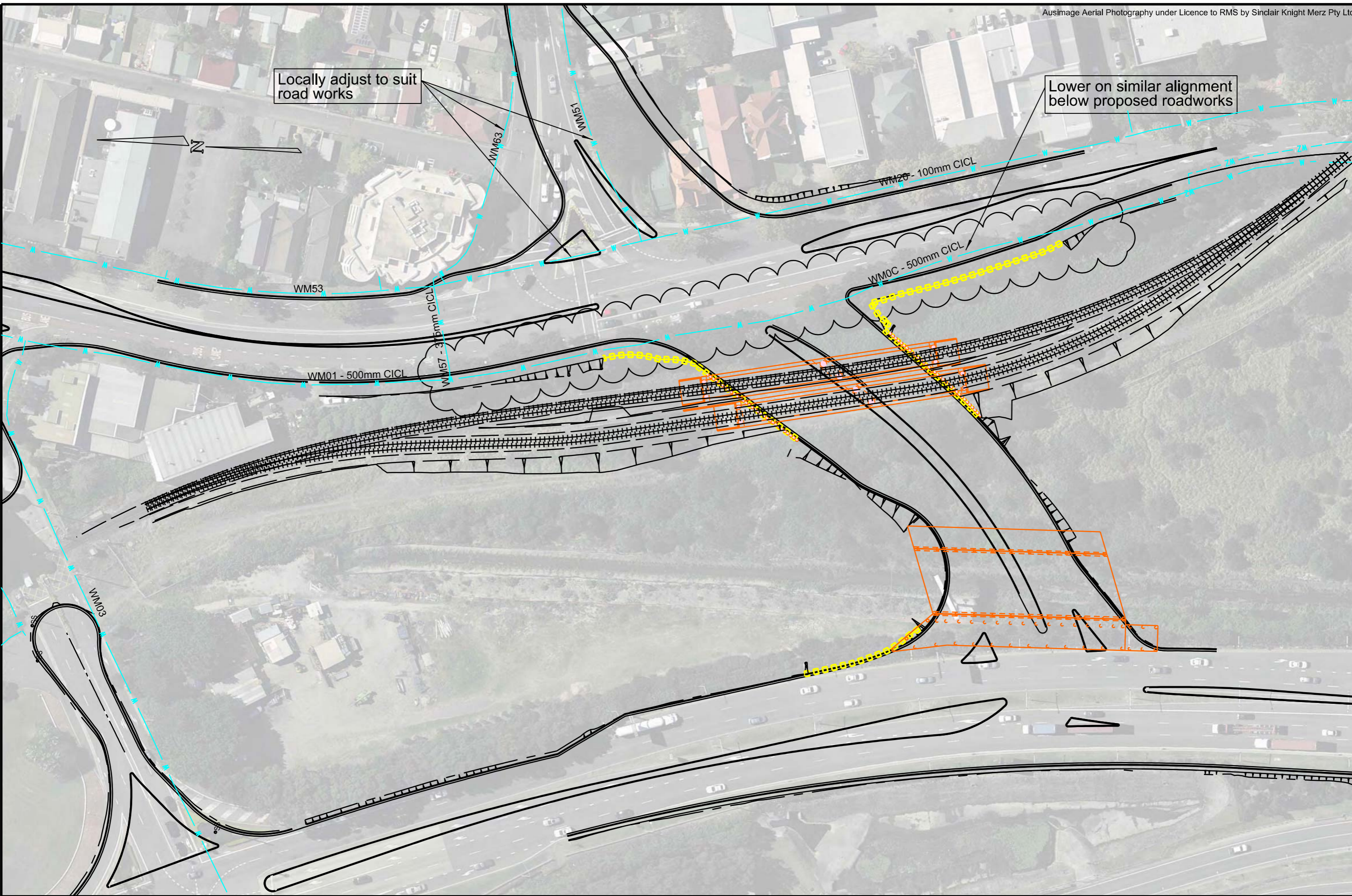
BOTANY BAY COUNCIL AREA
WESTCONNEX ENABLING WORKS
AIRPORT PRECINCT
MASCOT

NOT FOR CONSTRUCTION

UTILITIES RELOCATION-
TELECOMMUNICATIONS

PRINTED DATE
26/06/2014

REVISION
1



PREPARED BY:
ROAD DESIGN ENGINEERING
ENGINEERING TECHNOLOGY
ASSET MAINTENANCE

NSW GOVERNMENT
Transport
Roads & Maritime
Services

DESIGNED, A. JEDNIUK
REVIEWED, A. JEDNIUK

ROADS AND MARITIME SERVICES

BOTANY BAY COUNCIL AREA
WESTCONNEX ENABLING WORKS
AIRPORT PRECINCT
MASCOT

NOT FOR CONSTRUCTION

UTILITIES RELOCATION-
WATER

PRINTED DATE
26/06/2014

REVISION
1

Appendix E

Stakeholder consultation



Our reference: DOC14/151287
Contact: Peter Morrall 9995 6810

Liam Sheridan
Project Development Manager
Roads and Maritime Services
PO Box 973
PARRAMATTA NSW 2124

Dear Mr Sheridan,

RE: WestConnex Enabling Works – Airport East Precinct.

Thank you for your letter dated 1 August 2014 requesting the Environment Protection Authority's (EPA) comments for consideration in the preparation of the Review of Environmental Factors (REF) for the above project.

At this stage the EPA has no detailed comments to make on the proposal. However, the EPA considers that the REF should include a comprehensive noise impact assessment that clearly identifies noise impacts on the community and any planned noise mitigation measures. The noise impact assessment should address cumulative impacts from the project and activities being undertaken at Sydney Airport and Port Botany.

The REF should also investigate the requirement for the project to be licensed under the *Protection of the Environment Operations Act 1997* (POEO Act), particularly in relation to 'Railway systems activities' as defined under Schedule 1 of the POEO Act.

The EPA would appreciate the opportunity to provide more detailed comments after completion of the REF and prior to the commencement of construction.

If you have any questions in relation to this letter please contact Peter Morrall, Senior Operations Officer, EPA on 9995 6810 or by email peter.morrall@epa.nsw.gov.au.

Yours sincerely

A handwritten signature in blue ink, followed by the date '25.08.2014' written in blue ink.

Mark Hanemann
A/Unit Head Infrastructure
Environment Protection Authority

From: [Betts Judith](#)
To: [Cadungog, Vivira](#)
Subject: FW: WestConnex Enabling Works - airport east precinct ISEPP consultation
Date: Friday, 22 August 2014 10:49:24 AM

Hi Vivira

I have been asked to review and respond from an environmental perspective in regards to the west connex enabling works SEPP consultation letter. I have no issues in regards to the matters raised in this consultation. I have previously commented on potential environmental issues and it is more heritage, traffic and pedestrian impacts that the consultation relates to.

Regards

Judith Betts

Environmental Scientist
City of Botany Bay Council
T - 9366 3705
E - bettsj@botanybay.nsw.gov.au

Sustainable Botany Bay. Its our future. It makes sense.

From: Cadungog, Vivira [<mailto:VCadungog@globalskm.com>]
Sent: Monday, 4 August 2014 9:34 AM
To: Poulton Steven
Cc: SHERIDAN Liam J
Subject: WestConnex Enabling Works - airport east precinct ISEPP consultation

Hi Steve

Roads and Maritime Services are proposing to carry out road network improvements in the Airport east precinct. A Review of Environmental Factors (REF) is currently being prepared by Jacobs on behalf of Roads and Maritime.

While recognising Botany Bay City Council's involvement in the project to date, Roads and Maritime would like to provide Council with the opportunity to comment on the proposal. In this regard, please find attached the ISEPP consultation letter for the WestConnex enabling Works – airport east precinct REF.

It would be appreciated if you could provide any comments by 25 August 2014, 22 days from the date of this email. We would be pleased to provide further information if required.

A hardcopy was mailed to you on Friday via Express Post and should arrive shortly.

Kind regards

Vivira Cadungog on behalf of Liam Sheridan (Project Manager)
Jacobs
Environmental Planner
+61 2 4979 2680
Vivira.Cadungog@jacobs.com

710 Hunter Street
Newcastle West, NSW, 2302
Australia
www.jacobs.com

Jacobs is committed to working with its clients to deliver a sustainable future for all.
Please consider the environment before printing this e-mail.

Notice - This message contains confidential information intended only for the exclusive use of the addressee named above. No confidentiality is waived or lost by any mistaken transmission to you. If you have received this message in error please delete the document and notify us immediately.

Any opinion, text, documentation or attachment received is valid as at the date of issue only. The recipient is responsible for reviewing the status of the transferred information and should advise us immediately upon receipt of any discrepancy.

All email sent to Jacobs will be intercepted, screened and filtered by Jacobs or its approved Service Providers.

Any views expressed in this message or any attachments are those of the individual sender and cannot be relied upon for any legal relationship and is for information only, except where the sender specifies and with authority states them to be the views of the City of Botany Bay Council. The City of Botany Bay Council expressly disclaims liability for any loss or damage following from the content of this message or attachments, where direct or consequential.
