Great Western Highway and Reservoir Road intersection upgrade, Blacktown

Review of Environmental Factors

February 2018

NSW GOVERNMENT

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Roads and Maritime Services

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Prepared by Jacobs and Roads and Maritime Services

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Approval and authorisation

Title	Great Western Highway and Reservoir Road intersection upgrade, Blacktown, Review of Environmental Factors
Accepted on behalf of NSW Roads and Maritime Services by:	Johnny Curran Project Manager
Signed:	
Dated:	28/02/2018

Executive summary

The proposal

Roads and Maritime Services (Roads and Maritime), is proposing to upgrade the intersection of the Great Western Highway and Reservoir Road, Blacktown. The proposal involves the widening and upgrading of about 260 metres of the southern approach to the intersection from Reservoir Road between Honeman Close and the Great Western Highway, as well as the upgrade of the Reservoir Road northern approach to the intersection.

The proposal area includes the following sections of road:

- The Great Western Highway at the intersection with Reservoir Road,
- Reservoir Road between Honeman Close and the intersection with the Great Western Highway, and
- a short section of Reservoir Road to the north of the intersection.

Key features of the proposal would include:

- Upgrade of Reservoir Road from Honeman Close to the southern approach to the Great Western Highway (about 260 metres) to improve traffic efficiency. This includes acquiring a strip of land on the western side of Reservoir Road up to 30 metres beyond the existing road reserve boundary to provide:
  - Two dedicated right turn lanes into the Great Western Highway
  - Two through lanes
  - A dedicated left turn lane with a pedestrian crossing
- Duplicating the Great Western Highway (westbound) right turn lane onto Reservoir Road by utilising the existing chevron marked lane
- Upgrade Reservoir Road northern approach to the intersection including:
  - Localised widening of the north west corner of the intersection to accommodate the vehicle turning paths from the Great Western Highway dual right turn lanes
- Improve alignment of the Great Western Highway (westbound and eastbound) left turn slip lanes onto Reservoir Road
- Property acquisition and utility relocation to the ultimate design footprint to avoid future rework
- Adjustments to traffic signal infrastructure and reinstate existing safety camera infrastructure
- Upgrade and extension to the outlet of the cross culvert stormwater pipe including new outlet with headwall and scour protection (about 90 metres south of the intersection)
- Fill batters along the Reservoir Road northbound carriageway (4:1 slope)
- Vegetation clearing including an area of mapped Cumberland Plain Woodland endangered ecological community
- Utility adjustments including overhead powerline relocation, relocation of Telstra and NBN assets
- Driveway adjustment to adjacent businesses (petrol station and Mitre 10).

Need for the proposal

In February 2015, the NSW Government committed $300 million to the Urban Roads Pinch Point Program. The program aims to ease congestion on 32 of Sydney's busiest road corridors over the next 10 years, including the Great Western Highway. The proposal forms part of the Urban Roads Pinch Point Program.

The Great Western Highway/Reservoir Road intersection has been identified as a pinch point along the Great Western Highway corridor, with traffic congestion currently experienced by road users, particularly during morning and afternoon peak periods. The proposal would improve the overall performance of the Great Western Highway and Reservoir Road intersection, improve

travel time, reduce queue lengths, reduce congestion during the morning and afternoon peak periods, and improve road safety.

The proposal is consistent with NSW Government strategies to improve road transport throughout the state, revitalise suburbs and improving connectivity.

Proposal objectives and development criteria

The proposal aims to:

- Improve the right turn capacity of Reservoir Road northbound approach to Great Western Highway
- Improve the overall operational efficiency of the Great Western Highway and Reservoir Road intersection
- Improve road safety
- Deliver a solution that complements potential future intersection upgrades.

The development criteria for the proposal include:

- Ensure constructability and minimise utility impacts
- Minimise environment and community impacts
- Minimise property acquisition.

Options considered

Three options were identified and considered for the proposal, which included a 'do nothing' option (Option 1), an option to upgrade the northbound and westbound approaches to the intersection (Option 2), and an option to upgrade the northbound, southbound and westbound approaches to the intersection (Option 3).

Option 2 was selected as the preferred option as it performed best overall when evaluated against the proposal objectives and criteria. Option 2 and 3 had comparable congestion and safety benefits. Both Option 2 and 3 have construction related impacts though these could be satisfactorily managed with the implementation of safeguards.

The Do Nothing option avoided construction related impacts, however did not result in any safety or congestion improvements.

Option 3 performed well in the options analysis though when compared to Option 2, it had comparatively greater property acquisition impacts. Option 3 also had greater potential for operational noise impacts to residential receivers.

Statutory and planning framework

The proposed Great Western Highway and Reservoir Road Intersection Upgrade at Blacktown is subject to environmental impact assessment under Part 5 of the *Environmental Planning and Assessment Act 1979*. This review of environmental factors (REF) has been prepared to assess the environmental impacts of the proposal during construction and operation. The REF has been prepared in accordance with clause 228 of the Environment Planning and Assessment Regulation 2000 (the EP&A Regulation). In accordance with sections 111 of the EP&A Act, Roads and Maritime, as the proponent and determining authority, must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

As Roads and Maritime is a public authority and the proposed activity falls within the definition of a road or road infrastructure facilities under the *State Environmental Planning Policy (Infrastructure) 2007* (the Infrastructure SEPP), the proposal is permissible without consent. Consequently, the

environmental impacts of the proposal are being assessed by Roads and Maritime under Part 5 of the EP&A Act. An environmental impact statement is not required.

Community and stakeholder consultation

Roads and Maritime undertook stakeholder and community consultation in December 2017, which included the distribution of over 1700 community update letters to local residents and businesses, inviting feedback via email, mail or phone contact with the project team. Details of the proposal were also provided on the Roads and Maritime website and a targeted Facebook campaign was undertaken in December 2017.

In summary, 13 submissions were received from the community and stakeholders. The majority of respondents were in general support of the proposal. The key matters raised included:

- Left turning lane from Reservoir Road
- Pedestrian safety
- Entry and exiting ramps on the M4 Motorway from Reservoir Road.

Further details on the consultation undertaken to date, and future consultation are provided in Chapter 5 (Consultation) and Appendix G.

Environmental impacts

This REF identifies the potential environmental benefits and impacts of the proposal and outlines the management measures to mitigate the identified impacts. The main environmental impacts of the proposal are summarised below. Further information is provided in Chapter 6 (Environmental assessment) of this REF.

Noise and vibration

The proposal would involve temporary noise and vibration impacts to surrounding residential and other receivers as a result of construction works. A noise and vibration impact assessment was undertaken, which calculated a worst case scenario (with all equipment operating simultaneously) to model noise impacts during standard hours and out of hours' day, evening and night time works. This included the assessment of noise from one of the potential compound sites (Compound 4), representing the worst case impact in relation to the four identified potential compound sites with this one being located the closest to residential receivers.

The assessment found that there would be a number of highly noise affected residential receivers within the noise catchment area (NCA) closest to the road (NCA1). The largest numbers would be affected during the construction stages of Utility, Property and Service Adjustments, Bulk Excavation and Earthworks and Pavement Works. A small number of these receivers were also identified as experiencing noise impacts that would exceed the sleep disturbance criteria as a result of night works for some activities.

The majority of works is proposed to be completed outside of standard hours. It is proposed to work up to five nights for the duration of the construction period. High noise activities such as concrete cutting would be completed by midnight. Mitigation measures are proposed to manage these impacts. Sensitive receivers would also be informed of the proposed night work program and receive project updates during construction.

For operational noise levels, it was determined that the proposal was unlikely to result in road noise levels increasing by more than 2 dB(A) relative to existing road operations at surrounding receivers, and that no specific operational mitigation measures would be necessary.

Biodiversity

In the worst case scenario, the proposal would result in the removal of about 0.48 hectares in total of the following Plant Community Types (PCT):

- Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849)
- Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 835)
- Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071).

The proposal would also result in the removal of about 0.07 ha of planted native/exotic vegetation and about 1.30 ha of highly disturbed vegetation.

The *RMS Guideline for Biodiversity Offsets* (Nov 2016) indicates that offsets are to be considered where there is any clearing of national or NSW listed critically endangered ecological communities in moderate to good condition. The proposal would impact about 0.07 hectares of vegetation which meets this threshold therefore a plan for offsets or supplementary measures is to be developed for the proposal.

The vegetation to be removed was identified as representing suitable habitat for threatened fauna species, although the habitat was identified as being of moderate to poor quality. In addition, the proposal would require the removal of threatened plant species *Eucalyptus nicholii* (one individual tree) which has been planted at the edge of Reservoir Road.

No impacts to groundwater dependent ecosystems or aquatic biodiversity are anticipated. Overall the proposal would not be likely to significantly impact threatened species, populations or ecological communities or their habitats.

Landscape and visual

A landscape and visual impact assessment was carried out to assess the impacts of the proposal. The proposed works would alter the extent of road pavement, reconfigure the intersection, and result in the loss of vegetation along the western edge of Reservoir Road, which define the edge of the road corridor.

The landscape character impact assessment found that the greatest change in character was experienced at the road itself, as a result of increasing the paved area and the corresponding reduction in edge definition, as a result of vegetation clearing.

The overall visual impact of the proposal was assessed to be moderate on receiving viewpoints. The main impacts are as a result of vegetation clearing and the increased footprint of the road, increasing the dominance of the road in the view. Some temporary visual impacts were also identified during construction where the works would be visible from nearby properties and road users, particularly at potential compound sites.

These impacts would be mitigated through the consideration of urban design principles into the detailed design, including the preparation of a landscape plan.

Socio-economic

The socio-economic assessment concluded that while there would be negative impacts associated with the proposal, these impacts would largely be restricted to the construction phase of the proposal. The majority of the proposal would be undertaken within or immediately adjacent to the road corridor.

Impacts on the amenity of the affected residential receivers would be mitigated through the implementation of measures outlined in Section 7 and would include noise mitigation measures and consultation with landowners.

In the long term, the proposal would improve the overall efficiency and safety of the intersection for road users.

Non-Aboriginal heritage

Honeman Close is located to the immediate south of the proposal area, and has been identified as the site of the Former Great Western Road. This item is listed on the State Heritage Register (SHR) and the *Blacktown Local Environmental Plan 2015* (Blacktown LEP).

The proposal would result in potential impacts to this item during construction if appropriate management measures are not implemented. Potential impacts could occur as a result of access to the southern portion of the proposal area off Honeman Close, as well as access to the proposed Compound 1 located to the south of Honeman Close. Compound 2 is proposed to be located wholly within the SHR listing boundary along Boiler Close. Compound 3 is also partially located within the LEP listed boundary to the north west of the proposal area adjacent to the Great Western Highway.

Measures would be put in place to ensure no ground disturbance or excavation occurs within the heritage curtilage. Measures would include monitoring of the existing hardstand and protection where required to avoid damage from heavy vehicle and machinery tracking. Barrier fencing, mountable site sheds and ground protection measures, such as hardstand material or track mats, on non-hardstand areas within the curtilage are also proposed to protect potential impacts to the heritage item.

Additionally, the use of Compound 2 would require an Exemption Notification to be submitted to NSW Heritage Council with a copy of the REF in accordance with the *Heritage Act 1977*. This is on the basis that no excavation would occur within this site.

If any excavation or ground disturbance is required within these areas, further archaeological assessment and permit requirements would need to be investigated.

Justification and conclusion

The proposal forms part of Roads and Maritime's Urban Roads Pinch Point Program. The program aims to ease congestion on 32 of Sydney's busiest road corridors over the next 10 years, including the Great Western Highway. The proposal would provide improved capacity at intersection of the Great Western Highway and Reservoir Road.

The assessment of the proposal's impact has concluded:

- The proposal would be unlikely to cause significant impacts on the environment. Accordingly, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act. A Species Impact Statement is not required. The proposal is subject to assessment under Part 5 of the EP&A Act. Consent from Council is not required.
- The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A referral to the Australian Department of the Environment is not required.

Contents

Appendices

1 Introduction

This chapter introduces the proposal and provides the context of the environmental assessment. In introducing the proposal, the objectives and project development history are detailed and the purpose of the report provided.

1.1 Proposal identification

The NSW Roads and Maritime Services (Roads and Maritime) propose to upgrade the Great Western Highway/Reservoir Road intersection, Blacktown (the proposal). The intersection has been identified as a pinch point along the Great Western Highway corridor, with congestion experienced particularly during morning and afternoon peak periods. The proposal is required to address congestion and safety issues at this location and forms part of Roads and Maritime's Easing Sydney's Congestion and Urban Roads Pinch Point Programs.

Key features of the proposal include:

- Upgrade of Reservoir Road from Honeman Close to the southern approach to the Great Western Highway (about 260 metres) to improve traffic efficiency. This includes acquiring a strip of land on the western side of Reservoir Road up to 30 metres beyond the existing road reserve boundary to provide:
  - Two dedicated right turn lanes into the Great Western Highway
  - Two through lanes
  - A dedicated left turn lane with a pedestrian crossing
- Duplicating the Great Western Highway (westbound) right turn lane onto Reservoir Road by utilising the existing chevron marked lane
- Upgrade Reservoir Road northern approach to the intersection including:
  - Localised widening of the north west corner of the intersection to accommodate the vehicle turning paths from the Great Western Highway dual right turn lanes
- Improve alignment of the Great Western Highway (westbound and eastbound) left turn slip lanes onto Reservoir Road
- Property acquisition and utility relocation to the ultimate design footprint to avoid future rework
- Adjustments to traffic signal infrastructure and reinstate existing safety camera infrastructure
- Upgrade and extension to the outlet of the cross culvert stormwater pipe including new outlet with headwall and scour protection (about 90 metres south of the intersection)
- Fill batters along the Reservoir Road northbound carriageway (4:1 slope)
- Vegetation clearing including an area of mapped Cumberland Plain Woodland endangered ecological community
- Utility adjustments including overhead powerline relocation, relocation of Telstra and NBN assets
- Driveway adjustment and temporary construction access impacts to adjacent businesses (petrol station and Mitre 10).

The location of the proposal is shown in **Figure 1-1**. An overview of the proposal is shown in **Figure 1-2**, while a detailed description of the proposal is provided in Section 3.1.

Figure 1-1 Locality

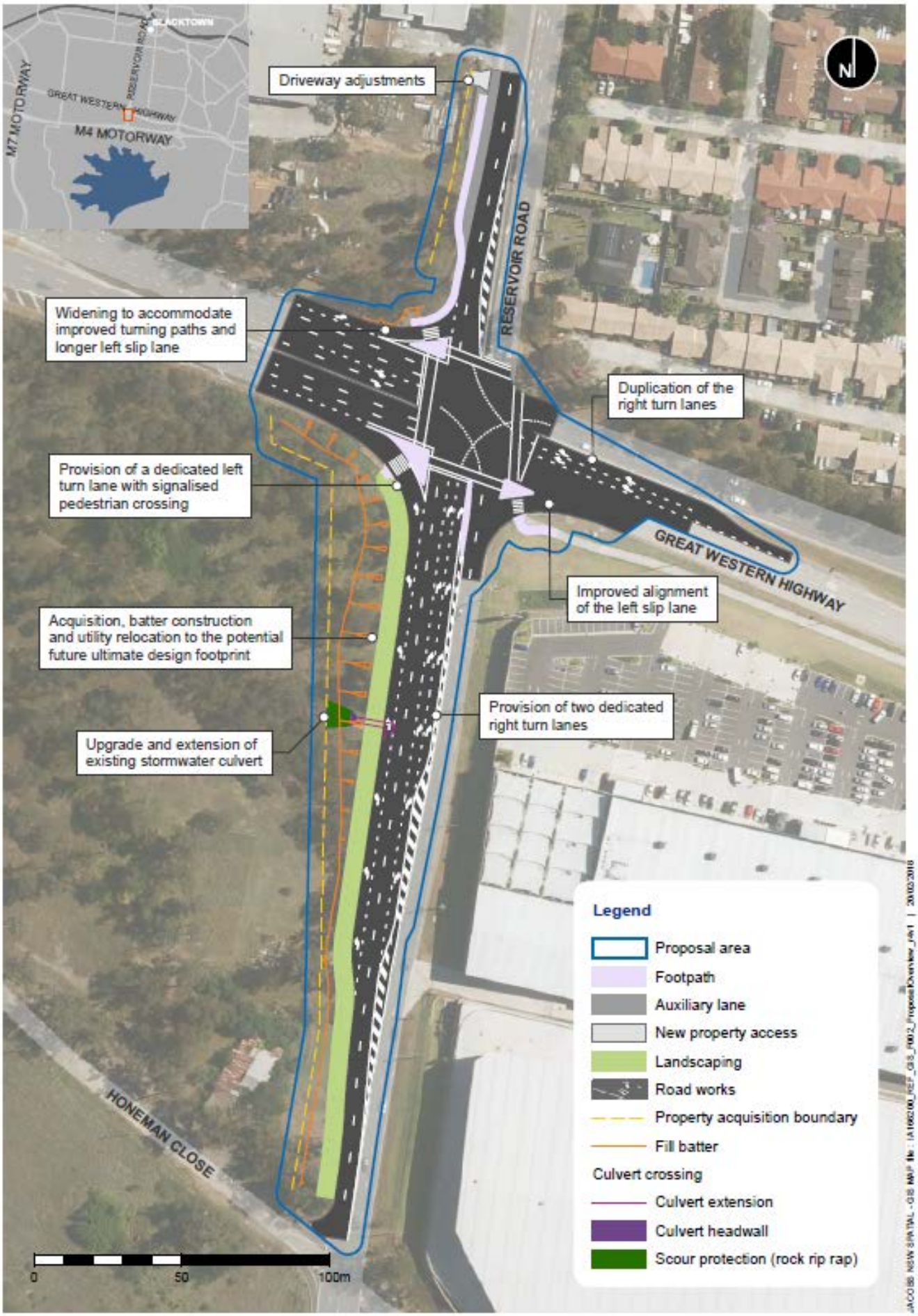

Figure 1-2 Proposal overview

1.2 Proposal location

The proposal is located within the suburb of Blacktown, which is located within the Blacktown City Council local government area (LGA) (refer to **Figure 1-1**).

The proposal area includes the Great Western Highway/Reservoir Road intersection, which is a four-way signalised intersection, with signalised pedestrian crossings at all approaches.

Reservoir Road provides access to the Blacktown central business district (CBD), about three kilometres north of the proposal, and the M4 Motorway, about 530 metres south of the proposal. The M4 Motorway is currently being upgraded by Roads and Maritime as part of the M4 Smart Motorways project. The Great Western Highway provides an east-west link from Penrith, about 20 kilometres west of the proposal, to Parramatta, about eight kilometres east of the proposal.

The area surrounding the Great Western Highway/Reservoir Road intersection is characterised by commercial, industrial and residential land uses. Commercial land uses are located within the south-east and north-west portions of the proposal area, including a Bunnings Warehouse, Mitre 10 and 7-Eleven petrol station. Residential land uses are located within the north-east portion of the proposal area. Unused land with established trees on private property is located within the south-west portion of the proposal area. It is noted though that at the time of writing this REF, this land was subject to an undetermined development application with Blacktown City Council which included proposed vegetation removal within the proposal area.

1.3 Purpose of the report

This REF has been prepared by Jacobs on behalf of Roads and Maritime's Easing Sydney's Congestion Program Office. For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation measures to be implemented.

The description of the proposed work and associated environmental impacts have been undertaken in the context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), the *Biodiversity Conservation Act 2016* (BC 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 seeks 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 findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and accordingly the necessity of an environmental impact statement, and whether approval is required to be sought from the Minister for Planning under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of

the Environment and Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

1.4 Terms used in this report

The following terms have been defined to describe the proposal in this REF:

- 'The proposal' refers to the design, construction and operation of the upgrade of the Great Western Highway/Reservoir Road intersection
- 'The proposal area' refers to the area that would be directly impacted by construction and operation of the proposal. It includes the total construction footprint, compound sites, stockpile sites and any other areas that would be temporarily disturbed
- '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. More specific definitions of the study area are provided in Chapter 6 of this REF.

2 Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

In February 2015, the NSW Government committed $300 million to the Urban Roads Pinch Point Program. The program aims to ease congestion on 32 of Sydney's busiest road corridors over the next 10 years, including the Great Western Highway. The proposal forms part of the Urban Roads Pinch Point Program.

The Great Western Highway/Reservoir Road intersection has been identified as a pinch point along the Great Western Highway corridor, with congestion experienced particularly during morning and afternoon peak periods.

Traffic modelling carried out for the proposal indicates that the Great Western Highway/ Reservoir Road intersection currently performs at a Level of Service (LoS) F during the morning peak period, with an average delay of 77 seconds and maximum queue length of 369.4 metres. During the afternoon peak period, the intersection also performs at a LoS F, with an average delay of 96.2 seconds and maximum queue length of 378.5 metres. By 2026, the intersection is predicted to continue to perform at a LoS F for both the morning and afternoon peaks, with increased average delays and increased maximum queue lengths up to 528.5 metres during the AM peak.

Observations made during a site visit in January 2017 identified the following:

- Heavy queuing was observed on the southern approach to the intersection along Reservoir Road, extending to the M4 overpass. The queue length was approximately 500 metres in both peak periods.
- Vehicles turning right from the southern approach had difficulty accessing the right turn bay due to the queue for the through movement blocking access to the right turn lane. The chevron median space was used by vehicles queuing to turn right.
- Heavy right turn movement from the eastern approach along the Great Western Highway was observed with queuing extending out of the right turn bay during the afternoon peak operation. Queuing on this approach was about 50 metres in the morning peak and about 200 metres in the afternoon peak.

Historical crash data relevant to the proposal area has been analysed for the five-year period between January 2011 and December 2015. 35 crashes (around 57%) occurred within ten metres of the intersection. Around 40% of crashes resulted in some level of injury (from minor to serious). No fatalities were recorded.

The crash summary indicates that over half of recorded crashes were rear end crashes (around 52%). A small number of crashes were occurred when vehicles entered the intersection from adjacent approaches (around 11%), vehicles turning in opposing directions (around 10%), vehicles changing lanes (around 8%) or vehicles turning in the same direction in parallel lanes (around 5%). This information has contributed to identifying the safety need for the proposal.

The proposed intersection upgrade would be expected to result in a reduction in rear-end crashes.

Further assessment of intersection performance and crash data analysis is provided in Section 6.1.

The existing drainage pit on the northeast corner of the intersection currently surcharges. This causes excessive water flow across the Reservoir Road at the intersection during rain events. The

upgraded pipe networks would increase the pipe efficiency, prevent the pit from surcharging and improve the road safety at the intersection.

The proposal would improve the overall performance of the Great Western Highway and Reservoir Road intersection, improve travel time, reduce queue lengths, reduce congestion during the morning and afternoon peak periods, and improve road user safety.

NSW Long Term Transport Master Plan

The *NSW Long Term Transport Master Plan* (Transport Master Plan) (NSW Government, 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.

The Great Western Highway (from Eastern Creek to Wentworthville) is identified as a pinch point corridor in the Transport Master Plan. The Transport Master Plan recommends targeted measures to improve congestion and road safety, with studies completed for targeted improvements along the Great Western Highway (from Eastern Creek to Wentworthville). The Great Western Highway/Reservoir Road intersection is identified as a potential site for treatment.

The proposal is required to address congestion and safety issues at this location and forms part of Roads and Maritime's Easing Sydney's Congestion and Urban Roads Pinch Point Programs.

Premier's Priorities and State Priorities

There are 30 State Priorities identified by the NSW Government to grow the economy, deliver infrastructure, protect the vulnerable, and improve health, education and public services across NSW. They include 12 priorities identified as the Premier's Priorities, which will allow the government to measure and deliver projects that create a stronger, healthier and safer NSW.

Building infrastructure is one of the priorities. Under this priority, the NSW Government is committed to improving road travel reliability. To ensure consistency of journey times on key roads continues to improve, the NSW Government is working to make better use of existing road infrastructure, build extra road capacity and encourage commuters to use public transport and to carry out off-peak travel more often.

The proposal would contribute to achieving this priority by improving travel time and travel time reliability, easing congestion and improving intersection performance and road safety at the Great Western Highway/Reservoir Road intersection.

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 throughout NSW.

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

Goals outlined in NSW 2021 which would be addressed by the proposal include:

- Goal 7: Reduce travel times
- Goal 10: Improve road safety.

The proposal is consistent with the objectives of NSW 2021 as it would ease congestion and improve intersection performance and road safety at the Great Western Highway/Reservoir Road intersection.

State Infrastructure Strategy

The *State Infrastructure Strategy* (Infrastructure NSW, 2012) is a 20 year strategy which identifies and prioritises the delivery of critical public infrastructure to drive productivity and economic growth.

Although the proposal is not specifically mentioned, the *State Infrastructure Strategy* makes a recommendation designed to improve pinch points in Parramatta and other growing centres. The *State Infrastructure Strategy* identifies that there has been a focus on large, long-term projects rather than the use of existing assets and opportunities to fix pinch points.

The *State Infrastructure Strategy* was updated in November 2014 in the *State Infrastructure Strategy Update* (Strategy Update) (Infrastructure NSW, 2014). The Strategy Update recommends that a reservation of $300 million should be made from the Rebuilding NSW initiative for the Urban Roads Pinch Points Program. The proposal forms part of the Urban Roads Pinch Point Program.

2.2 Existing infrastructure

The existing intersection layout and configuration is summarised below. The existing layout is also shown in **Figure 2-1**.

Great Western Highway

The Great Western Highway is classified as a State Road. The Great Western Highway provides an east-west link from Penrith, about 20 kilometres west of the proposal, to Parramatta, about eight kilometres east of the proposal. The posted speed limit on the Great Western Highway is 80 kilometres per hour in each direction.

The eastbound carriageway of the Great Western Highway consists of six lanes on the western side of the Great Western Highway/Reservoir Road intersection. This includes one left slip lane onto Reservoir Road, three through lanes and two dedicated right turn lanes onto Reservoir Road. The eastbound carriageway of the Great Western Highway consists of three through lanes on the eastern side of the intersection.

The westbound carriageway of the Great Western Highway consists of five lanes on the eastern side of the Great Western Highway/Reservoir Road intersection. This includes one left slip lane onto Reservoir Road, three through lanes and one dedicated right turn lane onto Reservoir Road. There is a chevron marked area between the right turn lane onto Reservoir Road and the through lane. The westbound carriageway of the Great Western Highway consists of three through lanes on the western side of the intersection, as well as a merge lane (about 100 metres long) from the Reservoir Road left slip lane.

Reservoir Road

Reservoir Road is classified as a State Road. Reservoir Road provides a north-south link, between the Blacktown CBD, about three kilometres north of the proposal, and the M4 Motorway, about 530 metres south of the proposal. The posted speed limit on Reservoir Road is 60 kilometres per hour in each direction.

The northbound carriageway of Reservoir Road consists of three lanes on the southern side of the Great Western Highway/Reservoir Road intersection. This includes two through lanes and a dedicated right turn lane onto the Great Western Highway. A left slip lane onto the Great Western Highway is located about 20 metres prior to the intersection. The northbound carriageway of Reservoir Road consists of two through lanes on the northern side of the intersection.

The southbound carriageway of Reservoir Road consists of three lanes on the northern side of the Great Western Highway/Reservoir Road intersection. This includes one shared though or left turn lane, one through lane and a dedicated right turn lane. The southbound carriageway of Reservoir Road consists of two lanes on the southern side of the intersection.

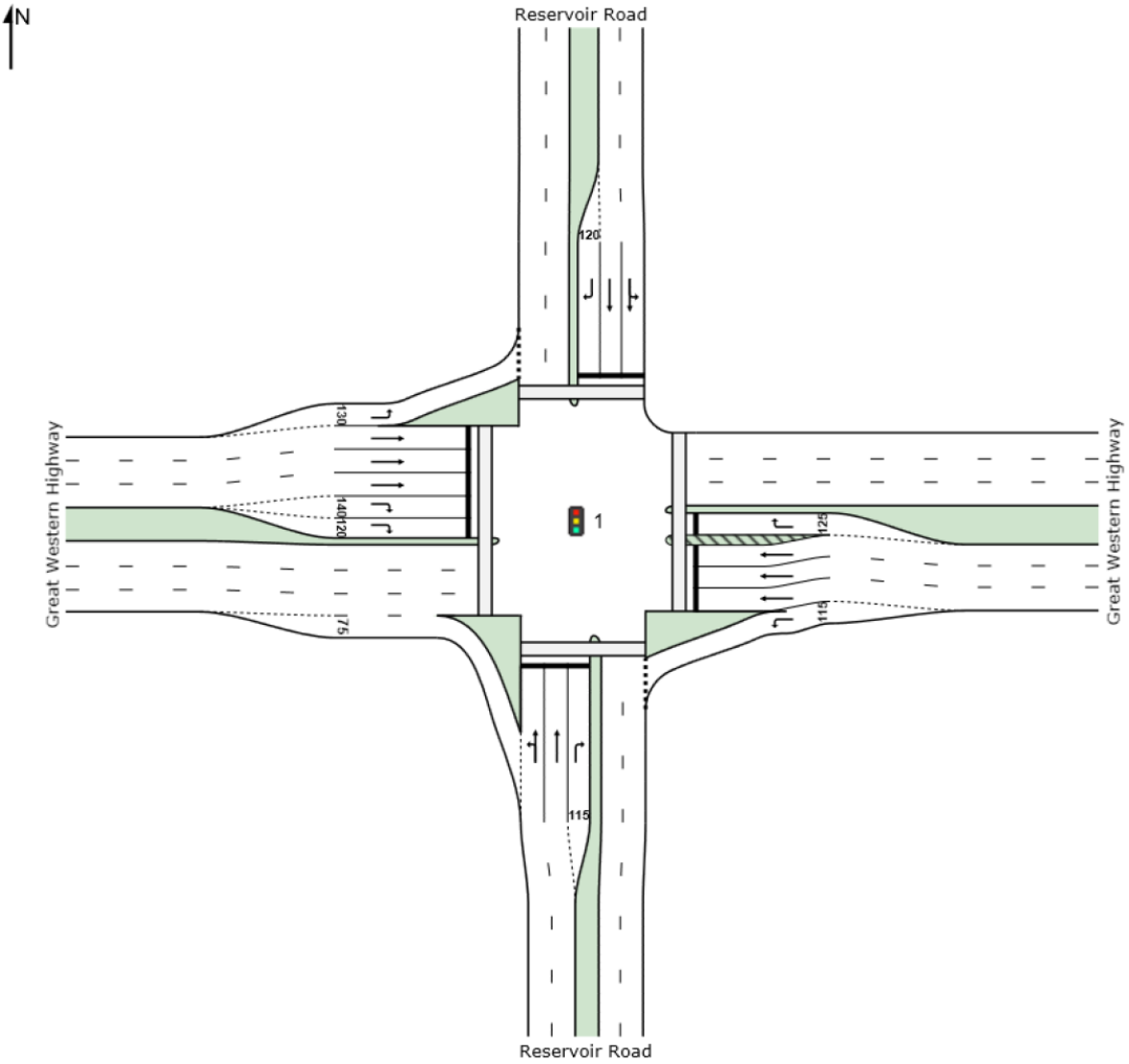

Figure 2-1: Existing intersection layout

Great Western Highway/Reservoir Road intersection

The Great Western Highway/Reservoir Road intersection is a four-way signalised intersection, with signalised pedestrian crossings at all approaches. A safety camera is located at the intersection.

Traffic light phasing of the intersection allows for concurrent right turn movements from the Great Western Highway onto Reservoir Road, and right turn movements from Reservoir Road onto the Great Western Highway.

Traffic modelling carried out for the proposal indicates that the Great Western Highway/ Reservoir Road intersection currently performs at a LoS F, with an average delay of over one minute, during the morning peak and afternoon period.

An existing sag area along Reservoir Road is located around 80 metres south of the intersection where the collected stormwater from both sides of Reservoir Road drainage networks is

discharged through the existing drainage culvert. The existing drainage network along the eastbound of Great Western Highway crosses Reservoir Road at the northern part of the intersection and discharges through an existing headwall around 190 metres west of the intersection.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The primary objectives of the proposal are to:

- Improve the right turn capacity of Reservoir Road northbound approach to Great Western Highway
- Improve the overall operational efficiency of Great Western Highway and Reservoir Road intersection
- Improve road safety
- Deliver a solution that complements potential future upgrades.

2.3.2 Development criteria

The development criteria for the proposal include:

- Ensure constructability and minimise utility impacts
- Minimise environment and community impacts
- Minimise property acquisition.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

During the strategic design phase, Roads and Maritime investigated potential intersection improvements which could address congestion issues at the Great Western Highway/ Reservoir Road intersection. During this phase it was identified that the proposal is intended to provide a short to medium term solution (i.e. to 2026) to address an existing Pinch Point. An additional project objective was also included which incorporated the need to 'deliver a solution that complements potential future upgrades' to evaluate whether identified options could be consistent with a potential future upgrade for beyond 2026 (hereafter referred to as potential ultimate options).

During concept design, intersection treatments were developed into design options and basic traffic modelling was also completed to review their potential benefits. These options and a 'Do Nothing' option were evaluated against identified proposal objectives (Section 2.3.1) and development criteria (Section 2.3.2). The options are outlined below in Section 2.4.2 and options analysis is presented in **Table 2-1**.

2.4.2 Identified options

The options considered are described below:

Option 1 – Do Nothing

The 'Do Nothing' option would result in no change to existing intersection conditions and the current lane configuration would remain unchanged. This option would involve no active measures to reduce traffic delays, manage congestion, or improve road safety.

Option 2 – Upgrade the northbound and westbound approaches to the intersection

Option 2 is represented in **Figure 2-2** and involves:

- Widening on the western side of Reservoir Road between Honeman Close and the Great Western Highway (about 260 metres) to accommodate:
  - Two dedicated right turn lanes into the Great Western Highway
  - Two through lanes
  - A dedicated left turn lane with a pedestrian crossing
- Duplicating the Great Western Highway (westbound) right turn lanes onto Reservoir Road by utilising the existing chevron marked lane
- Widening on the north-west corner of the intersection to:
  - Align with the vehicle turn paths of the dual right turn from the Great Western Highway
  - Improve the alignment of the existing left turn slip lane
- Improve the alignment of the Great Western Highway (westbound) left turn slip lane onto Reservoir Road
- Relocate utilities to the ultimate boundary footprint to avoid future rework. This includes acquisition to the ultimate boundary which is up to 30 metres from the existing boundary.

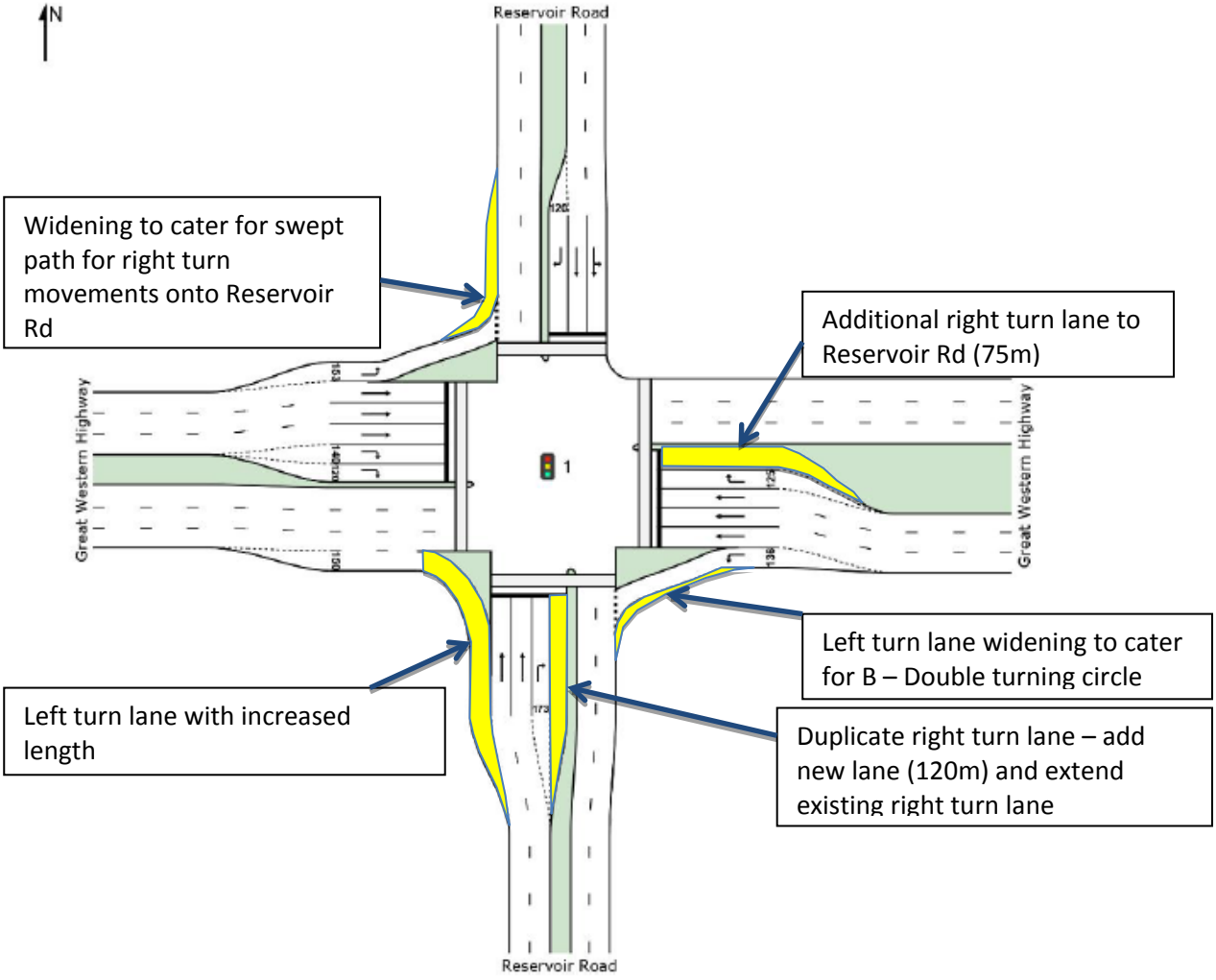

Figure 2-2: Option 2 intersection layout

Option 3 – Upgrade the northbound, southbound and westbound approaches to the intersection

This option is the same as option 2, however with additional widening on the southbound approach to the intersection to upgrade the lane configuration to dual through lanes and dedicated 60 metre left turn lane (onto Great Western Highway eastbound). This is represented in **Figure 2-3**.

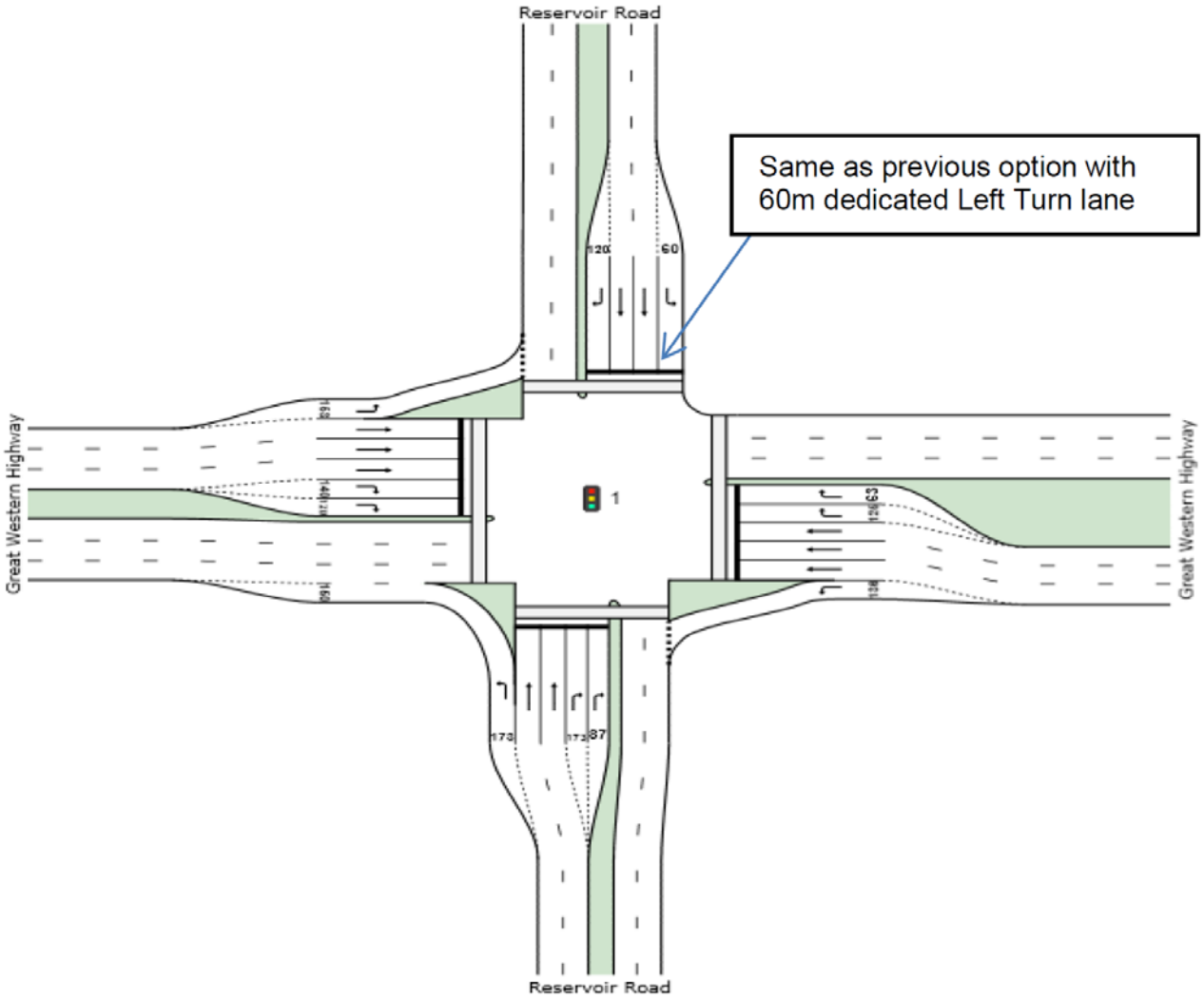

Figure 2-3: Option 3 intersection layout

2.4.3 Analysis of options

A review of each option against the proposal objectives (refer to Section 2.3.1) and criteria (refer to Section 2.3.2) is provided below in **Table 2-1**.

Table 2-1: Options analysis against the proposal objectives and criteria

Proposal objectives and criteria	Option 1 - Do Nothing option	Option 2	Option 3
Improve the right turn capacity of Reservoir Road northbound approach to Great Western Highway	☒ **Objective not met** Right turn capacity would not improve. Modelling indicates an increase in queue lengths (additional 40m+) and delay times (increase to over 2 minutes) by 2026. Reservoir Road northbound would also become a bottleneck once M4 Motorway upgrade works are complete.	☑ **Objective met** This option would reduce delay time by up to two minutes (124 seconds) and reduce queue lengths by up to 158 metres.	☑ **Objective met** This option would reduce delay time by up to two minutes (124 seconds) and reduce queue lengths by up to 159 metres.
Improve the overall operational efficiency of Great Western Highway/ Reservoir Road intersection	☒ **Objective not met** Overall intersection performance during the existing AM and PM peaks are LOS F. The do nothing option would result in no improvement (2026 model remains LOS F in 2026). Modelling also indicates that queue lengths and delay times would increase on all approaches	☑ **Objective met** >Modelled 2016 LoS improves to D in AM peak and E in PM peak >Modelled 2026 AM peak improves to LoS E >Delay time reduces up to 45 seconds >Reduces queue lengths by up to 147 metres >Improved LoS for GWH (westbound) RHT movement	☑ **Objective met** >Modelled 2016 LoS improves to D in AM peak and E in PM peak >Modelled 2026 AM peak improves to LoS D >Delay time reduces up to 54 seconds >Reduces queue lengths by up to 214 metres >Improved LoS for GWH (westbound) RHT movement
Improve road safety	☒ **Objective not met** No safety improvement. Existing safety issues would persist including queue lengths extending beyond RHT bays, width of stormwater flow in kerbside lanes and non-standard horizontal alignment	☑ **Objective met** >Proposed treatment options address the identified crash history. >increased RHT bay capacity to reduce queuing into through lane >Reduced queue length to also address rear end/lane change crash history >Reduced risk of aquaplaning (reduced kerbside stormwater flow width) >Improved road alignment and cross fall	☑ **Objective met** Same as option 2.

Proposal objectives and criteria	Option 1 - Do Nothing option	Option 2	Option 3
Deliver a solution that complements potential future upgrades	☒ **Objective not met** Potentially greater issues in future in relation to cost, constructability, potentially greater utility impacts, higher cost of land acquisition.	☑ **Objective met** >The design complements a potential future ultimate upgrade option. Acquisition and utility relocation are proposed to the ultimate boundary, including batter construction.	☑ **Objective met** The design complements a potential future ultimate upgrade option. Acquisition and utility relocation are proposed to the ultimate boundary, including associated batter construction.
Ensure constructability and minimise utility impacts	☑ **Objective partially met** No change therefore no constructability issues at present. (However, this may present a risk of potential future constructability issues if construction is required for the potential ultimate option under greater traffic pressures and with potentially greater utility asset impacts).	☑ **Objective met** Construction impacts would be associated with the proposal however they are considered manageable with appropriate planning and mitigation measures. >Temporary construction access impacts to Mitre 10 and service station >Estimated 12month construction duration >Protects utilities for ultimate upgrade option >The design and construction (i.e. timing and of the proposal have been considered in combination with the adjacent M4 Smart Motorways project	☑ **Objective partially met** Construction impacts would be associated with the proposal however they are considered manageable with appropriate planning and mitigation measures. >Access impacts would be experienced to both commercial and residential properties during construction on the southbound approach to the intersection. >Construction duration would be comparatively longer than option 2. >Protects utilities for ultimate upgrade option >The design and construction of the proposal have been considered in combination with the adjacent M4 Smart Motorways project
Minimise environment and community impacts	☑ **Objective partially met** No change therefore no acquisition impacts. (However if the potential ultimate option is pursued in the future, there would be greater cost required including costs related to land acquisition and utility adjustments)	☒ **Objective not met** > Vegetation removal required > Construction traffic impacts > Construction noise impacts	☒ **Objective not met** >Comparatively greater construction traffic and construction noise impacts to option 2 due to greater construction duration and scope of works > Potential operational noise impacts as a result of the road moving closer to receivers on the north-east corner of the intersection > Residents on southbound approach would be affected by strip acquisition

Minimise property acquisition	☑ **Objective partially met** No change therefore no acquisition impacts. (However greater land acquisition cost would be required in future to pursue the potential ultimate option).	☒ **Objective not met** Property acquisition would be required though can be limited to commercial property acquisition (three properties zoned for industrial use) and avoids residential property impacts.	☒ **Objective not met** Property acquisition would be required on multiple commercial and private properties (residential impacts). Widening on Reservoir Road southbound approach to the intersection would require strip acquisition along the frontage of a service station. This is not favoured due to a range of potential risks including risk of substantial cost, underground asset impacts, impacts on commercial operation during construction, contamination, and waste management.

2.5 Preferred option

Option 2 was selected as the preferred option as it performed best overall when evaluated against the proposal objectives and criteria. Option 2 and 3 had comparable congestion and safety benefits. Both Option 2 and 3 have construction related impacts though these can be satisfactorily managed with the implementation of safeguards.

The Do Nothing option avoided construction related impacts, however did not result in any safety or congestion improvements.

Option 3 performed well in the options analysis, though when compared to Option 2, it had comparatively greater property acquisition impacts. Option 3 also had greater potential for operational noise impacts to residential receivers.

3 Description of the proposal

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

3.1 The proposal

The proposal includes the upgrade of the Great Western Highway/Reservoir Road intersection, Blacktown. The proposal is required to address congestion and safety issues at this location and forms part of Roads and Maritime's Easing Sydney's Congestion and Urban Roads Pinch Point Programs.

The location of the proposal is shown in **Figure 1-1**. The proposal area and key features are shown in **Figure 1-2**. Drawings of the detailed design for the proposal are included in **Appendix C**.

Key features of the proposal include:

- Upgrade of Reservoir Road from Honeman Close to the southern approach to the Great Western Highway (about 260 metres) to improve traffic efficiency. This includes acquiring a strip of land on the western side of Reservoir Road up to 30 metres beyond the existing road reserve boundary to provide:
  - Two dedicated right turn lanes into the Great Western Highway
  - Two through lanes
  - A dedicated left turn lane with a pedestrian crossing
- Duplicating the Great Western Highway (westbound) right turn lane onto Reservoir Road by utilising the existing chevron marked lane
- Upgrade Reservoir Road northern approach to the intersection including:
  - Localised widening of the north west corner of the intersection to accommodate the vehicle turning paths from the Great Western Highway dual right turn lanes
- Improve alignment of the Great Western Highway (westbound and eastbound) left turn slip lanes onto Reservoir Road
- Property acquisition and utility relocation to the ultimate design footprint to avoid future rework
- Adjustments to traffic signal infrastructure and reinstate existing safety camera infrastructure
- Upgrade and extension to the outlet of the cross culvert stormwater pipe including new outlet with headwall and scour protection (about 90 metres south of the intersection)
- Fill batters along the Reservoir Road northbound carriageway (4:1 slope)
- Vegetation clearing including an area of mapped Cumberland Plain Woodland endangered ecological community
- Utility adjustments including overhead powerline relocation, relocation of Telstra and NBN assets
- Driveway adjustment and temporary construction access impacts to adjacent businesses (petrol station and Mitre 10).

3.2 Design

3.2.1 Design criteria

General

The road design has been developed in accordance with the following guidelines, standards and correspondence:

- Information received in meetings/emails from Roads and Maritime and Downer Mouchel

- Roads and Maritime documents
- Austroad Design Guidelines
- Published Roads and Maritime supplements to Austroad Guidelines
- Australian Standards
- Published Roads and Maritime supplements to Australian Standards
- Standards Australia handbooks.

The proposal

The design criteria used for the development of the concept design for the proposal is outlined in **Table 3-1**.

Table 3-1 Design criteria

Design element	Design value
Road geometry	
Posted speed	60 km/h on Reservoir Road
Design vehicle	19 metre semi-trailer and 26 metre B-Double
Check vehicle	26 metre B-Double
Stopping and approach sight distance	83 metres
Safe intersection sight distance	141 metres
Minimum through lane width	3.3 metres
Absolute minimum turn lane width	3.0 metres
Horizontal alignment	176 metres (3.0% superelevation)
Vertical alignment	0.5% (minimum), 8.0% (maximum)
Minimum K values	13.3 (sag), 15.3 (crest)
Average Recurrence Interval (ARI) storm event	Minor: 10 year ARI Major: 100 year ARI

3.2.2 Engineering constraints

A series of engineering constraints were identified during the development of the design, including the construction and operational phases of the proposal. The main constraints associated with the proposal include:

- Overhead and underground utility assets including Endeavour Energy, Optus, Telstra and NBN
- Undetermined development application for the parcel of land along the western side of Reservoir Road (risks include potential impacts to drainage design, constructability access)
- Stormwater drainage from the adjacent Bunnings property
- Potential cumulative impacts associated with the approved M4 Smart Motorway upgrade.

3.2.3 Major design features

The proposal involves upgrading the northbound and westbound approaches to the Great Western Highway and Reservoir Road intersection to increase intersection efficiency. This requires

widening on the western side of Reservoir Road (northbound approach) and widening on the north-west intersection corner. The proposed intersection layout is shown in **Figure 2-2**.

The key features of the proposal are described below and represented in **Figure 1-2**.

Horizontal and vertical alignment

The horizontal alignment of Reservoir Road between Honeman Close and Great Western Highway would shift slightly to the west to accommodate the additional right turn lane. The existing corridor would be widened to the west for the additional lanes and slightly increased through lane widths. This widening would extend up to 30 metres to the west to also accommodate utility adjustment to the potential ultimate boundary.

The horizontal alignment of the westbound approach to Great Western Highway would remain relatively unchanged as the additional right turn lane can be accommodated by utilising the existing chevron area.

There would be minor changes to the horizontal alignment of the northern leg of the intersection to cater for the vehicles turning paths from the dual right turn lane from Great Western Highway.

Typical pavement crossfall and superelevation will match the existing condition. At the intersection, vertical alignment would generally follow the existing road levels. The vertical alignment of Reservoir Road between Honeman Close and Great Western Highway would be improved slightly to correct an existing dip in the road (for the northbound carriageway).

Typical Cross Section

Reservoir Road (northbound approach to intersection)

The typical cross section of Reservoir Road would consist of two through lanes in each direction plus northbound turning lanes, separated by a short length of modified concrete island, plus chevron marking. **Figure 3-1** shows a typical cross section through the Reservoir Road northbound carriageway, about 60 metres south of the intersection which includes:

- Two 3.5 metre wide through lanes
- Two 3.0 metre wide right turn lanes
- A 3.5 metre wide left turn lane
- 1.5 metre wide concrete island, plus chevron marking
- 7.5 metre wide verge (with provision for future traffic lane and footpath)
- 4:1 fill batter. Overall verge width 7.1m including batter.

Great Western Highway (westbound approach to intersection)

The typical cross section of Great Western Highway Reservoir Road would remain similar to existing though with the existing chevron area converted to a second right turn lane. The opposing traffic would be separated by the existing raised concrete median. **Figure 3-2** shows a typical cross section of Great Western Highway, about 60 metres east of the intersection. The width of the left turn lane would also marginally increase to accommodate the improved geometry of the left turn.

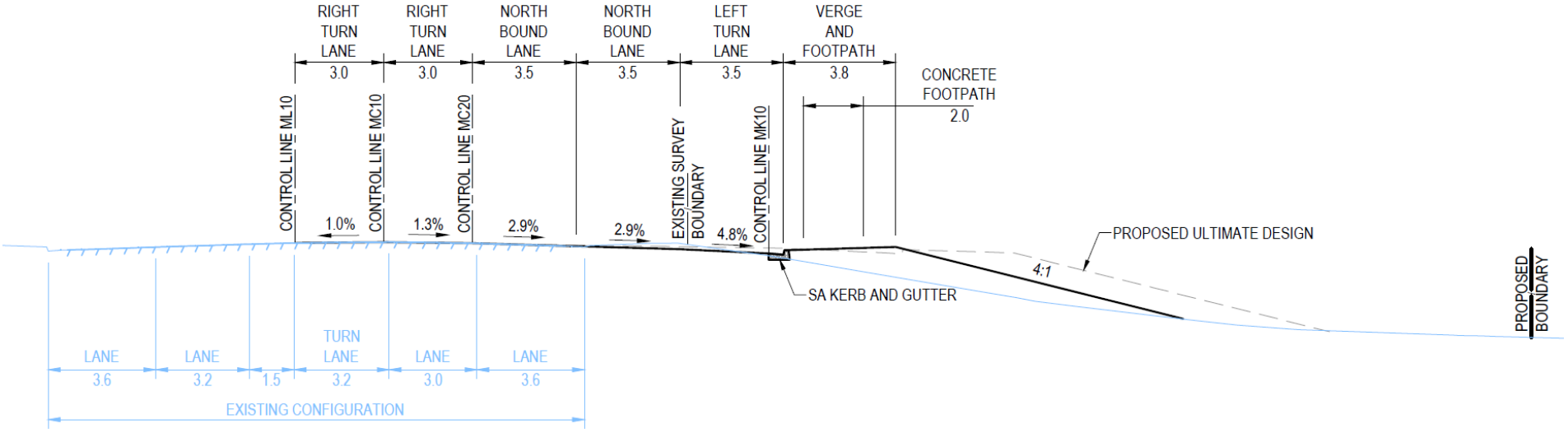

Figure 3-1: Cross section of Reservoir Road northbound approach to intersection Great Western Highway (westbound approach to intersection) (Note – the footpath shown is not included in the proposal, but has been included here to demonstrate the provision for potential future footpath).

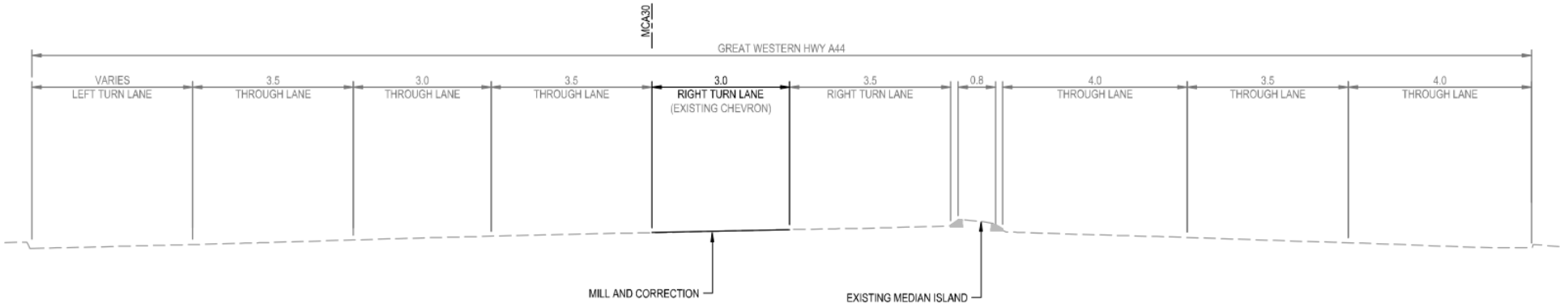

Figure 3-2: Cross section of Great Western Highway westbound approach to intersection

Stormwater

The proposal would involve upgrading the existing stormwater drainage system to manage the increase in pavement drainage flows.

The proposal would increase the catchment of the existing road drainage network by about 1,852 square metres. New pits and pipes would be required along the proposed left turn bay on Reservoir Road northbound.

The existing stormwater pipe crossing beneath Reservoir Road (about 100 metres south of the intersection) would need to be extended, including the existing 0.45 metre and twin 0.75 metre diameter pipes. This flows in a westerly direction to the property to the west of Reservoir Road.

The outlet on the western side of Reservoir Road would also need to be upgraded. This will include construction of concrete headwall and wing-walls, and rock scour protection up to 9.5 metres from the outlet point (refer to **Figure 3-3**).

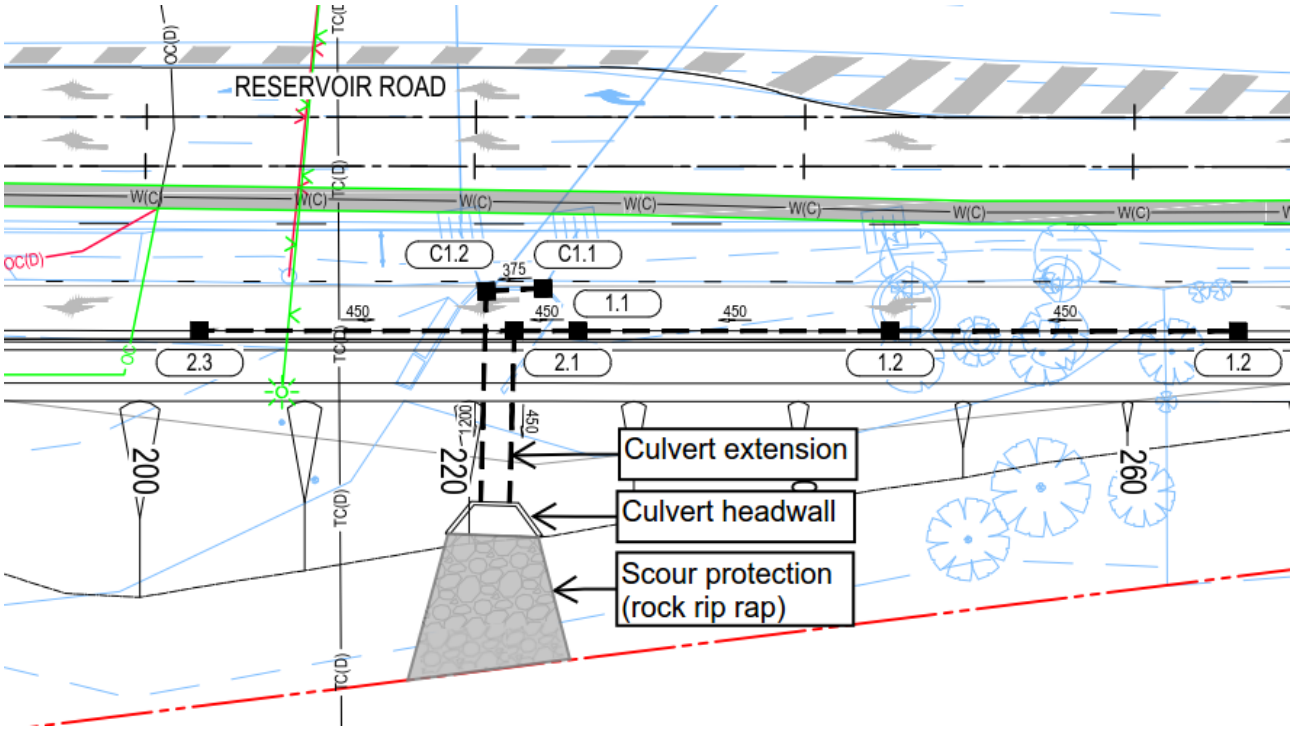

Figure 3-3: Culvert extension works

Property access

The proposal would require private driveway adjustment to both 6 Honeman Close and the Mitre 10 property at the north west corner of the intersection. Temporary construction access impacts would be managed with the implementation of standard safeguard measures as outlined in Chapter 7.

Traffic Control Signal

The current traffic control signal phasing and traffic loops and detectors would be upgraded to suit the upgraded intersection layout. Additionally, the safety camera located on the Great Western Highway would be relocated to suit the new kerb line.

Fill batter

The construction of the fill batter would involve:

- Extending the stormwater culvert
- Constructing new embankment to subgrade level
- Relocating utilities to new embankment
- Constructing new pavement drainage lines
- Constructing new pavement.

Vehicular access would be from the base of the batter and accessed from the corner of Honeman Close and Reservoir Road. 1 in 4 batter slopes would be used for the proposed works along the western edge of the proposal. The batter would be seeded by grass and would be finalised during detailed design. Refer to **Figure 3-1** showing a cross section of the proposed batter design.

Landscaping

Landscaping is proposed to stabilise the verge batter areas. Exact details of the landscaping proposed would be determined during detailed design and would consider urban and landscape design principles.

Other

- Street lighting adjustments would be required
- There are no existing bus facilities within the proposal area and no proposed change to existing bus facilities located to the north of the proposal area along Reservoir Road
- Existing parking restrictions would be unaffected by the proposal
- No retaining walls are proposed.

3.3 Construction activities

3.3.1 Work methodology

Construction activities would be guided by a Construction Environmental Management Plan (CEMP) that would be developed in accordance with the requirements of the Roads and Maritime QA Specification G36 Environmental Protection (Management System). The work area would be specified in the CEMP and would incorporate all safeguards as described in this REF and any other relevant Roads and Maritime environmental specifications.

Construction activities and methodologies associated with the proposal are provided in **Table 3-2**. These are indicative only and would be subject to change depending on the construction contractor, and associated methodology and staging of works. The timing of construction works would need to be coordinated with adjacent construction works such as the M4 Smart Motorways project to mitigate potential cumulative impacts.

Table 3-2 Construction activities

Construction activity	Construction methodology
Compound site establishment	Establish site boundary with security fences Install environmental controls including protection areas for vegetation to be retained Construct hard stand area to establish site sheds Install site office and amenities sheds Setup the designated stockpile and concrete washout areas

Construction activity	Construction methodology
Road construction site establishment	Install road traffic management control following the approval of Roads and Maritime Road Occupancy Licence Traffic staging to be approved and the proposed construction site establishment to be set up according to different staging plans Remove existing linemarking and shift the traffic slightly east with reduce lane widths Install concrete safety barriers on south part on the intersection along the Reservoir Road Install environmental management controls
Vegetation impacts	Identify and remove the trees and other vegetation in the proposed project areas
Bulk earthwork	Construction works would be carried out behind the established safety barriers Remove the top soil and clear the construction surface Carry out bulk earthworks to establish road formation and major structure construction such as culvert extension
Drainage works	Extend the existing culvert Construct the embankment to subgrade level Excavate and install the pavement drainage
Utility relocation	Relocate underground and overground utilities. The duration for utilities relocations would depend on requirements for outages and methodology of works. Utilities relocations would be carried out by utility providers or accredited service providers
Road widening and associated structures construction	Construction works would be carried out behind the established safety barriers Remove existing kerb and concrete pavements Carry out earthworks to establish road formation and major structure construction such as culvert extension Carry out drainage works installing the proposed pits and pipes Construct new pavements on the road widening sections Construct driveways adjustments, kerb and gutter and footpaths Construct new medians Install new traffic control signals cables and structures Reinstate safety camera infrastructure
Asphalt overlaying, signs and linemarking	Place the new asphalt wearing course at the intersection Apply the new linemarking and new pedestrian crossings Install and relocate new road signs Install the new fences

Construction activity	Construction methodology
Landscaping and Site Rehabilitation	Remove the site establishment fences and structures Remove environmental management controls Remove temporary traffic control method Carry out landscaping works

3.3.2 Construction hours and duration

Construction is anticipated to start in mid-2019 and would take about 18 months to complete, subject to weather and the timing of the M4 Smart Motorway project.

The recommended standard hours for construction as noted in the *NSW Interim Construction Noise Guideline* (DECC, 2009) are shown in **Table 3-3**. Where possible, construction would occur during standard working hours. However, in order to minimise disruptions to traffic during construction, the majority of construction is expected to be completed outside of standard hours. Out-of-hours work would be subject to permitted road occupancy licences (ROLs) and weather. Further discussion regarding out-of-hours work is provided in Section 6.2.

It is proposed to complete the construction work under 'duration respite' which condenses the work schedule to multiple consecutive nights to reduce the overall works program. It is proposed to work up to five nights a week with high noise activities, such as saw cutting, completed by midnight.

Table 3-3 Standard working hours

Day	Start time	Finish time
Monday to Friday	7am	6pm
Saturday	8am	1pm
Sunday and public holidays	No work	

3.3.3 Plant and equipment

A range of plant and equipment would be used during construction. The final equipment and plant requirements would be determined by the construction contractor. An indicative list of plant and equipment is provided below in **Table 3-4**.

Table 3-4: Construction phases and associated plant and equipment

Construction phase	Plant and equipment
Site Establishment	Trucks Cranes Clearing and grubbing equipment i.e. chainsaws and chippers

Construction phase	Plant and equipment
Utility relocations	Excavators Dump trucks Cranes Concrete pumps Welding equipment Concrete saws Light vehicles Concrete trucks Generators Oxy-cutting equipment
Earthworks and drainage, including culvert works	Excavator Jackhammers Dump trucks Compactors Water carts Concrete trucks Generators Bulldozers Boring machines Graders Profilers Vibrating rollers Concrete pumps Welding equipment
Pavement works	Dump trucks Compactors Water carts Graders Asphalt paving machines Light vehicles Concrete trucks Slip-forming machines Vibrating rollers Generators Compressors Welding equipment
Finishing and landscaping	Milling machines Piling machines Concrete pumps Cranes Welding equipment Trucks Rollers Road marking machine Concrete trucks Generators Oxy-cutting equipment Sprayers Light vehicles

3.3.4 Earthworks

The proposal would require earthworks for the excavation of road pavements, road widening and public utility adjustments. The volumes of materials associated with earthworks would be small due to the localised nature of the roadworks. It is estimated that about 400 cubic metres of spoil would be exported for the proposal.

Where possible, imported fill would be sourced from local supplies and would be delivered during normal working hours (however, outside of peak periods, where possible). Earthwork requirements would be confirmed 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 the CEMP.

3.3.5 Source and quantity of materials

Estimated quantities of the main materials based on the concept design of the proposal are provided in **Table 3-5**.

Table 3-5 Materials and estimated quantities required

Material	Volume (m^3)
Imported or borrowed material (below new pavement)	1,000
New pavement	2,200
Total	3,200

3.3.6 Traffic management and access

Construction of the proposal would generate heavy vehicle movements mainly associated with the delivery of construction materials, removal of spoil and delivery and removal of construction equipment and machinery.

Light vehicle movements would be required for the movement of construction personnel, including contractors, site labour force and specialist supervisory personnel. Construction vehicles would access the site via arterial roads wherever possible.

About 25 heavy vehicles would be required on-site per day. In addition, multiple light vehicle movements would also be required to transport workers and smaller materials throughout the site.

A Traffic Management Plan (TMP) would be prepared for the proposal in accordance with the *Traffic Control at Work Sites Manual Version 4* (RTA, 2010) and approved by Roads and Maritime before implementation. The TMP would provide details of the traffic management measures to be implemented during construction to ensure traffic flow on the surrounding network is maintained where possible.

The proposal would require private driveway adjustment and temporary construction access impacts to adjacent businesses (including a 7-Eleven petrol station and Mitre 10). Affected businesses would be notified prior to construction and impacts managed through the TMP.

Further details and assessment of traffic and transport impacts as a result of the proposal are provided in Section 6.1.

3.4 Ancillary facilities

Roads and Maritime have nominated two preferred main compound locations. An additional two compound locations have also been nominated at nearby locations to provide alternate options if needed. These potential sites are listed in **Table 3-6** and shown in **Figure 3-4**.

Table 3-6 Potential compound sites to be used by the proposal

Compound ID	Location	Area (m^2)	Description
C1 (preferred)	South of Honeman Close, Blacktown	2900	This compound site has been assessed for use as a compound for the M4 Smart Motorways project.
C2 (preferred)	End of Boiler Close, Blacktown	1600	This compound site has been assessed for use as a compound for the M4 Smart Motorways project.
C3	Great Western Highway, Blacktown	2400	This compound site is located on a roadside verge area adjacent to the Roads and Maritime Crash Lab facility. This is an existing cleared area previously used as a compound on other Roads and Maritime projects.
C4	North of Penny Place, Blacktown	4800	Use of this location would be subject to further investigation and consultation with Council.

Upon completion of construction, the temporary site compound, work areas and stockpiles would be removed and the site cleared of all rubbish and materials and disturbed areas would be appropriately stabilised.

Figure 3-4 Proposed compound sites

3.5 Public utility adjustment

The proposal would require public utilities to be relocated, adjusted or protected. **Table 3-7** outlines public utility adjustments as a result of the proposal (these would be confirmed during detailed design). All public utility adjustments would be entirely within the proposal footprint as shown in **Figure 1-2**.

Table 3-7 Public utility adjustments

Asset owner	Utility	Location	Details of adjustment
Endeavour Energy	Overhead electrical cables for street lighting	Overhead electrical supply is located on the eastern side of Reservoir Road between the Great Western Highway and Honeman Close. Overhead wires are also located within the Great Western Highway for lighting supply.	Relocation required. Overhead power lines that do not require relocation would to be protected during construction.
	Underground electrical cables	An existing conduit crossing under Reservoir Road which does not contain any electrical cables will be extended to the west to cater for the road widening. The total length of the crossing is approximately 30m.	The electrical conduits are to be extended to cater for the road widening. The extension is approximately 15m and is located approximately 80m from the intersection.
Telstra	Telecommunications cables	A Telstra cable is located along the southbound carriageway of Reservoir Road between Boiler Close and the Great Western Highway, extending to the westbound carriageway of the highway, on the eastern side of Reservoir Road. This cable also branches and crosses Reservoir Road south of the highway intersection and then continues north along the northbound carriageway of Reservoir Road. A Telstra ducts with optic fibre shared with NBN optic fibre is located along the northbound Reservoir Road and crosses Reservoir Road around 60m south of the intersection. A separate Telstra cable along the southbound carriageway of Reservoir Road at the northern limits of the proposal area.	Relocation and extension required

Asset owner	Utility	Location	Details of adjustment
Optus	Telecommunications cables shared with Telstra duct	An Optus cable is located north of Penny Place beside the northbound Reservoir Road carriageway.	The Optus cable would not be impacted by the proposal.
NBN	NBN optic fibre cable	A NBN optic fibre cable shared with Telstra duct is located adjacent to the northbound carriageway of Reservoir Road from the southern side of the Great Western Highway intersection to Penny Place. NBN cables are also located adjacent to the westbound carriageway of the Great Western Highway, and adjacent to the southbound carriageway of Reservoir Road, between the Great Western Highway intersection and Boiler Close.	Relocation and extension required.
Sydney Water	Water mains	A significant water main (900 millimetre SCL) is located within the northbound carriageway of Reservoir Road from Honeman Close to Penny Place. A smaller 150 millimetre uPVC main is located adjacent to the southbound carriageway. A 150 millimetre Duct Iron Cement Lined (DICL) water main, a 150 uPVC water main, Fire Hydrant & stop valve are located along the southbound Reservoir Road. A 150 millimetre uPVC and a 100 millimetre uPVC water main are located on either side of the Great Western Highway, east of Reservoir Road.	Relocation of 900 millimetre water main within the northbound carriageway of Reservoir Road not required. The protection or relocation of the existing water main on southbound Reservoir Road is required for the widening works for the left turn slip lane from westbound Great Western Highway. Other water mains would not be impacted by the proposal.

Asset owner	Utility	Location	Details of adjustment
Sydney Water	Sewer mains	A 225 millimetre PVC sewer main within a 500 millimetre steel casing crosses Reservoir Road at the Honeman Close intersection. A branch of this main traverses north to service the Bunnings Warehouse. A 150mm PVC sewer main is located along the eastbound carriageway of the Great Western Highway on the eastern side of the Reservoir Road intersection. The main traverses along the southbound carriageway of Reservoir Road towards Clare Street, increasing in size to a 225 millimetre PVC sewer main.	The sewer mains would not be impacted by the proposal.
Roads and Maritime	Underground Traffic Control Systems (TCS)	Underground TCS cables are located at the Great Western Highway and Reservoir Road intersection.	Relocation required. Potential adjustment, including extension of the lantern arm of a pole to cater for the dual right turns.
	Safety camera	Safety camera infrastructure including connecting power supply.	Adjustment required.

3.6 Property acquisition

The proposal would include the acquisition of about 5600 square metres of private land, owned by three separate landowners. Details regarding property acquisition for the proposal are outlined in **Table 3-8** and shown in **Figure 3-5**.

All acquisitions would be conducted in accordance with the Roads and Maritime Land Acquisition Policy, and compensation would be based on the requirements of the *Land Acquisition (Just Terms) Compensation Act 1991.*

Table 3-8 Proposed property acquisition

Lot and DP	Total area (m^2)	Acquisition type	Current owner	Description	Land use zone (LEP)
Lot 102 DP 828155	260	Partial	Private	Unused parcel of grassed land and roadside trees adjacent to Mitre 10.	IN2 – Light Industrial
Lot 1 DP 229466	280	Partial	Private	Unused parcel of grassed land and roadside trees adjacent to Mitre 10.	IN2 – Light Industrial
Lot 2 DP 229466	5060	Partial	Private	Unused parcel of land with native vegetation. A Development Application is currently with Council for proposed future development of the site as a service station.	IN1 – General Industrial

Figure 3-5 Proposed property acquisition

4 Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, local environmental plans and other legislation.

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims 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 road infrastructure facilities 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*. Development consent from council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does 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 (Major Development) 2005*.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in Chapter 5 of this REF.

State Environmental Planning Policy (Western Sydney Employment Area) 2009

The NSW Government established the Western Sydney Employment Area to provide businesses in the region with land for industry and employment, including transport and logistics, warehousing and office space.

Development proposals in the Western Sydney Employment Area must relate to a development control plan which establishes a master plan for the proposal and surrounding areas.

Development in the Western Sydney employment area is governed by the *State Environmental Planning Policy (Western Sydney Employment Area) 2009*. The proposal area is located within Precinct 3, Huntingwood, under the *State Environmental Planning Policy (Western Sydney Employment Area) 2009.*

Clause 33 of this policy does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out without consent, or that is exempt development, under the ISEPP.

As identified above, 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.

4.1.2 Local Environmental Plans

Blacktown Local Environmental Plan 2015

The *Blacktown Local Environmental Plan 2015* (Blacktown LEP) applies to land within the Blacktown local government area. The proposal area contains a mix of land zones under the Blacktown LEP including SP2 Infrastructure, R2 General Residential, IN1 General Industrial, IN2 Light Industrial, RE2 Private Recreation. The land use objectives for each zone under the Blacktown LEP, and the proposal's consistency with those objectives, are detailed in **Table 4-1**.

Table 4-1 LEP zone objectives

Zone	Objectives	Consistency with objectives
SP2 Infrastructure	To provide for infrastructure and related uses.	The proposal would provide new and upgraded road related infrastructure, to reduce congestion and improve traffic flow within the area. The proposal is consistent with these objectives of this zone.
	To prevent development that is not compatible with or that may detract from the provision of infrastructure.	
	To ensure that development does not have an adverse impact on the form and scale of the surrounding neighbourhood.	
R2 General Residential	To provide for the housing needs of the community.	The proposal involves the upgrade of an existing land use, which meets the access and transport needs of residents. The proposal is consistent with these objectives of this zone.
	To provide for a variety of housing types and densities.	
	To enable other land uses that provide facilities or services to meet the day to day needs of residents.	
IN1 General Industrial	To provide a wide range of industrial and warehouse land uses.	The proposal would provide improved access and ease congestion to local industrial land uses. The proposal aims to minimise any adverse impacts to the natural environment. Further details are provided in Chapter 6 (Environmental assessment). The proposal is consistent with this objective for the zone.
	To encourage employment opportunities.	
	To minimise any adverse effect of industry on other land uses.	
	To support and protect industrial land for industrial uses.	
	To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.	
	To minimise adverse impacts on the natural environment.	

Zone	Objectives	Consistency with objectives
IN2 Light Industrial	To provide a wide range of light industrial, warehouse and related land uses.	The proposal would provide improved access and ease congestion to local industrial land uses. The proposal aims to minimise any adverse impacts to the natural environment. Further details are provided in Chapter 6 (Environmental assessment). The proposal is consistent with this objective for the zone.
	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.	
	To minimise adverse impacts on the natural environment.	
RE2 Private Recreation	To enable land to be used for private open space or recreational purposes.	The proposal would potentially involve the temporary use of a portion of open space land for the purpose of a site compound to facilitate construction works. However, these impacts would be temporary and short-term, with the site restored to its current condition upon completion of the works. Access to this open space would be maintained throughout the works. The proposal aims to minimise any adverse impacts to the natural environment. Further details are provided in Chapter 6 (Environmental assessment). The proposal is consistent with this objective for the zone.
	To provide a range of recreational settings and activities and compatible land uses.	
	To protect and enhance the natural environment for recreational purposes.	

4.2 Other relevant NSW legislation

Other NSW environmental legislation that is relevant to the approval and assessment of the proposal is considered below.

4.2.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (the POEO Act) administers environment protection licences for specific activities relating to air, water and noise pollution, and waste management. The NSW Environment Protection Authority and local government, where relevant, administer the POEO Act. Development activities require an environment protection licence under the POEO Act if those activities meet the assessment criteria outlined in Schedule 1 of the Act.

Under clause 35 to Schedule 1 of the POEO Act, an environment protection licence is required for any road construction activities that result in the establishment of four or more traffic lanes, over a distance of at least five kilometres. The proposal would not result in the establishment of four or more traffic lanes. Accordingly, an environment protection licence would not be required for the proposal, pursuant to clause 35 to Schedule 1 of the POEO Act.

Under clause 19 to Schedule 1 of the POEO Act, an environment protection licence is required for any land-based extraction activities that involve the extraction, processing or storage of more than 30,000 tonnes per year of extractive materials. The proposal would not require a substantial volume of earthworks, which may trigger the need for an environment protection licence under clause 19 to Schedule 1 of the POEO Act.

The maintenance and operation of the proposal would not be a scheduled activity under the POEO Act and would be managed under Roads and Maritime's existing Environmental Management System.

4.2.2 Roads Act 1993

Section 138 of the *Roads Act 1993* (Roads Act) requires consent from the relevant road authority for the carrying out of work in, on or over a public road. Clause 5(1) in Schedule 2 of the Roads Act states that public authorities do not require consent for works on unclassified roads.

The Great Western Highway and Reservoir Road are classified as a State Road. Roads and Maritime is the proponent and relevant roads authority for the proposal.

4.2.3 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 (BC Act) commenced on 25 August 2017 and repeals the Threatened Species Conservation Act 1995, the Nature Conservation Trust Act 2001 and parts of the National Parks and Wildlife Act 1974. The BC Act introduces a Biodiversity Assessment Method (BAM) and Biodiversity Offsets Scheme (BOS). The BC Act lists a number of threatened species, populations or ecological communities to be considered in deciding whether a development or activity "likely to significantly affect threatened species". A development or an activity is likely to significantly affect threatened species if:

(a) it is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in section 7.3 (of the BC Act), or
(b) the development exceeds the BOS threshold if the biodiversity offsets scheme applies to the impacts of the development on biodiversity values, or
(c) it is carried out in a declared area of outstanding biodiversity value.

The BOS does not apply to development that is an activity subject to environmental impact assessment under Part 5 of the EP&A Act unless the proponent chooses to opt into the BOS. Roads and Maritime have not opted in to the BOS for this proposal. As such, the test of significance detailed in section 7.3 of the BC Act must be used to determine whether the proposal likely to significantly affect threatened species.

The proposal is not likely to significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the BC Act and therefore a Species Impact Statement (SIS) is not required.

4.2.4 Heritage Act 1977

The *Heritage Act 1977* aims to provide for the identification, registration and conservation of items of State heritage significance. Approval must be obtained from the Heritage Council where the proposal affects a place listed on the State Heritage Register, or where excavation may affect an archaeological relic.

Investigations of the proposal's potential to interact with or impact on items of heritage significance are documented in Section 6.8. In summary, some of the proposed compound sites (and the site access) cover an area mapped as a heritage listed former road alignment of State heritage significance. Based on the provision that no excavation would occur within the identified curtilage of the heritage item, it is proposed to lodge an Exemption Notification with NSW Heritage Council for approval in accordance with Act. If, however, the proposal scope changes and any excavation or ground disturbance is required within the heritage area, further archaeological assessment and permit requirements would need to be investigated.

If any item or material is uncovered during construction of the proposal that has potential heritage value or significance, Roads and Maritime would follow an established unexpected finds procedure. Under this procedure, all work at the location of the find would cease until the item or material can be investigated by a suitably qualified person, to establish whether the item or material is of heritage significance, and whether any further actions are warranted for its removal and/or protection.

4.2.5 National Parks and Wildlife Act 1974

Sections 86, 87 and 90 of the *National Parks and Wildlife Act 1974* (NPW Act) require consent from Office of Environment and Heritage (OEH) for the destruction or damage of Aboriginal objects.

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) was carried out on 25 October 2017. The search identified three Aboriginal sites within 300 metres of the proposal area and compound sites.

The Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI) was followed (Roads and Maritime, 2011). A Stage 1 PACHCI clearance letter was obtained for the proposal area from the Roads and Maritime cultural heritage advisor and is provided in **Appendix D**.

4.2.6 Biosecurity Act 2015

The *Biosecurity Act 2015* and its subordinate legislation commenced on 1 July 2017. The *Biosecurity Act 2015* replaces wholly or in part 14 separate pieces of biosecurity related legislation including the *Noxious Weeds Act 1993*. Under the *Biosecurity Act 2015*, all plants, including weeds are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

The Biosecurity *Act 2015* and Regulations provide specific legal requirements for high risk activities and State level priority weeds. The State level priority weeds and associated legal requirements relevant to the region are outlined in the *Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022* (Greater Sydney Local Land Services, 2017) together with the high risk priority weeds from the regional prioritisation process. As such if present, priority weeds on the site should be assessed and controlled to fulfil the General Biosecurity Duty and minimise biosecurity risks.

4.2.7 Land Acquisition (Just Terms Compensation) Act 1991

The proposal would require Roads and Maritime to acquire strips of private land in the study area. All land acquisitions would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991.* Property requirements for the proposal, and the process that Roads and Maritime would follow in its dealings with affected landowners, are discussed in Chapter 3.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in **Appendix A** and Chapter 6 of this REF.

A referral is not required for proposed road activities that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Potential impacts to these biodiversity matters are also considered as part of Chapter 6 of this REF and **Appendix F**.

Findings – matters of national environmental significance (other than biodiversity matters)

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment under the EPBC Act.

Findings – nationally listed biodiversity matters

The assessment of the proposal's impact on nationally listed threatened species, populations, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Chapter 6 of the REF describes the safeguards and management measures to be applied.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road and road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Part 5 of the EP&A Act and an environmental impact statement is not required.

Some of the proposed compound sites (and the site access) cover an area mapped as a heritage listed former road alignment with archaeological value. Based on the provision that no excavation would occur within the identified curtilage of the heritage item, it is proposed to lodge an Exemption Notification with NSW Heritage Council for approval in accordance with the *Heritage Act 1977*. If however, the proposal scope changes and any excavation or ground disturbance is required within the heritage area, further archaeological assessment and permit requirements would need to be investigated.

Roads and Maritime is the determining authority for the proposal. This REF fulfils Roads and Maritime's obligation under clause 111 of the EP&A Act to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5 Consultation

This chapter discusses the consultation undertaken to date for the proposal and the consultation proposed for the future.

5.1 Consultation strategy

Consultation with community and key stakeholders was undertaken to:

- Seek comment, feedback, ideas, and suggestions for us to consider when developing the proposal, including consultation outcomes into the environmental impact assessment known as a review of environmental factors
- Build a database of interested and concerned community members with whom we can continue to engage during the proposal's development and delivery.

A summary of consultation undertaken to date is provided below. Roads and Maritime will continue to consult with the community and relevant stakeholders during the detailed design and construction of the proposal.

5.2 Community involvement

Roads and Maritime consulted with the community and key stakeholders about the proposal in December 2017. Consultation was conducted by the following methods:

- Have Your Say community update – 1700 letters were distributed to local residents and businesses in December 2017
- Website – Roads and Maritime project webpage was updated with the latest project information including the community update
- Social media – A targeted Facebook campaign was undertaken between 7 December and 18 December 2017. The campaign reached 68,473 residents and road users travelling within the area.

In summary, 13 submissions were received from the community and stakeholders. The majority of respondents were in general support of the proposal.

A summary of the feedback received is provided below:

- Requests for a left turn slip lane from Reservoir Road southbound onto the Great Western Highway eastbound
- Requests for design changes relating to entry and exit ramps associated with the M4 Motorway
- Pedestrian/cyclist facilities and safety. This included a request for slip lane crossings to be signalised, and for shared user footpaths for the length of Reservoir Road
- Request for native vegetation removal to be offset
- Feedback on the consultation process including a request for consultation to also include a survey of the local area
- Request for 'Keep Clear' line marking on the approach to Clare Street
- Requests considered outside of the scope of the proposal. This included request for other sections of Reservoir Road to be upgraded, consideration of other road upgrades, and suggested overpass/ tunnel/ underpass ideas.

A detailed response to the feedback received is provided within **Appendix G**.

Roads and Maritime have responded to all feedback received by responding directly to the person who comments and as well in the Consultation Report provided in **Appendix G** which will be made

available to the public. Roads and Maritime have reviewed and considered all the feedback received and have decided to proceed with the proposal unchanged.

5.3 Aboriginal community involvement

The proposal has been considered against the requirements of the Roads and Maritime PACHCI (Roads and Maritime, 2011). This procedure is generally consistent with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (Department of Environment, Climate Change and Water, 2010). An outline of the procedure is presented in **Table 5-1**.

Aboriginal consultation has been carried out in accordance with Stage 1 of the PACHCI. A PACHCI clearance letter was obtained for the proposal area from the Roads and Maritime Aboriginal cultural heritage advisor and is provided in **Appendix D**. Aboriginal cultural heritage impacts are not expected as a result of the proposal (refer to Section 6.9).

Table 5-1 Summary of Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation

Stage	Description
Stage 1	Initial Roads and Maritime assessment. Desktop assessment to determine whether a Roads and Maritime project is likely to harm Aboriginal cultural heritage, and whether further assessment or investigation is required.
Stage 2	Desktop assessment and site survey. Further assessment and a survey with specific Aboriginal stakeholders and an archaeologist to assess whether a project would impact Aboriginal cultural heritage.
Stage 3	Formal consultation and preparation of cultural heritage assessment report (where Stages 1 and 2 have let to the preliminary view that harm to Aboriginal objects or places will occur or is likely to occur). Aboriginal parties must be involved in the preparation of these reports in accordance with legislative requirements and the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010).
Stage 4	Implement of mitigation measures. Undertake salvage and/or project implementation in accordance with an AHIP and/or a Part 5.1/Part 4 approval or Part 5 determination obtained under the *Environmental Planning and Assessment Act 1979*.

5.4 ISEPP consultation

Appendix B contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered. No Councils or agencies were considered required to be consulted under the relevant provisions of the ISEPP.

5.5 Ongoing or future consultation

Consultation with directly affected residents, community groups, and stakeholders would be carried out before and during construction where necessary. Members of the public would be able to contact Roads and Maritime during construction.

Prior to construction, a Construction Environment Management Plan (CEMP) would be developed.

Roads and Maritime would provide contact details in relation to the proposal. These contact details are published on the proposal website. Any community complaints or suggestions lodged to this hotline would be addressed in a prompt manner by the project team in accordance with the CEMP. In addition, the following ongoing consultation would be undertaken:

- Ongoing meetings with the affected property owners, Blacktown City Council, local businesses and other stakeholders as required
- Ongoing updates to the community during the detailed design/construction phase
- Consultation with community stakeholders to assist in managing impacts during construction
- Follow-up meetings to discuss access arrangements with directly affected landowners prior to construction impacts.

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the guidelines Is an EIS required? (DUAP 1995/1996) as required under clause 228(1) of the *Environmental Planning and Assessment Regulation 2000* and the *Roads and Related Facilities EIS Guideline (DUAP 1996)*. The factors specified in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* are also considered in **Appendix A**.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Traffic and transport

A traffic assessment was prepared in 2016 as part of the concept design report for the proposal. A subsequent updated assessment memo was prepared in 2017. Information from both reports has been used to inform this assessment. A summary of the assessments is provided below.

6.1.1 Methodology

Traffic modelling of the intersection of Reservoir Road and the Great Western Highway was initially carried out by Jacobs on behalf of Downer Mouchel in 2016 as part of a traffic assessment to inform the concept design report (Jacobs 2016). Existing and upgraded intersection layouts were modelled using SIDRA Version 6.1 intersection traffic modelling software, which is a software tool used in the evaluation of intersection performance including capacity, LoS, delay and queue lengths.

A subsequent traffic model and memorandum was prepared on behalf of Roads and Maritime in 2017 due to some discrepancies identified in the 2016 report in relation to the data used. This revised assessment was carried out using SIDRA Version 7, a newer version of the software tool.

Existing traffic volumes used in the modelling were derived from traffic surveys undertaken on Wednesday 10 February 2016. A site visit to the intersection during the AM Peak Hour (7:15 to 8:15) and the PM Peak Hour (4:45 to 5:45) was conducted on Tuesday 31 January 2017. The model was validated against observations made during the site visit as summarised in Section 6.1.2.

The purpose of the assessment was to determine the current and expected performance of the existing and proposed intersection configuration under the base year (2016) and future year (2026) scenarios. To facilitate the future year assessment, the Roads and Maritime EMME strategic model was used to inform future year traffic volumes. EMME is a travel demand modelling system used for urban, regional and national transportation forecasting and is used by Roads and Maritime to undertake traffic modelling and forecasting of road schemes with wide-reaching network impacts, and to examine the effects of significant new residential or employment land releases, major incidents, tolling or other strategies.

Crash analysis was undertaken as part of the 2016 assessment using historical crash data for the five-year period from January 2010 to December 2014.

6.1.2 Existing environment

Existing network

Existing traffic volumes used in the modelling were derived from traffic surveys. Additionally, the following observations were made during the visit:

- Heavy queuing was observed on the south approach to the intersection along Reservoir Road, extending to the M4 overpass. The queue length was approximately 500 metres in both peaks
- Vehicles turning right from the south approach had difficulty accessing the right turn bay due to the queue for the through movement blocking access to the right turn lane. The hatched median space was used by the right turn traffic
- Heavy right turn movement from the east approach along the Great Western Highway was observed with queuing extending out of the right turn bay during the PM peak operation. Queuing on this approach was approximately 50 metres in the AM peak and around 200 metres in the PM peak.

Morning (AM) and evening (PM) peak traffic volumes at the intersection are provided in **Table 6-1**.

Table 6-1 AM and PM peak base volumes

2017 Base Case	AM peak traffic volumes (vehicles)	PM peak traffic volumes (vehicles)
Reservoir Road, southbound	1116	1077
Great Western Highway, eastbound	1418	2519
Reservoir Road, northbound	997	1055
Great Western Highway, westbound	2326	1762
TOTAL	**5857**	**6413**

Existing intersection performance

Table 6-2 and **Table 6-3** summarise the existing morning and evening weekday peak performance of the Great Western Highway/Reservoir Road intersection for the base year (2016).

During the morning (AM) and evening (PM) peak hour, the intersection operates unsatisfactorily at LoS F, with queues of up to 379 metres which exceeds the length of the existing turn bays.

Table 6-2 Morning (AM) peak intersection performance for the base year (2016)

	Average delay(s)	LoS	Max queue length (m)
Reservoir Road, southbound	86.6	F	287.8
Great Western Highway, eastbound	54.6	D	170
Reservoir Road, northbound	111.2	F	322.3
Great Western Highway, westbound	71.4	F	369.4
All	**77.0**	**F**	**369.4**

Table 6-3 Evening (PM) peak intersection performance for the base year (2016)

	Average delay (s)	LoS	Max queue length (m)
Reservoir Road, southbound	116.0	F	338.1
Great Western Highway, eastbound	107.7	F	378.5
Reservoir Road, northbound	118.7	F	322.8
Great Western Highway, westbound	54.0	D	180.9
All	**96.2**	**F**	**378.5**

Walking and cycling

There are pedestrian facilities on the approach to the intersection from the north on either side of Reservoir Road, and from the east along the southern side of the Great Western Highway adjacent to the Bunnings site. There are no pedestrian pathways to the south of the intersection on either side of Reservoir Road. There are no formal cyclist facilities within the proposal area.

Public transport

Two bus routes travel through the proposal (723 and 724) with bus stops on Reservoir Road just north of the proposal area.

The 723 route travels along Reservoir Road to the north of the intersection through the proposal area, and along the Great Western Highway to the west. The 724 travels along Reservoir Road to the north and south of the intersection through the proposal area, as well as along Penny Place to the south of Compound 4.

Parking

There is no parking on either side of Reservoir Road or Great Western Highway within the proposal area. Further assessment of parking is therefore not provided within this REF.

Crash data analysis

Crash analysis was undertaken using historical crash data provided by Roads and Maritime for a five-year period between January 2011 and December 2015. The assessment below provides an analysis of data from crashes occurring within ten metres of the intersection which accounted for 35 crashes (56.5%) and non-intersection crashes which accounted for 27 crashes (43.5%) over the five-year period assessed.

A breakdown of the crash severity is provided in **Table 6-4**.The majority of crashes (59.7%) were non-injury incidents. There were no fatalities or serious injury crashes reported. A summary of the associated crash movements is provided in **Table 6-5**.

Table 6-4 Crash severity summary (January 2011 to December 2015)

Crash Severity	Number of crashes	% of Total
Fatal	0	0%
Injury (serious)	9	14.5%
Injusy (moderate)	3	4.8%

Crash Severity	Number of crashes	% of Total
Injury (minor/other)	13	21%
Non-casualty	37	59.7%
TOTAL	**62**	**100%**

Table 6-5 Crash movement summary (January 2011 to December 2015)

Crash movement	Number of crashes	% of Total
Intersection, from adjacent approaches	7	11.3%
Head on	0	0%
Opposing vehicle turning	6	9.7%
U-turn	1	1.6%
Rear end	32	51.6%
Lane change	5	8.1%
Parallel lanes turning	3	4.8%
Vehicle leaving driveway	2	3.2%
Other	6	9.7%
TOTAL	**62**	**100%**

The crash summary indicates that over half of recorded crashes (51.6%) were rear end crashes. A small number of crashes were accounted for by vehicles entering the intersection from adjacent approaches (11.3%), vehicles turning in opposing directions (9.7%), vehicles changing lanes (8.1%) or vehicles turning in the same direction in parallel lanes (4.8%).

6.1.3 Potential impacts

Construction

Some partial road closures would be required for construction works along Reservoir Road and Great Western Highway. It is not anticipated that there will be a requirement for road closures during peak periods.

Together with a relatively limited number of construction vehicle movements (25 heavy vehicles and multiple light vehicle daily movements), no significant impact on traffic capacity is anticipated. All bus stops will be retained during construction.

The low number of movements of heavy and light vehicles means that there will be little to no impact on current congestion along the routes required to get to and from the proposed site compound options as described in Section 3.4.

Appropriate construction staging and traffic management would be required during construction to minimise disruption to traffic flow and enable safe working on the project. Construction staging would be further developed in the detailed design stage. In order to minimise disruption to traffic, it is likely that majority of works would be completed at night.

Potential cumulative traffic impacts have been considered further in Section 6.11.

No significant impacts to pedestrians are anticipated as a result of construction works, and any temporary pedestrian diversions or footpath closures would be short distance and managed in accordance with the relevant traffic management plan.

Operation

Overall intersection performance

For the purpose of the traffic assessment, the proposal was assessed for the 2016 base year and 2026 which incorporates anticipated levels of background traffic growth. **Table 6-6** to **Table 6-9** summarise the operational performance of the intersection both with and without (do nothing scenario) the proposal for both morning and evening weekday peak times for the base year (2016) and in the future (2026). Improvements in traffic conditions are highlighted by green shading.

The modelling shows that for the 2016 AM peak, there would be an overall reduction in average delays, and the maximum queue length would be reduced on all approaches. By 2026, the average length of delay at the intersection would be reduced to 60.5 seconds during the AM peak as a result of the proposal.

Similarly, the modelling shows that the overall average delays and maximum queue lengths during the PM peak would also improve. By 2026, the average length of delay at the intersection would be reduced to 90.5 seconds during the PM peak as a result of the proposal.

Table 6-6 Proposal AM peak intersection performance (2016)

	Average Delay (s)			LoS		Max Queue (m)		
	Do nothing	Proposal	Difference (s)	Do nothing	Proposal	Do nothing	Proposal	Difference (m)
Reservoir Road, southbound	86.6	46.3	40.3	F	D	287.8	145.0	142.8
Great Western Highway, eastbound	54.6	55.4	+0.8	D	D	170	130.4	39.6
Reservoir Road, northbound	111.2	64.3	46.9	F	E	322.3	224.3	98
Great Western Highway, westbound	71.4	45.9	25.5	F	D	369.4	274.2	95.2
Total	**77.0**	**51.4**	25.6	**F**	**D**	**369.4**	**274.2**	**95.2**

Table 6-7 Proposal PM peak intersection performance (2016)

	Average Delay (s)			LoS		Max Queue (m)		
	Do nothing	Proposal	Difference (s)	Do nothing	Proposal	Do nothing	Proposal	Difference (m)
Reservoir Road, southbound	116.0	48.4	67.6	F	D	338.1	155.7	182.4
Great Western Highway, eastbound	107.7	73.8	33.9	F	F	378.5	317.4	61.1
Reservoir Road, northbound	118.7	92.4	26.3	F	F	322.8	76.3	246.5
Great Western Highway, westbound	54.0	61.5	+7.5	D	E	180.9	209.9	+29.0
Total	**96.2**	**69.2**	27	**F**	**E**	**378.5**	**317.4**	61.1

Table 6-8 Future year AM peak intersection performance (2026)

	Average Delay (s)			LoS		Max Queue (m)		
	Do nothing	Proposal	Difference (s)	Do nothing	Proposal	Do nothing	Proposal	Difference (m)
Reservoir Road, southbound	114.9	48.3	66.6	F	D	363.6	156.8	206.8
Great Western Highway, eastbound	60.7	60.7	0	E	E	207.6	154.7	52.9
Reservoir Road, northbound	138.7	77.8	60.9	F	F	383.7	266.3	117.4
Great Western Highway, westbound	114.9	58.8	56.1	F	E	528.5	381.9	146.6
Total	**105.9**	**60.5**	45.4	**F**	**E**	**528.5**	**381.9**	146.6

Table 6-9 Future year PM peak intersection performance (2026)

	Average Delay (s)			LoS		Max Queue (m)		
	Do nothing	Proposal	Difference (s)	Do nothing	Proposal	Do nothing	Proposal	Difference (m)
Reservoir Road, southbound	147.1	48.2	98.9	F	D	402.1	164.4	237.7
Great Western Highway, eastbound	135.4	101.0	34.4	F	F	450.9	405.1	45.8
Reservoir Road, northbound	187.8	128.7	59.1	F	F	452.0	373.3	78.7
Great Western Highway, westbound	56.8	77.3	+20.5	E	F	202.1	268.6	+66.5
Total	**124.9**	**90.5**	34.4	**F**	**F**	**452.0**	**405.1**	46.9

Walking and cycling

The existing footpaths within the proposal area would be adjusted to suit the new alignment and would tie into the existing footpaths along Great Western Highway adjacent to the Bunnings site and the western edge of Reservoir Road to the north of the intersection adjacent to the Mitre 10 property. The paths will return to Blacktown City Council ownership once operational.

The proposal also includes upgrades to existing pedestrian crossing facilities at the intersection.

Public transport

There would be no impact to existing bus routes during operation of the proposal. Existing bus stops on Reservoir Road to the north of the proposal area would be retained.

6.1.4 Safeguards and management measures

Mitigation measures provided in **Table 6-10** would be implemented to minimise traffic and transport impacts.

Table 6-10 Safeguards and management measures for traffic and transport

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident	Contractor	Detailed design / Pre-construction	Core standard safeguard TT1 Section 4.8 of QA *G36 Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
	• consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic monitoring, review and amendment mechanisms.			
Traffic and transport	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	Contractor	Construction	Standard safeguard
Traffic and transport	Pedestrian and cyclist access is to be maintained throughout construction. Provision of signposts outlining the pedestrians and cyclist diversion routes would be displayed during construction.	Contractor	Construction	Standard safeguard

6.2 Noise and vibration

A noise and vibration assessment was undertaken for the proposal and is provided in **Appendix E**. A summary of the assessment is provided in this chapter.

6.2.1 Methodology

Unattended noise monitoring was undertaken in accordance with Section 3 of the *NSW Industrial Noise Policy* (INP) (NSW Environment Protection Authority, 2000) and relevant requirements from Section 4 of *Procedure: Preparing an Operational Traffic and Construction Noise and Vibration Assessment* (POTCNVA) (Roads and Maritime, 2016) using Type 1 Ngara noise logging device. Attended measurements were undertaken using a SVAN Type 1 sound level meter.

Prediction of construction noise levels at sensitive receivers was modelled using the SoundPLAN (Version 7.4) noise modelling software based on the Concawe prediction algorithm. This three-dimensional model accounts for noise source and receiver locations, ground and air absorption as well as any acoustic shielding provided by intervening topography and structures.

The *Construction Road Traffic Noise Estimator component* of the Roads and Maritime Construction Noise Estimator was utilised to assess potential impacts arising from construction traffic using traffic data provided by Roads and Maritime and anticipated workforce numbers.

Operational noise prediction modelling was undertaken using SoundPLAN (version 7.4) noise modelling software. SoundPLAN is recognised and accepted by both the Roads and Maritime and the NSW Environment Protection Authority. The traffic noise prediction model adopted by SoundPLAN is based on a method developed by the United Kingdom Department of Transport entitled "*Calculation of Road Traffic Noise"* (CoRTN)*,* (UK Department of Transport, 1988). This

method has been adapted to Australian conditions and extensively tested by the Australian Road Research Board. To assess operational noise a project specific 3D noise prediction model was developed.

Further details of the methodologies and assumptions adopted are provided in **Appendix E**.

6.2.2 Existing environment

Surrounding land use and receivers

The area surrounding the proposal area is characterised by industrial, commercial and residential land uses. Commercial land uses are located within the south-east and north-west portions of the proposal area, including a Bunnings Warehouse, Mitre 10 and 7-Eleven petrol station. Residential land uses are located within the north-east portion of the proposal area. Unused land with established trees on private property is located within the south-west portion of the proposal area.

The sensitive receivers considered as part of this assessment are displayed below in **Figure 6-1**.

Background noise monitoring

Monitoring details

Continuous unattended monitoring and attended measurements were undertaken to quantify levels of existing background noise around the proposal area. The unattended (N01) and attended (N01 and N02) noise monitoring locations are shown in **Figure 6-1**. Details of the monitoring and results are presented in **Appendix E**. Noise monitoring results are presented in **Table 6-11**.

Table 6-11 Noise monitoring results

Long term unattended monitoring

Location	Background noise levels dB(A)					
	Standard Hours (7:00-18:00)		Evening (18:00-22:00)		Night (22:00-7:00)	
	RBL	L_{eq}	RBL	L_{eq}	RBL	L_{eq}
N01	53.1	62.6	48.5	58.6	43.2	58.1

15 minute attended monitoring

Location	Date/Time	Measured noise levels – dB(A)			Comment
		L_{Aeq}	L_{A90}	L_{A10}	
N01	10 Nov 2017 10:30 to 10:45am	64.4	53.7	66.6	Reservoir Road and GWH traffic: 52-72 dB(A) Birds: 58-62 dB(A) Dog barking: 73 dB(A) Neighbour activities (sanding and vacuuming): 61-76 dB(A)
	10 Nov 2017 10:45 to 11:00am	61.3	52.5	62.7	
N02	10 Nov 2017 11:15 to 11:30am	50.3	44.8	51.4	Reservoir Road and GWH traffic: 49-

Location	Date/Time	Measured noise levels – dB(A)			Comment
		L_{Aeq}	L_{A90}	L_{A10}	
	10 Nov 2017 11:30 to 11:45am	52.7	43.5	53.8	56 dB(A) Birds: 51-69 dB(A) Insect: 73 dB(A) People talking: 49 dB(A)

Based on the noise logger data and the results from the attended noise measurements, the background noise levels at residences a couple of rows away from the road traffic have been determined to be 44.1 dB(A) for the daytime period (i.e. standard hours), 39.5 dB(A) for the evening period and 34.2 dB(A) for the night-time period.

The noise environment at the first attended noise monitoring location, i.e. 181 Reservoir Road (N01 – logger location) is primarily influenced by continuous traffic noise from the Reservoir Road and Great Western Highway.

At the second attended noise monitoring location (N02), the primary noise source is the distant traffic noise from Reservoir Road and Great Western Highway and local fauna (birds and insects).

The measured attended noise levels at 181 Reservoir Road (N01) as presented in **Table 6-11** are generally consistent with the results of the unattended noise monitoring at the same location.

The difference in background noise levels, i.e. LA90 between the two monitoring locations is approximately 9 dB(A).

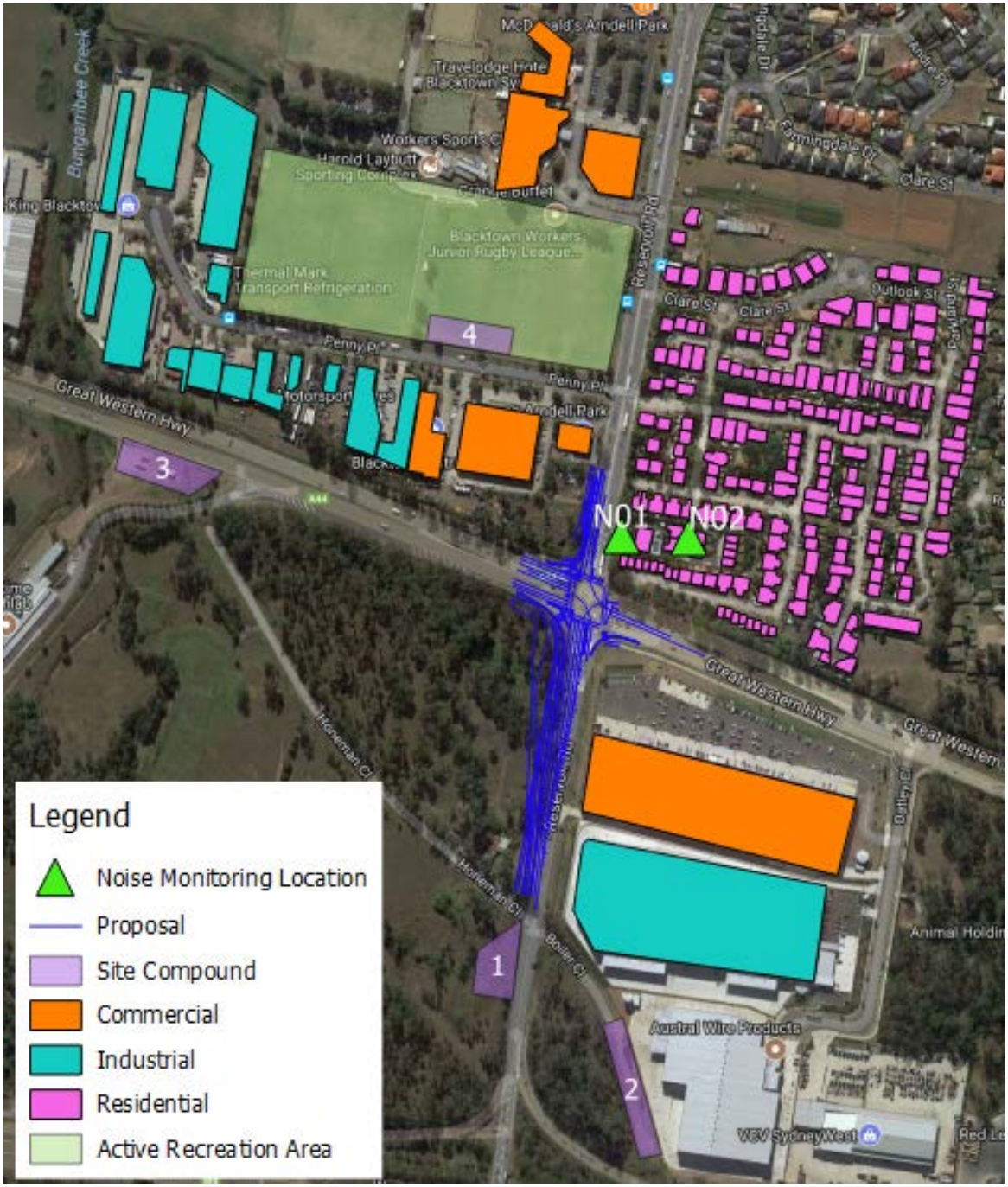

Figure 6-1 Proposal and surrounding receivers

6.2.3 Criteria

Construction noise

The Roads and Maritime Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime 2016) refers to the Interim Construction Noise Guideline (ICNG) (Department of Environment and Climate Change NSW, 2009) for the establishment of noise management levels (NMLs) during construction. **Table 6-12** details the method for determining NMLs for residential receivers potentially affected by the proposal. Often works that may cause inconvenience to members of the community (e.g. traffic congestion) or safety concerns are done outside standard hours. NMLs outside the recommended hours are presented in **Table 6-12**.

Table 6-12 Procedure for establishing construction NMLs at residential receivers, (ICNG, DECC 2009)

Time of day	Management level $LA_{eq\ (15\ min)}$	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected (RBL + 10 dB)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ 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 works to be carried out, the expected noise levels and the duration, as well as contact details.
	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: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. 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 strong justification would typically be required for works outside the recommended standard hours The proponent should apply all feasible and reasonable work practices to meet the noise affected level 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 negotiate with the community For guidance on negotiating agreements see Section 7.2.2 of the ICNG (DECC, 2009).

The ICNG also provides external NMLs of 65 dB(A), 70 dB(A) and 75 dB(A) for active recreation areas, commercial premises and industrial premises respectively.

To develop NMLs, the study area was broken into four Noise Catchment Areas (NCAs) as shown in **Figure 6-2**. Each NCA has a separate NML criterion, based on the data collected.

Considering the background noise statistics presented in **Table 6-11** and the guidance from the ICNG in **Table 6-12**, the following NMLs presented in **Table 6-13** were established to manage noise impacts during construction.

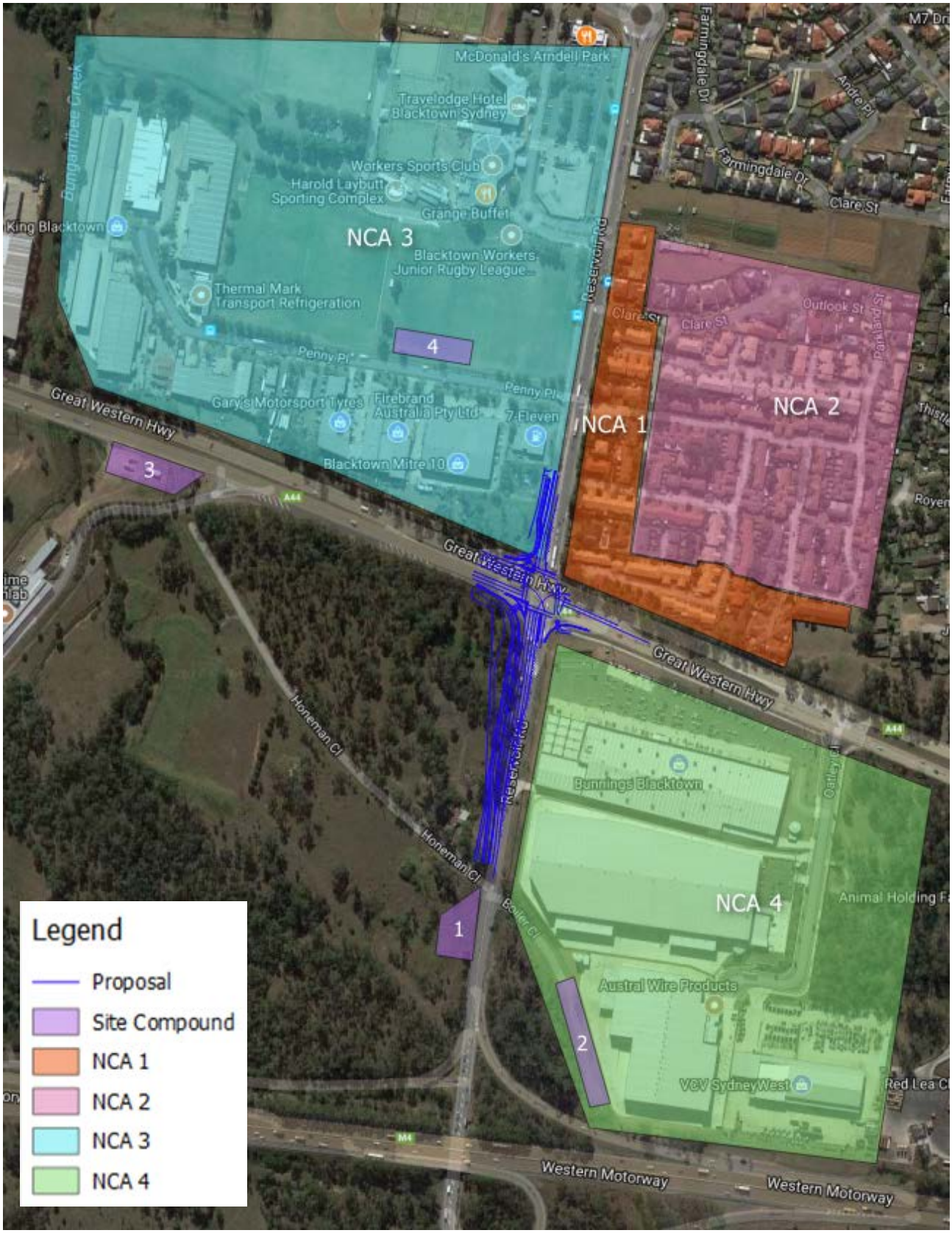

Figure 6-2 NCA boundaries

Table 6-13 Construction noise management levels for noise sensitive receivers

Noise monitoring location	Noise management level (NML) $L_{eq\ 15\ minute}$ dB(A)			
	Standard hours of construction	Outside recommended standard hours of construction		
		Day	Evening	Night
NCA 1 (residential receivers only)	63	58	54	48
NCA 2 (residential receivers only)	54	49	45	39
NCA 3 (non-residential receivers)	65 (active recreational area) 70 (commercial) 75 (industrial)	n/a	n/a	n/a
NCA 4 (non-residential receivers)	70 (commercial) 75 (industrial)	n/a	n/a	n/a

Sleep disturbance

The proposal is generally expected to be completed outside of standard hours of construction to minimise traffic disruption. Accordingly, sleep disturbance impacts were considered as part of this assessment.

The ICNG does not provide a specific method for assessment of potential sleep disturbance noise impacts; and guidance on the acceptability of these events is taken from the *NSW Road Noise Policy* (RNP), (DECCW, 2011).

The RNP provides two criteria:

- Sleep disturbance screening criterion – used to identify situations where there is the potential for sleep disturbance
- Sleep disturbance awakening criterion – levels below which awakening is unlikely to occur.

The sleep disturbance screening criterion recommends that where the $L_{A1\ (1\ minute)}$ does not exceed the $L_{A90\ (15\ minute)}$ by 15 dB(A) or more, sleep disturbance impacts are likely to be maintained at an acceptable level. The $L_{A1,\ (1\ minute)}$ descriptor is meant to represent a maximum noise level when measured using a 'fast' time response.

The sleep disturbance awakening criterion is the threshold at which an awakening reaction is likely to occur. Research discussed in the RNP identified this threshold to be an internal bedroom noise level of around 50 to 55 dB(A).

Windows often allow the greatest amount of sound transmission from outside to inside across a building façade. Noting guidance presented in AS2436-2010, where bedrooms are ventilated by an opened window, a sleep disturbance awakening criterion measured outside the bedroom window of 60 to 65 dB(A) less the conversion from $L_{Aeq\ 15\ minute}$ to an $L_{A\ 1\ minute}$ (conservatively assumed to be 10 dB(A)) would generally apply (i.e. 55 dB(A)).

Construction vibration

Vibration arising from construction activities can result in impacts on human comfort or the damage of physical structures such as dwellings. These two outcomes have different criteria levels, with the effects of vibration on human comfort having a lower threshold.

Regarding human comfort, vibration arising from construction activities must comply with criteria presented in *Assessing Vibration: a technical guideline*, (DECC, February 2006) and *British Standard 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting* (BS 6472-1: 2008).

Section J4.4.3 of *Australian Standard AS2187.2 – 2006 Explosives – Storage and use Part 2: Use of explosives* provides frequency-dependent guide levels for cosmetic damage to structures arising from vibration. These levels are adopted from *British Standard BS7385: 1990 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from groundborne vibration* (BS7385-2:1993).

Section 7 of the CNVG recommends safe working distances for achieving human comfort (*Assessing Vibration: a technical guideline*, (DECC, February 2006)) and cosmetic building damage (BS7385-2:1993) criteria for a range of different plant and equipment. These have been reproduced in **Table 6-14**.

Table 6-14 Recommended safe working distances for vibration-intensive plant and equipment, (CNVG, Roads and Maritime 2016)

Plant	Rating / description	Safe working distance (metres)	
		Cosmetic damage (BS7385-2: 1993)	Human response (DECC, 2006)
Vibratory Roller	<50 kN (typically 1-2 t) <100 kN (typically 2-4 t) <200 kN (typically 4-6 t) <300 kN (typically 7-13 t) >300 kN (typically 13-18 t) >300 kN (> 18 t)	5 m 6 m 12 m 15 m 20 m 25 m	15 m to 20 m 20 m 40 m 100 m 100 m 100 m
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 m	7 m
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 m	23 m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 m	73 m
Vibratory pile driver	Sheet piles	2 to 20 m	20 m
Pile boring	≤800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

Construction traffic

Application notes for the RNP (DECCW, 2011) state the following:

'…for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.'

The CNVG notes that this guidance also applies to traffic noise associated with construction activities.

Operational noise criteria

Where a proposal has the potential to generate a new source of noise for residential receivers due to changes in road alignment or where a proposal would result in a change to the volume or mix of vehicles, an operational traffic noise assessment is undertaken in accordance with the RNP (DECC, 2011). Where the changes of an existing road alignment are only minor, a less detailed assessment of traffic noise impacts is required.

The primary operational noise criteria considered for this assessment is whether the proposal would result in a traffic noise increase of more than 2 dB(A) at any nearby receiver.

6.2.4 Potential impacts

Construction noise

Construction activities and proposed equipment, with sound power levels are indicated in **Table 6-15**. The schedule of plant and equipment to be used would be confirmed with the final construction program. For this assessment, Compound 4 has been assessed as this site is the closest to residential receivers and is therefore considered to be the worst case. The site compound has been assessed to operate concurrently with all construction stages.

Table 6-15 Construction stages and sound power levels used in the modelling of construction noise

Construction phase	Typical plant and equipment	Sound Power Level dB(A) $L_{Aeq(15min)}$
Mobilisation & Site Establishment	Truck (HIAB) Road Truck Scissor Lift Franna Crane Light Vehicles Hand Tools	103 108 98 98 88 95
Utility, Property and Service Adjustments	Excavator (tracked) 35t Dump Truck Franna Crane 20t Pneumatic Hammer* Concrete Saw* Vacuum Truck Backhoe Generator	110 110 98 115 115 109 103 101

Construction phase	Typical plant and equipment	Sound Power Level dB(A) $L_{Aeq(15min)}$
Drainage Work	Backhoe Franna Crane 20t Excavator (tracked) 35t Concrete Truck Truck Compressor Vibratory Roller Road Truck	103 98 110 108 75 110 108
Bulk Excavations and Earthworks	Bulldozer D9* Scraper Excavator (tracked) 35t Grader Dump truck Compactor Roller Water Cart	116 110 110 110 110 110 110 107
Pavement Works	Pavement Laying Machine Front End Loader Dump Truck Asphalt Truck and Sprayer Concrete Truck Smooth Drum Roller Concrete Saw*	114 112 110 106 108 107 115
Finishing Works	Road truck Scissor Lift Franna Crane 20t Line Marking Machine	108 98 98 108
Concurrently operating Ancillary Facility		
Ancillary Facility (assumed to operate 24/7)	Front End Loader Road Truck Compressor Welding Equipment Light Vehicles Generator	112 108 109 105 88 101

**Pneumatic hammer and concrete saw assumed to be not operating after midnight. Additionally, Bulldozer D9 assumed to be not operating during OOHW Night (OOHW2), as recommended by the RMS CNVG.*

Residential receivers

Detailed predictions of noise levels from construction activities at individual residences are presented in **Appendix E**.

An assessment of noise impact to residential receivers (NCA 1 and 2) was completed for all of the main construction stages. **Table 6-16** presents a summary of the number of affected noise receivers and level of exceedance during night works (to present the worst case scenario).

Table 6-16 A summary of the number of residential receivers above the night noise management level and the level of exceedance

NCA	NML (OOHW2)	Construction Stage							
				Mobilisation & Site Establishment	Utility, Property & Services Adjustment	Drainage Works	Bulk Excavation & Earthworks	Pavement Works	Finishing Works
1	48	Range of predicted noise levels (dB(A))		36-74	43-84	39-79	43-84	43-84	36-75
		Number of Residences	Complying	7	2	4	2	2	6
			0-5 dB(A) above NML	9	4	7	4	4	8
			5-15 dB(A) above NML	16	13	15	13	13	16
			15-25 dB(A) above NML	28	13	21	13	13	30
			≥25 dB(A)	3	31	16	31	31	3
		Highly noise affected	≥75 dB(A)	0	26	7	26	26	1
2	39	Range of predicted noise levels (dB(A))		31-61	36-69	34-66	36-69	36-69	32-62
		Number of Residences	Complying	47	9	23	9	9	42
			0-5 dB(A) above NML	50	35	48	35	36	47
			5-15 dB(A) above NML	41	84	61	84	84	49
			15-25 dB(A) above NML	7	12	10	12	12	7
			≥25 dB(A)	0	5	3	5	5	0
		Highly noise affected	≥75 dB(A)	0	0	0	0	0	0

A more detailed assessment of construction noise impacts was completed for the 'bulk excavation and earthwork' construction stage across standard hours, out of hours' day (OOH Day), out of hours evening (OOH evening) and out of hours' night (OOH Night) and is included within **Appendix E**. Bulk excavation and earthworks was chosen to represent the loudest construction phase based on the sound power levels of required plant. **Figure 6-3** presents a map of the noise impact radius of bulk excavation and earthworks activities to demonstrate the predicted worst case construction noise impact scenario.

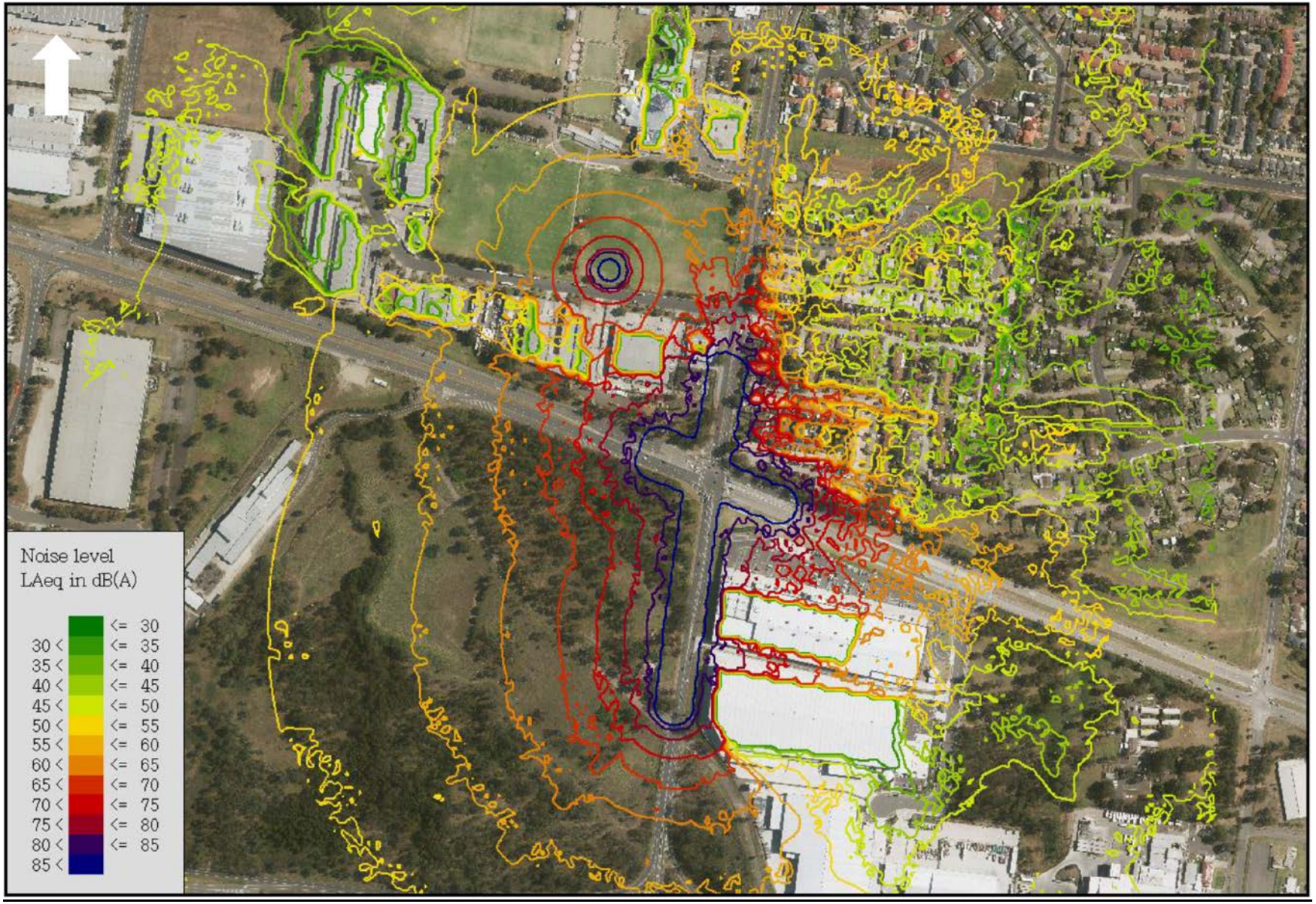

Figure 6-3 Predicted worst case scenario noise impact map – bulk excavation and earthworks

Highly affected noise receivers

Table 6-17 below presents a summary of the number of residential receivers predicted to be highly affected by each construction activity for standard hours, and out of hours' night (OOH Night).

Highly affected receivers are classified as those which have an impact greater than 75 dB(A) during standard construction hours.

As NCA3 and NCA4 do not contain any residential receivers, these NCAs have not been included in **Table 6-17**.

These exceedance counts show there are a number of highly affected receivers in NCA1 during all construction stages (except mobilisation). There are no highly affected receivers in NCA2 during any of the construction stages. The full results of this assessment are presented in **Appendix E**.

Table 6-17 Summary of highly noise affected residential receivers

NCA	Construction Hours	Mobilisation & Site Establishment	Utility, Property & Services	Drainage Works	Bulk Excavation & Earthworks	Pavement Works	Finishing Works
1	Standard	0	26	7	26	26	1
	OOH Night	0	26	7	26	26	1
2	Standard	0	0	0	0	0	0
	OOH Night	0	0	0	0	0	0

Construction Noise and Vibration Guideline (RMS CNVG, 2016)

Construction of the proposal will generate noise impacts above noise management levels therefore a review of mitigation measures within the RMS CNVG are to be considered. Roads and Maritime propose to complete the construction works as 'duration respite'. Duration respite condenses work into blocks of up to five nights a week to reduce the overall works program. It is proposed to work up to five nights a week for the duration of construction. Additionally, high noise activities such as sawcutting and jackhammering would be required to be completed as night works and would be required to be completed by midnight. Advanced notification will be sent out to the community to provide information on the proposed construction schedule and mitigation measures to be implemented to minimise the potential impacts. Verification by noise monitoring during construction is also proposed and has been captured within the Noise and Vibration Management plan safeguard.

Non-residential receivers

Table 6-18 presents impacts from construction works across all construction stages on non-residential receivers in the study area. The commercial receivers at 180 Reservoir Road and 183 Reservoir Road, industrial premises at 4 Oatley Close and the active recreation area at Arndell Park would be impacted above the NML during most construction stages.

It should be noted that 166 Reservoir Road is the Travelodge Hotel which has been classified as a commercial receiver. The worst case construction noise at the most impacted facade of the hotel has been predicted to be 54 dB(A) which is well within in the commercial NML. Based on this predicted level, the worst case construction noise impact inside the hotel rooms is calculated to be 34 dB(A) (assuming a 20 dB(A) attenuation through the masonry facade and non-operable glazing). This predicted internal construction noise level is well below the most stringent night-time construction NML of 39 dB(A) (NCA 2). Therefore, construction activities outside standard hours are unlikely to adversely impact the hotel.

Table 6-18 Predicted Noise Impacts on non-residential receivers (standard hours only)

Building ID/NCA	Address	Usage	NML	Mobilisation and Site Establishment	Utility, Property, Service Adjustments	Drainage Work	Bulk Excavation and Earthworks	Pavement Works	Finishing Works
NCA03-1	180 Reservoir Road	COM	70	70	80	75	80	80	71
NCA03-2	3 Penny Lane	COM	70	65	73	69	73	73	66
NCA03-3	9 Penny Lane	COM	70	66	69	67	69	69	66
NCA03-4	11 Penny Lane	IND	75	66	68	66	68	68	66
NCA03-5	13 Penny Lane	IND	75	61	64	62	64	64	61
NCA03-6	15 Penny Lane	IND	75	57	58	57	58	58	57
NCA03-7	17 Penny Lane	IND	75	54	55	54	55	55	54
NCA03-8	19 Penny Lane	IND	75	53	57	54	57	57	53
NCA03-9	21 Penny Lane	IND	75	45	54	49	54	54	46
NCA03-10	23 Penny Lane	IND	75	50	55	52	55	55	50
NCA03-11	25 Penny Lane	IND	75	51	54	52	54	54	51
NCA03-12	27 Penny Lane	IND	75	47	52	49	52	52	47
NCA03-13	29 Penny Lane (south building)	IND	75	32	37	33	37	37	32
NCA03-14	26 Penny Lane	IND	75	44	47	45	47	47	44
NCA03-15	24 Penny Lane	IND	75	43	49	45	49	49	43
NCA03-16	31 Penny Lane	IND	75	41	49	45	49	49	42
NCA03-17	29 Penny Lane (south building)	IND	75	39	47	43	47	47	39
NCA03-19	170 Reservoir Road (Blacktown Worker Club)	COM	70	55	60	57	60	60	56
NCA03-20	166 Reservoir Road (Travelodge Hotel Blacktown)	COM	70	44	54	49	54	54	45

NCA04-1	183 Reservoir Road Bunnings Blacktown	COM	70	71	81	76	81	81	72
NCA04-2	4 Oatley Close	IND	75	70	80	75	80	80	71
NCA03-21	170 Reservoir Road	ARA	65	50-75	53-75	51-75	53-75	53-75	50-75

NOTE: NCA03-18 is a multi-storey car park. Therefore, the noise impacts are not included in the table above

COM: Commercial, IND: Industrial, ARA: Active Recreation Area

Sleep disturbance

The number of noise exceedances in relation to sleep disturbance is presented in **Appendix E**. The sleep disturbance assessment predicts seven receivers would be highly noise affected in NCA1 during drainage works, bulk excavations and earthworks and pavement works. There are no highly affected receivers in NCA2 during any of the construction stages.

Construction vibration

Vibration-intensive equipment that may be used during the proposal includes compaction equipment such as a vibratory roller and hydraulic hammer. Relevant recommended safe setback distances for these types of plant are reproduced below in **Table 6-19**.

Table 6-19 Recommended safe setback distances for relevant vibration-generating plant

Plant	Rating / description	Safe working distance (metres)	
		Cosmetic damage (BS7385-2: 1993)	Human response (DECC, 2006)
Vibratory Roller	<50 kN (typically 1-2 t) <100 kN (typically 2-4 t) <200 kN (typically 4-6 t) <300 kN (typically 7-13 t) >300 kN (typically 13-18 t) >300 kN (> 18 t)	5 m 6 m 12 m 15 m 20 m 25 m	15 m to 20 m 20 m 40 me 100 m 100 m 100 m
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 m	7 m
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 m	23 m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 m	73 m

The safe working distances presented in **Table 6-19** are indicative only and will vary depending on the particular item of plant and local geotechnical conditions. They apply to typical buildings under typical geotechnical conditions.

The separation distances between the proposed works and the nearest residential buildings are about 25 metres.

Cosmetic Damage Assessment

The separation distance(s) between the proposed works and the nearest receivers will typically be sufficient to ensure that the nearby buildings are unlikely to fall within the safe working distances with regard to 'Cosmetic Damage' for most of the proposed construction equipment. Based on the separation distance between the proposed works and nearest residential buildings, there will be no restriction to the size of vibratory roller and hydraulic hammer that can be used to ensure construction vibration is within vibration limits for cosmetic damage.

Human Comfort Vibration Assessment

In relation to human comfort (response), the safe working distances in **Table 6-19** relate to continuous vibration and apply to residential receivers. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are permitted (refer British Standard BS 6472 1).

Based on the separation distance between the proposed works and nearest residential buildings, it is recommended that vibratory roller 4 tonnes or less and small or medium hydraulic hammer be used to ensure construction vibration is within vibration limits for human comfort. To ensure that vibration is not perceptible at nearest receivers, small to medium sized vibration intensive equipment should be used when construction activities are 25 metres or closer to any residential building.

Construction traffic

Based on traffic volume data from Reservoir Road provided by Roads and Maritime, and estimated additional traffic generated during construction based on the anticipated workforce on an hourly basis, it was found that additional noise arising from construction traffic is unlikely to result in changes of more than 2 dB(A) above existing noise levels.

Operation

Existing noise levels for the adjacent residential receiving environment (NCA1) are presented in **Table 6-11** (long term unattended noise monitoring). The existing background levels at night are 43.2 dB(A).

The predicted operational noise levels showed a minor increase of up to 0.3 dB(A) for the worst affected residential receivers and therefore no specific operational mitigation measures would be necessary.

6.2.5 Safeguards and management measures

Mitigation measures provided in **Table 6-20** would be implemented to minimise noise and vibration impacts.

Table 6-20 Safeguards and management measures for noise and vibration

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	A Noise and Vibration Management Plan (NVMP) for the project will be completed for the project and form part of the Construction Environment Management Plan. The plan will include:	Contractor	Detailed design / pre-construction	Core standard safeguard NV1 Section 4.6 of *QA G36*

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
	• all potential high noise and vibration generating activities associated with the activity • a map indicating the locations of sensitive receivers including residential properties. • a quantitative noise assessment in accordance with the Environment Protection Authority Interim Construction Noise Guidelines (DECCW, 2009) • Feasible and reasonable mitigation measures to be implemented • a process for assessing the performance of the implemented mitigation measures. • A review of safe working distances for vibration generating equipment • a feasible and reasonable monitoring program to assess performance against relevant noise and vibration criteria • a plan for consultation with affected neighbours and sensitive receivers. A process for documenting and resolving issues and complaints. A process for updating the plan when activities affecting construction noise and vibration change. • identify in toolbox talks where noise and vibration management is required • a review of the work schedule and mitigation measures will be carried out in response to noise and vibration complaints. Roads and maritime Environmental Officer to be consulted as part of the review process.			*Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least five days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • the project • the construction period and construction hours • contact information for project management staff • complaint and incident reporting • how to obtain further information.	Contractor	Detailed design / pre-construction	Core standard safeguard NV2
Noise and vibration	Set up of the site compound will be carried out during standard construction hours, pending ROL approval.	Contractor	Construction	Additional safeguard
Noise and vibration	Investigation of the setup and operation of the site compound will be carried out and include consideration of: • site shed placement • temporary or mobile noise screens (where practicable) • enclosures to shield fixed noise sources such as pumps, compressors, fans (where practicable) • site topography when situating stationary plant.	Contractor	Construction	Additional safeguard
Noise and vibration	High noise activities such as sawcutting and jack hammering are to be completed by midnight	Contractor	Construction	Additional safeguard
Noise and vibration	Where activities are in very close proximity to residences for extended periods, the erection of temporary hoardings/screens is to be considered	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	Where smaller, stationary plant is located closer to residences, low noise equipment enclosures are to be considered and used where practicable	Contractor	Construction	Additional safeguard
Vibration	Where vibration issues are identified during the work, alternative equipment and construction methodologies are to be investigated	Contractor	Pre-construction / construction	Additional safeguard

In addition to these mitigation measures, the guidance outlined in Appendix C of the CNVG recommends additional measures which would be required during the proposal (refer to **Appendix E**). These measures are for worst-case circumstances and would be reviewed in relation to the specific location(s) of the works, detailed construction staging, plant and equipment, noting the linear nature of the proposal and implemented accordingly.

6.3 Biodiversity

A biodiversity assessment was undertaken for the proposal and is provided in **Appendix F**. A summary of the assessment is provided in this chapter.

6.3.1 Methodology

Study area

This assessment uses the following terms:

- Proposal footprint – this area comprises the limits of the construction footprint and compound site locations including a five metre buffer (see **Figure 6-4**)
- Study area – includes the proposal footprint and surrounding area (see **Figure 6-4**) that may be used for site access
- Locality – this is defined as the area within a 10 kilometre radius surrounding the proposal footprint
- Bioregion – the study area is located in the Sydney Basin bioregion (Thackway and Cresswell, 1995) and within the Cumberland sub-region.

Background research

A background review of database searches, ecological reports and mapping was undertaken to identify the existing environment of the locality. These included:

- BioNet - the website for the Atlas of NSW Wildlife and OEH Threatened Species Profile Database
- NSW Department of Primary Industries (DPI) freshwater threatened species distribution maps
- The federal Department of Environment's Protected Matters Search Tool
- OEH BioNet Vegetation Classification database
- The federal Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems (GDE)
- Department of Environment's directory of important wetlands
- Department of Planning and Environment's SEPP 14 wetlands spatial data
- Regional vegetation mapping

- OEH NSW Threatened Species Scientific Committee website (Office of Environment and Heritage, 2017)
- Annual Final Priority Assessment List of nominated species and ecological communities that have been approved for assessment by the Minister responsible for the EPBC Act (period commencing 1 October 2017) (Department of the Environment and Energy, 2017)
- Honeman Close Species Impact Statement (Cumberland Ecology, 2017).

Habitat assessment

A habitat assessment was undertaken within the study area on the identified list of threatened flora and fauna species known or predicted to occur in the locality (see **Appendix F** for the habitat assessment results). This list was identified from databases, literature and past surveys. The habitat assessment compared the preferred habitat features for these species with the type and quality of the habitats identified in the study area. The habitat assessment was undertaken to determine the likelihood of the species being present in the study area (ie subject species). The habitat assessment formed the basis for targeted surveys within the study area.

The criteria used in the habitat assessment are detailed in **Table 6-21**. The results of the habitat assessment are provided in **Appendix F**.

Table 6-21 Likelihood of occurrence classification and criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the field survey.
High	It is highly likely that the species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are noncryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.

Figure 6-4 The proposal

6.3.2 Field survey

A field survey was undertaken within the study area on 3 November 2017 to ground-truth the results of the background research and habitat assessment.

Vegetation surveys

A plot-based vegetation survey of the study area was undertaken. The survey was stratified and targeted to assess the expected environmental variation and address any areas with gaps in existing mapping and site information. The broad scale vegetation mapping and aerial photography reviewed during the desktop assessment was used to initially identify vegetation extent. The initial vegetation mapping was ground-truthed while in the field and where possible assigned to Plant Community Types (PCTs) according to OEH BioNet Vegetation Classification Database (Office of Environment and Heritage, 2017b). Surveys assessed the environmental variation within the study area and any areas with gaps in existing mapping and site information to determine vegetation zones.

A vegetation integrity assessment was undertaken for each vegetation zone and to assess vegetation structure and composition attributes (species richness and foliage cover), function attributes (number of large trees, tree stem size class, tree regeneration and length of fallen logs), litter cover and the number of trees with hollows.

Areas of landscape plantings were sampled and mapped to identify the composition and abundance of this vegetation type within the study area. These areas were not assigned vegetation zones as they are not naturally occurring and cannot be matched to a PCT.

Targeted flora surveys

There is about 0.7 ha of potential habitat for threatened flora species in the study area. Targeted flora surveys were undertaken for species considered moderately likely to occur with the study area. These species include:

- *Acacia pubescens* listed as vulnerable under the BC Act and EPBC Act
- *Dillwynia tenuifolia* listed as vulnerable under the BC Act
- *Grevillea juniperina subsp. juniperina* listed as vulnerable under the BC Act
- *Pultenaea parviflora* listed as endangered under the BC Act and vulnerable under the EPBC Act
- *Pultenaea pedunculata* listed as endangered under the BC Act
- *Persoonia nutans* listed as endangered under the BC Act and EPBC Act
- *Pimelea spicata* listed as endangered under the BC Act and EPBC Act
- *Marsdenia viridiflora subsp. viridiflora* endangered population listed as endangered under the BC Act
- *Eucalyptus nicholii* listed as vulnerable under the BC Act and EPBC Act.

Targeted fauna surveys

Targeted fauna surveys for the Cumberland Plain Land Snail were undertaken throughout areas of suitable habitat during the field survey.

Other fauna surveys were not undertaken during the field survey. Targeted fauna surveys (for insectivorous bats and birds) were previously undertaken for the Honeman Close Huntingwood SIS (Cumberland Ecology, 2017) and this data has been used to inform the assessment for this proposal. Where a species has not been surveyed, the habitat assessment has been used to determine the likelihood of occurrence.

Aquatic surveys

An aquatic habitat assessment was conducted to assess the drainage line. Habitat assessment for threatened aquatic species was undertaken for the first-order stream. The habitat assessment was visual only and no fish surveys or macroinvertebrate surveys were conducted; nor was water quality sampling undertaken. The aim of the habitat assessment was to identify the presence of 'key fish habitat'.

The habitat characteristics observed did not match the habitat characteristics of any threatened aquatic species known or predicted to occur in the locality hence targeted surveys for aquatic species were not undertaken.

Limitations

A period of several seasons or years is often needed to identify all the species present in an area, and specific weather conditions are required for optimum detection (eg breeding and flowering periods). The conclusions of the biodiversity assessment are therefore based upon available data and limited field survey and are indicative of the environmental condition of the study area at the time of the survey. To address this limitation, the assessment has aimed to identify the presence and suitability of the habitat for threatened species.

Data and results from the ecological surveys undertaken for the Honeman Close Huntingwood SIS (Cumberland Ecology, 2017) have been relied upon and are assumed to be accurate.

The mapping included in the biodiversity assessment shows the inferred distribution of plant community types and habitat within the study area. The boundaries between plant community types and habitats are not well-defined and the mapping provides an approximation of on-ground conditions. The maps represent a snapshot in time.

6.3.3 Existing environment

Environmental context

The study area is located within the Cumberland sub-region of the Sydney Basin Bioregion and the Cumberland Plain Mitchell Landscape. The study area is situated in an extensively cleared landscape with roadside vegetation and small scattered bushland remnants forming the bulk of the remaining vegetation. The vegetation on 6 Honeman Close forms one of the largest areas of native vegetation on private property within the Blacktown LGA.

The aquatic environment is limited to an unnamed and unmapped creek (Strahler 1st order stream) that exits a culvert on the western edge of Reservoir Road onto the property at 6 Honeman Close and drains north west into Bungarribee Creek which eventually discharges into Eastern Creek, South Creek then finally the Hawkesbury River.

Plant community types

The majority of native vegetation within the study area is confined to the western side of Reservoir Road on 6 Honeman Close (see **Figure 6-5**). A small remnant of native vegetation is also present in the northwest corner of the Reservoir Road – Great Western Highway intersection within the Mitre 10 building. The remainder of the study area contains strips of remnant roadside trees and scattered individual trees in addition to planted native / exotic vegetation. The cleared and disturbed areas (including all four compound sites) contain exotic grassland dominated by weeds.

The following PCTs were identified in the study area:

- Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849)

- Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 835)
- Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071).

Areas of planted native / exotic vegetation that cannot be matched to a PCT were also present. The remainder of vegetated areas are classed as highly disturbed areas – road verges, table drains, road embankments, ploughed paddocks etc.

Groundwater dependent ecosystems

The study area does not contain any aquatic groundwater dependent ecosystems (GDEs) and is not located within a floodplain alluvial groundwater source.

While PCT 849 and PCT 835 are considered with a high likelihood to be GDEs (Kuginis et al., 2012), these two PCTs are not obligate GDEs (ie they not entirely dependent on groundwater). These PCTs are not restricted to locations of groundwater discharge, are not located within aquifers and likely to be opportunistic facultative GDEs.

PCT 1071 only occurs in the study area as a consequence of stormwater management works and is not a naturally occurring wetland. This wetland in man-made and exists due to ponding of stormwater. A freshwater wetland would not have naturally occurred in this location. The occurrence of PCT 1071 in the study area is rain fed and is not likely to be a GDE.

Threatened ecological communities

The following threatened ecological communities (TECs) listed under the BC Act were identified in the study area and are shown in **Figure 6-6**):

- Cumberland Plain Woodland in the Sydney Basin Bioregion (listed as critically endangered).
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (listed as endangered).

Threatened flora species

Twenty-seven threatened flora species and two endangered populations have been previously recorded or modelled as having potential to occur in the locality (see **Appendix F**).

One individual of the threatened flora species (*Eucalyptus nicholii*) was recorded in the study area during the field survey (refer to **Figure 6-6**). This species has been planted at the western edge of Reservoir Road within the proposal area. The Cumberland Plain is not the natural habitat of this species and is outside of the species' natural range. The *Eucalyptus nicholii* tree is isolated from naturally-occurring or naturalised populations of the species and is not able to complete its natural life cycle in this environment.

The habitats in the study area are not considered optimal for any of the remaining threatened flora species listed in **Appendix F** due to the degraded nature of the vegetation, mowing and/or grazing regimes, disturbance to the soil, and dominance of exotic species. Overall, threatened flora species are considered to have a low likelihood of occurrence or are unlikely to occur

Threatened fauna species

No threatened fauna species were found on site during the field survey but the following species are either known to occur in adjacent habitat or are considered at least moderately likely to occur based on the presence of suitable habitat:

- Cumberland Plain Land Snail (*Meridolum corneovirens*)
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)

- Little Eagle (*Hieraaetus morphnoides*)
- Square-tailed Kite (*Lophoictinia isura*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Swift Parrot (*Lathamus discolor*)
- Little Bent-wing Bat (*Miniopterus australis*)
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Eastern Freetail-bat (*Mormopterus norfolkensis*)
- Southern Myotis (*Myotis macropus*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

The Cumberland Plain Land Snail and the Eastern Bentwing-bat were previously recorded during the field survey undertaken for the Honeman Close Species Impact Statement (Cumberland Ecology, 2017). The location of these species is shown in **Figure 6-6**.

No hollow bearing trees were present in the study area which limits the habitat suitability for nestling and roosting. However, the study area is likely to be suitable as foraging habitat. The pipe at the stormwater outlet is not considered likely to be used by the Little Bentwing-bat or Eastern Bentwing-bat due to its small size and construction.

Aquatic species and habitat

The aquatic habitat in the study area is limited to an unnamed stream (Strahler 1st order stream) with intermittent flow following rain events only with little or no defined drainage channel. The stream is considered to be in moderately to highly degraded condition. The stream does not have characteristics suitable for any of the threatened aquatic species known or predicted to occur in the locality as shown in **Appendix F**.

Wildlife connectively corridors

The habitats in the study area retain some form of functional connectivity with the Prospect Nature Reserve to the south and the Western Sydney Parklands to the north west. There is likely to be some movement of species and genetic material between the study area and these adjacent habitats.

Figure 6-5 Plant community types

Figure 6-6 Threatened ecological communities and threatened species

6.3.4 Matters of National Environmental Significance

Threatened ecological communities

One threatened ecological community listed under the EPBC Act was identified within the study area: Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (listed as critically endangered).

There is about 0.1 hectares of the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest community within the study area (**Figure 6-7**).

Threatened species

One individual of the plant species *Eucalyptus nicholii*, which is listed as vulnerable under the EPBC Act, was found in the study area (**Figure 6-7**).

The following two threatened species listed under the EPBC Act are considered moderately likely to use the habitats in the study area for foraging:

- Swift Parrot (listed as critically endangered)
- Grey-headed Flying-fox (listed as vulnerable).

Migratory species

The Fork-tailed Swift and White-throated Needletail are considered moderately likely to fly over the study area but would not use it as habitat.

While some migratory species of bird are likely use the study area and locality, the study area would not be classed as an ‘important habitat’. A nationally significant proportion of the population would not be supported by the study area, as the habitats are not large enough or high enough quality.

Figure 6-7 Matters of National Environmental Significance

6.3.5 Potential impacts

Construction

Removal of native vegetation

The impacts of the proposal must be considered in light of the proposed impact from the development of 6 Honeman Close (Lot 2 DP 229466). The vegetation in the study area on 6 Honeman Close is proposed for removal for the development of a service station. If this development is approved and the vegetation is cleared prior to construction of the proposal, then the impacts assessed for this area would be less than anticipated. The impacts assessed in this REF are based on a worst case scenario and as a precautionary approach the vegetation within the study area on 6 Honeman Close is assumed to be present when works begin.

As a 'worst case' scenario, the proposal would remove about 0.48 hectares in total of the following PCTS:

- Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849)
- Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 835)
- Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071).

The proposal would also result in the removal of about 0.07 ha of planted native/exotic vegetation and about 1.30 ha of highly disturbed vegetation.

A breakdown of the approximate vegetation removal in each vegetation zone is provided in **Table 6-22**.

Table 6-22 Impacts on vegetation

Plant community type (PCT)	Condition class	BC Act	EPBC Act	Proposal area (hectares)	Percent cleared in CMA
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good	CE	CE	0.07	93
	Moderate/ Good_Poor	CE	-	0.31	
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good_Poor	E	-	0.06	93
Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate/ Good_Poor	-	-	0.04	75

Plant community type (PCT)	Condition class	BC Act	EPBC Act	Proposal area (hectares)	Percent cleared in CMA
Planted native / exotic vegetation	-	-	-	0.07	-
Highly disturbed areas - road verges, table drains, road embankments, ploughed paddocks etc	-	-	-	1.30	-

CE = Critically Endangered, E = Endangered

Removal of threatened species and habitat

The proposed vegetation removal includes planted trees which provide suitable habitat for a range of threatened fauna species listed under the BC Act and EPBC Act. Accordingly, direct impacts to habitat for threatened fauna species (although the habitat is only moderate to poor quality) would occur during construction.

No hollow bearing trees would be impacted. The pipe at the stormwater outlet is not considered likely to be used by the Little Bentwing-bat or Eastern Bentwing-bat due to its small size and construction.

There would also be impacts to the single individual of the threatened plant species *Eucalyptus nicholii* which has been planted at the edge of Reservoir Road.

A breakdown of direct impacts to habitat for threatened fauna species in provided in **Appendix F**.

Aquatic impacts

Threatened species listed under the FM Act are not likely to occur in the stream or existing culvert infrastructure due to its poor condition and lack of characteristic habitat features associated with threatened species.

There are no key fish habitat in the study area and as such, there would be no impacts to sensitive or key fish habitats. Impacts to aquatic habitat would be of low magnitude and standard mitigation measures would be implemented to limit impacts (see Section 6.3.6).

Injury and mortality

Fauna injury or death has the greatest potential to occur during construction when vegetation clearing would occur. The extent of this impact would be proportionate to the extent of vegetation that is cleared.

The study area is only likely to contain a limited a number of arboreal species (eg possums) and birds that may be injured or killed during vegetation removal. No hollow bearing trees would be impacted. Reptiles and frogs may also be injured or killed during construction as habitat is cleared.

Entrapment of wildlife in any trenches or pits that are dug is a possibility if the trenches are deep and steep sided. Wildlife may also become trapped in or may choose to shelter in machinery that is stored in the study area overnight. If these animals were to remain inside the machinery, or under the wheels or tracks, they may be injured or may die once the machinery is in use.

Mitigation measures designed to reduce an injury and mortality of fauna are provided in Section 6.3.6.

Invasion and spread of weeds

The most likely causes of weed dispersal and importation associated with the proposal include earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery during construction. The study area contains significant weed growth and no undisturbed weed free habitat exists. Mitigation measures to limit the spread and germination of weeds are provided in Section 6.3.6.

Invasion and spread of pests, pathogens and disease

The study area is currently habitat for a range of pest species including rabbits. Proposal activities have the potential to disperse pest species out of the proposal footprint across the surrounding landscape. The magnitude of this impact would be low and mitigation measures are not deemed necessary.

Several pathogens known from NSW have potential to impact on biodiversity as a result their movement and infection during construction. Of these, three are listed as a key threatening process under either the EPBC Act and/or BC Act including:

- Dieback caused by Phytophthora (Root Rot; EPBC Act and BC Act)
- Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis (EPBC Act and BC Act)
- Introduction and establishment of exotic Rust Fungi of the order Pucciniales on plants of the family Myrtaceae (BC Act).

While these pathogens were not observed or tested for in the study area the potential for pathogens to occur should be treated as a risk during construction. The most likely causes of pathogen dispersal and importation associated with the proposal include earthworks, movement of soil, and attachment of plant matter to vehicles and machinery during construction. Pathogens would be managed within the proposal footprint in accordance with the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (NSW Roads and Traffic Authority, 2011).

Noise, lights and vibration

During construction the proposal would generate noise and vibration which may result in locally common fauna temporarily avoiding habitats adjacent to the construction. However, the current traffic noise is likely to be significant deterrent to most fauna groups. The magnitude of this impact would be low and mitigation measures are not deemed necessary.

Lighting used for night time work may result in impacts to nocturnal fauna. Common nocturnal species such as possums and microbats may avoid the habitat in the study area during construction as temporary ‘daylight’ conditions would be created by the mobile lighting system. This impact is considered temporary and would not have long lasting effects on the biodiversity of the study area. The magnitude of this impact would be low and mitigation measures are not deemed necessary.

Groundwater dependent ecosystems

The PCTs within the study area are likely to be opportunistic facultative GDEs that depend on the subsurface presence of groundwater (often accessed via the capillary fringe – subsurface water just above the water table) when an alternative source of water (ie rainfall) cannot be accessed to maintain ecological function. The proposal would impact on these PCTs.

Operation

Noise, light and vibration

Considering the existing levels of noise and vibration from the surrounding urban development and the high levels of use of the existing Great Western Highway and Reservoir Road by vehicles, it is unlikely there would be a significant increase in noise and vibration during operation of the road that would result in any increased impacts to biodiversity within the study area.

Injury and mortality

There is a chance of fauna mortality during the operational phase of the proposal through vehicle collision (ie roadkill). As there are no definitive data on current rates of roadkill or fauna population densities in the study area, the consequences of vehicle strike on local populations is unknown. With the expansion of an existing road the risk of vehicle strike should remain in a similar level to that currently experienced but the significance of such an impact cannot be predicted. The impact on threatened species however is expected to be minimal. Based on evidence from other roadways in the locality most vehicle strike impacts can be expected to occur to common mammals such as birds and possums and exotic animals including foxes.

Wildlife connectivity and habitat fragmentation

The proposal would not break apart continuous habitats into separate smaller 'fragments'. The proposal would however result in an increase in isolation of habitats as the current habitat patches would be made smaller which would increase the physical distance between habitat fragments. The isolation that may be caused by the proposal is not likely to have an appreciable impact on nomadic or migratory species such as birds. The proposal is likely to be detrimental to the dispersal of arboreal mammals and other species including frogs and reptiles but the effects would only be marginally greater than that which is already experienced.

The predicted level of isolation from the proposal is not likely to be enough to prevent the breeding and dispersal of plant pollinators or the dispersal of plant propagules (ie seed or other vegetative reproductive material) between habitat patches. Functional connectivity for many species would remain in the study area. However, local division of some wildlife populations, isolation of key habitat resources, loss of genetic interchange, and loss of population viability for some species may result.

This impact would be of low magnitude and mitigation measures are not deemed necessary.

Edge effects on adjacent native vegetation and habitat

The proposal would be built in an area that is currently subject to a high level of edge effects from the existing roadways and urban development. The vegetation patches are suffering from intense weed invasion and the habitats that would be impacted by the proposal are edge habitats without any undisturbed core. There is unlikely to be any further impacts from edge effects resulting from the proposal as all vegetation is suffering from edge effects in the form of weed invasion, increased light levels, increased wind speeds, and greater temperature fluctuations. No new edge habitats would be created as the study area does not possess large core areas of undisturbed habitat.

This impact would be of low magnitude and mitigation measures are not deemed necessary.

Conclusion on significance of impacts

An Assessment of Significance (AoS) was undertaken for threatened species that were positively identified within the study area or that are considered to have a moderate or high likelihood of occurring in the study area due to the presence of suitable habitat (refer to **Appendix F**). The AoS concluded that the proposal is not likely to significantly impact threatened biodiversity listed under the BC Act (refer to **Table 6-23**). Therefore, a Species Impact Statement is not required.

The AoS concluded that the proposal is not likely to significantly impact threatened biodiversity listed under the EPBC Act (refer to **Table 6-24**).

Table 6-23 Summary findings of the BC Act test of significance

Biodiversity Conservation Act 2016 test of significance						
Threatened species, or communities	**Significance assessment question1**					**Likely significant effect?**
	a	**b**	**c**	**d**	**e**	
Cumberland Plain Woodland in the Sydney Basin Bioregion	X	N	Y	N	Y	No
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	X	N	Y	N	Y	No
Eucalyptus nicholii (Narrow-leaved Black Peppermint)	N	X	N	N	Y	No
Cumberland Plain Land Snail (*Meridolum corneovirens*)	N	X	Y	N	Y	No
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	N	X	N	N	Y	No
Little Eagle (*Hieraaetus morphnoides*)	N	X	N	N	Y	No
Square-tailed Kite (*Lophoictinia isura*)	N	X	N	N	Y	No
Varied Sittella (*Daphoenositta chrysoptera*)	N	X	N	N	Y	No
Little Lorikeet (*Glossopsitta pusilla*)	N	X	N	N	Y	No
Swift Parrot (*Lathamus discolor*)	N	X	N	N	Y	No
Little Bent-wing Bat (*Miniopterus australis*)	N	X	N	N	Y	No
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)	N	X	N	N	Y	No
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	N	X	N	N	Y	No
Eastern Freetail-bat (*Mormopterus norfolkensis*)	N	X	N	N	Y	No
Southern Myotis (*Myotis macropus*)	N	X	N	N	Y	No
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	N	X	N	N	Y	No
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	N	X	N	N	Y	No
Grey-headed Flying-fox (*Pteropus poliocephalus*)	N	X	N	N	Y	No

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ?= unknown impact.
1. Refer to Appendix F for Significance Assessment Questions as set out in the BC Act.

Table 6-24 Summary findings of the EPBC Act significance assessments

Species/Ecological Community	*Assessment of significance questions (EPBC Act)									Important Population+	Likely Significant Impact
	1	2	3	4	5	6	7	8	9		
Ecological communities											
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Y	N	N	N	N	N	Y	X	X	NA	No
Vulnerable species[+]											
Eucalyptus nicholii (Narrow-leaved Black Peppermint)	N	N	N	N	N	N	N	N	N	No	No
Grey-headed Flying-fox (*Pteropus poliocephalus*)	N	N	N	N	N	N	N	N	N	Yes	No
Critically Endangered species											
Swift Parrot (*Lathamus discolour*)	N	N	N	N	N	N	N	N	N	NA	No

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ?= unknown impact.
1. Refer to Appendix F for Significance Assessment Questions as set out in the EPBC Act.

6.3.6 Safeguards and management measures

A key part of Roads and Maritime's management of biodiversity for this proposal is the application of the 'avoid, minimise, mitigate and offset' hierarchy. The current approach with respect to biodiversity is:

1. Avoid and minimise impact as the highest priority
2. Mitigate impact where avoidance is not feasible or practicable in the particular circumstance
3. Offset where residual, significant unavoidable impact would occur.

Safeguards and management measures to mitigate potential biodiversity impacts are discussed below in **Table 6-25**.

Table 6-25 Safeguards and management measures for biodiversity

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Biodiversity	During detailed design, a plan for offsets or supplementary measures is to be developed for the proposal in accordance with *RMS Guideline for Biodiversity Offsets* (Nov 2016).	RMS Project Manager	Detailed design	Additional safeguard
Removal of native vegetation and habitat	Native vegetation and habitat removal would be minimised through detailed design.	Contractor	Detailed design	Standard safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Biodiversity	A Flora and Fauna Management Plan would be prepared in accordance with Roads and Maritime's Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS Projects (RMS, 2011) and implemented as part of the CEMP. It would include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and any revegetation areas • pre-clearing survey in accordance with RMS biodiversity procedure (RMS 2011) • procedures for unexpected threatened species finds and fauna handling • Protocols to manage weeds and pathogens.	Contractor	Pre-construction / Construction	Standard safeguard
Biodiversity	The environmental induction program will include specific biodiversity issues awareness training including, but not limited to: • All project specific and relevant standard biodiversity mitigation measures • Sensitive area maps • Work zone/vegetation clearing boundary.	Contractor	Construction	Additional safeguard
Removal of native Vegetation and threatened plants	Pre-clearing surveys would be undertaken in accordance with *Guide 1: Preclearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Pre-construction	Standard safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Removal of native Vegetation and habitat	Vegetation and habitat removal would be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	Standard safeguard
Removal of native vegetation and habitat	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) if threatened ecological communities and threatened fauna and flora species, not assessed in the biodiversity assessment, are identified in the proposal site.	Contractor	Construction	Standard safeguard
Removal of native vegetation, edge effects on adjacent native vegetation and habitat and invasion and spread of pests	Exclusion zones would be set up at the limit of clearing (ie the edge of the impact area) and managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	Standard safeguard
Aquatic impacts	Aquatic habitat would be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) and Section 3.3.2 *Standard precautions and mitigation measures* of the *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI (Fisheries NSW) 2013).	Contractor	Construction	Standard safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Injury and mortality of fauna	Fauna would be managed in accordance with *Guide 9: Fauna handling* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	Standard safeguard
Invasion and spread of weeds	Weed species would be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	Standard safeguard

6.3.7 Biodiversity offsets/ supplementary measures

Although efforts have been made to avoid, minimise and mitigate potential ecological impacts from the proposal, some residual impacts would occur. This biodiversity assessment identifies that the proposal is not likely to have a significant impact on any threatened biodiversity listed under the BC Act or EPBC Act. In this instance, and due to the Strategic Assessment, the EPBC Act environmental offsets policy does not apply.

The *RMS Guideline for Biodiversity Offsets* (Nov 2016) indicates that offsets are to be considered where there is any clearing of national or NSW listed critically endangered ecological communities in moderate to good condition.

The proposal would involve clearing of the EPBC Act listed Cumberland Plain Shale Woodlands and Shale- Gravel Transition Forest critically endangered ecological community and the BC Act listed Cumberland Plain Woodland in the Sydney Basin Bioregion critically endangered ecological community. Areas of these critically endangered ecological communities are in moderate to good condition and as such offsets or supplementary measures are to be considered for the proposal in accordance with *RMS Guideline for Biodiversity Offsets* (Nov 2016). Vegetation to be considered for offset or supplementary measures is presented in **Table 6-26**.

Table 6-26 Vegetation to be considered for offset or supplementary measures

Plant community type (PCT)	Predicted impact (ha)
Cumberland Plain Woodland in the Sydney Basin Bioregion (Critically Endangered, BC Act) Includes the subset of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Critically endangered EPBC Act)	0.07

6.4 Soils and contamination

6.4.1 Methodology

A visual site inspection was undertaken on 17 October 2017 during which existing site features were noted. Background desktop searches and review of existing information was also undertaken in November 2017 to inform the assessment.

6.4.2 Existing environment

Soils and topography

The published 1:100,000 series Soil Landscape mapping (NSW OEH, 2014) indicates the proposal area is underlain by the Bringelly Shale geological unit of the Wianamatta Group, overlain by residual soils of the Blacktown Soil Landscape.

Blacktown soil landscape is formed by residual processes (deep soils formed from in situ weathering of parent materials). These soils are typically shallow to moderately deep (<1 metre) red and brown podsoils on crests, upper slopes and well-drained areas; deep (1.5-3 metres) yellow podsoils on lower slopes and in areas of poor drainage. These soils are moderately reactive highly plastic subsoil, with low soil fertility and poor soil drainage.

Contour mapping of the area shows topography ranges from about 74 metres to the east of Reservoir Road, to about 68 metres AHD to the west.

Salinity

Salinity potential mapping prepared by the Department of Infrastructure, Planning and Natural Resources (Department of Infrastructure, Planning and Natural Resources, 2002) indicates that there is a moderate potential for salinity to occur within the proposal area.

Contamination

A search of the contaminated land record of notices maintained by the NSW Office of Environment and Heritage (EPA) did not identify any records of contaminated sites with the suburb of Blacktown.

A previous Stage 1 and 2 preliminary contamination investigation was carried out for the proposed Huntingwood service station development to the west of the proposal, as part of the development application (DA) for the site (Meinhardt, March 2017). The study area for the DA included the western portion of the proposal area.

This study identified the potential risk of groundwater contamination from sources originating at the site to be considered low. This included a number of fill stockpiles located in the northeast part of the site from which samples recovered comprised ripped shale. All soil sample results relevant to the proposal area were below the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 2013 Health Investigation Levels (HILs) for commercial industrial (HILS D). Therefore, the site does not pose an unacceptable risk under the proposed commercial/industrial use scenario which is in accordance with the current and proposed land use for the proposal area.

Abandoned buildings in the south east corner of the site were identified in the report as potentially containing asbestos roofing materials. However, no buildings or structures within the adjacent site would be demolished or impacted as a result of the proposal.

Acid sulphate soils

A search of the Australian Soil Resource Information System (ASRIS) on 9 November 2017 identified the proposal area as having an extremely low probability of occurrence.

6.4.3 Potential impacts

Construction

Topography

The proposal would result in an area of up to 30 metres to the west of the existing Reservoir Road being filled to form the batter for the road extension to the west as part of the proposal.

Soil disturbance

Most of the proposal would be constructed within the existing road corridor, with the majority of earthworks required for the construction of the road widening including construction of the fill batter and culvert extension. This would involve the disturbance of an area of approximately 4,350 cubic metres over a period of approximately six weeks.

As outlined in Section 3.3.4, about 400cubic metres of spoil would be removed as part of earthworks for the proposal, and about 3,200 cubic metres of fill material would need to be imported. Construction works that are likely to disturb soil would include:

- Initial soil disturbance from clearing of vegetation, including grubbing, for the construction of the fill batter to support the road extension, utility relocations, road and footpath construction adjacent to the western side of Reservoir Road. Appropriate environmental controls would be implemented to manage the potential risk of erosion and sediment issues. For example, topsoil material and / or mulch from vegetation clearing may be utilised to form a perimeter berm for potential reuse later in the project during landscaping works
- Stripping, stockpiling and managing of topsoil for pavement works
- Bulk earthworks, including:
  - Excavation for road widening and construction of the road
  - Excavation for utility adjustments and relocations
- Road sub-grade preparation and road pavement work
- Construction of the fill batter. Batter chutes are likely to be required to convey water down the batter during construction. Temporary stabilisation measures would also be required for the exposed batter such as soil stabiliser or sprayseed cover to reduce and manage the potential erosion risk
- Construction of drainage infrastructure, including the culvert extension and scour protection works. This would involve the construction of a temporary outlet diversion to construct the culvert extension. Due to the size of the new headwall it would need to be constructed insitu. Appropriate controls would be implemented within the catchment area to prevent erosion and sediment issues ahead of the low-point at the drainage line, for example the use of small sumps
- Transport and handling of soil and materials to and from the proposal site resulting in potential soil disturbance as a result of the movement of construction vehicles and plant if not appropriately managed
- Driveway adjustment resulting in soil disturbance and potential erosion and sediment issues if not appropriately managed.

Stockpiling at the compound sites and transport of materials from the compound to the construction site could result in the erosion of exposed soil and stockpiled materials, or dispersal of stockpiled materials, if not adequately managed.

Progressive stabilisation of the batter is required to prevent potential erosion issues during construction. As identified above, this may include the application of soil stabiliser or sprayseed cover.

As identified above, although no contamination or requirement for soil remediation was identified at the adjacent proposed service station site, a waste management plan for the management of soils during construction was recommended. The same measure would be required for the proposal, the western portion of which lies within the assessed DA site boundary. Refer to Section 6.10.2 for proposed waste management measures.

Operation

All disturbed areas would be reinstated which would remove operational risks to soils and topography.

Landscaping is proposed on the fill batter to prevent erosion issues during operation.

As identified above, soil sample results from the adjacent DA site were below the NEPM 2013 HILS D criteria, therefore, the western portion of the proposal does not pose an unacceptable risk under the IN1 General Industrial zoning of the land. No remediation requirements were identified at the adjacent DA site.

6.4.4 Safeguards and management measures

Mitigation measures provided in **Table 6-27** would be implemented to minimise impacts on soils and contamination.

Table 6-27 Safeguards and management measures for soils and contamination

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Soil and water	A site specific Erosion and Sediment Control Plan/s will be prepared as part of the CEMP and is to include as a minimum: • Identification of catchment areas, high risk areas and sensitive areas • Rough sizing of each of the above areas • 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 • Dewatering plan which includes process for monitoring, flocculating and dewatering water from site (ie sediment sumps) • Progressive stabilisation plan for disturbed areas,	Contractor	Detailed design / Pre-construction	Core standard safeguard SW2 Section 2.2 of QA G38 *Soil and Water Management*

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
	including the fill batter • The ESCP is to be updated at least fortnightly • A process to routinely monitor the BOM weather forecast • Preparation of a wet weather (rain event) plan which includes a process for monitoring potential wet weather and identification on the plans showing controls to be implemented in the event of wet weather. • Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.			
Soil and Water	The CEMP is to include an environmental work method statement (EWMS) for all works associated with the construction of the culvert extension and scour protection works.	Contractor	Detailed design/ Pre-construction	Additional safeguard
Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Detailed design / Pre-construction	Core standard safeguard C2 Section 4.2 of QA G36 Environment Protection

6.5 Water, hydrology and flooding

6.5.1 Methodology

A visual site inspection was undertaken on 17 October 2017 during which existing site features were noted. Background desktop searches and review of existing information was also undertaken in November 2017 to inform the assessment.

6.5.2 Existing environment

Surface water

The nearest waterways to the proposal are as follows:

- Bungarribee Creek located about 390 metres to the west of the proposal
- Prospect Nature Reserve located about 850 metres to the south of the proposal
- Robert Brown Nature Reserve located about 520 metres to the east of the proposal
- The Boiler Paddock located about 330 metres to the south-west of the proposal.

Stormwater runoff within the proposal area is collected by a network of kerbs and gutters.

As part of the proposal, the existing stormwater culvert outlet to the west of Reservoir Road would be disturbed for the extension of the culvert and construction of associated scour protection. Vehicles would not be permitted to cross the drainage line unless approved as part of the EWMS. The existing culvert outlet is shown in **Figure 6-8**.

Figure 6-8 Existing culvert outlet (Source: Roads and Maritime Services, 2017)

Flooding

The proposal is not located within flood prone land. One of the compound sites, Compound 3, is located within an area of low-medium flood risk.

The land surrounding Bungarribee Creek is mapped as having a low-high flood risk.

Groundwater

A review of Office of Water data for groundwater boreholes in the surrounding area identified three groundwater monitoring boreholes within 500 metres of the proposal. The available data is summarised in **Table 6-28**. No other detail was available, including no standing water level (SWL) details available.

Table 6-28: Groundwater and geological borehole logs

Groundwater bore number	Location	Distance to proposal	Drill depth (m) below ground surface
GW113284	7 Eleven service Station at 180 Reservoir Road to the north of the site	Immediately to the north	12
GW1113285	7 Eleven service Station at 180 Reservoir Road to the north of the site	Immediately to the north	10.5
GW113286	7 Eleven service Station at 180 Reservoir Road to the north of the site	Immediately to the north	10.5

Based on local topography, groundwater flow is anticipated to flow west from the proposal area. Based on the search of licensed groundwater bores, no identified users of groundwater are located in the near down-gradient of the proposal.

6.5.3 Potential impacts

Construction

Refer to Section 6.4 for associated soil erosion risks and safeguards.

Surface water

Construction activities also have the potential to affect local surface water if not appropriately managed, including as a result of:

- Sediment run off during rainfall events due to increased soil exposure
- Pollutants from site (including paint for line marking, chemicals or wastewater from accidental spills, and sediment from excavations and stockpiles) reaching nearby storm water drains and flowing into waterways.

Erosion and sediment controls would need to be implemented at the site and construction compounds in order to mitigate potential risks.

The location and management of compound sites would be undertaken in accordance with the *Stockpile Site Management Procedures* (RTA, 2011). Therefore, it is unlikely that sediment from this site could impact on any surrounding sensitive receiving waterways.

Flooding

Construction of the proposal is not expected to be impacted by flooding as the proposal area, excluding compound site three, is not located in flood prone land. Construction of the proposal is also unlikely to increase the likelihood or intensity of flood events.

Appropriate management measures would be implemented to manage potential flood risks at Compound 3 which is mapped as having a low-medium flood risk.

Groundwater

Due to the nature of the works and minimal excavation, groundwater levels are not expected to be affected by construction works.

Operation

All disturbed areas would be reinstated which would remove operational risks to water quality.

Modification and upgrade to the existing drainage network would be required to allow for a larger impervious area due to the widening of the road corridor. The proposal would be designed to meet the requirements for a 1 in 10 year ARI event.

6.5.4 Safeguards and management measures

Mitigation measures provided in **Table 6-29** would be implemented to minimise impacts on water, hydrology and flooding.

Table 6-29 Safeguards and management measures for water, hydrology and flooding

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).	Contractor	Detailed design / Pre-construction	Core standard safeguard C3 Section 4.3 of QA G36 Environment Protection
Works within the drainage line	Vehicles would not be permitted to cross the drainage line unless approved as part of the Culvert work EWMS.	Contractor	Detailed design / Pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Storage of substances	Storage of fuels, chemicals and liquids at Compound 3 will be kept in bunded sheds above the flood height level. If this is not practicable, storage of fuels, chemical and liquid would not occur in Compound 3.	Contractor	Construction	Additional safeguard

6.6 Landscape character and visual impacts

6.6.1 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).

Both Landscape Character and Visibility are assessed in a similar way and adopt the same matrix as part of the assessment process. This matrix assesses both the sensitivity of a site to change as well as the magnitude of the proposed change to determine a level of impact for the proposal. These terms are defined below:

- **Sensitivity** refers to the qualities of an area, the type number and type of receivers and how sensitive the existing character of the setting is to the proposed change. For example, a pristine natural environment will be more sensitive to change than a built up industrial area.
- **Magnitude** refers to the nature of the project. For example, a large interchange would have a very different impact on landscape character than a localised road widening in the same area.

Figure 6-9 summaries the ranking of the assessment of these two criteria and how they are combined to provide an overall impact assessment.

		Magnitude			
		High	*Moderate*	*Low*	*Negligible*
Sensitivity	*High*	High Impact	High - Moderate	Moderate	Negligible
	Moderate	High - Moderate	Moderate	Moderate - low	Negligible
	Low	Moderate	Moderate - low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Figure 6-9 Landscape Character and Visual Impact Assessment Matrix

Source: Environmental Impact Assessment Practice Note: Guidelines for landscape character and visual impact assessment (EIA No.4) (Roads and Maritime, 2013)

6.6.2 Existing environment

Landuse

The site is adjoined by a number of land uses, including industrial, commercial, residential and open space lands as shown in **Figure 6-13**.

Topography

Topography has a strong influence on visibility and the ability of the site to address changes in character. The topography and soils of the proposal area are discussed in Section 6.4.2.

Waterways and drainage

The nearest waterways to the proposal are as outlined in Section 6.5.2. Two minor ephemeral watercourses, located within the natural valleys of the site, cross the extents of the proposed upgrade as a combination of surface or piped flows. A small basin/body of water is present on the southernmost watercourse in the south western corner of the intersection at the headwall of the drainage culvert just west of Reservoir Road. A fenced basin, located at the base of the Bunnings retaining wall is present on the south eastern corner.

Vegetation

The presence of vegetation is limited to a number of sites adjoining the road corridor and consists largely of remnant eucalypts within a grassland setting. This vegetation either anchors the corner of the intersection as is the case of the south western corner of the intersection or provides a veil of vegetation which minimises the visibility of the adjoining land uses as is the case of the north western corner of the intersection.

The south western corner of the intersection remains undeveloped and is covered by an open canopy of a range of indigenous species which comprise both Cumberland Plain Woodland and River flat Eucalypt Forest. Similarly, a stand of remnant Cumberland Plain Woodland has been preserved on the north western corner providing a tree lined frontage to this portion of the Great Western Highway.

The Reservoir Road and Great Western Highway frontages to Bunnings are largely without any vegetation of any scale. A small detention basin is located at the south-east corner of the intersection associated with the Bunnings site.

Landscape character

The landscape character contributes to its sense of place including all built, natural and cultural aspects, covering towns, countryside and all shades between (Roads and Maritime Services, 2013). Five landscape character zones (LCZs) have been identified, reflecting the road environment and its surrounding land uses as follows:

- LCZ1: South eastern corner of the intersection surrounding the Bunnings site and adjoining industrial warehouses. This site is dominated by the large format warehouse development of the Bunnings building
- LCZ2: South western corner of the intersection surrounding the open space woodland area. This site is characterised by its vegetative cover consisting of a semi enclosed woodland dominated by a eucalypt canopy and exotic grass understorey
- LCZ3: North western corner of the intersection surrounding the vegetated area and fence and Mitre 10 warehouses beyond. The canopy breaks down the mass of the large format warehouse buildings which are also set below the adjoining road levels in relation to the topography of the site
- LCZ4: North eastern corner of the intersection surrounding the residential precinct of the intersection. This zone presents a distinct and low rise built form, composed of single and two

storey freestanding and townhouse developments. The mass of the built form is broken in part by vegetation both within the lots and the adjoining streetscapes
- LCZ5: Reservoir Road and its intersection with the Great Western Highway. This zone is dominated by the road infrastructure and presents a distinct zone of use and character which all the adjoining character zones address.

These LCZs are shown in **Figure 6-10**.

Viewpoints

Views are experienced by road users, pedestrians, and those visiting, living or employed on the adjoining lands. Having regard to these potential viewers, residents are likely the most sensitive to the proposal. All other users are largely transient or do not relate to the view as personally as a resident would.

Viewpoints assessed as part of the proposal are outlined in **Figure 6-11** and summarised below:

- VP1: View from Bunnings in the south eastern corner of the intersection looking north west across the intersection
- VP2: View from Reservoir Road south of Boiler Close looking north
- VP3: View from Reservoir Road south of Honeman Close looking north
- VP4: View from west of Bunnings looking north along Reservoir Road towards the intersection
- VP5: View from the north west corner of the intersection looking south across the Great Western Highway
- VP6: View looking west from residential properties along the eastern side of Reservoir Road
- VP7: View from the north eastern side of the intersection looking west along the Great Western Highway.

Viewpoints assessed in relation to the proposed location of potential construction compound sites are outlined in **Figure 6-11** and summarised below:

- VPC8: View looking west across Reservoir Road towards the location of proposed Compound 1
- VPC9: View looking south east from intersection of Reservoir Road and Boiler Close toward the location of proposed Compound 2
- VPC10: View looking south across the Great Western Highway toward proposed Compound 3
- VPC11: View looking north from commercial properties on the southern side of Penny Place toward the location of proposed Compound 4.

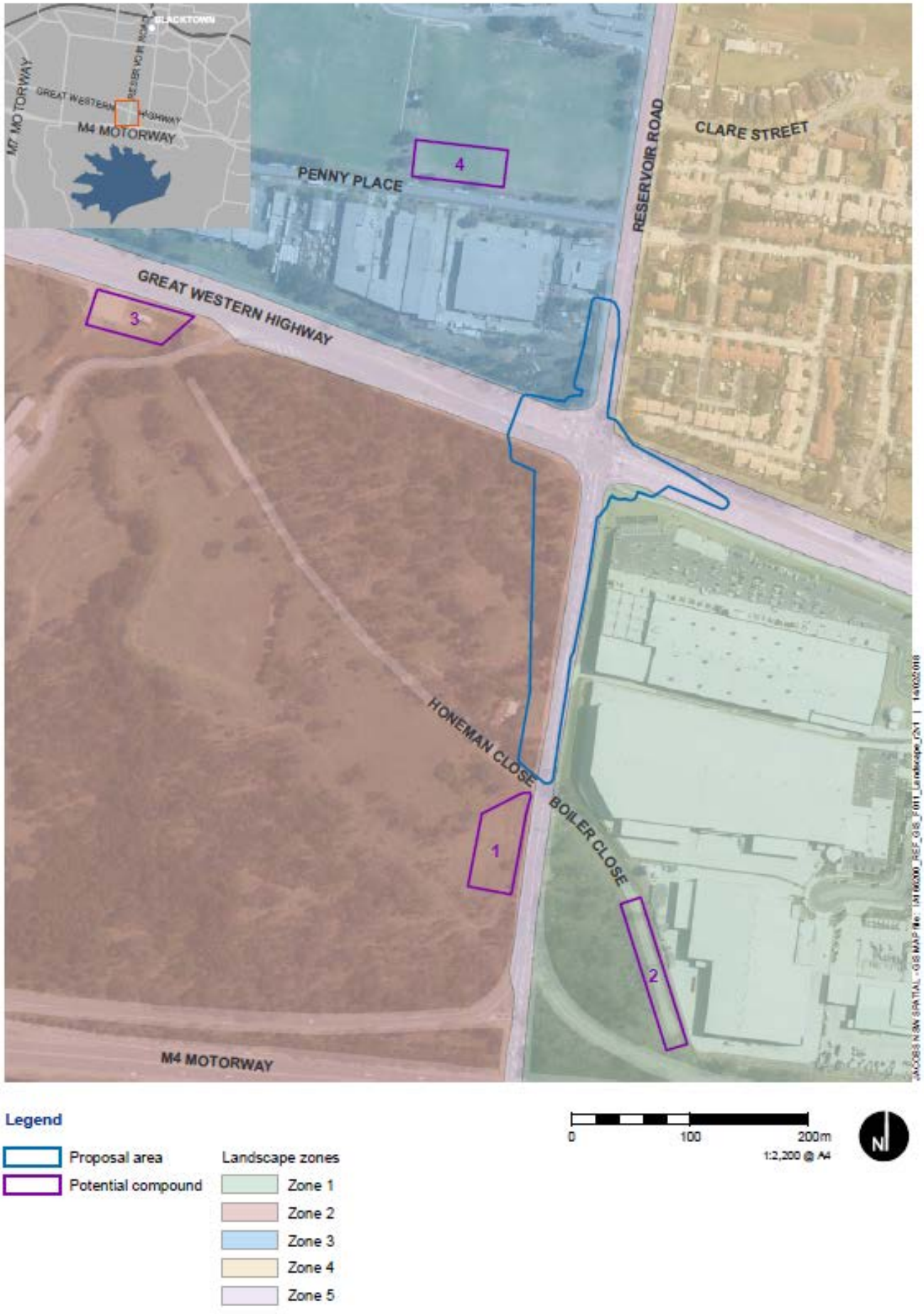

Figure 6-10 Landscape character zones

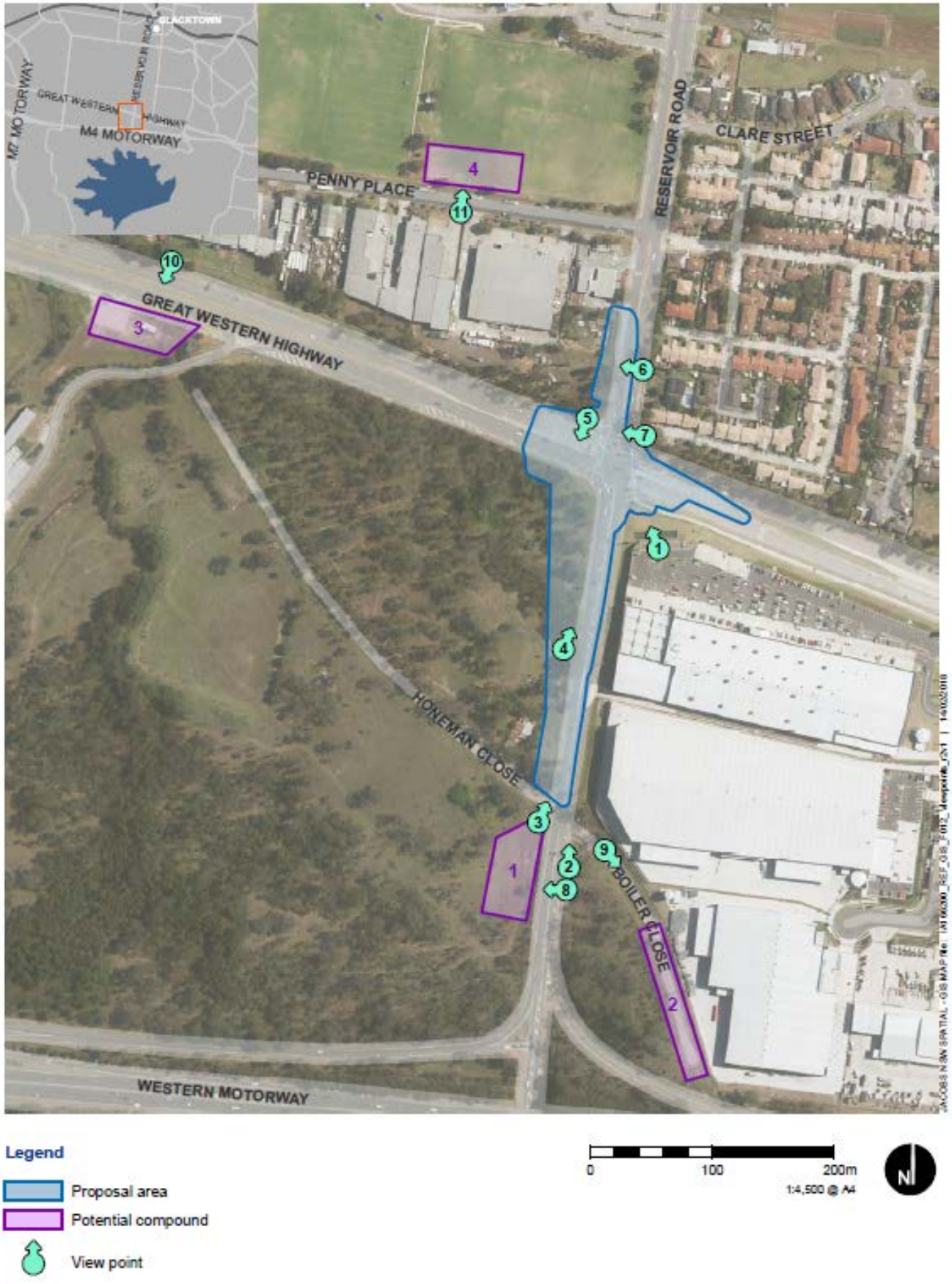

Figure 6-11 Key viewpoints

6.6.3 Potential impacts

Construction

Visual impacts during construction would be associated with the presence of work vehicles and the construction site. These impacts would be minor and short-term. During evening and night-time works, temporary construction lighting would be required which has the potential to result in light spill to adjacent properties.

Visual impacts to residential properties would be limited to works in the northern portion of the proposal area. As there are no residential receivers located in the southern portion of the proposal area, works would have limited impact in comparison to works undertaken in the northern portion,

In addition to the works along Reservoir Road and the Great Western Highway, there are a number of potential compound sites proposed which would be operated during day and night time as required, to facilitate construction works. Construction materials and site sheds would be contained within the compound site and would be subject to the movement of staff, plant and equipment as well as potential temporary site hoarding along its perimeter. Temporary impacts from compound sites would be minor and short-term given the nature of the works.

Potential visual impacts from all the compounds have been assessed in **Table 6-30**, however it is noted that not all compounds would be required for the project.

Table 6-30 Visual impacts from construction compounds

ID	Location	Photo	Impact		Comment
VP8	View looking west across Reservoir Road		Sensitivity: Magnitude: Impact:	Low Low Low	Visible on the edge of Reservoir Road
VP9	View looking South East from intersection of Reservoir Road and Boiler Close.		Sensitivity: Magnitude: Impact:	Negligible Low Negligible	Recessed from view off Reservoir Road

ID	Location	Photo	Impact		Comment
VP10	View looking South across the Great Western Highway		Sensitivity: Magnitude: Impact:	Low Moderate Low to Moderate	Exposed to view from Great Western Highway
VP11	View looking North from commercial properties southern side of Penny Place		Sensitivity: Magnitude: Impact:	Moderate Moderate Moderate	Views from the Penny Lane and adjoining ovals see this assigned a comparatively higher sensitivity value than the other locations.

Operation

The proposal would introduce new features into the streetscape including new pavements, signage and the upgrade of existing traffic signals. However, these features would have minimal visual prominence, would be consistent with the character of the Reservoir Road and the Great Western Highway and would not significantly affect any views.

The greatest potential impact would be the increase in scale of the extent of pavement which would increase with clearing of vegetation up to about 30 metres west for the proposal. As a result, distance between the remnant vegetation and the road corridor would provide a more open visual landscape.

Landscape character impact

Table 6-31 summarises the potential impact to LCZs during operation of the proposal. The assessment of impacts is based on the landscapes ability to absorb change and the potential impact the proposal has in relation to the character of each zone.

Of the character zones assessed the greatest change in character experienced is to the road itself as a result of increasing the pavement footprint and an increase in vegetation clearance with a corresponding reduction in edge definition.

Table 6-31 Landscape character impacts

ID	Magnitude	Sensitivity	Impact	Comment
CZ1	Low	Negligible	Negligible	Minor works are proposed within this portion of the study area resulting in minimal impact
CZ2	Moderate	Low	Low - Moderate	All works expand into this character zone reducing the definition of the road edge and resulting in the loss of trees, including mature trees
CZ3	Low	Low	Low	Expansion of the road footprint into this zone results in the loss of some trees opening up views
CZ4	Negligible	Moderate	Negligible	No works are proposed within this portion of the study area.
CZ5	Moderate	Moderate	Moderate	Increase in pavement width by a third with the addition of two lanes and a wide verge

Visual impact

Table 6-32 summarises the outcomes of the assessment of potential impacts on key viewpoints.

Overall the proposal is considered to have a moderate visual impact on the proposal area. The main impacts are as a result of vegetation clearing and the increased footprint of the road, increasing the dominance of the road in the view.

It is also considered that with appropriate landscaping the impact within zones CZ2 and CZ3 can be adequately mitigated.

Table 6-32 Visual impacts

ID	Location	Photo	Impact	
VP1	View from Bunnings in south eastern corner of the intersection looking north west across the intersection		Sensitivity: Magnitude: Impact:	Low Low Low
VP2	View from Reservoir Road south of Boiler Close, looking north along Reservoir Road within the southern portion of the proposal area		Sensitivity: Magnitude: Impact:	Negligible Low Negligible

ID	Location	Photo	Impact	
VP3	View from Reservoir Road south of Honeman Close, looking north along Reservoir Road within the southern portion of the proposal area		Sensitivity: Magnitude: Impact:	Low Low Low
VP4	View from west of Bunnings looking north along Reservoir Road towards the intersection		Sensitivity: Magnitude: Impact:	Low High Moderate

ID	Location	Photo	Impact	
VP5	View from the north west corner of the intersection looking south across the Great Western Highway		Sensitivity: Magnitude: Impact:	Moderate Moderate Moderate
VP6	View looking west from residential properties along the eastern side of Reservoir Road		Sensitivity: Magnitude: Impact:	Moderate Moderate Moderate

ID	Location	Photo	Impact	
VP7	View from the north eastern side of the intersection looking west along the Great Western Highway		Sensitivity:	Low
			Magnitude:	Moderate
			Impact:	Low to Moderate

6.6.4 Safeguards and management measures

Table 6-33 summarises the measures proposed to manage and mitigate potential landscape character and visual impacts of the proposal as identified above.

Table 6-33 Mitigation measures – landscape character and visual

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Landscape plan	A landscape plan would be developed during detailed design to outline the proposed landscape treatment for the proposal.	Roads and Maritime	Detailed Design	Additional safeguard
Construction lighting impacts	Construction lighting will be oriented so as to minimise the potential for light spill to adjacent areas.	Contractor	Construction	Additional safeguard
Construction stage visual impacts	The work site will be left tidy at the end of each working day.	Contractor	Construction	Additional safeguard
Impact on trees	Establishment of Tree Protection Zones and tree protection measures consistent with AS4970-2009 Protection of Trees on Development Sites will be implemented for all trees within or immediately adjacent to the construction footprint.	Contractor	Construction	Additional safeguard

6.7 Property, land use and socio-economic

6.7.1 Methodology

The study area for this assessment is based on those communities, including residents, workers, business customers, visitors and public transport users that are likely to experience changes to socio-economic conditions due to the construction and operation of the proposal. The study area is located within the Australian Bureau of Statistics (ABS) Statistical Area Level 1 (SA1) locations of:

- 1131801 SA1, comprising predominantly industrial land to the north and south of the Great Western Highway, west of Reservoir Road
- 1156026 SA1, comprising predominantly residential land to the north of the Great Western Highway, east of Reservoir Road
- 1130818 SA1, comprising predominantly industrial and commercial land (including Bunnings Warehouse) south of the Great Western Highway, east of Reservoir Road.

At a regional level, the study area is located within the ABS Statistical Area Level 2 (SA2) of:

- Prospect Reservoir SA2
- Blacktown (South) SA2
- Seven Hills-Toongabbie SA2.

The study area for the assessment is shown in **Figure 6-12**.

The methodology for this socio-economic assessment is guided by the *Environmental Impact Assessment Practice Note: Socio-economic assessment* (EIA-N05) (Roads and Maritime, 2013). Key steps in the assessment included:

- Scoping of the potential socio-economic impacts of the proposal and potentially affected communities, both locally and regionally
- Analysing existing socio-economic conditions and values, including population, social infrastructure (ie education, recreation and health services and facilities), and local businesses
- Identifying and assessing potential socio-economic impacts of the proposal's construction and operation, including on local amenity, access and connectivity, social infrastructure and local community values
- Identifying safeguards and management measures to mitigate or manage the identified impacts.

The description of the existing socio-economic environment principally draws on data and information from the ABS 2016 Census of Population and Housing. This is supplemented with data and information from:

- NSW Department of Planning and Environment, relating to population projections
- The Blacktown City Council website, as well as relevant Council plans and policies.

Figure 6-12 Socio-economic study area

6.7.2 Socio-economic policy context

The proposal is located within the Blacktown City Council LGA. The *Community Strategic Plan: Our Blacktown 2036, Our Vision, Our Plan* (Community Strategic Plan) outlines the vision of the LGA and identifies six strategic directions to guide growth over the next 20 years. The theme relevant to the proposal includes:

> A growing city supported by accessible infrastructure: *Our neighbourhoods are well planned and liveable with housing, transport and infrastructure that meet the diverse needs of our growing community.*

Focus areas of this theme which are relevant to the proposal include providing transport networks that connect Blacktown for vehicle and non-vehicle users and improve road safety. A key indicator of this theme is travel time (journey to work).

The proposal would meet the objectives of the Community Strategic Plan by improving travel time by reducing delays and maximum queue lengths once operational. The proposal would also meet the proposal objective detailed in Section 2.3 by improving traffic flow and road safety and easing traffic congestion at the intersection.

6.7.3 Existing environment

Property

Land within the proposal area is owned by private landowners, Roads and Maritime and Blacktown City Council.

Land use

The proposal area and potential compounds contains a mix of land zones under the Blacktown LEP including SP2 Infrastructure, IN1 General Industrial, IN2 Light Industrial and RE2 Private Recreation. These land use zones are shown in **Figure 6-13**.

The industrial zoned lands in the south-western corner of the intersection are currently undeveloped, presenting a very different character to the adjoining developments. A development application for a service station on this site has been received by Blacktown City Council which would impact the overall character of this corner of the intersection.

The south-eastern corner of the intersection is occupied by a Bunnings Warehouse which is set above a large retaining wall which creates a level platform for the warehouse and its associated car parking.

The north western corner is also zoned Light Industrial (IN2) and is occupied by a Mitre 10 Hardware Warehouse. Its presence on the Great Western Highway and Reservoir Road, however, is reduced by remnant vegetation and the fall of the site to the west which sees it set lower than both the adjoining roads. A 7-Eleven is located east of the Mitre 10.

Residential developments (R2) occupy the north-eastern corner of the intersection and are located outside of the proposal area. These consist of a mix of town house developments located on the Great Western Highway frontage, and freestanding individual lot developments, which front Reservoir Road. Despite a number of these properties having a frontage to either the Great Western Highway or Reservoir Road their access is from the adjoining street network. The scale of residential development is largely limited to single or double storey dwellings.

Open spaces occur both on Reservoir Road (RE2) and outside the proposal area on the Great Western Highway (RE1). The open space off Reservoir Road is located north west of the proposal area and consists of playing fields and a club house which are owned by the Blacktown Workers Sports Club. Compound 4 is proposed to be located in this open space (subject to Blacktown City

Council approval). The open space off the Great Western Highway is located east of the proposal area, on top of an embankment. A wide tree lined verge visually links this to the intersection.

Community profile

Population and growth and demography

In 2016, the study area had an estimated resident population of 729 people (ABS, 2017). The population of the Blacktown LGA is projected to increase to 521,450 people by 2036. This represents an average annual growth of 2.1 per cent from 2011, above the NSW average of 1.2 per cent (NSW Department of Planning and Environment, 2017).

Socio-economic characteristics of the study area are shown in **Table 6-34**. Communities in the study area are generally characterised by:

- A median age and proportions of children similar to NSW, and lower proportion of elderly people
- A culturally diverse population with relatively high proportions of people born overseas and households where a non-English language is spoken compared to NSW.

Table 6-34 Socio-economic characteristics of the study area (ABS, 2016)

Socio-economic characteristics	Study area	New South Wales
Total population	729	7,480,228
Median age	36.7	38
0-14 years*	20.6%	18.5%
65 + years*	6.8%	16.3%
Aboriginal and Torres Strait Islander*	0	2.9%
Born in Australia*	32.1%	65.5%
Households where a non-English language is spoken*	69.5%	26.5%
Total private dwellings	259	2,889,061
Households with no vehicle*	5.8%	9.2%
Households with two or more vehicles*	42.6%	50.8%
Travel to work by car (as driver or passenger)*	74.5%	64.6%
Travel to work by public transport*	17.2%	16%
Median weekly household income	$1,137	$1,486
Unemployment rate*	7.3%	6.3%

Source: Based on ABS Census, 2016; *1156026 SA1 data only

Workforce participation, employment and income

The study area had relatively high rates of workforce participation however had slightly higher levels of unemployment compared to NSW. About 7.3 per cent of the population was unemployed, compared to about 6.3 per cent in NSW in the 2016 Census.

Major industries of employment in the study area include hospitals, aged care residential services, takeaway food services, road freight transport and other warehousing and storage services.

In 2016, the study area recorded a lower median weekly household incomes compared to NSW.

Access and connectivity

In 2016, private vehicle was the dominant mode of travel to work for residents in the study area, with about 74.5 per cent of people travelling to work by car, as either a driver or passenger. This is compared to 64.6 per cent in NSW. Public transport use in the study area is slightly above the NSW average.

Major roads that are located within or near the proposal include Great Western Highway and Reservoir Road. The Great Western Highway is classified as a State Road. The Great Western Highway provides an east-west link from Penrith, about 20 kilometres west of the proposal, to Parramatta, about eight kilometres east of the proposal. Reservoir Road is classified as a State Road. Reservoir Road provides a north-south link, to the Blacktown CBD, about three kilometres north of the proposal, and the M4 Motorway, about 530 metres south of the proposal. A number of local roads are also located near the proposal area. These roads provide access and connectivity for residential, commercial, industrial and recreational areas near the proposal.

There is no parking on either side of Reservoir Road or Great Western Highway within the proposal area.

Two bus routes travel through the proposal (723 and 724) with bus stops on Reservoir Road just north of the proposal area. The 723 route travels along Reservoir Road to the north of the intersection through the proposal area, and along the Great Western Highway to the west. The 724 travels along Reservoir Road to the north and south of the intersection through the proposal area, as well as along Penny Place to the south of Compound 4.

There are pedestrian facilities on the approach to the intersection from the north on either side of Reservoir Road, and from the east along the southern side of the Great Western Highway adjacent to the Bunnings site. There are no pedestrian pathways to the south of the intersection on either side of Reservoir Road. There are no formal cyclist facilities within the proposal area.

Social infrastructure

Social infrastructure located near the proposal is outlined in **Table 6-35**.

Table 6-35 Social infrastructure located near the proposal

Social infrastructure	Type	Description
Harold Laybutt Sporting Complex	Sport and recreation	The sporting complex is located to the north of the proposal, with vehicle access off Reservoir Road. The sporting complex includes a number of sporting facilities including soccer fields, football fields, a baseball field, tennis courts, netball courts and a bowling greens.

Social infrastructure	Type	Description
Blacktown Workers Sports Club	Social	The Blacktown Workers Sport Club is located north of the proposal area.
Robert Brown Reserve	Open space	The reserve is located to the east of the proposal area, with vehicle access of Flushcombe Road. The reserve consists of an open grassed area with sparse trees. The reserve is located in front of residential properties.

Community values

Areas within and near the proposal area mainly comprise industrial, commercial, residential and recreation uses. Established trees located on the north-eastern and north-western corner of the intersection are likely to offer some landscaping and visual relief for residential properties and customers and workers accessing the industrial area respectively.

The recreational and social facilities located north of the proposal are likely to be important amenities to the community.

Improved road safety and efficient road networks are likely to be important to the community.

Local business and industry

Local businesses located within or near the proposal area include:

- Bunnings Warehouse on the south-eastern corner of Great Western Highway and Reservoir Road
- Blacktown Mitre 10 located at 3-7 Penny Place, Arndell Park
- Austral Wire Products located at 17 Oatley Close, Blacktown
- VCV SydneyWest located at 9 Oatley Close, Blacktown
- Animal Holding Facility located at 415 Flushcombe Road, Blacktown
- Red Lea Chickens at located at 421-427 Flushcombe Road, Blacktown
- 7 Eleven Arndell Park located at 180 Reservoir Road, Arndell Park
- Gary's Motorsport Tyres located at 3/13 Penny Place, Arndell Park
- Firebrand Australia Pty Ltd located at 9 Penny Place, Arndell Park
- ACE Windscreens & Autoglass located at 11 Penny Place, Arndell Park
- Mr Rental Parramatta at Parramatta located at 2/13 Penny Place, Arndell Park
- Healthy Canteens Australia located at 1/13 Penny Place, Arndell Park
- Global Machinery Sales located at 1/21 Penny Place, Arndell Park
- Amazing Fencing NSW located at 25 Penny Place, Arndell Park
- Travelodge Hotel Blacktown located at 170 Reservoir Road, Prospect
- Workers Sport Club located at 170 Reservoir Road, Arndell Park
- McDonalds Arndell Park located on the corner of Reservoir Road and Holbeche Road.

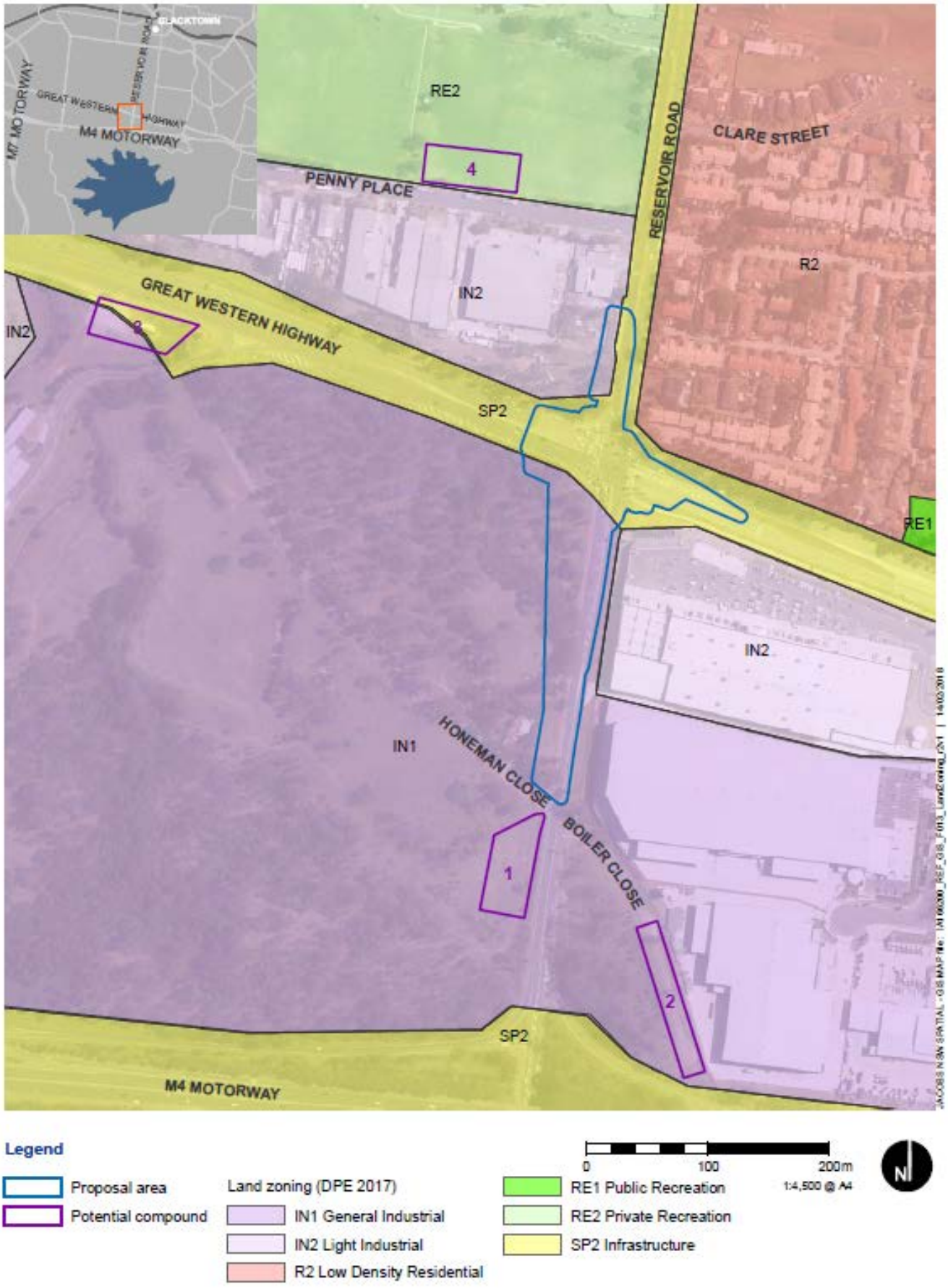

Figure 6-13 Land use

6.7.4 Potential impacts

Construction

Access and connectivity

During construction, potential impacts on local access and connectivity would generally be associated with increased construction traffic, including heavy vehicles, near to construction works and temporary changes to road conditions at Reservoir Road and Great Western Highway, such as reduced speed limits, temporary lane closures and diversions, and temporary access changes. This may result in delays and disruptions for some motorists and other road users. The proposed construction works impact on perceptions of road safety for some motorists, pedestrians and cyclists.

Temporary delays and disruptions to some bus services may also result from changes to road conditions, impacting on some commuters. These impacts are expected to be minor as majority of construction would be carried out during out-of-hours working hours.

Temporary pedestrian diversions or footpath closures would be required and would be managed in accordance with the relevant traffic management plan.

Potential impacts on access and connectivity during construction would be mitigated through the implementation of safeguards and management measures outlined in Section 6.7.5.

Community values

During construction, temporary impacts on local amenity may result for residents, local businesses and users of community facilities closest to construction activities due to increased construction noise, and dust (refer to Section 6.2 and Section 6.10).

Land uses surrounding the proposal area mainly comprise industrial, commercial, residential and recreation uses. Impacts on night-time amenity may be experienced by these residents during out of hours work. These impacts would be managed in accordance with the safeguard and management measures outlined in 6.2.5.

Potential impacts on community values during construction would be mitigated through the implementation of safeguards and management measures outlined in Section 6.7.5.

Social infrastructure

The proposal has the potential to temporarily impact users of social infrastructure located near the proposal. For example, users of the recreational and social facilities located north of the proposal may experience increased noise, dust and visual impacts during construction of the proposal and use of the construction Compound 4. This has the potential to impact on the use and enjoyment of the facilities by the local community.

Construction traffic along Reservoir Road and Great Western Highway, as well as increased heavy vehicles, may also result in disruptions to accessing these facilities due to reduced speed limits and potential lane closures.

Potential impacts on social infrastructure during construction would be mitigated through the implementation of safeguards and management measures outlined in Section 6.7.5.

Local business

Temporary impacts may be experienced by local businesses closest to construction activities due to temporary access changes for motorists and pedestrians and changes to amenity resulting from increased construction noise, dust and traffic. These impacts are expected to be minor and would

be mitigated through the implementation of safeguards and management measures outlined in Section 6.7.5.

Operation

Property impacts

The proposal would require partial acquisition of private land owned by three separate landowners. Property acquisition would be undertaken in accordance with the safeguards and management measures outlined in Section 6.7.5.

Access and connectivity

Operation of the proposal would improve access and connectivity within the study area and assist in alleviating congestion along Reservoir Road and Great Western Highway. This would benefit motorists and bus commuters, through improved travel times.

Potential impacts on access and connectivity during operation would be mitigated through the implementation of safeguards and management measures outlined in Section 6.7.5.

Community values

The proposal would require the removal of vegetation on the south-western and north-western corner of the intersection. This would impact on the local amenity values.

Potential impacts on community values during operation would be mitigated through the implementation of safeguards and management measures outlined in Section 6.7.5.

Social infrastructure

The proposal would support improved access to local and regional social infrastructure, such as the recreational and social facilities located north of the proposal, through reduced traffic congestion, improved access and connectivity, and enhanced road safety for motorists and other road users travelling via Reservoir Road and Great Western Highway.

Potential impacts on social infrastructure during operation would be mitigated through the implementation of safeguards and management measures outlined in Section 6.7.5.

Local business

Benefits for local and regional businesses are likely to result from safer and improved access and efficiency for motorists within the study area. This includes commercial vehicles and customers of local businesses.

The partial acquisition of some properties would be required as part of the proposal. The partial acquisition is not expected to impact on the operation of these businesses.

6.7.5 Safeguards and management measures

The proposed safeguards and management measures for property, land use and socio-economic impacts are listed in **Table 6-36**. Other safeguards and management measures that would address socio-economic impacts are identified in:

- Section 6.1 Traffic and transport
- Section 6.2 Noise and vibration
- Section 6.3 Biodiversity
- Section 6.6 Landscape character and visual impacts
- Section 6.10 Air quality.

Table 6-36 Safeguards and management measures for property, land use and socio-economic impacts

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Property acquisition	All property acquisition will be carried out in accordance with the *Land Acquisition Information Guide* (Roads and Maritime, 2012) and the *Land Acquisition (Just Terms Compensation) Act 1991*.	Roads and Maritime project manager	Pre-construction and construction	Core standard safeguard PL1
Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, road users, pedestrians and cyclists including changed traffic and access conditions • Contact name and number for complaints • A complaints handling procedure and register, which will be maintained for the duration of the project. The CP will be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008).	Contractor	Pre-construction / construction	Standard safeguard
Socio-economic	In the event that utility service interruptions are required as a result of utilities relocation, residents would be informed prior to any interruptions.	Contractor	Pre-construction / construction	Standard safeguard
Socio-economic	Fencing with material attached (eg shade cloth) would be provided around the construction compound and other areas to screen views of the construction compound from adjoining properties.	Contractor	Pre-construction	Standard safeguard

6.8 Non-Aboriginal heritage

6.8.1 Methodology

The following desktop investigations were undertaken:

- Heritage register searches to confirm heritage status of the State heritage listed Former Great Western Road, Prospect, and identify any other heritage items in the vicinity of the proposal, and associated legislative requirements
- Review of previous relevant heritage impact assessments *including M4 Smart Motorways Project: Non-Aboriginal Heritage Assessment and Statement of Heritage Impacts* (Artefact 2014) and *Huntingwood Development Historical Heritage Advice: Honeman Close* (EMM Consulting 2017)

No site visit was undertaken for the purpose of the non-Aboriginal heritage assessment.

6.8.2 Existing environment

Register searches

The only registered heritage item within or adjacent to the proposal area is the Former Great Western Road, which is listed on the State Heritage Register (SHR) (ID 01911) and the Blacktown LEP (ID 60) (OEH 2017). Each listing includes slightly different boundaries but comprises three or four non-contiguous sections running from Tarlington Place in the east to the end of Honeman Close in the west (**Figure 6-14**). In the vicinity of the proposal area, the LEP listing boundary extends further west at the end of Honeman Close than the SHR listing boundary.

In addition to the SHR and Blacktown LEP listings, Honeman Close and Boiler Close (which overlap with the southern end of the proposal area in the case of Honeman Close, and with Compound 2 in the case of Boiler Close) are subject to heritage controls under the Huntingwood Precinct Development Control Plan (*State Environmental Planning Policy (Western Sydney Employment Area) 2009*).

Description and significance of Former Great Western Road

The SHR listing describes the Former Great Western Road as follows (excerpts):

> *For most of its length, the Former Great Western Road alignment consists of a two-laned asphalted pavement with mostly unformed edges that is flanked by wide gravelled and grassed shoulders. There is little obvious evidence of any major drainage infrastructure, other than the use of the sloping ground and the camber of the road, to shed stormwater…*
>
> *The landscape through which the road travels is mostly open paddocks with stands of indigenous trees with some exotic species and remnants of low scale agricultural activities such as single houses, outbuildings, yards and lengths of fences…*
>
> *The current alignment of most of the Former Great Western Road reflects the original alignment, notwithstanding the loss of the sections cut by the late twentieth century road works for the M4 and Prospect Highway. The asphalt surface along Reservoir Road itself is in reasonable to poor condition. It is still maintained by Blacktown City Council as suitable for the moderate and constant volumes of traffic that use the road. Tarlington and Yallock Places and Boiler and Honeman Closes are in poorer condition. Parts of these sections of the road are closed by gates or cut by the M4; the pavement is degraded and the verges are overgrown. Nevertheless, the condition of these sections is mostly cosmetic and the principal feature of the road persists: that is the original alignment with little*

modern road infrastructure within a mostly open underdeveloped rural landscape (as at March 2012) …

In terms of archaeology, it appears that any maintenance of the pavements, verges and any drainage infrastructure since the middle of the twentieth century has involved patching and laying new asphalt over the older layer and has not resulted in the removal of earlier pavements. The road was metalled in 1865 and asphalted in 1939…Therefore, earlier pavement layers and drainage infrastructure may still be retained below the current road levels.

The following summary statement of significance has been summarised from the full SHR listing:

The Former Great Western Road, Prospect has exceptional state significance as the only surviving original alignment of the 1818 Great Western Road that itself most likely followed an earlier Aboriginal track for a route over Prospect Hill. The road has the potential to retain highly significant archaeology of the convict and colonial eras…

Most of the Former Great Western Road, Prospect --- despite being cut in two places by the M4 and affected by traffic works at the intersection of the Prospect Highway and the M4 --- is still laid onto and follows the undulations of the original landforms as it winds up and over the northern ridge and flanks of Prospect Hill through a relatively undeveloped former agricultural landscape. The setting in the vicinity of the subject road at Prospect still retains a bucolic character with its early to mid-twentieth century subdivision pattern, scattered houses flanking the road, sheds and outbuildings, fences and paddock enclosures and mature tree cover (as at March 2012) …

The views from the road to the Blue Mountains in the west and the Blacktown hills to the north still convey a powerful understanding of the wider topography and views and a sense of anticipation which travellers on the road would have experienced for over 180 years since the early nineteenth century…

The former Great Western Road at Prospect has important historical association with the Aboriginal people of the Prospect area as the probable alignment of an earlier Aboriginal route over Prospect Hill. It is directly associated with significant early colonial persons: William Cox of Clarendon (former Captain in the NSW Corps) …Surveyor George Evans…and Governor Lachlan Macquarie…

…it is likely that the Former Great Western Road has the potential to retain highly significant archaeology of convict built infrastructure and of the colonial era.

The heritage significance against each of the NSW criteria for the Former Great Western Road is provided in **Table 6-37**, which has been excerpted from the SHR Listing. The Former Great Western Road is listed on the LEP for similar reasons.

Table 6-37 Significance assessment for Former Great Western Road, Prospect

NSW Criterion	Assessment
a) Historical significance	The alignment of the Former Great Western Road, Prospect may have followed an earlier Aboriginal track for a route over Prospect Hill which avoided the creeks and more flood prone and heavier ground to the north. The Former Great Western Road, Prospect demonstrates exceptional historical significance as a remnant surviving section of one of the three Great

NSW Criterion	Assessment
	Roads (along with the Great North and Great South Roads) which were constructed between the 1820s and the 1840s by convict labour to open up the interior of the colony to agricultural and pastoral production and European settlement.
b) Associative significance	The Former Great Western Road at Prospect has state significance for its associations with Aboriginal people and with significant persons of the early colony of NSW. The Former Great Western Road is directly associated with Governor Lachlan Macquarie, William Cox of Clarendon (former Captain in the NSW Corps and road builder of the early colony) and most probably with Surveyor George Evans.
c) Aesthetic significance	The Former Great Western Road, Prospect has aesthetic and landmark significance at state level for its capacity to demonstrate the experience of travel with views of historical significance on a remnant section of the 1818 road that remains largely undeveloped and on its original 1818 alignment as it follows a ridge line and winds up and over the flanks of Prospect Hill in a semi-rural landscape with views of historical significance across to the Blue Mountains from the road's highest point close to Watch House Lane.
d) Social significance	The Former Great Western Road has local significance under this criterion. Based on research to date, the road itself does not appear to have any appreciable direct association with a particular European community or cultural group, past or present other than the residents and people that have lived on and used the road. Nevertheless, members of the local community have shown some esteem for the road and its rural character prompted by the recent demonstrations for its retention and care (August 2011).
e) Research potential	The Former Great Western Road, Prospect has the potential for State significant archaeology. While there has been no formal extensive archaeological assessment of the Former Great Western Road, Prospect, there is every likelihood that the road has the potential to retain archaeology of convict built infrastructure of the early colonial period. This is based on the premise that the road has not been substantially widened or improved since the middle of the twentieth century and that any road improvements until then involved new pavements over older layers. Experience shows that when early roads are disturbed that evidence of earlier road fabric and surfaces may be revealed and that deposits which include archaeological 'relics' may also be encountered.

NSW Criterion	Assessment
f) Rarity	The Former Great Western Road, Prospect is the only surviving section of Governor Macquarie's Great Western Road (completed in 1818) that follows its original alignment, is still in use and (at March 2012) remains relatively undeveloped.
g) Representativeness	The Former Great Western Road, Prospect has state significance for its capacity to demonstrate the characteristics of the Great Roads network of the early colonial period.

Previous assessments

The M4 Smart Motorways (M4SM) project Non-Aboriginal Heritage Assessment (Artefact Heritage 2014) assessed works in the vicinity of the current proposal area, including two of the current proposed compounds (Compounds 1 and 2). The heritage listing of the Former Great Western Road was not identified in this assessment, as the register search for the assessment was undertaken prior to the heritage item being listed on the SHR (27 June 2014) or the LEP (7 July 2015). Therefore, the M4SM assessment did not consider impacts to the heritage significance of the Former Great Western Road, nor require any approvals in relation to this heritage item.

Preliminary historical heritage advice was provided for the proposed development of a service station on the corner of Reservoir Road and Great Western Highway, located in the vicinity of the proposal area, including potential impacts on Honeman Close (EMM Consulting 2017). The proposed development includes an entrance driveway from Honeman Close and upgrade of the Honeman Close roadway. EMM Consulting (2017) identified the key legislative requirements to be met for proposed works within the heritage boundaries of the Former Great Western Road. Their recommendations were for further assessment of the detailed design to be developed, and likely an application under the Heritage Act for approval.

Site-specific Heritage Act exemptions

Under section 57(2) of the Heritage Act, site-specific exemptions from requiring a section 60 permit have been established for the Former Great Western Road. Exemption 1 is relevant to the proposed construction works along Reservoir Road at the southern end of the proposal area where it overlaps with a small portion of the SHR boundary, as follows:

> *Exemption 1. The carrying out of road work or traffic control work, within the meaning of the Roads Act 1993, at the following intersections (and surrounding land that is required for associated works and infrastructure):*
>
> *…*
>
> *Honeman Close and Boiler Close (Former Great Western Road, Prospect) with Reservoir Road*
>
> *…*
>
> *is exempt from subsection 57(1) of the Heritage Act 1977 (NSW), subject to all excavation or disturbance of land being carried out in accordance with any archaeological management plan with which compliance is required either by any approval for those works issued under the Environmental Planning and Assessment Act 1979, or required in accordance with a determination of environmental assessment by the determining authority under Part 5 of that Act, and in accordance with the Heritage Controls of the Huntingwood Precinct*

Development Control Plan (August 2011) adopted by Blacktown City Council and applicable to those above roads.

…

Exemption 2. Excluding any matter falling within Exemption No.3 or No.5 below, excavation or disturbance of land of the kind specified below does not require approval under subsection 57(1) of the Heritage Act 1977, provided that the Heritage Council or its Delegate is satisfied that the criteria in (a), (b) or (c) have been met and the person proposing to undertake the excavation or disturbance of the land has received a notice advising that the Heritage Council or its Delegate is satisfied that:

(a) an archaeological assessment, zoning plan or management plan has been prepared in accordance with applicable and current guidelines published by the Heritage Council of NSW which assessment indicates that any relics in the land are unlikely to have state or local heritage significance; or

(b) disturbance of land will have a minor impact on archaeological relics including the testing of land to verify the existence of relics without destroying or removing them; or

(c) a statement describing the proposed excavation demonstrates that evidence relating to the history or nature of the site, such as its level of disturbance indicates that site has little or no archaeological research potential.

A person proposing to excavate or disturb land in the manner described in paragraph 1 must write to the Heritage Council and describe the proposed excavation or disturbance of land and set out why it satisfies the criteria set out in paragraph 1. If the Heritage Council or its Delegate is satisfied that the proposed development meets the criteria set out in paragraph 1 (a), (b) or (c) the Heritage Council or its Delegate shall notify the applicant.

Standard Heritage Act exemptions

Standard Exemption 7 covers minor activities in SHR listed places which would have little or no adverse impact on heritage significance, in accordance with the following:

1. Anything which in the opinion of the Director-General is of a minor nature and will have little or no adverse impact on the heritage significance of the item does not require approval under subsection 57(1) of the Act.

2. A person proposing to do anything of the kind described in paragraph 1 must write to the Director-General and describe the proposed activity. If the Director-General is satisfied that the proposed activity meets the criteria set out in paragraph 1, the Director-General shall notify the applicant.

The guidelines for Standard Exemption 7 indicate that:

In order to assess whether a proposal has an adverse effect on heritage significance it is necessary to submit a clear and concise statement of the item's heritage significance and an assessment of whether a proposal impacts on that significance.

Huntingwood Precinct Development Control Plan

The Huntingwood Precinct DCP identified Honeman Close (and the former service station, roadside diner and dwelling complex) and Boiler Close as sites with heritage significance within the Precinct. The following controls are of relevance to the proposal:

> (b) Any proposed development that is likely to impact on the site of the Honeman Close roadway should be subject to a Statement of Heritage Impact (SOHI) that addresses the likely impact of the development on the roadway and proposes an appropriate heritage impact mitigation strategy.
>
> (d) Future road layout and subdivisions must respect and retain the Boiler Close and Honeman Close road alignments as examples of the original Great Western Highway alignment.

Figure 6-14 Non-Aboriginal heritage items in the proposal area

6.8.3 Potential impacts

Construction

The key aspect of the Former Great Western Road which has the potential to be impacted by the proposal is the potential for State significant archaeology. As the SHR listing indicates:

> *While there has been no formal extensive archaeological assessment of the Former Great Western Road, Prospect, there is every likelihood that the road has the potential to retain archaeology of convict built infrastructure of the early colonial period. This is based on the premise that the road has not been substantially widened or improved since the middle of the twentieth century and that any road improvements until then involved new pavements over older layers. Experience shows that when early roads are disturbed that evidence of earlier road fabric and surfaces may be revealed and that deposits which include archaeological 'relics' may also be encountered.*

The following construction activities associated with the proposal have the potential to impact on the Former Great Western Road.

Southern end of proposal area boundary and access to Compound 1

The proposed construction works would require a tie into the existing kerb along Reservoir Road immediately north of Honeman Close. While the proposed works would be located outside the SHR and LEP heritage boundaries, there is the potential for accidental ground disturbance as a result of construction vehicles or machinery driving within the heritage boundary. This could also potentially cause compaction of subsurface archaeological remains.

Construction plant and vehicles would need to drive on the entrance into Honeman Close to obtain access to the southern end of the proposal area, and to access Compound 1. Honeman Close is within the heritage curtilage, though it is an existing sealed road which reduces the potential for disturbance from vehicle activity.

In order to manage this potential impact, barrier fencing is recommended to limit the potential works area and minimise the risk of accidental disturbance. This includes blocking off access to Honeman Close except as required to access the southern end of the site and Compound 1. Additional measures such as track mats may be warranted at designated vehicle access points from the sealed road into the construction area/compound to minimise potential accidental disturbance at the edge of the heritage boundary.

Although Honeman Close is currently a sealed road, there is potential for damage from heavy equipment and machinery tracking if not appropriately managed. This should be monitored during construction and, where required, track mats or other ground protection measures installed to prevent damage.

Compound 2 on Boiler Close

The proposed Compound 2 on Boiler Close is situated wholly within the SHR and LEP heritage boundary. While detailed activities for the compound are yet to be finalised, in order to minimise impacts on the archaeological potential of the heritage item, if this compound were to be used during construction of the proposal, it would be subject to no excavation or ground disturbance, including no excavation for installation of services, temporary buildings, signage or carparking facilities.

This could be achieved through the use of mountable site sheds, fencing off areas outside of existing hardstand as no go areas, site inductions, etc. Although Boiler Close is currently a sealed road, there is potential for damage from heavy equipment and machinery tracking if not

appropriately managed. This should be monitored during construction and, where required, track mats or other ground protection measures installed to prevent damage.

If ground disturbance is avoided including during restoration of the site, there would be little or no impact on the heritage significance of the Former Great Western Road. As such, the proposed works would meet the conditions of Standard Exemption 7. In this case, an Exemption Notification Form would be required to be submitted to the NSW Heritage Council with the REF attached as supporting documentation.

If any excavation or ground disturbance is required within Compound 2, or on Boiler Close which provides access to Compound 2, further assessment including an archaeological management plan would be required. This assessment would determine whether the proposed works meet the requirements of site-specific Exemption 2, or whether a Heritage Act section 60 permit would be required.

Compound 3 at north end of Honeman Close

Approximately half of Compound 3 overlaps with the LEP listing boundary of the Former Great Western Road. Compound 3 does not overlap with the SHR listing boundary of the Former Great Western Road.

If access to the compound is to be via the access road to the Roads and Maritime CrashLab leading off the Great Western Highway, then this is also within the LEP listing boundary for the Former Great Western Road. No access to this compound would be permitted via Honeman Close.

While detailed activities for the compound are yet to be finalised, in order to minimise impacts on the archaeological potential of the heritage item, use of this compound would be subject to no excavation or ground disturbance, including no excavation for installation of services, temporary buildings, signage or carparking facilities. Measures similar to those identified for Compound 2 could be implemented to achieve this. Additionally, if access to the compound requires entering areas of unsealed road within the curtilage of the LEP listing boundary, track mats or other suitable means of ground protection would be implemented during and on completion of the works to ensure no ground disturbance.

If these measures are put in place, there would be little or no impact on the heritage significance of the Former Great Western Road. As such, the proposed works would meet the conditions of ISEPP, and consultation with Blacktown Council would not be required.

If ground disturbance would be required, further assessment, and potentially consultation with Blacktown City Council in accordance with Part 2 of the ISEPP would be required.

Operation

There is not likely to be any impacts on heritage significance from the operation of the proposal, due to the area already being currently in use as a roadway, and the relatively minor change that the works would have on the physical nature and extent of the roadway.

6.8.4 Safeguards and management measures

Mitigation measures provided in **Table 6-38** would be implemented to minimise impacts on Non-Aboriginal heritage.

Table 6-38 Safeguards and management measures for Non-Aboriginal heritage

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Non-Aboriginal heritage	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage, specifically the State and locally heritage listed Former Great Western Road. Exclusion zones, and areas requiring protection would be mapped as part of the NAHMP. Protection measures would be implemented to ensure no excavation or ground disturbance within the heritage curtilage. Mitigation measures are to include: • Monitoring, and protection as required, of existing hardstand areas to avoid damage • Ground protection measures such as track mats where potential damage to existing hard stand areas is identified or suspected, or where works are required outside of hardstand areas within the curtilage (eg to gain access to the site off Honeman Close) • Mountable site sheds to avoid ground disturbance • Barrier fencing to establish exclusion zones • Restricted access to Honeman Close • Any other measures as required to protect avoid damage to this heritage item.	Contractor	Detailed design / pre-construction	Core standard safeguard H1 Section 4.10 of QA *G36 Environment Protection*
Non-Aboriginal heritage	• The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered.	Contractor	Detailed design / pre-construction	Core standard safeguard H2 Section 4.10 of QA *G36 Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
	• Work will only re-commence once the requirements of that Procedure have been satisfied.			
Non-Aboriginal heritage	• Where Compound 2 is proposed for use on Boiler Close and no ground disturbance (eg excavation) is proposed, an Exemption Notification Form would be submitted to the NSW Heritage Council with the REF attached as supporting documentation prior to works commencing • Where excavation or ground disturbance is required within Compound 2 or via the access on Boiler Close, further assessment including an archaeological management plan would be required prior to works commencing. This assessment would determine whether the proposed works meet the requirements of site-specific Exemption 2, or whether a Heritage Act section 60 permit would be required. • If ground disturbance is required for Compound 3, including any access routes into the site, further assessment and potentially consultation with Blacktown City Council in accordance with Part 2 of the ISEPP would be required.	Contractor	Pre-construction	Additional safeguard

6.9 Aboriginal heritage

6.9.1 Methodology

An Aboriginal heritage assessment was carried out for the proposal in accordance with the Stage 1 Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI).

This assessment comprised of a review of the following databases:

- Aboriginal Heritage Information Management System (AHIMS) (searches undertaken 25 October 2017)
- Australian Heritage Database (search undertaken 27 October 2017)

- Native Title Register (search undertaken 27 October 2017)
- State Heritage Inventory Register (search undertaken 27 October 2017).

A Stage 1 PACHCI checklist was prepared to outline the findings of the desktop assessment. A copy of the assessment and associated Roads and Maritime clearance letter is provided in **Appendix D**. A summary of the findings are provided below.

6.9.2 Existing environment

An extensive search of the OEH AHIMS was carried out, which indicated that no known Aboriginal objects or places are located within the proposal area. The following AHIMS sites were identified within one kilometre of the proposal (refer to **Table 6-39** and **Figure 6-15**).

An Aboriginal Heritage assessment previously undertaken for the proposed DA site adjacent to and including the western portion of the proposal area also identified these sites.

Table 6-39: Aboriginal heritage sites within one kilometre of the proposal

AHIMS Site ID	Location	Distance from proposal
[redacted]		

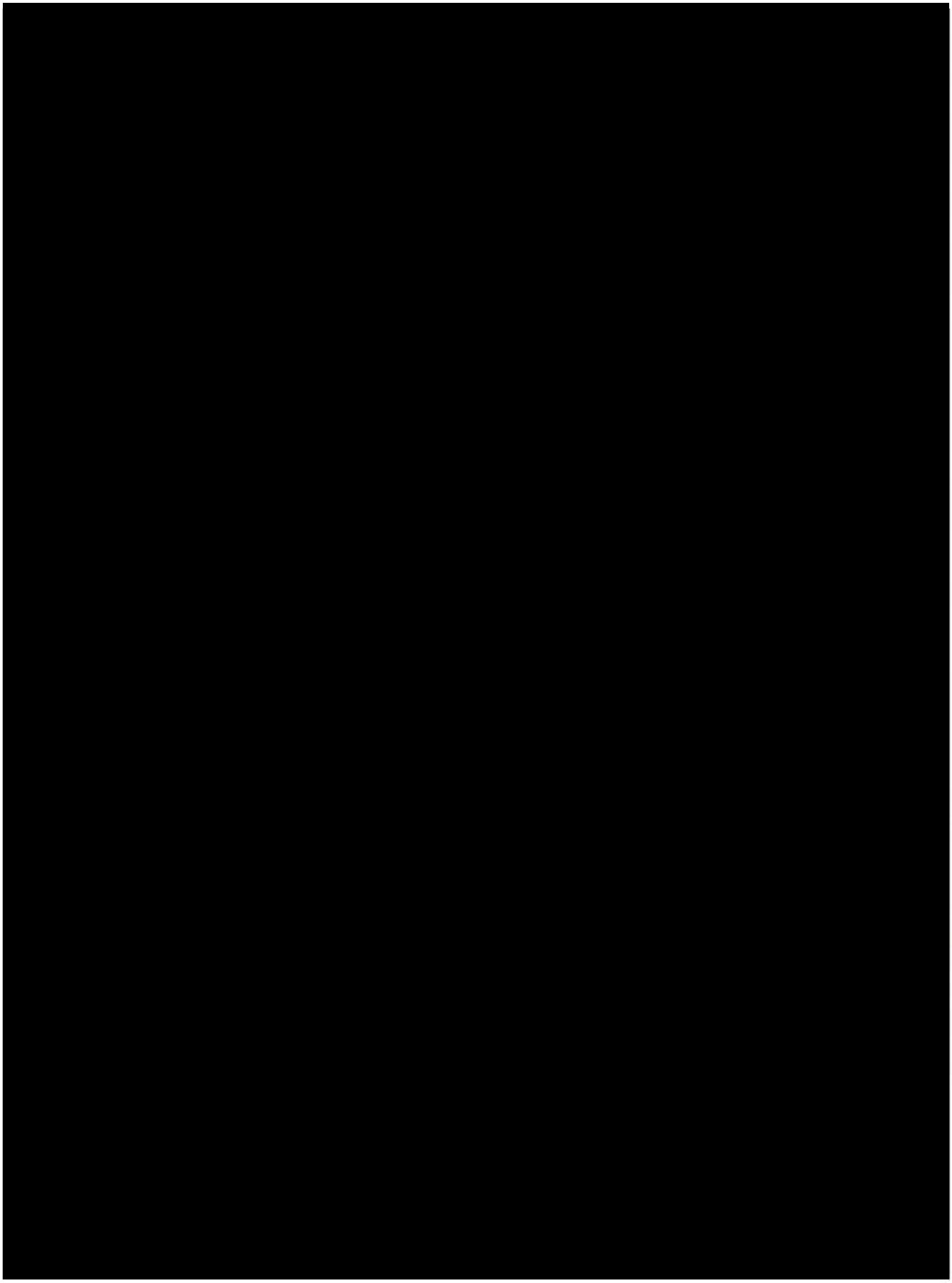

Figure 6-15 AHIMS site locations

6.9.3 Potential impacts

Construction

Based on the findings of the Stage 1 PACHCI investigation, no impacts on identified Aboriginal items are anticipated during construction.

A clearance letter was provided by Roads and Maritime on 21 February 2018 (see **Appendix D**).

The natural landscape of the proposal area has been substantially modified as a result of cutting, levelling and filling for the construction of Reservoir Road, the Great Western Highway and surrounding development, and use of the site compounds and stockpile site would not result in any below ground disturbance.

The proposal would impact on an area which has previously been highly disturbed and exhibits low archaeological potential. As such there is a low likelihood that previously unrecorded Aboriginal objects or sites would be uncovered during construction. The proposal is not anticipated to have any impact on Aboriginal cultural heritage during construction. Any unexpected finds would be managed in accordance with the safeguards in **Table 6-40**.

Operation

No impact to Aboriginal heritage is anticipated during operation as the proposal will consist of continued use of the existing road corridor. No disturbance of the surrounding land would occur during operation.

6.9.4 Safeguards and management measures

Mitigation measures provided in **Table 6-40** would be implemented to minimise impacts on Aboriginal heritage

Table 6-40 Safeguards and management measures for Aboriginal heritage

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Aboriginal heritage	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design / pre-construction	Core standard safeguard AH2 Section 4.9 of QA *G36 Environment Protection*

6.10 Other impacts

6.10.1 Existing environment and potential impacts

Table 6-41 identifies the existing environment and potential impact of the proposal on air quality, waste and resource management, greenhouse gas and climate change.

Table 6-41 Existing environment and potential impacts on air quality, waste and resource management, greenhouse gas and climate change

Environmental factor	Existing environment	Potential impacts
Air quality	**Sensitive receivers** Sensitive receivers near the proposal area include residential receivers located on the north-eastern corner of Great Western Highway and Reservoir Road, customers accessing nearby commercial and industrial areas, pedestrians and the public using nearby recreational areas. **Ambient quality** No air quality monitoring was carried out specifically for this proposal. The OEH operates a nearby ambient air quality monitoring station at Prospect about 1.4 kilometres northeast of the proposal. The Prospect air quality monitoring station records sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone, PM_{10}, $PM_{2.5}$, visibility (NEPH) and carbon monoxide (CO). Data collected for the period 2016-2017 showed the following: • The 1-hour average criteria for ozone was exceeded once in December 2016 and twice in February 2017	**Construction** There is potential for temporary localised air quality impacts during construction due to ground disturbances, demolition of existing road infrastructure and plant machinery and equipment. The likely impacts would be from dust creation and exhaust emissions. The sources of potential dust generation include: • Demolition of existing road infrastructure • Excavation for new road infrastructure • Relocation and/or installation of services • Fill batters along Reservoir Road northbound carriageway • Upgrade of existing stormwater pipe about 90 metres south of the intersection • Vegetation removal • Stripping, stockpiling and managing of topsoil for pavement works • Road sub-grade preparation and road pavement work • Transport and handling of soil and materials to and from

Environmental factor	Existing environment	Potential impacts
	• The 4-hour average criteria for ozone was exceeded twice in February 2017 • The 24-hour average criteria for PM_{10} was exceeded once in September 2017 • The criteria for $PM_{2.5}$ was exceeded once in August 2017 and twice in September 2017 • The 1-hour average criteria for visibility (NEPH) was exceeded once in May 2017, once in July 2017, eight times in August 2018 and 14 times in September 2017. Many OEH monitoring stations record that the PM_{10} 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. The National Pollutant Inventory was searched on 22 November 2017. Within the Blacktown LGA, a total of 53 substances were emitted from 24 facilities during the 2015/2016 reporting period. The nearest facility listed on the National Pollutant Inventory is Schweppes Huntingwood located at 27 Huntingwood Drive, Huntingwood. This facility is located about 950 metres southwest of the proposal. Emissions of this source include carbon monoxide, ethanol, oxides of nitrogen, particulate matter (PM_{10} and $PM_{2.5}$) and sulfur dioxide. The main contributors to air quality in the study area are likely to be emissions from motor vehicles on the surrounding road network and emissions from the surrounding industrial area.	the proposal site • Use of construction vehicles • Use of stockpiles at the compound site. Air quality impacts as a result of dust generation are considered to be minor as they would be limited to the construction phase and would be minimised by the implementation of the safeguards and management measures outlined in **Table 6-42**. The operation of machinery and other construction vehicles would result in the emission of exhaust fumes. The impact of these emissions would be limited to the duration of construction and are considered to be minor. **Operation** The proposal would improve the operation of the Great Western Highway and Reservoir Road intersection by reducing local congestion and queuing times. This would therefore reduce the number of idling vehicles and may improve local air quality during peak periods.

Environmental factor	Existing environment	Potential impacts
Waste and resource management	Waste sources are limited to roadside litter, some waste material from clearing roadside drainage and green waste associated with the maintenance of roadside vegetation.	**Construction** ***Waste*** The proposal has the potential to generate waste from the following activities: • Demolition of existing road infrastructure • Excavation for new road infrastructure • Relocation and/or installation of services • Fill batters along Reservoir Road northbound carriageway • Upgrade of existing stormwater pipe about 90 metres south of the intersection • Vegetation removal. Waste streams likely to be generated during construction of the proposal include: • Demolition waste • Vegetation waste • Excess construction materials • Excess spoil unsuitable for reuse • Roadside materials • Oils, grease and other liquid waste from the maintenance of construction plant and equipment • General waste from staff and sewage from site compound offices • Waste water from wash down or bunded areas • Redundant erosion and sediment controls • Hazardous waste from existing utilities • Packaging or protective products for materials.

Environmental factor	Existing environment	Potential impacts
		Materials and spoil found unsuitable to be reused would be classified in accordance with the Waste Classification Guidelines (DECCW, 2009) and disposed of at an approved recycling or waste disposal facility. ***Resource use*** Construction of the proposal would require the use of various construction materials, including topsoil, pavement (subbase and base), asphalt and concrete (refer to Section 3.3.5). The proposal would not create any significant demand on these resources, such that they would become in short supply. **Operation** The operation of the proposal would not result in increased waste generation.
Greenhouse gas and climate change	The proposal is not within the coastal zone therefore is not at risk of being affected by coastal hazards. The increased intensity and frequency of rainfall events could lead to flooding, however the proposal is not within flood prone land with the exception of Compound 3 which is located within an area of low-medium flood risk. The proposal would include modification and upgrade to the existing drainage network and would be designed to meet the requirements for a 1 in 10 year ARI event. With this capacity, impacts from an extreme rainfall event would be minimal.	**Construction** Construction would generate greenhouse gas emissions. The emissions would be predominantly carbon monoxide from plant exhaust. The greenhouse gas emissions due to the construction of the proposal are considered to be minor and temporary. The impacts of greenhouse gas emissions would be managed through measures and safeguards proposed in Section **Table 6-42**.

Environmental factor	Existing environment	Potential impacts
	The proposal is not located within bushfire prone land and is not anticipated to be impacted by increased frequency and intensity of bushfires. The proposal is also unlikely to contribute to increased likelihood of fires.	**Operation** Greenhouse gas emissions may reduce when compared to the existing environment as a result of improved traffic flow and reduction in delays to general traffic.

6.10.2 Safeguards and management measures

Table 6-42 identifies the safeguards and management measures that would be implemented to minimise impacts on air quality, waste and resource management, greenhouse gas and climate change.

Table 6-42 Safeguards and management measures for air quality, waste and resource management, greenhouse gas and climate change and hazard and risk management

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Air quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA and/or OEH guidelines • mitigation and suppression measures to be implemented • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces.	Contractor	Detailed design / pre-construction	Core standard safeguard AQ1 Section 4.4 of QA *G36 Environment Protection*
Air Quality	Measures for dust suppression, including watering or covering exposed areas and stockpiles, are to be implemented and be in accordance with the Roads and Maritime Services *Stockpile Site Management Guideline (EMS-TG-10).*	Contractor	Construction	Standard safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Air Quality	Disturbed areas will be minimised in extent and rehabilitated progressively.	Contractor	Construction	Standard safeguard
Air Quality	Stockpiles will be located as far away from residences and other sensitive receivers as possible.	Contractor	Construction	Standard safeguard
Air Quality	Burning of material on-site is prohibited	Contractor	Construction	Standard safeguard
Air Quality	Vehicles transporting waste, spoil or other material that may produce odours or dust will be covered during transport.	Contractor	Construction	Standard safeguard
Air Quality	Construction works (including the spraying of paint and other materials) during periods of high winds would be modified to avoid drift.	Contractor	Construction	Standard safeguard
Waste	A Waste and Resource Management Plan would be prepared as part of the CEMP, which details waste management strategies which are consistent with the *Waste Avoidance and Resource Recovery Act 2007* and the resource management hierarchy principles (in order of priority) of avoidance, resource recovery and disposal.	Contractor	Detailed design / pre-construction	Standard safeguard
Waste	The Waste and Resource Management Plan would include procedures to classify all waste types in accordance with the *Waste Classification Guidelines* (EPA, 2014) and NSW legislative requirements and would include procedures for reuse (where feasible) and disposal arrangements for unsuitable excavated material or contaminated material (if encountered).	Contractor	Detailed design / pre-construction	Standard safeguard
Waste	Waste disposed of off-site would be disposed of to a waste facility that is licensed under the POEO Act to receive wastes of that type.	Contractor	Construction	Standard safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Waste	There is to be no disposal or re-use of construction waste on to other land.	Contractor	Construction	Standard safeguard
Waste	Types of waste collected, amounts, date/time and details of disposal are to be recorded in a waste register.	Contractor	Construction	Standard safeguard
Waste	Cleared weed free vegetation will be chipped and reused on-site as part of the proposed landscaping and to stabilise disturbed soils where possible.	Contractor	Construction	Standard safeguard
Waste	The works area will be kept free of rubbish, with appropriate bins provided for waste management and recycling.	Contractor	Construction	Additional safeguard

6.11 Cumulative impacts

6.11.1 Study area

Cumulative impacts occur when two or more projects are carried out concurrently and in close proximity to one another. The impacts may be caused by both construction and operational activities, and can result in a greater impact to the surrounding area than would be expected if each project was carried out in isolation.

A search of the Department of Planning and Environment's Major Projects Register, Sydney West Central Planning Panel Development and Planning Register and Blacktown City Council Development Applications on Public Display in November 2017 was carried out for Blacktown, Arndell Park, Huntingwood, Prospect and Eastern Creek. The identified projects are described in **Table 6-43**. Other developments likely to occur within the locality would be small scale projects such as residential dwellings in adjacent residential areas.

6.11.2 Broader program of work

The proposal is part of the Roads and Maritime's Urban Roads Pinch Point Program. The Urban Roads Pinch Point Program aims to ease congestion on 32 of Sydney's busiest road corridors over the next 10 years. The following two projects would be undertaken as part of this program and are located in close proximity to the proposal:

- Great Western Highway, Doonside Road and Brabham Drive intersection upgrade, Eastern Creek
- Great Western Highway and Blacktown Road intersection upgrade, Prospect.

These projects are described in detail in **Table 6-43**.

6.11.3 Other projects and developments

Table 6-43 describes the identified development projects with the potential to occur simultaneously with the proposal.

Table 6-43: Other projects and developments within the area

Project	Construction impacts	Operational impacts
Proposed Subdivision, Service Station, Signage and Removal of Vegetation DA at 6 Honeman Close, Huntingwood (Lot 2 DP2294666) Development application to subdivide land into 4 lots, demolish existing structures on site, removal of vegetation, construction of a service station, construction of a new internal access road, landscaping and signage.	The proposed development overlaps with the western extent of the proposal area. Cumulative construction impacts may include: • Increased noise, vibration and dust impacting surrounding receivers • Increased traffic due to an increase of construction vehicles and deliveries • Visual impacts due to the construction work site/s and vegetation clearing • Cumulative biodiversity impacts	No operational impacts are anticipated

Project	Construction impacts	Operational impacts
Great Western Highway, Doonside Road and Brabham Drive intersection upgrade, Eastern Creek Roads and Maritime propose to upgrade this intersection by: • Widening Great Western Highway from the centre median to create additional right turn lanes onto Doonside Road and Brabham Drive • Widening the existing eastbound and westbound left turn slip lanes from Great Western Highway onto Brabham Drive and Doonside Road • Adding two signalised pedestrian crossings on the north and south sides of the intersection. Construction is programmed for 2018.	The project is located about 2.5 kilometres west of the proposal. Cumulative construction impacts may include: • Increased noise, vibration and dust impacting surrounding receivers • Increased traffic due to an increase of construction vehicles and deliveries • Visual impacts due to the construction work site/s.	Positive cumulative impact on travel times and road safety.
Great Western Highway and Blacktown Road intersection upgrade, Prospect Roads and Maritime propose to upgrade this intersection by: • converting the bus lanes to general traffic lanes on both Blacktown Road and Great Western Highway • providing one dedicated right turn lane, one shared through and right turn lane and creating a left turn slip lane on Blacktown Road approach • the right turns from Blacktown Rd will be protected right turns • providing dual right turn lanes on Great Western Highway into Blacktown Road • providing a dedicated left turn lane and a shared through and right lane on Clunies Ross Street • relocation of the bus stops to ease congestion at the intersection • adjustment to the pedestrian crossing on Blacktown Rd • adjustment to the traffic signal infrastructure and phasing.	The proposed upgrade is located about 3.0 kilometres east of the proposal. Cumulative construction impacts may include: • Increased noise, vibration and dust impacting surrounding receivers • Increased traffic due to an increase of construction vehicles and deliveries • Visual impacts due to the construction work site/s.	Positive cumulative impact on travel times and road safety.
M4 Smart Motorway project The M4 Smart Motorway project will introduce intelligent technology, known as a motorway management system, to	The closest part of the project is located about 250 metres south of the proposal. Compound site one and two have also been nominated for use on the M4	Positive cumulative impact on travel times and road safety.

Project	Construction impacts	Operational impacts
Sydney's M4 Motorway between Pitt Street, Mays Hill and Russell Street, Lapstone. The M4 Smart Motorway will introduce a smarter way of travelling the M4 by using real time information, communication and traffic management tools to provide motorists with a safer, smoother and more reliable journey. Key features of the project include, variable message signs, ramp metering, lane use signs and additional traffic sensors and CCTV cameras. Construction of this project has commenced.	Smart Motorway project. Cumulative construction impacts may include: • Increased noise, vibration and dust impacting surrounding receivers • Increased traffic due to an increase of construction vehicles and deliveries • Visual impacts due to the construction work site/s.	
Warehouses, 36 Huntingwood Drive Huntingwood (2017SWC032 DA) Development application for the demolition of the existing structures, construction of an industrial warehouse facility containing two units and a total floor area of 32,805 square metres, 134 car parking spaces and associated access, loading facilities, circulation ring road, stormwater works, signage and landscaping.	The proposed development is located about 1.3 kilometres west of the proposal. Cumulative construction impacts may include: • Increased noise, vibration and dust impacting surrounding receivers • Increased traffic due to an increase of construction vehicles and deliveries • Visual impacts due to the construction work site/s.	No operational impacts are anticipated
Warehouses, 1 Huntingwood Drive, Huntingwood (2016SYW239 DA) Development application for the construction of a new warehouse and distribution facility, modification of the existing warehouse and associated stormwater works, car parking and landscaping.	The proposed development is located about 640 metres west of the proposal. Cumulative construction impacts may include: • Increased noise, vibration and dust impacting surrounding receivers • Increased traffic due to an increase of construction vehicles and deliveries • Visual impacts due to the construction work site/s.	No operational impacts are anticipated

Project	Construction impacts	Operational impacts
Seniors Living Development, 134 Reservoir Road, Blacktown (2016SYW166 DA) Development application for alterations and additions to the existing St Hedwig Village Seniors Housing development.	The proposed development is located about 800 metres north of the proposal. Cumulative construction impacts may include: • Increased noise, vibration and dust impacting surrounding receivers • Increased traffic due to an increase of construction vehicles and deliveries • Visual impacts due to the construction work site/s.	No operational impacts are anticipated
Shop top housing development, Lot 102 DP 801310, Aldgate Street, Prospect (2016SYW034 DA) Development application for the construction of a part 3 and part 4 storey shop top housing development containing commercial spaces, 37 apartments, basement car parking and strata subdivision.	The proposed development is located about 2.5 kilometres east of the proposal. Cumulative construction impacts may include: • Increased noise, vibration and dust impacting surrounding receivers • Increased traffic due to an increase of construction vehicles and deliveries • Visual impacts due to the construction work site/s.	No operational impacts are anticipated

6.11.4 Potential impacts

Construction

There is potential for cumulative impacts to occur if construction work associated with the above mentioned development applications are carried out simultaneously with the proposal. Potential cumulative impacts may include:

- Increased construction noise and vibration impacts due to simultaneous work being carried out
- Increased construction traffic impacts due to additional construction vehicles and deliveries
- Increased visual impacts due to additional construction work sites
- Increased air quality impacts.

Development in the area would result in the continued loss of biodiversity on the Cumberland Plain. Biodiversity impacts on the Cumberland Plain from surrounding projects are as follows:

- The construction footprint of the M4 Managed Motorway project is anticipated to impact on about 31.25 hectares of planted and remnant vegetation in various states of condition. This
- area of clearing includes 3.82 hectares of remnant vegetation (Jacobs, 2015)
- Honeman Close SIS completed for the proposed service station subdivision indicates that approximately 4.5 hectares of native vegetation would be removed from Lot 2 DP 229466 (Cumberland Ecology, 2017) (note that some of this vegetation is within the same area as this RMS proposal).

When considered together, these projects combine to remove about 8.32 ha of remnant native vegetation from the Cumberland Plain. This is a large cumulative impact in terms of the over cleared nature of the region. The impacts from the proposal are largely captured within the impacts calculated for the Honeman Close SIS but an additional 0.07 ha would be removed from the Mitre 10 site.

It is likely these impacts would be managed at the project level through appropriate mitigation measures. Additional safeguards and management measures to mitigate potential cumulative impacts are provided in **Table 6-44**.

Operation

The long term effect of the proposal would have a positive cumulative impact on travel times and the efficiency of the road network. This would be beneficial as many of the new and proposed developments in the locality comprise of mixed use developments including residential, commercial and industrial developments.

6.11.5 Safeguards and management measures

Safeguards and management measures to mitigate potential cumulative impacts are discussed below in **Table 6-44**.

Table 6-44 Safeguards and management measures for potential cumulative impacts

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Cumulative construction impacts	The CEMP is to consider potential cumulative impacts from surrounding development activities and will be progressively updated.	Contractor	Pre-construction/ during construction	Additional safeguard
Cumulative construction impacts	Prior to the commencement of construction, Roads and Maritime will commence coordination efforts with the M4SM project team to routinely review works programs and identify potential cumulative impacts and opportunities to coordinate works to mitigate impacts.	Roads and Maritime	Pre-construction/ during construction	Additional safeguard
Cumulative construction impacts	RMS would continue ongoing consultation with the adjacent landowner of the proposed service station development site throughout detailed design to identify potential cumulative construction impacts to be addressed within the CEMP.	Roads and Maritime	Pre-construction/ during construction	Additional safeguard

7 Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are also listed.

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Sydney region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP 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), QA Specification G40 – Clearing and Grubbing, QA Specification G10 - Traffic Management.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in **Table 7-1**.

Table 7-1 Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor / Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN1

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
GEN2	General - notification	All businesses, residential properties and other key stakeholders (eg local council) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor / Roads and Maritime project manager	Pre-construction	Core standard safeguard GEN2
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. The environmental awareness training is to include (as a minimum): • Environmentally sensitive locations and/or no go zones • Requirement to report and the process for reporting environmental issues on-site • Requirement to report and the process for reporting damaged environmental controls • Erosion and sediment control measures • Incident management process • Site staff environmental responsibilities.	Contractor / Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN3
Traffic and transport					
TT1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties	Contractor	Detailed design / Pre-construction	Core standard safeguard TT1 Section 4.8 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		• site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic monitoring, review and amendment mechanisms.			
TT2	Traffic and transport	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	Contractor	Construction	Standard safeguard
TT3	Traffic and transport	Pedestrian and cyclist access is to be maintained throughout construction. Provision of signposts outlining the pedestrians and cyclist diversion routes would be displayed during construction.	Contractor	Construction	Standard safeguard
Noise and vibration					
NV1	Noise and vibration	A Noise and Vibration Management Plan (NVMP) for the project will be completed for the project and form part of the Construction Environment Management Plan. The plan will include: • all potential high noise and vibration generating activities associated with the activity • a map indicating the locations of sensitive receivers including residential properties. • a quantitative noise assessment in accordance with the Environment Protection Authority Interim Construction Noise Guidelines (DECCW, 2009)	Contractor	Detailed design / pre-construction	Core standard safeguard NV1 Section 4.6 of *QA G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		• Feasible and reasonable mitigation measures to be implemented • a process for assessing the performance of the implemented mitigation measures. • A review of safe working distances for vibration generating equipment • a feasible and reasonable monitoring program to assess performance against relevant noise and vibration criteria • a plan for consultation with affected neighbours and sensitive receivers. A process for documenting and resolving issues and complaints. A process for updating the plan when activities affecting construction noise and vibration change. • identify in toolbox talks where noise and vibration management is required • a review of the work schedule and mitigation measures will be carried out in response to noise and vibration complaints. Roads and maritime Environmental Officer to be consulted as part of the review process.			
NV2	Noise and vibration	All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least five days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • the project • the construction period and construction hours • contact information for project management staff • complaint and incident reporting • how to obtain further information.	Contractor	Detailed design / pre-construction	Core standard safeguard NV2
NV3	Noise and vibration	Set up of the site compound will be carried out during standard construction hours, pending ROL approval.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
NV4	Noise and vibration	Investigation of the setup and operation of the site compound will be carried out and include consideration of: • site shed placement • temporary or mobile noise screens (where practicable) • enclosures to shield fixed noise sources such as pumps, compressors, fans (where practicable) • site topography when situating stationary plant	Contractor	Construction	Additional safeguard
NV5	Noise and Vibration	High noise activities such as sawcutting and jack hammering are to be completed by midnight	Contractor	Construction	Additional safeguard
NV6	Noise and vibration	Where activities are in very close proximity to residences for extended periods, the erection of temporary hoardings/screens is to be considered	Contractor	Construction	Additional safeguard
NV7	Noise and vibration	Where smaller, stationary plant is located closer to residences, low noise equipment enclosures are to be considered and used where practicable	Contractor	Construction	Additional safeguard
NV8	Vibration	Where vibration issues are identified during the work, alternative equipment and construction methodologies are to be investigated	Contractor	Pre-construction / construction	Additional safeguard
Biodiversity					
B1	Biodiversity	During detailed design, a plan for offsets or supplementary measures is to be developed for the proposal in accordance with *RMS Guideline for Biodiversity Offsets* (Nov 2016).	RMS Project Manager	Detailed design	Additional safeguard
B2	Removal of native vegetation and habitat	Native vegetation and habitat removal would be minimised through detailed design.	Contractor	Detailed design	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
B3	Biodiversity	A Flora and Fauna Management Plan would be prepared in accordance with Roads and Maritime's Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS Projects (RMS, 2011) and implemented as part of the CEMP. It would include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and any revegetation areas • pre-clearing survey in accordance with RMS biodiversity procedure (RMS 2011) • procedures for unexpected threatened species finds and fauna handling • Protocols to manage weeds and pathogens.	Contractor	Pre-construction / construction	Standard safeguard
B4	Biodiversity	The environmental induction program will include specific biodiversity issues awareness training including, but not limited to: • All project specific and relevant standard biodiversity mitigation measures • Sensitive area maps • Work zone/vegetation clearing boundary.	Contractor	Construction	Additional safeguard
B5	Removal of native Vegetation and threatened plants	Pre-clearing surveys would be undertaken in accordance with *Guide 1: Preclearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Pre-construction	Standard safeguard
B6	Removal of native Vegetation and habitat	Vegetation and habitat removal would be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
B7	Removal of native vegetation and habitat	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) if threatened ecological communities and threatened fauna and flora species, not assessed in the biodiversity assessment, are identified in the proposal site.	Contractor	Construction	Standard safeguard
B8	Removal of native vegetation, edge effects on adjacent native vegetation and habitat and invasion and spread of pests	Exclusion zones would be set up at the limit of clearing (ie the edge of the impact area) and managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	Standard safeguard
B9	Aquatic impacts	Aquatic habitat would be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) and Section 3.3.2 *Standard precautions and mitigation measures* of the *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI (Fisheries NSW) 2013).	Contractor	Construction	Standard safeguard
B10	Injury and mortality of fauna	Fauna would be managed in accordance with *Guide 9: Fauna handling* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	Standard safeguard
B11	Invasion and spread of weeds	Weed species would be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Soils and contamination					
SW1	Soil and water	A site specific Erosion and Sediment Control Plan/s will be prepared as part of the CEMP and is to include as a minimum: • Identification of catchment areas, high risk areas and sensitive areas • Rough sizing of each of the above areas • 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 • Dewatering plan which includes process for monitoring, flocculating and dewatering water from site (ie sediment sumps) • Progressive stabilisation plan for disturbed areas, including the fill batter • The ESCP is to be updated at least fortnightly • A process to routinely monitor the BOM weather forecast • Preparation of a wet weather (rain event) plan which includes a process for monitoring potential wet weather and identification on the plans showing controls to be implemented in the event of wet weather. • Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.	Contractor	Detailed design / Pre-construction	Core standard safeguard SW2 Section 2.2 of QA G38 *Soil and Water Management*
SW2	Soil and water	The CEMP is to include an environmental work method statement (EWMS) for all works associated with the construction of the culvert extension and scour protection works.	Contractor	Detailed design/ Pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
SW3	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Detailed design / Pre-construction	Core standard safeguard C2 Section 4.2 of QA G36 Environment Protection
Water, hydrology and flooding					
C1	Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).	Contractor	Detailed design / Pre-construction	Core standard safeguard C3 Section 4.3 of QA G36 Environment Protection
C2	Works within the drainage line	Vehicles would not be permitted to cross the drainage line unless approved as part of the Culvert work EWMS.	Contractor	Detailed design / Pre-construction	Additional safeguard
C3	Storage of substances	Storage of fuels, chemicals and liquids at Compound 3 will be kept in bunded sheds above the flood height level. If this is not practicable, storage of fuels, chemical and liquid would not occur in Compound 3.	Contractor	Construction	Additional safeguard
Landscape character and visual impact					
UD1	Landscape plan	A landscape plan would be developed during detailed design to outline the proposed landscape treatment for the proposal.	Roads and Maritime	Detailed Design	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
UD2	Construction lighting impacts	Construction lighting will be oriented so as to minimise the potential for light spill to adjacent areas.	Contractor	Construction	Additional safeguard
UD3	Construction stage visual impacts	The work site will be left tidy at the end of each working day.	Contractor	Construction	Additional safeguard
UD4	Impact on trees	Establishment of Tree Protection Zones and tree protection measures consistent with AS4970-2009 Protection of Trees on Development Sites will be implemented for all trees within or immediately adjacent to the construction footprint.	Contractor	Construction	Additional safeguard
Property, land use and socio-economic					
PL1	Property acquisition	All property acquisition will be carried out in accordance with the *Land Acquisition Information Guide* (Roads and Maritime, 2012) and the *Land Acquisition (Just Terms Compensation) Act 1991*.	Roads and Maritime project manager	Pre-construction and construction	Core standard safeguard PL1
PL2	Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, road users, pedestrians and cyclists including changed traffic and access conditions • Contact name and number for complaints • A complaints handling procedure and register, which will be maintained for the duration of the project. The CP will be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008).	Contractor	Pre-construction / construction	Standard safeguard SE1

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
PL3	Socio-economic	In the event that utility service interruptions are required as a result of utilities relocation, residents would be informed prior to any interruptions.	Contractor	Pre-construction / construction	Standard safeguard
PL4	Socio-economic	Fencing with material attached (eg shade cloth) would be provided around the construction compound and other areas to screen views of the construction compound from adjoining properties.	Contractor	Pre-construction	Standard safeguard
Non-Aboriginal heritage					
H1	Non-Aboriginal heritage	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage, specifically the State and locally heritage listed Former Great Western Road. Exclusion zones, and areas requiring protection would be mapped as part of the NAHMP. Protection measures would be implemented to ensure no excavation or ground disturbance within the heritage curtilage. Mitigation measures are to include: • Monitoring, and protection as required, of existing hardstand areas to avoid damage • Ground protection measures such as track mats where potential damage to existing hard stand areas is identified or suspected, or where works are required outside of hardstand areas within the curtilage (eg to gain access to the site off Honeman Close) • Mountable site sheds to avoid ground disturbance • Barrier fencing to establish exclusion zones • Restricted access to Honeman Close • Any other measures as required to protect avoid damage to this heritage item.	Contractor	Detailed design / pre-construction	Core standard safeguard H1 Section 4.10 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
H2	Non-Aboriginal heritage	• The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. • Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design / pre-construction	Core standard safeguard H2 Section 4.10 of QA *G36 Environment Protection*
H3	Non-Aboriginal heritage	• Where Compound 2 is proposed for use on Boiler Close and no ground disturbance (eg excavation) is proposed, an Exemption Notification Form would be submitted to the NSW Heritage Council with the REF attached as supporting documentation prior to works commencing • Where excavation or ground disturbance is required within Compound 2 or via the access on Boiler Close, further assessment including an archaeological management plan would be required prior to works commencing. This assessment would determine whether the proposed works meet the requirements of site-specific Exemption 2, or whether a Heritage Act section 60 permit would be required. • If ground disturbance is required for Compound 3, including any access routes into the site, further assessment and potentially consultation with Blacktown City Council in accordance with Part 2 of the ISEPP would be required.	Contractor	Pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Aboriginal heritage					
AH1	Aboriginal heritage	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design / pre-construction	Core standard safeguard AH2 Section 4.9 of QA *G36 Environment Protection*
Other safeguards					
AQ1	Air quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA and/or OEH guidelines • mitigation and suppression measures to be implemented • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces.	Contractor	Detailed design / pre-construction	Core standard safeguard AQ1 Section 4.4 of QA *G36 Environment Protection*
AQ2	Air Quality	Measures for dust suppression, including watering or covering exposed areas and stockpiles, are to be implemented and be in accordance with the Roads and Maritime Services *Stockpile Site Management Guideline (EMS-TG-10).*	Contractor	Construction	Standard safeguard
AQ3	Air Quality	Disturbed areas will be minimised in extent and rehabilitated progressively.	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
AQ4	Air Quality	Stockpiles will be located as far away from residences and other sensitive receivers as possible.	Contractor	Construction	Standard safeguard
AQ5	Air Quality	Burning of material on-site is prohibited	Contractor	Construction	Standard safeguard
AQ6	Air Quality	Vehicles transporting waste, spoil or other material that may produce odours or dust will be covered during transport.	Contractor	Construction	Standard safeguard
AQ7	Air Quality	Construction works (including the spraying of paint and other materials) during periods of high winds would be modified to avoid drift.	Contractor	Construction	Standard safeguard
W1	Waste	A Waste and Resource Management Plan would be prepared as part of the CEMP, which details waste management strategies which are consistent with the *Waste Avoidance and Resource Recovery Act 2007* and the resource management hierarchy principles (in order of priority) of avoidance, resource recovery and disposal.	Contractor	Detailed design / pre-construction	Standard safeguard
W2	Waste	The Waste and Resource Management Plan would include procedures to classify all waste types in accordance with the *Waste Classification Guidelines* (EPA, 2014) and NSW legislative requirements and would include procedures for reuse (where feasible) and disposal arrangements for unsuitable excavated material or contaminated material (if encountered).	Contractor	Detailed design / pre-construction	Standard safeguard
W3	Waste	Waste disposed of off-site would be disposed of to a waste facility that is licensed under the POEO Act to receive wastes of that type.	Contractor	Construction	Standard safeguard
W4	Waste	There is to be no disposal or re-use of construction waste on to other land.	Contractor	Construction	Standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
W5	Waste	Types of waste collected, amounts, date/time and details of disposal are to be recorded in a waste register.	Contractor	Construction	Standard safeguard
W6	Waste	Cleared weed free vegetation will be chipped and reused on-site as part of the proposed landscaping and to stabilise disturbed soils where possible.	Contractor	Construction	Standard safeguard
W7	Waste	The works area will be kept free of rubbish, with appropriate bins provided for waste management and recycling.	Contractor	Construction	Additional safeguard
Cumulative					
C1	Cumulative construction impacts	The CEMP is to consider potential cumulative impacts from surrounding development activities and will be progressively updated.	Contractor	Pre-construction/ during construction	Additional safeguard
C2	Cumulative construction impacts	Prior to the commencement of construction, Roads and Maritime will commence coordination efforts with the M4SM project team to routinely review works programs and identify potential cumulative impacts and opportunities to coordinate works to mitigate impacts.	Roads and Maritime	Pre-construction/ during construction	Additional safeguard
C3	Cumulative construction impacts	RMS would continue ongoing consultation with the adjacent landowner of the proposed service station development site throughout detailed design to identify potential cumulative construction impacts to be addressed within the CEMP.	Roads and Maritime	Pre-construction/ during construction	Additional safeguard

7.3 Licensing and approvals

Road and Maritime would be required to seek a formal licence and/or agreement for the use of the proposed construction compounds prior to site establishment.

The use of Compound 2 would require an Exemption Notification to be submitted to NSW Heritage Council with the REF under the *Heritage Act 1977*. If any excavation or ground disturbance is required within Compound 2, or on Boiler Close as the proposed access to Compound 2, further assessment including an archaeological management plan would be required. This assessment would determine whether the proposed works meet the requirements of site-specific Exemption 2, or whether a Heritage Act section 60 permit would be required.

8 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 proposal is also considered 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*.

8.1 Justification

The proposal is considered to be consistent with a number of national, State and regional strategies and plans, including:

- Premier's Priorities and State Priorities
- NSW Long Term Transport Master Plan
- NSW 2021 – A Plan to Make NSW Number One
- State Infrastructure Strategy.

The proposal is considered to be justified as it would:

- Improve the right turn capacity of Reservoir Road northbound approach to Great Western Highway
- Improve the overall operational efficiency of the Great Western Highway and Reservoir Road intersection
- Improve road safety
- Deliver a solution that complements potential future intersection upgrades.

While there would be some environmental impacts as a consequence of the proposal, they have been avoided or minimised wherever possible through design and site-specific safeguards summarised in Chapter 7 (Environmental management).

8.2 Objects of the EP&A Act

Table 8-1 provides consideration of the proposal in accordance with Section 5 of the EP&A Act.

Table 8-1: 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	The proposal would improve the road network whilst minimising impacts on the built environment. The proposal would promote the social and economic welfare of the community by improving the user experience. See Chapter 6 (Environmental assessment) for further details.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land	The proposed transport improvements support the orderly economic use and development of land.

Object	Comment
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services	The proposal would impact on the protection, provision and co-ordination of communication and/or utility services as several utilities would be relocated to accommodate the construction works of the proposal. Relevant water, gas, communications and electric utility providers would be consulted during the development of the proposal.
5(a)(iv) To encourage the provision of land for public purposes	The proposal would upgrade the existing road network including some of which would be used for public bus services.
5(a)(v) To encourage the provision and co-ordination of community services and facilities	The proposal would upgrade the existing road network.
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	Construction of the proposal would require the clearing or permanent modification of existing vegetation. The potential impacts on vegetation, threatened species, population and ecological communities are discussed in Section 6.3.
5(a)(vii) To encourage ecologically sustainable development	Ecologically sustainable development is considered in Sections 8.2.1 to 8.2.4 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing	Not relevant to the proposal.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State	Not relevant to the proposal.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment	Consultation with the community and relevant government agencies was carried out during the development of the proposal. Details of this consultation are provided in Chapter 5 (Consultation).

8.2.1 The precautionary principle

The precautionary principle upholds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

When applying the precautionary principle public and private decisions should be guided by:

- Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment
- An assessment of risk-weighted consequences of various options.

A precondition for the operation of the precautionary principle is that there are threats of serious or irreversible damage to the environment. This REF has demonstrated that such threats are not present for the proposal.

Detailed design of the proposal would ensure no serious or irreversible environmental damage would arise from the proposed works. The developed safeguards and management measures would be implemented to minimise or mitigate any potential impacts.

Conservative 'worst case' scenarios were considered while assessing the environmental impact of the proposal. For example, conservative estimates of the number of trees to be removed and the number of construction vehicles were used for the impact assessments. Worst case construction times were also assessed.

Specialist advice in traffic modelling, noise and vibration, biodiversity, landscape character and visual impact, and socio-economic impacts were incorporated for a detailed understanding of the existing environment.

8.2.2 Intergenerational equity

The principle of intergeneration equity states, '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 not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations. The proposal would benefit future generations with this being a positive benefit for all road users.

Should the proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower level of service associated with the intersection performance and local transport in the area.

8.2.3 Conservation of biological diversity and ecological integrity

The principle of biological diversity upholds that the conservation of biological diversity and ecological integrity should be a fundamental consideration.

The construction planning outcomes and safeguard and management measures described in Section 6.3 would minimise the impacts of the proposal on terrestrial biodiversity and ecological integrity of the proposal area and its surrounding landscapes

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle requires that 'costs to the environment should be factored into the economic costs of a project', and upholds that environmental factors should be included in the valuation of assets and services, such as:

- Polluter pays, that is, those who generate pollution and waste should bear that cost of containment, avoidance or abatement
- The users of goods and service should pay prices based on the full life cycle of costs or providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste
- Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Environmental issues have been considered in the strategic planning for the proposal. The environmental goals of the proposal have also been pursued in the most cost effective way through the design and construction planning process.

8.3 Conclusion

The proposed The Great Western Highway and Reservoir Road intersection upgrade at Blacktown 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 by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the BC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Commonwealth EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on biodiversity and noise. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also result in improved road safety, improved intersection performance and reduce travel times. On balance the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act. A Species Impact Statement is not required. The proposal is subject to assessment under Part 5 of the EP&A Act. Consent from Council is not required.

Significance of impact under Commonwealth legislation

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of the Environment is not required.

9 Certification

This REF 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.

Laura Lynch

Senior Environmental Planner

Jacobs (Australia) Group

Date: 28/02/2018

I have examined this review of environmental factors and accept it on behalf of Roads and Maritime Services.

Johnny Curran

Project Manager

Easing Sydney's Congestion Program Office | Sydney Division

Date: 28/02/2018

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Terms and acronyms used in this REF

Term / Acronym	Description
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AQMP	Air Quality Management Plan
ARI	Average Recurrence Interval
ASRIS	Australian Soil Resource Information System
BAM	Biodiversity Assessment Method
BOS	Biodiversity Offsets Scheme
CBD	Central Business District
CEMP	Construction Environmental Management
CNVG	Construction Noise and Vibration Guideline
DCP	Development Control Plan
DICL	Duct Iron Cement Lined
DPI	Department of Primary Industries
EIA	Environmental impact assessment
EIS	Environmental impact statement
EPA Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
EPL	environmental protection licence
GDE	Groundwater Dependent Ecosystems
GWH	Great Western Highway
ICNG	*Interim Construction Noise Guideline*
INP	*Industrial Noise Policy*

Term / Acronym	Description
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EPA Act.
LGA	Local Government Area
LOS	Level of Service
NAHMP	Non-Aboriginal Heritage Management Plan
NBN	National broadband Network
NCA	Noise Catchment Areas
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 2013
NML	noise management levels
NPW	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
NVMP	Noise and Vibration Management Plan
OEH	Office of Environment and Heritage
OOH	Out of Hours
OOHW	Out of Hours Work
PACHCI	Aboriginal Cultural Heritage Consultation and Investigation
PCT	Plant Community Types
POEO Act	*Protection of the Environment Operations Act 1997*
POTCNVA	*Preparing an Operational Traffic and Construction Noise and Vibration Assessment*
RBL	rating background levels
REF	Review of Environmental Factors
RMS	Roads and Maritime Services
RNP	*Road Noise Policy*
RTA	Roads and Traffic Authority
SHR	State Heritage Register
SIS	Species Impact Statement
SOHI	Statement of Heritage Impact

Term / Acronym	Description
SWL	standing water level
SWMP	Soil and Water Management Plan
TCS	Traffic Control Systems
TMP	Traffic Management Plan
TSC	*Threatened Species Conservation Act 1995* (NSW)

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