Mona Vale Road East upgrade

Addendum review of environmental factors

December 2017

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Roads and Maritime Services

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Executive summary

The proposed modification

After the Mona Vale Road East upgrade review of environmental factors (REF) was determined by Roads and Maritime Services, further design development and detailed construction planning was carried out. During this process, modifications to the project were identified that were not previously considered or assessed in the REF.

This Addendum REF considers the following modifications to the project:

- a range of route refinements that are outside of the project footprint
- site compound and ancillary sites
- changes to drainage and flooding management strategies
- changes to noise management measures
- changes to shared use path
- updated road surface design and construction methodology
- refinements to utility adjustments
- new and upgraded emergency access tracks
- improved fauna connectivity measures
- landscaping changes near the Pittwater RSL Club
- construction methodology changes including:
  - temporary traffic changes during construction
  - establishment of a site compound and ancillary facilities during construction.

Background

Mona Vale Road is the main east–west link between the Pacific Highway, Pymble, and Pittwater Road, Mona Vale, totalling about 20 kilometres in length and carrying about 22,000 vehicles per day in both directions.

Roads and Maritime is proposing to upgrade and widen about 3.2 kilometres of Mona Vale Road between Manor Road, Ingleside, and Foley Street, Mona Vale (Mona Vale Road East upgrade). The road would be upgraded from a two lane (one in each direction) undivided road to a four lane (two lanes in each direction) divided road. The project includes a range of work including new retaining walls, rock cuttings, cyclist and pedestrian facilities, road safety improvements, intersection adjustments and upgrades, drainage measures, fauna connectivity provisions and landscaping.

An REF was prepared for the Mona Vale Road East upgrade in July 2015. The REF was placed on public display between 29 July 2015 and 28 August 2015 for community and stakeholder comment. A Submissions Report, dated December 2015 was prepared to respond to issues raised.

Need for the proposed modifications

Mona Vale Road between Manor Road, Ingleside, and Foley Street, Mona Vale, has two narrow lanes, steep grades on a curved alignment and is signposted with a speed limit of 70 km/h. Traffic volumes are increasing steadily as a result of population growth and urban development leading to congestion and slowing travel times, particularly during the morning and afternoon peaks. There is also a history of crashes, including fatalities, on this section of Mona Vale Road and there is limited provision for the safe movement of pedestrians and cyclists.

The proposed modification as listed above is consistent with the project need and provides for improved design, construction and operational outcomes.

By providing additional capacity and an improved road design, the project would deliver improved road safety, reduced congestion and provide for future population and employment growth.

Statutory and planning framework

State Environmental Planning Policy (Infrastructure) 2007 aims to facilitate the effective delivery of infrastructure across the State and applies to this proposal. Clause 94 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 the upgrade of a road and associated 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.

An environmental protection licence for road construction under the *Protection of the Environment Operations Act 1997* will be required.

Significant impacts on matters of national environmental significance or on Commonwealth land are not expected. Therefore, referral of the proposal to the Australian Government Department of Environment under the *Environmental Protection and Biodiversity Conservation Act 1999* is not considered necessary.

Community and stakeholder consultation

The REF was displayed for community consultation between 29 July 2015 and 28 August 2015, with 156 public submissions received. After reviewing the issues raised by the community, some aspects of the project and management measures were revised. These changes were detailed in the Submissions Report prepared in December 2015 and were published on the Roads and Maritime website. The changes detailed in the Submissions Report formed part of the project that received approval.

After determination of the REF, further design development and construction planning was undertaken. Further consultation was undertaken with a range of stakeholders during detailed design and construction planning. These stakeholders included residents, community groups, Northern Beaches Council (formerly Pittwater Council), commercial organisations, and affected property owners.

The consultation methods, submissions received and the Roads and Maritime response to the issues raised during the consultation activities are summarised in Section 4 of this Addendum REF.

Environmental impacts

A summary of the main environmental impacts associated with the proposed modification is provided below.

Biodiversity

The proposal (including the proposed modification) would remove or indirectly impact around 16.8 hectares of vegetation including 11.35 hectares of remnant native vegetation. The proposed modification would remove or indirectly impact around 4.76 hectares of remnant native vegetation that was not previously assessed for removal in the REF. No endangered ecological communities would be impacted by the proposed modification.

The proposed modification would remove or indirectly impact on known or potential habitat for a number of threatened species. Assessments of significance carried out under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Threatened Species Conservation Act 1995* (TSC Act) determined the proposed modification would not result in any significant impact.

Safeguards and management measures outlined in this Addendum REF would be implemented to avoid or minimise any inadvertent impact to flora and fauna species as a result of the proposed modification.

Landform, geology and soils

The proposed modification has the potential to generate sediment during rainfall events due to ground disturbance during construction activities such as earthworks and vegetation removal. A site-specific soil and water management plan would be prepared including measures to mitigate erosion and sedimentation. After the revegetation of areas of land disturbed by construction, the potential for erosion and sediment generation to occur would be minimised.

An ancillary site proposed at 1-7 Walana Crescent potentially contains buried asbestos containing material. Suitable safeguards would be put in place during construction including the development and implementation of a contaminated land management plan to manage the impact associated with potentially contaminated soils.

Hydrology, hydraulics and water quality

The ancillary facility site at Waratah Road is currently subject to modest flooding during major storm events. The flooding risk at this site during construction would be removed by the introduction of temporary low earth bunds during construction. The modified design includes permanent channel diversions around the site to eliminate flooding risk on the site after construction has finished.

The proposed modification would be constructed in accordance with a detailed erosion and sediment control plan which will be developed in accordance with the requirements Managing Urban Stormwater: Soils and Construction, Volume 1 and 2 (Landcom, 2004).

During operation, the proposed modification would increase the risk of erosion and scour in waterways due to increased water velocities. The proposed modification would reduce flooding risk at a number of locations and would increase flooding risk at one private property. Council and any affected landowners would be consulted prior to construction about any increased flooding risks.

During operation, the proposed modification would reduce risks to water quality by providing spill containment provisions at the truck arrestor bed.

Traffic and transport

The proposed modification would temporarily increase traffic during construction, including heavy vehicle traffic on Mona Vale Road and on some local roads. This would primarily be associated with the construction and operation of ancillary facilities proposed as part of the proposed modification. A traffic management plan would be prepared to address the traffic impact.

Once complete, the proposed modification would reduce congestion and shorten travel times for general traffic, buses and freight vehicles.

The proposed modification no longer provides a shared use path for cyclists and pedestrians along Lane Cove Road. Instead, the proposed modification provides a shared use path between Samuel Street, Mona Vale, and Lane Cove Road, Ingleside, however cyclists would need to use the road shoulder to travel along Mona Vale Road west of Lane Cove Road. Additional local pedestrian and

cyclist facilities are planned as part of the Ingleside Structure Plan, currently being developed by the Department of Planning and Environment.

Aboriginal heritage

No changes to Aboriginal heritage impact is predicted as part of the proposed modification.

Non-Aboriginal heritage

Land surveys during design development identified a dry-stone sandstone wall located beneath dense vegetation along the northern side of Mona Vale Road adjacent to 119 Mona Vale Road. The wall does not meet the definition of a 'relic' under the *Heritage Act 1977*. Under the Act, the wall would be classified as a 'work' and therefore does not trigger statutory approval requirements for impact to relics.

Noise and vibration

During construction the construction contractor would temporarily require an area for the establishment of a construction site compound as well as areas to store material and equipment for a range of construction related activities.

The level of construction noise impact at the site compound and each construction ancillary site would depend on the activities undertaken, the duration of those activities and the time of day (or night) that activities were undertaken. The site compound at 30 Walana Crescent and ancillary site at 127 Mona Vale Road are generally located away from a small number of sensitive receivers and would be expected to result in negligible or minor noise impacts. They are likely to be suitable for most construction activities.

Waratah Road ancillary site and 1-7 Walana Crescent ancillary site are located closer to a larger number of sensitive receivers. Depending on the activities proposed at these facilities by the construction contractor, the construction noise impacts are expected to be higher and would affect a greater number of receivers. The construction contractor will be required to prepare a noise management plan to mitigate the noise impacts from this site.

During operation, road noise would impact a number of sensitive receivers. The proposed modification includes a 4.5 metre high noise barrier alongside Mona Vale Road between Walana Crescent / Wallaby Circuit and Fazzolari Avenue. At sensitive receivers identified as requiring noise mitigation, but where the provision of a noise barrier would not be reasonable or feasible, at-house noise reduction treatments would be provided.

Urban design and visual amenity

The proposed modification includes features that would change the visual amenity of the project. These changes include proposed construction ancillary facilities, a 4.5 metres high proposed noise barrier, a new fauna overpass over Mona Vale Road, new access tracks alongside Mona Vale Road and landscaping changes in the vicinity of the Pittwater RSL Club. For each of these visual changes the sensitivity and magnitude has been assessed to determine the visual impact. The visual impact of these changes was assessed to be low, with the exception of the new fauna bridge which was assessed to have a moderate visual impact.

Air quality

No changes to air quality impact are predicted as part of the proposed modification.

Socio-economic

The proposed modification would require changes to property acquisitions and may result in an impact to the amenity of existing social infrastructure. During operation, the proposed modification

may have a socio-economic impact relating to amenity and travel behaviour. No additional safeguards and management measures are required for socio-economic issues as a result of the proposed modification.

Hazards and risks

The REF identified that stability of rock cuttings is a concern through the proposed cuttings at the western end of the project area. The proposed modification introduces rock fall clear zones to the design to minimise this risk of rock fall on to the road.

Justification and conclusion

The proposed modification would meet the objectives of the Mona Vale Road East upgrade and would be anticipated to result in a minor environmental impact.

Roads and Maritime has considered the proposed modification against the potential benefits and impact, and has determined the benefits outweigh the impact, provided adequate mitigation measures are implemented.

Contents

Appendices

1 Introduction

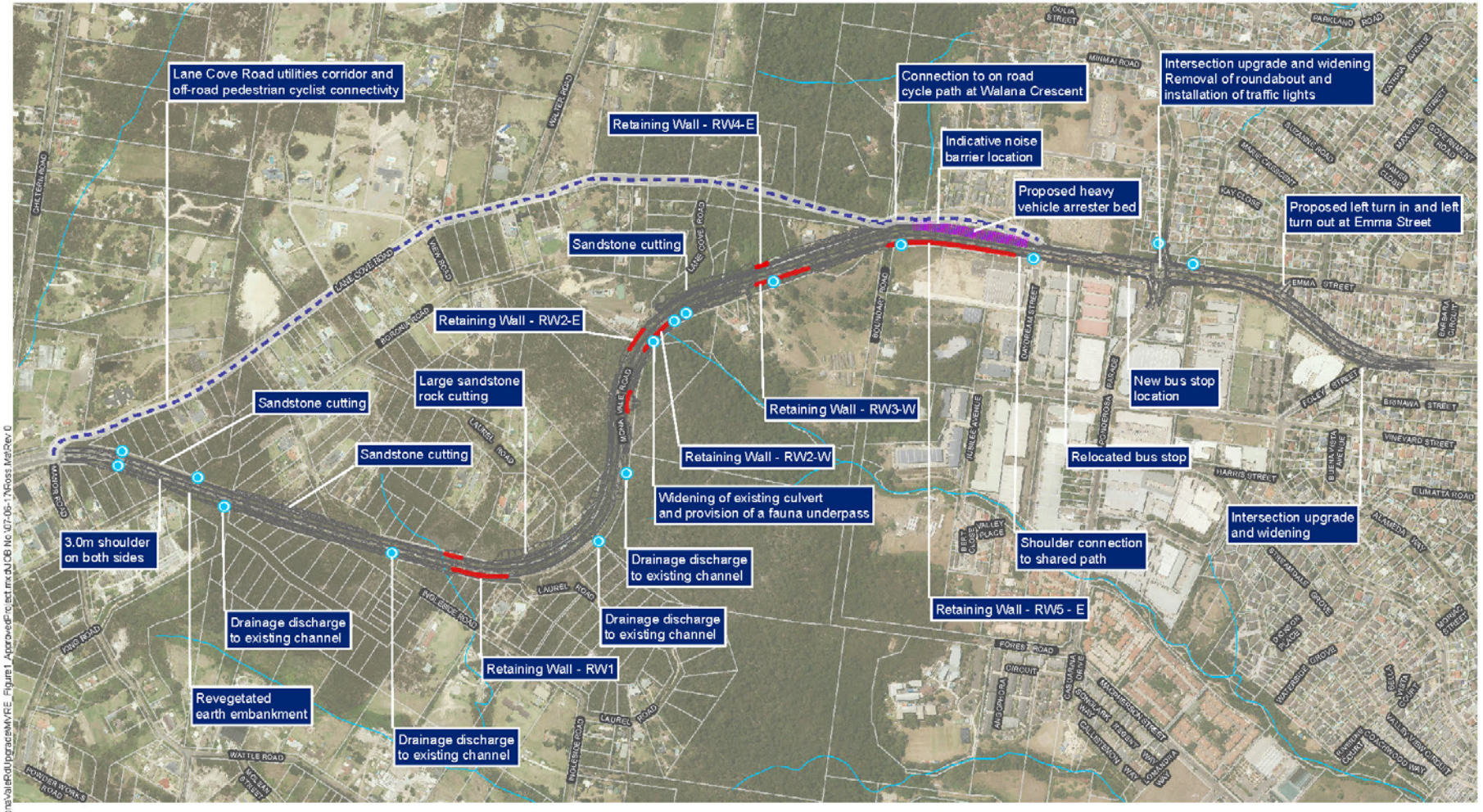
1.1 Proposed modification overview

Roads and Maritime Services proposes to modify the Mona Vale Road East upgrade review of environmental factors (REF) by refining several elements of the project to improve safety, overcome engineering constraints and to more effectively achieve the project objectives (proposed modification). Key features of the proposed modification would include:

- a revised footprint for construction
- revised drainage structures
- revision of the noise mitigation measures
- removal of the existing road surface and construction of a new road surface (except to the east of Foley Street where road surfaces would be milled and re-sheeted)
- removal of the need for a Lane Cove Road utilities corridor and provision for a revised range of utility adjustments
- modification of and provision of new emergency and maintenance access tracks
- removal of the proposed rope canopy bridge
- provision of a dedicated fauna overpass and a dedicated fauna underpass
- modification of proposed landscaping
- provision of only one active travel lane in each direction between Emma Street and Foley Street, during some stages of construction
- the potential for establishment of a construction site compound at 30 Walana Crescent
- the potential for establishment of construction ancillary facilities at:
  - Waratah Road
  - 1-7 Walana Crescent
  - 127 Mona Vale Road.

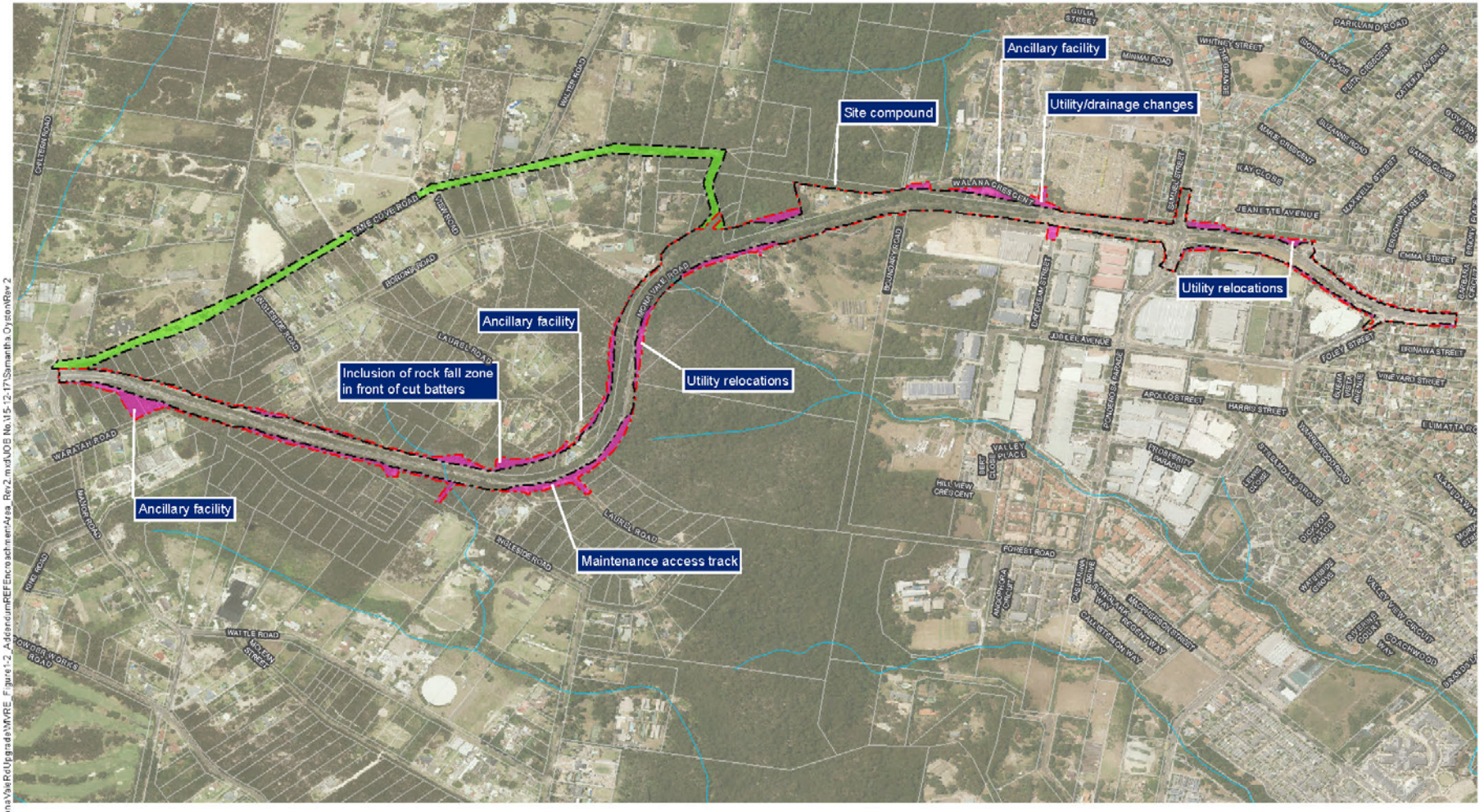
An REF was prepared for the Mona Vale Road East upgrade in July 2015. The REF was placed on public display between 29 July 2015 and 28 August 2015 for community and stakeholder comment. A Submissions Report, dated December 2015 was prepared to respond to issues raised.

Figure 1-1 shows the key features of the project as described in the REF. The proposed modifications addressed in this Addendum REF are shown in Figure 1-2 to Figure 1-7. Chapter 2 describes the proposed modifications in more detail.



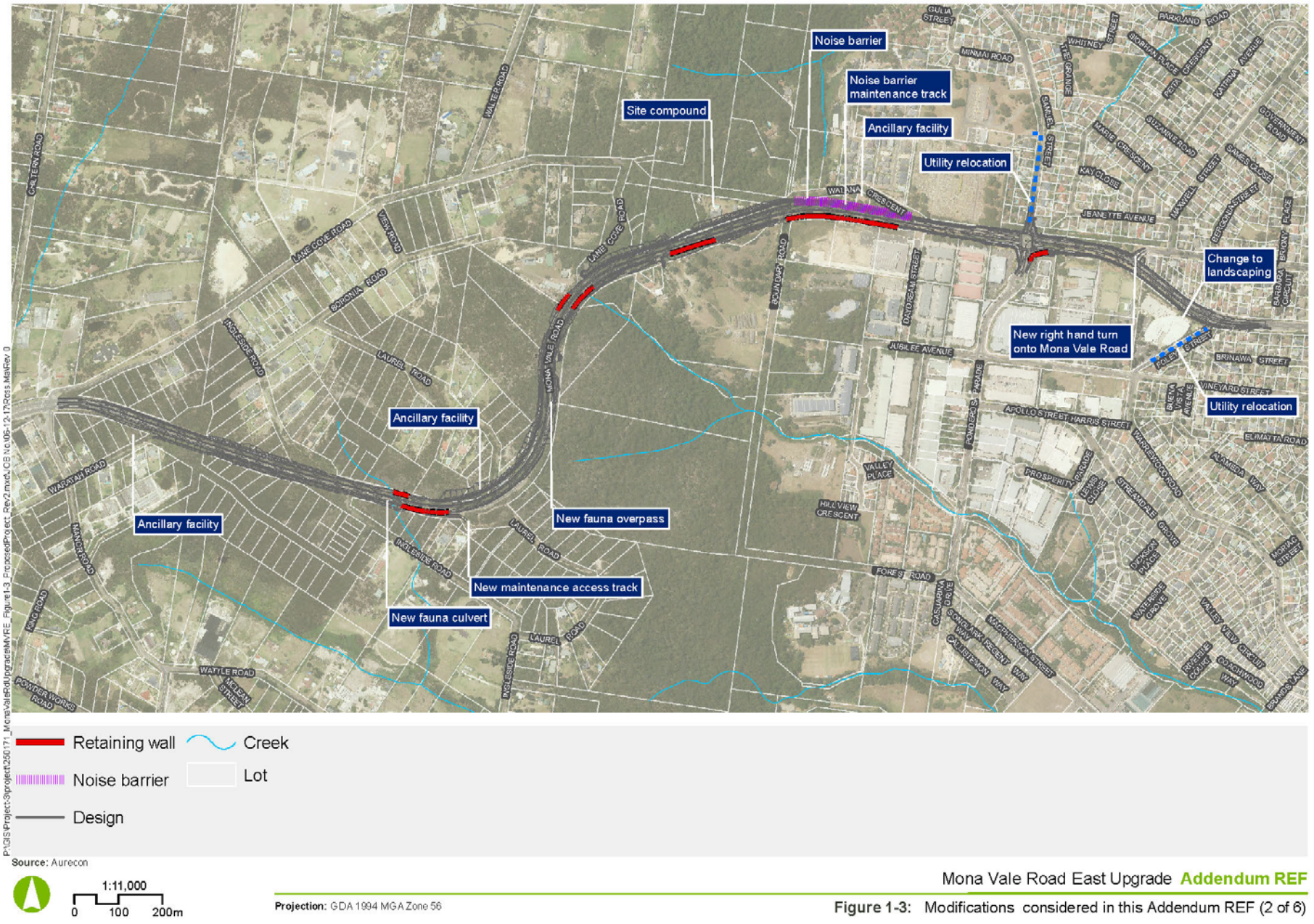
Mona Vale Road East Upgrade **Addendum REF**

FIGURE 1-1: Approved proposal



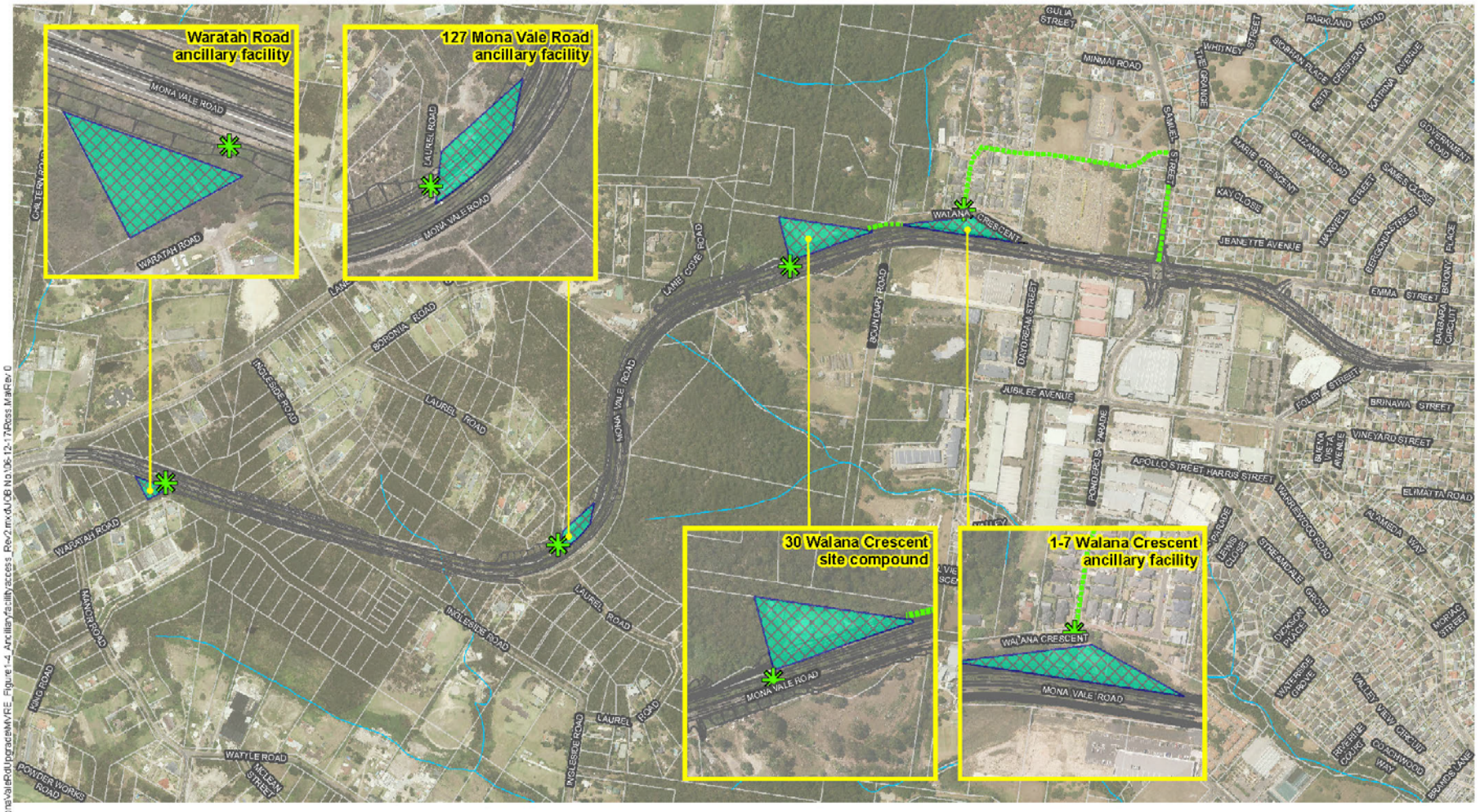
Mona Vale Road East Upgrade **Addendum REF**

FIGURE 1-2: Modifications considered in this Addendum REF (1 of 6)



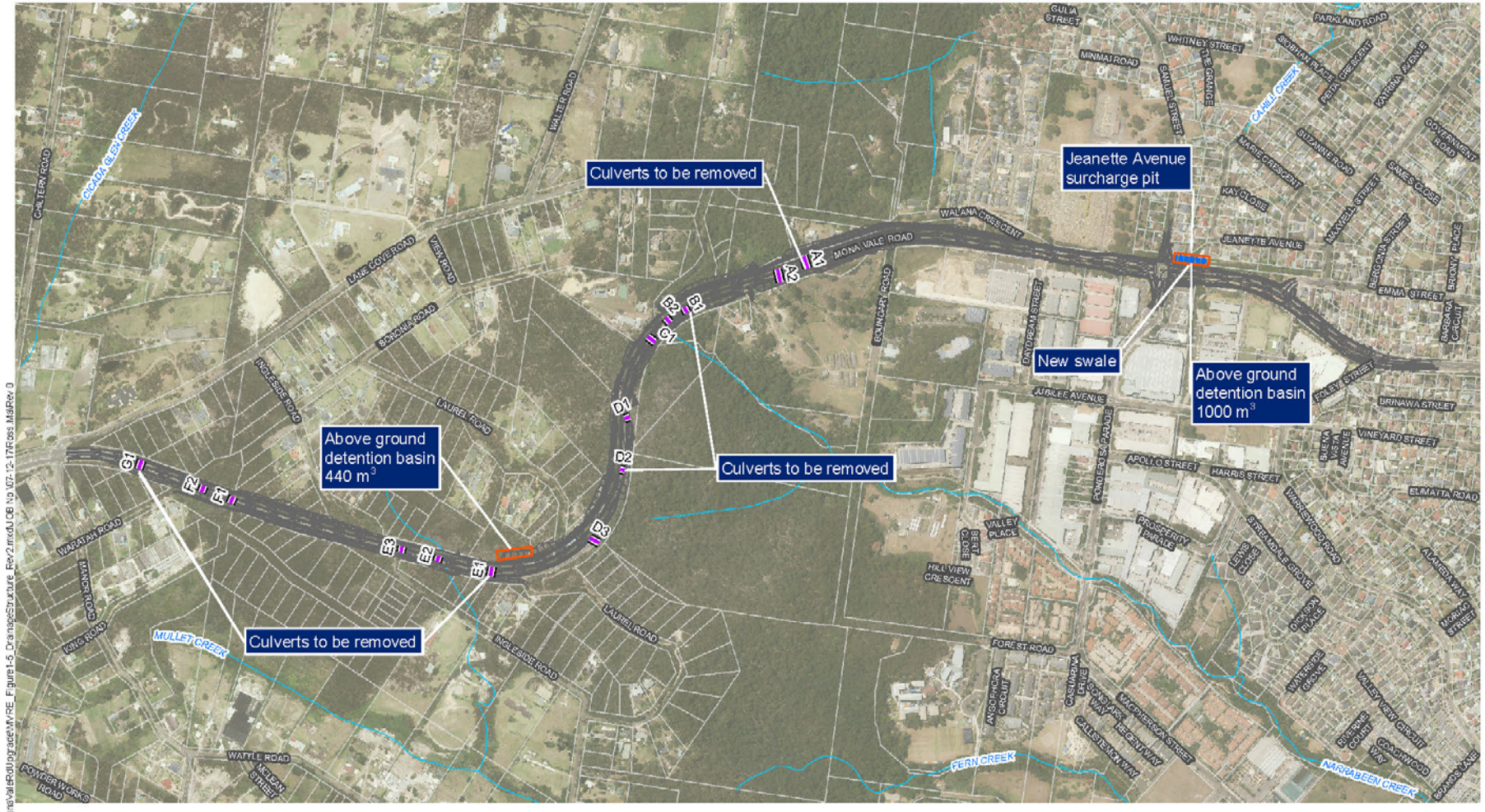
Mona Vale Road East Upgrade **Addendum REF**

Figure 1-3: Modifications considered in this Addendum REF (2 of 6)



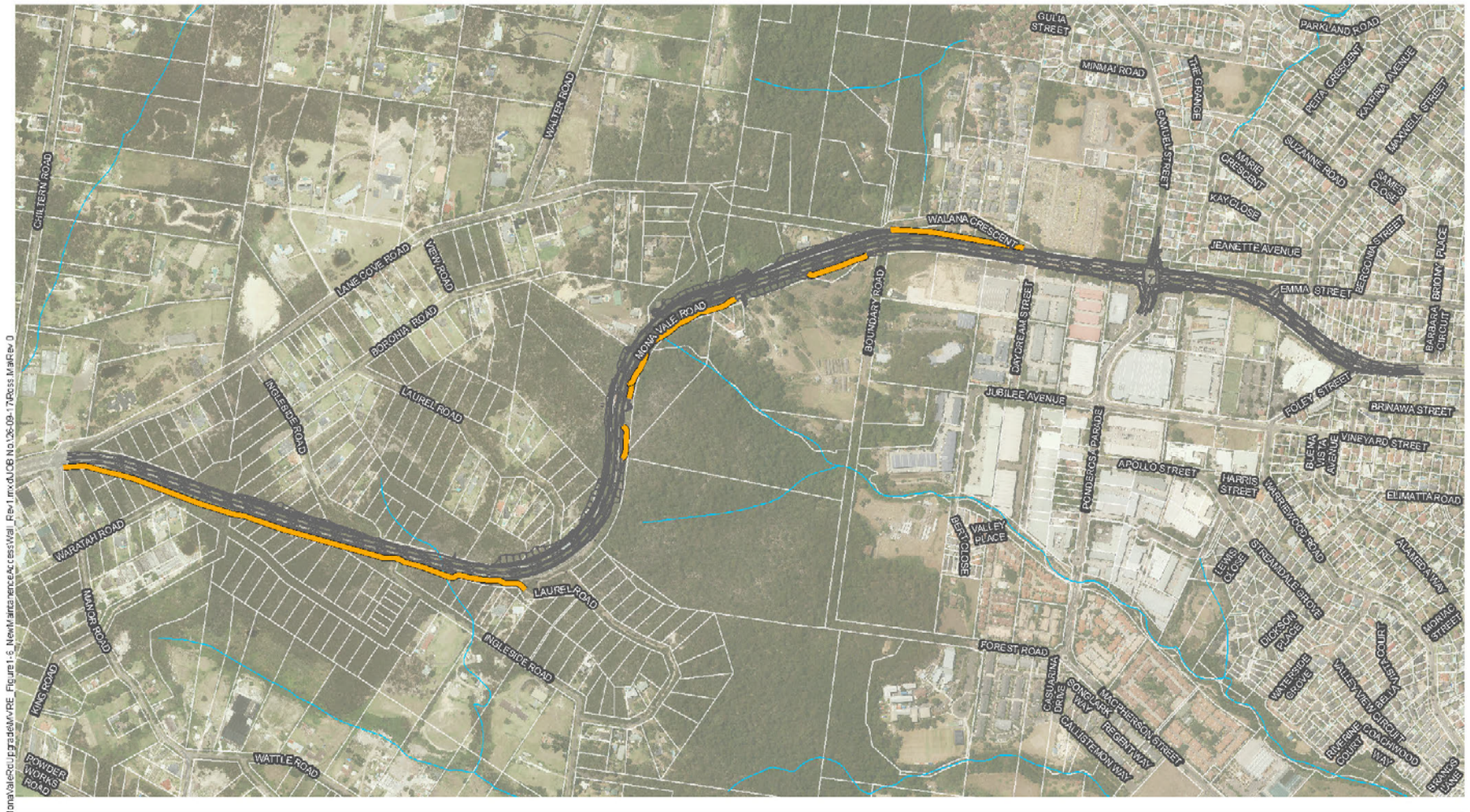
Mona Vale Road East Upgrade **Addendum REF**

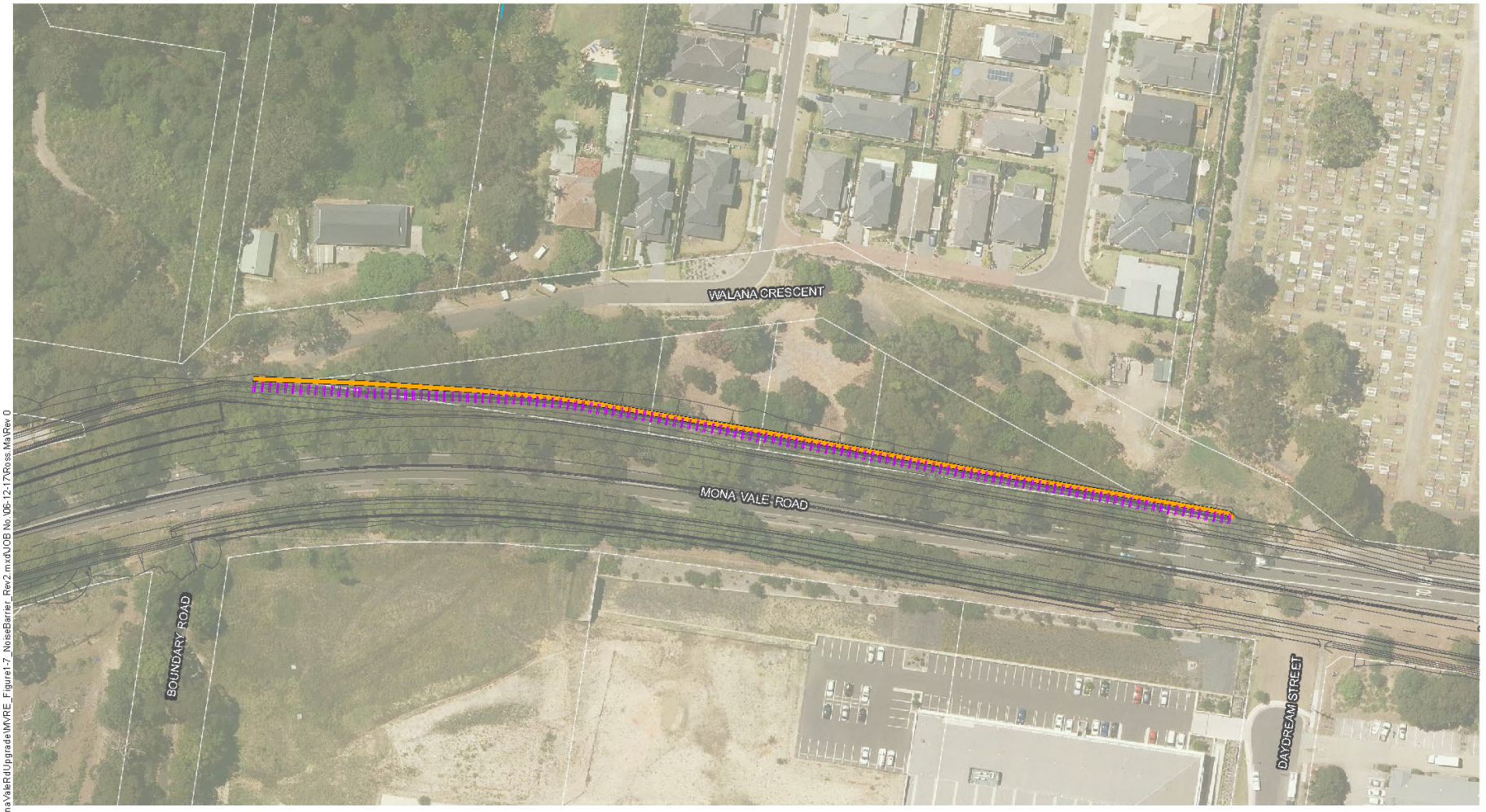
Figure 1-4: Modifications considered in this Addendum REF (3 of 6)



Mona Vale Road East Upgrade **Addendum REF**

Figure 1-5: Modifications considered in this Addendum REF (4 of 6)


Maintanence access track (unsealed)
Design
Creek
Lot
Source: Aurecon
1:11,000
0 100 200m
Projection: GDA 1994 MGA Zone 56
Mona Vale Road East Upgrade Addendum REF
Figure 1-6: Modifications considered in this Addendum REF (5 of 6)



Mona Vale Road East Upgrade **Addendum REF**

Figure 1-7: Modifications considered in this Addendum REF (6 of 6)

1.2 Purpose of the report

This addendum REF has been prepared by Aurecon Australasia Pty Ltd on behalf of Roads and Maritime Greater Sydney Project 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).

This Addendum REF is to be read in conjunction with the REF and Submissions Report for the project. The purpose of this Addendum REF is to describe the proposed modification, to document and assess the likely impact of the proposed modification on the environment, and to detail protective measures to be implemented.

The description of the proposed work and associated environmental impact have been undertaken in context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the Addendum REF helps to fulfil the requirements of:

- Section 111 of the EP&A Act that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.
- the strategic assessment approval granted by the Federal Government under the EPBC Act in September 2015, with respect to the impacts of Roads and Maritime's road activities on nationally listed threatened species, populations, ecological communities and migratory species.

The findings of the addendum REF would be considered when assessing:

- whether the proposed modification is likely to have a significant impact on the environment and therefore the necessity 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
- the significance of any impact on threatened species as defined by the TSC Act and/or FM Act, in section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement (SIS)
- the significance of any impact on nationally listed threatened species, populations, ecological communities and migratory species under the EPBC Act, in accordance with the strategic assessment approval granted by the Federal Government under the EPBC Act with respect to Roads and Maritime's activities.

2 Description of the proposed modification

2.1 The proposed modification

Roads and Maritime proposes to modify the Mona Vale Road East upgrade to better meet the project objectives by providing for a range of improved design, construction and operational outcomes. Figure 1-1 shows the project key features as described in the REF. The proposed modifications are shown in Figure 1-2 to Figure 1-7.

Key features of the proposed modification would include:

- a revised footprint for construction
- revised drainage structures
- revision of the noise mitigation measures
- removal of the existing road surface and construction of a new road surface (except to the east of Foley Street where road surfaces would be milled and re-sheeted)
- removal of the need for a Lane Cove Road utilities corridor and provision for a revised range of utility adjustments
- modification of and provision of new emergency and maintenance access tracks
- removal of the proposed rope canopy bridge
- provision of a dedicated fauna overpass and a dedicated fauna underpass
- modification of proposed landscaping
- provision of only one active travel lane in each direction between Emma Street and Foley Street, during some stages of construction
- the potential for establishment of a construction site compound at 30 Walana Crescent
- the potential for establishment of construction ancillary facilities at:
  - Waratah Road
  - 1-7 Walana Crescent
  - 127 Mona Vale Road.

2.2 Overview of the proposed modifications

2.2.1 Construction footprint modifications

During the development of the detailed design and detailed construction planning, there have been a number of modifications to the determined project that would result in changes in the construction boundary. These include:

- utility relocations (discussed further in Section 2.2.5)
- widening of cuttings to allow a rock fall safety zone adjacent to Mona Vale Road
- changes to property acquisitions (discussed further in Section 2.3)
- provision of an unsealed access track from Manor Road to Boundary Road, along the southern side of Mona Vale Road for maintenance and inspection (discussed further in Section 2.2.6)

Some proposed modifications would reduce the approved construction footprint. These include:

- not providing a shared use path and some utilities along Lane Cove Road
- avoidance of the Little Man Aboriginal heritage site.

Figure 1-2 shows the proposed construction footprint changes.

2.2.2 Drainage system modifications

Further flood modelling and additional assessment of hydrology and flooding was undertaken during the detailed design phase. This has identified the need for changes to proposed management of drainage from and through the proposal area.

The proposed modification includes two new onsite detention storages to mitigate against potential flood impacts on downstream properties. One onsite detention storage would have a capacity of about 440 cubic metres located upstream of culvert E1 as in Figure 1.5. The second onsite detention storage would be located on the land to the north west of the Ponderossa Avenue/Mona Vale Road intersection and would have a capacity of around 1000 cubic metres.

Other refinements to the cross drainage culverts are proposed which include the removal of some existing culverts and the augmentation of all remaining culvert drainage structures identified in the REF. The new culvert sizes are described in Table 5-8.

2.2.3 Noise mitigation modifications

An operational noise and vibration assessment was undertaken to compare the findings of the REF and Submissions Report with the detailed design. This operational noise and vibration assessment was undertaken specifically to comply with environmental safeguard NV2 in the REF (and Submissions Report). The NV2 safeguard specifically required:

- *During the detailed design stage of the proposal, further investigations of all feasible and reasonable mitigation options would be undertaken for affected receivers in accordance with the Road Noise Policy (DECCW 2011) and Roads and Maritime's Environmental Noise Management Manual Practice Note 4 (RTA 2001).*

The assessment predicted that road noise would exceed the relevant noise criteria at 58 sensitive receivers and that these receivers would require at-house noise treatments to reduce noise impacts.

The assessment also considered the optimal height of a noise wall proposed to be located along the proposed truck arrester bed, from the end of the cutting to the cemetery. The assessment confirmed the noise wall location as being consistent with the REF. A range of noise wall heights between three metres and 4.5 metres were considered. The assessment concluded that a 4.5 metre high wall would be appropriate because this would provide the maximum amount of noise attenuation to the surrounding sensitive receivers.

2.2.4 Road surfacing modification

Further investigations on the quality of the existing Mona Vale Road pavement has resulted in a change to the road surfacing strategy for the project. Rather than patching the defects in the existing road surface as was proposed in the REF, the entire existing road surface would be removed and a new road surface laid. The only exception would be to the east of Foley Street, where road surfaces would be milled and re-sheeted.

The REF estimated a milled asphalt volume of about 23,700 cubic metres would be generated. This modification increases the estimated milled asphalt volume to about 45,000 cubic metres.

2.2.5 Utility modifications

The REF included provision for a new Lane Cove Road utilities corridor that would include a range of overhead and underground utilities. The proposed modification removes the Lane Cove Road utilities corridor.

In consultation with the utility agencies, including AusGrid, Telstra, Optus, gas providers, Sydney Water and Jemena, the location of utility relocations have been confirmed. The modified utility relocation strategy is outlined in Table 2-2.

Table 2-1 Utility relocations

Chainage	Modified relocation strategy
2600 to 2850	Astrid 33kV would be relocated along the southern side of Mona Vale Road.
1200 to 1400	SRM and Optus would be moved from new footway to dedicated access track at base of retaining wall along the southern side of Mona Vale Road.
60 to 300	High pressure gas pipeline would be retained in current location and protected during construction. Water, Telstra, Optus and gas utilities would be relocated.
1700 to 2050	Sewer rising main, Optus major Optic Fibre and Ausgrid 11kV would be moved from the proposed footway to the top of the embankment.
2330 to 2700	Sewer rising main would be moved from under the roadway to under the eastbound footpath.
2070 to end	ITS communications would be moved from under the roadway to under the footpath.
1600 to 2060	Ausgrid high voltage and low voltage underground services on north side of Mona Vale road would be relocated to overhead on the south side of Mona Vale Road on shared 33kV poles. An underground road crossing for the Ausgrid high voltage and low voltage underground services would be provided at CH1600.
3130 and 3160	Two Jemena service road crossings would be changed from retain in-place to replace with deeper cover.
Samuel Street	Ausgrid high voltage services would be trenched within the pavement of Samuel Street from the Mona Vale Road intersection to an existing services junction just north of the Fazzolari Avenue intersection.
Foley Street	Ausgrid high voltage services would be trenched within the pavement of Foley Street from Mona Vale Road intersection to an existing services junction just east of the Pittwater RSL Club.

2.2.6 Emergency services and maintenance access tracks

New and upgraded unsealed access tracks have been incorporated into the design, along the southern side of Mona Vale Road between Boundary Street and Manor Road. These access tracks would generally be three metres wide. They would be used for maintenance activities, retaining wall inspections, emergency services access (if required) and may also be used by utility providers to access poles and overhead services.

A new unsealed three metre wide access track would be provided behind the noise barrier proposed to be located along the proposed truck arrester bed, from the end of the cutting to the cemetery along the northern side of Mona Vale Road. This would be used for maintenance purposes.

Figure 1-6 shows the location of proposed access tracks.

2.2.7 Fauna crossing strategy

A dedicated fauna overpass would be provided about 250 metres north of the existing Mona Vale Road and Laurel Road West intersection connecting Katandra Bushland Sanctuary and Ingleside Nature Reserve. The fauna overpass would consist of a single span structure, about 4.6 metres wide and 34 metres long. The eastern abutment would be cast directly onto underlying sandstone. A fill batter would link the bridge deck to Ingleside Nature Reserve bushland to the east.

The fauna overpass would have about 600 millimetres of topsoil placed on it and would be vegetated with native shrubs and grasses to encourage fauna use. The structure would have a four per cent grade towards the southern abutment and a constant one per cent cross fall to provide for adequate drainage. Fauna fencing targeted to funnel the Eastern Pygmy-possum would be provided along the structure and for a minimum of 100 metres on the approaches to the abutments and beyond.

A dedicated fauna underpass would be provided between Ingleside Road and Laurel Road. The underpass would be provided with a box culvert 2.1 metres wide, 1.5 metres high and about 30 metres long. The northern entrance to the underpass would be within a retaining wall, below the existing surface level. The southern entrance would be within a headwall with a four metre apron and a steep approach gradient. The underpass would contain an elevated (500 millimetres) timber platform to allow safe passage for small terrestrial and arboreal fauna. A three per cent grade from north to south would provide for drainage. Fauna fencing targeted to funnel the Eastern Pygmy-possum would be provided for a minimum of 100 metres on either side of the underpass.

Figure 1-3 shows the location of the proposed fauna overpass and underpass.

2.2.8 Landscaping modification near Foley Street

The landscaping on the southern side of Mona Vale Road to the west of Foley Street adjacent to the Pittwater RSL Club has been revised due to access requirements. The landscaping has changed from the row of trees proposed in the REF to now consisting of low shrubs and native grasses.

2.2.9 Construction traffic modification between Emma Street and Foley Street

Construction of the project would require temporary traffic management. During construction, only one active travel lane in each direction would be provided between Emma Street and Foley Street.

2.2.10 Ancillary facilities

Construction of the project would require the establishment of a construction site compound for site office facilities and amenities for construction personnel. Construction of the project would also require ancillary facilities to be established nearby the project area in order to store project construction materials, as well as plant and equipment that would be used during construction.

Operation of the site compound and construction ancillary facilities would continue throughout the construction work and they would generally be used within standard working hours. The construction site compound and ancillary facilities would be decommissioned and rehabilitated on completion of the works in consultation with the landowner. All environmental controls would be removed.

Construction ancillary facilities or site compounds were not identified in the REF. Detailed construction planning has identified the following sites for consideration:

- Waratah Road access off Mona Vale Road (ancillary facility)
- 30 Walana Crescent (site compound)
- 127 Mona Vale Road (ancillary facility)
- 1-7 Walana Crescent (ancillary facility).

These four properties are owned by Council or the NSW Government. The location of these sites and the most likely access arrangements for each are shown in Figure 1-4.

Suitability of each potential construction ancillary sites has been assessed against the selection criteria for stockpile and compound sites as identified in Table 3-7 of the REF. This review has identified that all proposed sites would be suitable for all typical construction ancillary activities provided appropriate safeguards and management measures were applied.

Table 2-2 provides the ancillary site assessment. Where a site does not explicitly meet one of the selection criteria, the impact is assessed within this Addendum REF and suitable mitigation measures are proposed.

Table 2-2 Site compound and ancillary site suitability assessment

Selection criteria	Waratah Road ancillary site	30 Walana Crescent site compound	1-7 Walana Crescent ancillary site	127 Mona Vale Road ancillary site
Location Located within the project study area or directly adjacent to the proposal	Meets criteria	Meets criteria	Meets criteria	Meets criteria
Location Stockpiling sites are not to be located on slopes with a gradient greater than 2:1 horizontal to vertical.	Meets criteria	Meets criteria	Meets criteria	Earthworks required to meet criteria
Location Locate compound sites on relatively level ground.	Meets criteria	Meets criteria	Meets criteria	Earthworks required to meet criteria
Services Locate site offices where they can be easily serviced with electricity and potable water.	Meets criteria	Meets criteria	Meets criteria	Meets criteria
Services All ancillary sites are to have direct and safe access to the road.	Meets criteria	Meets criteria	Meets criteria	Meets criteria
Environmental Wherever possible, sites are to be located above the 1 in 100 year flood level.	Site is subject to flooding however flooding risk would be removed by measures associated with the modification.	Meets criteria	Meets criteria	Meets criteria
Environmental Locate facility more than 50 metres from watercourses	Meets criteria	Meets criteria	Meets criteria	Meets criteria
Environmental No substantial vegetation clearing. Ancillary sites are to be located on land of existing low conservation significance for flora and fauna.	Clearing of Red Bloodwood - Scribbly Gum heathy woodland would be required. Impacts of clearing the site have been assessed within this Addendum	Clearing of Turpentine - Smooth-barked Apple moist shrubby forest would be required. Impacts of clearing the site have been assessed	Clearing of Turpentine - Smooth-barked Apple moist shrubby forest would be required. Impacts of clearing the site have been assessed	Meets criteria. Clearing was assessed within the REF.

Selection criteria	Waratah Road ancillary site	30 Walana Crescent site compound	1-7 Walana Crescent ancillary site	127 Mona Vale Road ancillary site
	REF	within this Addendum REF	within this Addendum REF	
Environmental Wherever possible, sites are to be located and designed to satisfy noise and vibration management levels, relevant to the noise catchment area, and vibration goals at the sensitive receiver (or building, in the case of vibration). If noise management levels or vibration goals cannot be met, feasible and reasonable mitigation measures, the restriction of hours of operation and/or negotiated agreements with affected parties would be considered.	Likely impact on two sensitive receivers	Possible impact on two sensitive receivers however proposed use as a site compound would not be associated with construction noise impact	Possible impact on eight sensitive receivers.	Possible impact on nine sensitive receivers
Heritage Locate on sites that have a low likelihood of having Aboriginal or non- Aboriginal heritage significance and/or potential.	Meets criteria	Meets criteria	Meets criteria	Meets criteria

2.3 Property acquisition

Due to the proposed modification, there are a number of changes to property acquisition and adjustments along the alignment. These changes are identified in Table 2-3.

The proposed modification has confirmed the properties that need to be acquired or have boundaries adjusted. This differs from the property acquisitions previously described in the REF. In summary, the property acquisitions for the proposed modification comprise:

- four properties identified for part acquisition in the REF which no longer require acquisition, comprising two government owned and two privately owned properties
- 12 new properties that would be affected by acquisition which were not previously identified, comprising six government owned and six privately owned properties
- 35 properties affected overall by acquisition, including:
  - 21 government owned properties with a total acquisition impact of about 1.53 hectares
  - 14 privately owned properties with a total acquisition impact of about 1.37 hectares
- 33 part-property acquisitions of which 13 are privately owned
- two whole-property acquisitions of which one is a private property
- a total acquisition area of about 2.9 hectares, being about 0.79 hectares less than was previously identified under the REF.

A detailed breakdown of the property acquisition required for the proposed modification is provided in Table 2-3. The impact of property acquisition is discussed in Section 5.10.

Table 2-3: Proposed property acquisition

Lot/DP	Ownership	Whole/Part	Acquisition area required (ha)	Change in acquisition area compared to the REF (ha) (+/-)

Lot/DP	Ownership	Whole/Part	Acquisition area required (ha)	Change in acquisition area compared to the REF (ha) (+/-)
Lot 44 DP114318	Private	Part	0.031	0.002
Lot 1 DP549098	Private	Part	0.044	0.015
Lot 1 DP114318	Government	Part	0.062	0.014
Lot 1&2 DP114318	Government	Part	0.053	-0.042
Lot 3 DP114318	Government	Part	0.047	-0.006
Lot 4 DP114318	Government	Whole	0.015	0.000
Lot 35 DP114318	Government	Part	0.003	New
Lot 36 DP114318	Government	Part	0.008	New
Lot 37 DP114318	Government	Part	0.008	New
Lot 2 DP114385	Government	Part	0.052	New
Lot 55 DP812289	Private	Part	0.12	New
Lot 11 DP114318	Government	Part	0.016	New
Lot 5 DP114318	Government	Part	0.273	0.142
Lot 5 DP12297	Government	Part	0.03	New
Lot 35 DP12297	Government	Part	0.126	0.033
Lot 34 DP12297	Private	Part	0.007	New
Lot 1 DP502582	Government	Part	0.434	-0.009
Lot 2 DP502582	Government	Part	0.158	-0.058
Lot 3 DP502582	Private	Part	0.034	-0.038
Lot 1 DP519037	Government	Part	0.064	0.006
Lot A DP372094	Private	Whole	0.809	0.595
Lot 1 DP350940	Government	Part	0.054	-0.083
Lot 2 DP350940	Government	Part	0.023	-0.033
Lot 3 DP350940	Government	Part	0.021	-0.031
Lot 4 DP350940	Government	Part	0.041	-0.062
SP57385	Private	Part	0.004	New
Lot 1 DP864322	Private	Part	0.026	New
SP70187	Private	Part	0.053	0.030
Lot 12 DP241313	Government	Part	0.003	-0.032
Lot 101 DP749415	Government	Part	0.0364	-0.006

Lot/DP	Ownership	Whole/Part	Acquisition area required (ha)	Change in acquisition area compared to the REF (ha) (+/-)
Lot 102 DP749415	Private	Part	0.001	-0.004
Lot 1 DP270291	Private	Part	0.064	-0.016
Lot 20 DP1141261	Private	Part	0.06	New
Lot 120 DP135512	Private	Part	0.053	New
Lot 26 DP654262	Private	Part	0.066	0.027

All property valuations and acquisitions would be carried out in accordance with the *Roads and Maritime Services Land Acquisition Information Guide* and the *Land Acquisition (Just Terms Compensation) Act 1991*.

3 Statutory and planning framework

3.1 Environmental Planning and Assessment Act 1979

3.1.1 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 proposed modification is for a road and is to be carried out by 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 proposed modification 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 Addendum REF.

3.2 Other relevant NSW or local government legislation

A review of the relevant NSW legislation assessed in the project REF has been undertaken with consideration of the proposed modification. The proposed modification would not result in any changes to the existing approval pathway or requirement identified in the REF. No additional or modified state or local government legislation, environmental planning instruments or provisions are relevant to the proposed modification.

Additional permits and approvals are required in addition to the Part 5 determination and these are detailed in Section 7.3 of the REF. These include an Environmental Protection Licence (EPL) for activities listed under Schedule 1 of the *Protection of the Environment Operations Act 1997*, given that the project meets the criteria in Schedule 1 of the Act.

As identified in the REF, a road occupancy licence would be required for work in or affecting the normal operations of state owned roads.

As identified in the REF, if groundwater extraction is required, the NSW Office of Water may require that an aquifer interference licence is obtained.

3.3 Commonwealth legislation

3.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the 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 Section 5.2 of this Addendum REF.

A referral is not required for proposed road actions 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 Section 5.2 of this Addendum REF and Appendix A.

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

The assessment of the proposed modification's impact on matters of national environmental significance and the environment of Commonwealth land found that there would be no change to the findings of the approved activity and would be unlikely to cause a significant impact on matters of national environmental significance or the environment of Commonwealth land. A referral to the Australian Department of the Environment is not required.

3.4 Confirmation of statutory position

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

3.5 Ingleside Draft Land Use and Infrastructure Strategy

Since preparation of the REF, a draft land use and infrastructure strategy for the Ingleside Precinct has been placed on public exhibition by the Department of Planning and Environment.

The structure plan would provide for 3400 dwellings. The plan considers environmental constraints and hazards including ecology, bushfire risk and infrastructure servicing. The area to the south of Mona Vale Road is likely to be developed first, due to its proximity to existing infrastructure. The area to the north of Mona Vale Road is likely to be developed later when essential infrastructure has been constructed.

The structure plan identifies the upgrade of Mona Vale Road would provide improved access (including public transport) and enhance opportunities for urban development. The structure plan identifies that the development of the Ingleside precinct will be co-ordinated with the upgrade of the proposal, estimated for completion in 2021.

The proposed modifications are consistent with the Ingleside Draft Land Use and Infrastructure Strategy.

4 Consultation

4.1 Consultation undertaken

Roads and Maritime has consulted with the community throughout the development of the project. Key consultation activities include:

- preliminary concept design – between 20 October and 14 November 2014. Consultation activities included distribution of a community update and community information sessions. A total of 94 submissions were received
- Review of Environmental Factors – between 29 July and 28 August 2015. Activities included distribution of a community update and advertisements, video animation and website updates, stakeholder briefings and community information sessions. A total of 156 submissions were received
- Community Updates regarding the project were distributed to the local community by letter box drop in October 2012, August 2013, June 2014, October 2014, July 2015, January 2016 and February 2017. Each community update included contact details for Roads and Maritime.

4.2 Consultation undertaken for the proposed modification

A range of consultation activities have been undertaken with the community and affected stakeholders since the REF and Submissions Report were prepared.

Roads and Maritime has met with affected residents, property owners, businesses, Council and interest groups, and the wider community have been informed of project updates via website content and newsletters distributed via letterbox, and Roads and Maritime has responded to all enquiries received.

Table 4-1: Summary of issues raised by the community

Group	Issue raised	Response / where addressed in the Addendum REF
Residents	One-on-one consultation with affected residents and property owners relating to a range of issues: • property adjustment • property acquisition • noise (operational and during construction)	• Changes to property boundaries and acquisition footprint (Section 2.2.1) • Minor property adjustments (Section 2.3)
Local Business	• Property acquisition • Property adjustment • Parking • Intersection upgrades • Traffic management	• Changes to property boundaries and acquisition footprint (Section 2.3) • Property adjustment work (Section 2.3)
Environment groups	• Fauna crossings and fauna fencing	• Additional fauna crossing included in the final design (Section 2.2.7)
Council	• Property acquisition • Property adjustment • Landscaping and design • Lighting	• Design refinements (Section 2.2) • Additional landscaping (Section 2.2.8) • Changes to drainage and flood management strategies (Section 2.2.2)

Group	Issue raised	Response / where addressed in the Addendum REF
Utility providers	• Design of relocations • Maintenance access	• Design changes for utilities (Section 2.2.5)

4.3 Aboriginal community involvement

No Aboriginal community consultation has been specifically undertaken for the proposed modification. Table 4-2 summarises the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) process.

Table 4-2: Summary of Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation

Stage	Description
Stage 1	Initial Roads and Maritime assessment
Stage 2	Site survey and further assessment
Stage 3	Formal consultation and preparation of a cultural heritage assessment report
Stage 4	Implement environmental impact assessment recommendations

Following stage 1 of the PACHCI process, Roads and Maritime noted the presence of previously recorded Aboriginal sites near the project site and decided that further assessment was needed. An Aboriginal archaeological survey report was then prepared by Kelleher Nightingale in accordance with the requirements of the PACHCI and the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales: Part 6 *National Parks and Wildlife Act 1974* (Department of Environment, Climate Change and Water, 2010).

The Aboriginal archaeological survey report was prepared in consultation with the Awabakal and Guringai People Native Title Claimants (AGPNTC) and the Metropolitan Local Aboriginal Land Council (MLALC). Representatives of both AGPNTC and MLALC participated in archaeological surveys carried out in May 2014 and subsequently provided reports that were then considered as part of the assessment process.

Following consideration of the Aboriginal archaeological survey report, Roads and Maritime decided that any impact to Aboriginal sites would be unlikely provided suitable safeguards are implemented. As a result, formal consultation and preparation of a cultural heritage assessment report under stage 3 of the PACHCI is not necessary. A copy of the advice provided by the Roads and Maritime Aboriginal Cultural Heritage Officer for the Greater Sydney Region is included in the REF.

4.4 ISEPP consultation

ISEPP consultation was undertaken as part of the REF. The proposed modification does not trigger the need for any further consultation with Council or with any other government agencies. However, Roads and Maritime has been consulting with relevant Public Authorities throughout the design development process as described in Table 4-1.

4.5 Government agency and stakeholder involvement

Throughout the detailed design process, Roads and Maritime has continued to consult with relevant government agencies. This consultation included meetings and briefings. These meetings

were designed to ensure agencies were kept informed and any issues and concerns were understood, and considered through the preparation of the concept design and environmental assessment, and that attendees had an opportunity to discuss any aspect of the proposal. Additionally phone calls, emails and various forms of correspondence have been ongoing for the project.

Table 4-3 summarises the consultation undertaken with government agencies and stakeholders, details the issues raised and where these issues have been addressed in the Addendum REF.

Table 4-3: Summary of issues raised by the Government agencies

Agency	Issue raised	Response / where addressed in REF
Department of Planning and Environment	• Fauna connectivity measures • Provision of infrastructure to service future Ingleside Precinct	• Fauna connectivity measures proposed are consistent with Department of Planning and Environment plans • Depending on the timing of works, utility augmentation on Mona Vale Road to support future development in Ingleside could be accommodated as part of the upgrade works
Northern Beaches Council	• Property acquisition • Property adjustment • Landscaping and design • Lighting • Mona Vale Cemetery	• Design refinements • Additional landscaping • Changes to drainage and flood management strategies
Office of Environment and Heritage	• Biodiversity • Flora and fauna	• Additional fauna crossing included in the final design as described in Section 2.2.7

4.6 Ongoing or future consultation

This Addendum REF will not be placed on public exhibition; however, it will be available on the Road and Maritime website. Although community comments will not be specifically invited, any comments that are received would be considered in construction planning. The community would be kept informed of any further changes to the project resulting from this and any future consultation process.

In addition, the following ongoing consultation would be undertaken:

- consultation with community stakeholders to assist in managing the impact during construction
- follow-up meetings to discuss access arrangements with directly affected property owners
- ongoing updates to the community during construction
- ongoing consultation with Northern Beaches Council (formerly Pittwater Council) and other relevant government agencies
- a 24-hour project information telephone number would be established for the construction phase and the project website would continue to be maintained.

5 Environmental assessment

This section of the Addendum REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposed modification of the Mona Vale Road East upgrade. All aspects of the environment potentially impacted upon by the proposed modification are considered. This includes consideration of the factors specified in the guidelines *Roads and Related Facilities* (DUAP 1996) and *Is an EIS required?* (DUAP 1999) as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000. The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix A.

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

5.1 Issue identification

The existing environment described in the REF is consistent with the existing environment potentially impacted and assessed by the proposed modification. As such, the existing environment information throughout this section has not been duplicated within the Addendum REF.

The majority of the potential environmental impacts identified and assessed in the REF and Submissions Report are unchanged by the proposed modification. Table 5-1 provides a summary of the differences in impact between the determined project described in the REF and Submissions Report and the proposed modification described in Section 2 of this Addendum REF. Where additional potential impacts or differences in impacts are predicted, further assessment is provided.

Table 5-1: Identification of issues for further assessment

Aspect	Further assessment required?	Reasoning
Biodiversity	Yes	The proposed modification changes the construction footprint so that it would impact previously unassessed biodiversity values. Fauna connectivity modifications are proposed. Ancillary facilities are proposed that have not previously been assessed for potential biodiversity impacts.
Landform, geology and soils	Yes	The proposed modification changes the construction footprint so that it would interact with previously unassessed landforms, geology and soils. Ancillary facilities are proposed that have not previously been assessed for potential landform, geology or soil impacts.
Hydrology, hydraulics and water quality	Yes	Drainage design refinements for the proposed modification could affect the assessed impacts in the REF. These include changes to the drainage strategy and new and altered drainage structures. Ancillary facilities are proposed that have not previously been assessed from the perspective of hydrology, hydraulics or water quality.
Traffic and transport	Yes	Modifications are proposed potentially affecting traffic and transport impacts assessed in the REF. These changes include no upgrade to the shared use path on Lane Cove Road, new and upgraded access tracks and access provisions required for proposed ancillary facilities.

Aspect	Further assessment required?	Reasoning
Aboriginal heritage	No	Modifications proposed would not affect any known Aboriginal heritage items. Management measures identified in the REF would be appropriate to manage Aboriginal heritage sites, items and unanticipated finds during construction.
Historic heritage	Yes	During detailed survey investigations, a retaining wall was discovered within the project area that had not been previously identified. Given the structure appears to be a historic feature its heritage values would require assessment.
Urban design and visual amenity	Yes	Modifications are proposed that could affect the landscape character and visual impact assessed in the REF. These include modifications to the noise mitigation strategy, access tracks, landscaping and ancillary facilities.
Noise and vibration	Yes	Modifications are proposed that could affect the noise and vibration impact assessed in the REF. These include operational noise mitigations and the establishment and operation of construction ancillary facilities.
Air quality	Yes	Modifications are proposed that could affect the air quality impact assessed in the REF. These include the re-surfacing of Mona Vale Road and the establishment and operation of construction ancillary facilities.
Greenhouse gas and climate change	No	Modifications proposed would not result in additional impact from those assessed in the REF. Management measures identified in the REF would be appropriate to manage potential greenhouse gas and climate change impacts.
Socio-economic	Yes	Modifications are proposed that could affect the socio-economic impact assessed in the REF. These include an altered construction boundary (leading to potential impact on property, pedestrians and cyclists) and the establishment and operation (including access) of construction ancillary facilities.
Hazards and risks	Yes	The modified proposal includes a rock fall zone within the project area to reduce hazards and risks to road users.
Waste management and resource use	No	Modifications proposed would not result in additional impacts from those assessed in the REF. Management measures identified in the REF would be appropriate to manage potential impacts from waste and resource use.
Cumulative impact	No	Modifications proposed would result in an increased area of vegetation clearing, but the overall cumulative impacts would be similar to those assessed in the REF. Management measures identified in the REF would be appropriate to manage cumulative impacts.

5.2 Biodiversity

5.2.1 Methodology

The REF was accompanied by a detailed biodiversity technical study that investigated the potential impacts of the concept design (Ecosure 2015). The survey area for this assessment included a 100 metre buffer from the centreline of the existing Mona Vale Road. The construction boundary of the

proposed modification is predominantly within the survey area of the Ecosure (2015) assessment, therefore the description of the existing environment has been derived from that report. No additional biodiversity surveys were undertaken for this Addendum REF.

5.2.2 Existing environment

Mona Vale Road follows an undulating ridgeline which is surrounded by steep topography and an escarpment to the east. The study area is dominated by natural bushland amongst some semi-rural to mid density residential areas and some commercial properties. The study area is part of a larger section of bushland within the Sydney metropolitan area that contains high fauna diversity and is therefore of high conservation priority. The existing road alignment represents a barrier to wildlife connectivity, with instances of roadkill along this section of road being common. There is currently one unfenced drainage underpass at Narrabeen Creek that provides passage opportunities for fauna under the road. A detailed description of the existing environment is provided in the Ecosure (2015) report and is summarised in Table 5-2.

Table 5-2: Existing environment summary

Feature	Existing environment
Flora	A total of 190 plant species were recorded during field surveys, 90.5 per cent of which were native. One threatened flora species was recorded within the study area – Angus's onion orchid (*Microtis angusii*). At the time of writing, this species is listed as endangered under both the TSC Act and EPBC Act, although it is subject to ongoing genetic investigation to resolve taxonomic uncertainty and revise its conservation status.
Native plant communities	Five native plant communities are present as presented in the Ecosure (2015) study: • Coastal Sandstone Sheltered Peppermint – Apple Forest (1781) • Hornsby Sandstone Exposed Bloodwood Woodland (DSF11) • Hornsby Sandstone Heath – Woodland (DSF12) • Coastal Sandstone Plateau Rock Plate Heath (1825) • Coastal Enriched Sandstone Moist Forest (WSF02)
Threatened ecological communities	One endangered ecological community (EEC) was recorded within the study area – Duffy's Forest. Duffy's Forest EEC is listed as endangered under the TSC Act.
Fauna habitat	The vegetation communities within the study area can be grouped into three fauna habitat units – sandstone heath, open woodland and disturbed areas. Other habitat features include rock outcrops providing habitat for invertebrates, reptiles and mammals. Narrabeen Creek is an ephemeral water course that runs north to south under the existing road alignment.
Reptiles and amphibians	13 reptile species and nine amphibian species were recorded during detailed surveys. Of these, threatened species include Rosenberg's Goanna, Giant Burrowing Frog and Red-crowned Toadlet.
Birds	82 bird species were detected during detailed surveys. Of these, threatened species include Regent Honeyeater, Little Lorikeet, Powerful Owl, Glossy Black-cockatoo and Little Eagle.
Microbats	Calls from 10 different bat species could be identified from targeted surveys. Of these, threatened species include Large-eared Pied Bat, Little Bentwing-bat, Southern Myotis and Eastern Bentwing-bat.
Other threatened mammals	Eastern Pygmy-possum was recorded during targeted surveys. Grey-headed Flying-foxes have been recorded within the study area multiple times, however no camp locations are within the study area. No evidence of koala activity was recorded, however one preferred koala feed tree species is present within the study area (Grey gum – *Eucalyptus punctata*).
Weeds	A total of 18 weed species were found within the survey area. Nine of these were noxious weeds, listed under the *Noxious Weeds Act 1993* (NW Act) in Pittwater local government area (LGA) and two were Weeds of National Significance (WoNS).

5.2.3 Potential impacts

Vegetation communities and threatened flora habitat

The construction boundary has changed to accommodate the modified proposal. This has resulted in an increase to the direct and indirect biodiversity impact.

About 11.35 hectares of native vegetation would be removed or indirectly impacted as a result of the proposed modification, including for proposed ancillary facilities and maintenance access tracks. 6.59 hectares of this native vegetation was assessed in the REF. The proposed modification would therefore impact on an additional 4.76 hectares.

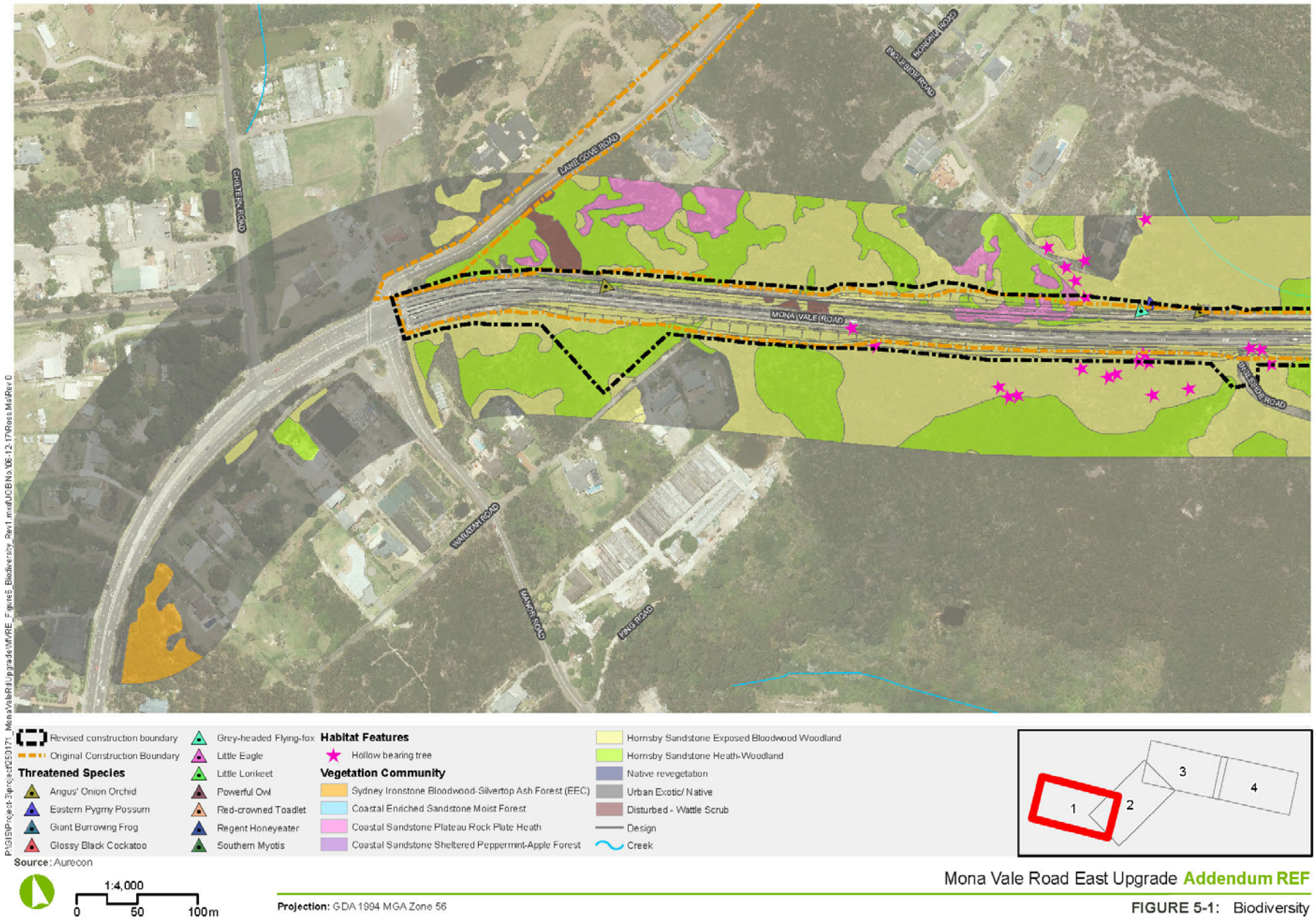
In addition, about 5.45 hectares of other vegetation types would be directly and indirectly impacted by the proposed modification, including for ancillary facilities and maintenance access tracks. 3.28 hectares of these other vegetation types were assessed in the REF. The proposed modification would therefore impact on an additional 2.17 hectares.

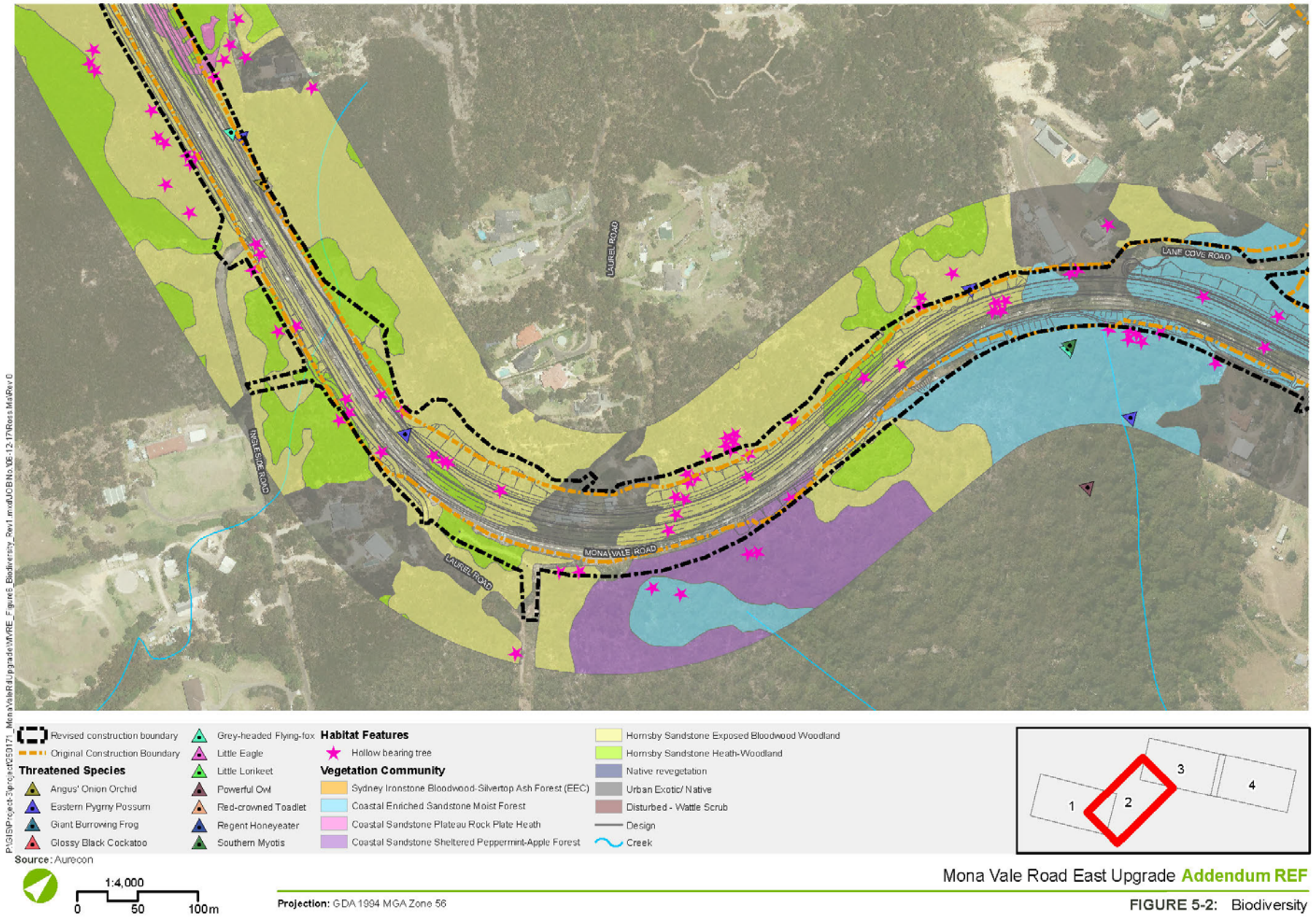
A comparison of predicted vegetation clearing impacts between those assessed for the project and the proposed modification are provided in Table 5-3 and are shown in Figure 5-1 to Figure 5-4.

None of these vegetation communities impacted by the modified proposal are consistent with any threatened ecological community listed under the TSC Act or EPBC Act. The affected vegetation communities are well represented and well protected within the locality. The sandstone derived forests, wetland and heath vegetation types are common on the sandstone ridge tops, upper slopes and sheltered gullies across Sydney's north. Garigal National Park and Ku-ring-gai Chase National Park are within three kilometres of the project area and both National Parks contain areas of similar vegetation types in more intact condition.

Table 5-3 Comparison of vegetation communities affected by the original determined project and proposed modification

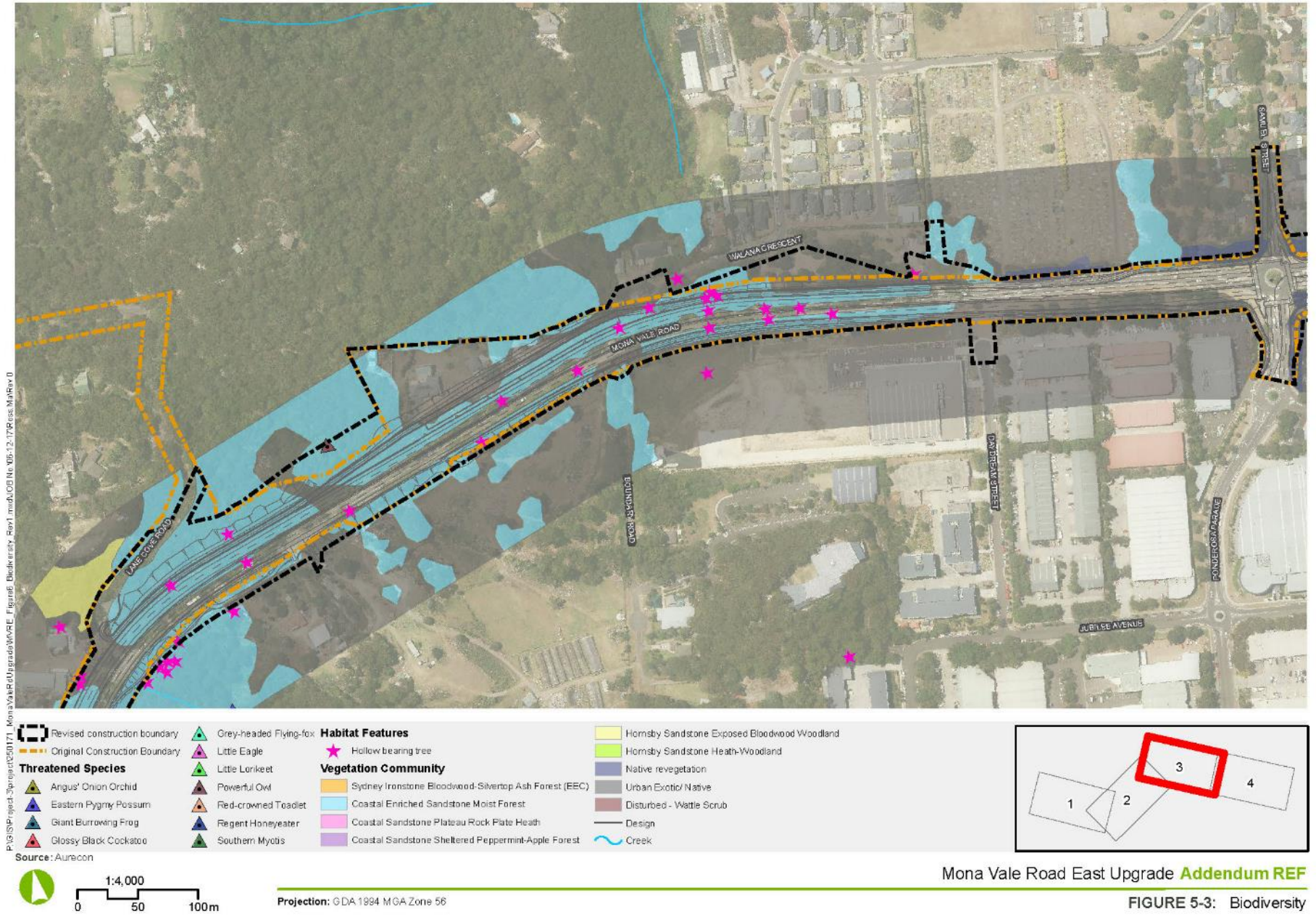
Vegetation community type as described in Ecosure (2015)	Direct impact area (ha)			Indirect impact area (ha)			Total impact area (ha)		
	Original	Revised	Difference	Original	Revised	Difference	Original	Revised	Difference
Coastal sandstone sheltered peppermint-apple forest	0.04	0.24	0.2	0.03	0.09	0.06	0.07	0.33	0.26
Hornsby sandstone exposed bloodwood woodland	2.49	4.33	1.84	0.79	0.95	0.16	3.28	5.28	2.00
Hornsby sandstone heath - woodland	0.3	1.13	0.83	0.21	0.41	0.2	0.51	1.54	1.03
Coastal sandstone plateau rock plate heath	0.11	0.13	0.02	0.02	0.01	0.01	0.13	0.14	0.01
Coastal enriched sandstone moist forest	2.03	3.49	1.46	0.57	0.57	0	2.60	4.06	1.46
Total native	4.97	9.32	4.35	1.62	2.03	0.43	6.59	11.35	4.76
Urban exotic/native	1.61	3.35	1.74	0.99	1.04	0.05	2.60	4.39	1.79
Disturbed – wattle scrub	0.03	0.03	0	0	0.01	0.01	0.03	0.04	0.01
Native revegetation	0.37	0.71	0.34	0.28	0.31	0.03	0.65	1.02	0.37
Grand Total	**6.98**	**13.41**	**6.37**	**2.89**	**3.39**	**0.52**	**9.87**	**16.8**	**6.93**


LANE COVE ROAD
GHILTER ROAD
MONA VALE ROAD
WARATAH ROAD
MANOR ROAD
KING ROAD
INGLESIDE ROAD
Revised construction boundary
Original Construction Boundary
Threatened Species
Angus' Onion Orchid
Eastern Pygmy Possum
Giant Burrowing Frog
Glossy Black Cockatoo
Grey-headed Flying-fox
Little Eagle
Little Lorikeet
Powerful Owl
Red-crowned Toadlet
Regent Honeyeater
Southern Myotis
Habitat Features
Hollow bearing tree
Vegetation Community
Sydney Ironstone Bloodwood-Silvertop Ash Forest (EEC)
Coastal Enriched Sandstone Moist Forest
Coastal Sandstone Plateau Rock Plate Heath
Coastal Sandstone Sheltered Peppermint-Apple Forest
Hornsby Sandstone Exposed Bloodwood Woodland
Hornsby Sandstone Heath-Woodland
Native revegetation
Urban Exotic/ Native
Disturbed - Wattle Scrub
Design
Creek
1
2
3
4
Source: Aurecon
1:4,000
0
50
100m
Projection: GDA 1994 MGA Zone 56
Mona Vale Road East Upgrade Addendum REF
FIGURE 5-1: Biodiversity



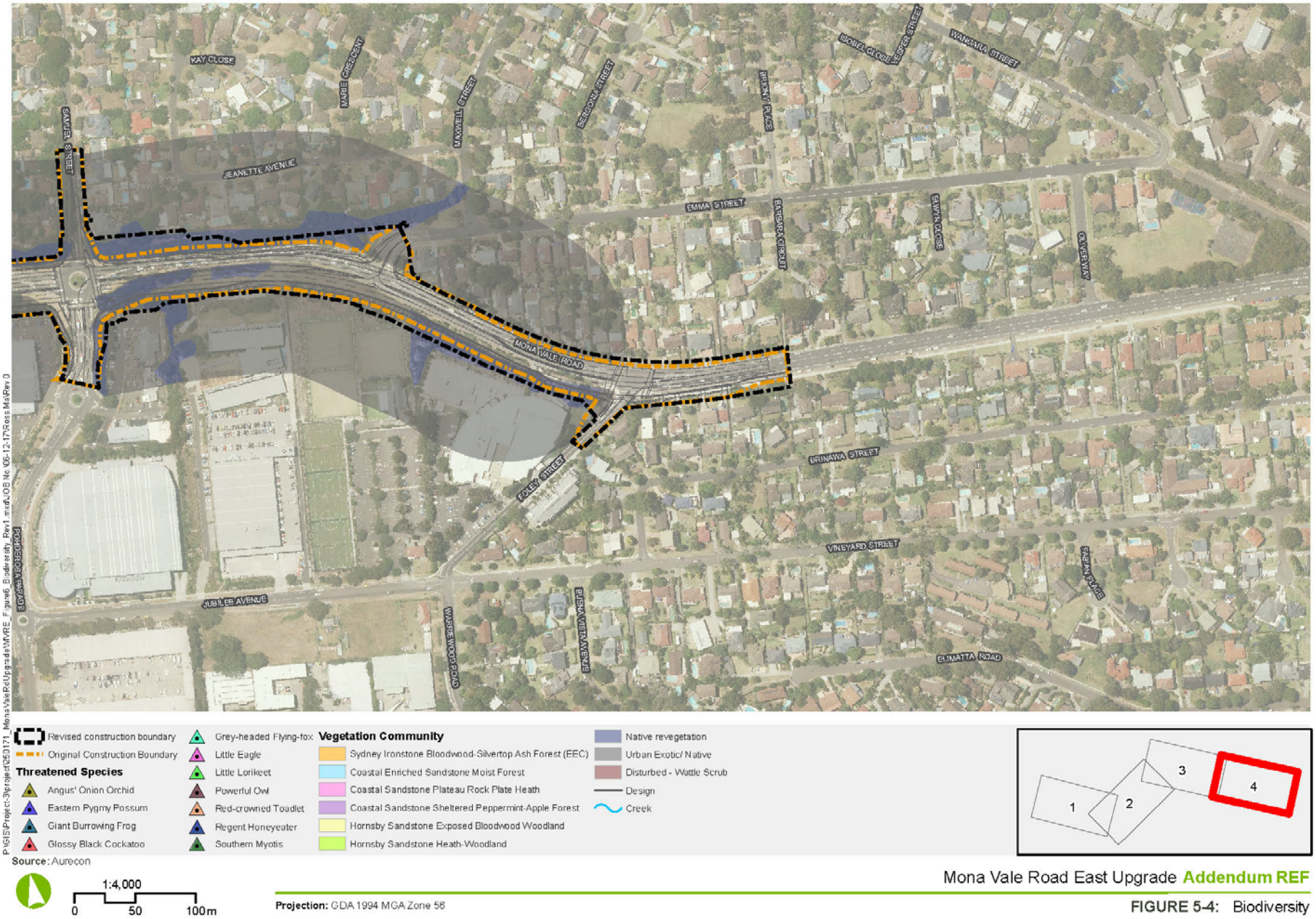
Mona Vale Road East Upgrade **Addendum REF**

FIGURE 5-2: Biodiversity



Mona Vale Road East Upgrade **Addendum REF**

FIGURE 5-3: Biodiversity



Mona Vale Road East Upgrade **Addendum REF**

FIGURE 5-4: Biodiversity

Loss of threatened species individuals

Flora

Angus's onion orchid (*Microtis angusii*) was recorded at two locations within the project area. The REF identified two populations that consisted of one stem at one location and six stems at the other location (as at the September 2014 survey). Angus's Onion Orchid is subject to ongoing genetic investigation to resolve taxonomic uncertainty and revise the conservation status of the species. At the time of authoring, this species is listed as endangered under both the EPBC Act and TSC Act.

The REF outlined that the concept design was modified to retain these two Angus's onion orchid populations. They were, however located only about one metre from the proposed road embankment and therefore the feasibility of avoiding them during construction was low. The modified proposal would encroach upon these two Angus's onion orchid populations. The avoidance of impact to these populations is no longer feasible.

Since the preparation of the REF, a considerable amount of additional biodiversity survey and genetic analysis of the Angus's onion orchid has been undertaken (EcoLogical Australia 2016). The results have greatly increased the understanding of the Angus' Onion Orchid distribution across the Northern Beaches area, NSW and Australia and have increased the population estimate threefold. Further, the results of the genetic testing have indicated that Angus' Onion Orchid is genetically identical to the common *Microtis unifolia*. This suggests that morphological characteristics that are used to differentiate these two species may in fact be variation across a single species. These findings have been passed to the NSW Scientific Committee to inform a potential reduction or removal of the species' TSC Act conservation status. Notwithstanding, the Angus' Onion Orchid has now been updated as a species that can withstand a loss of 150 individuals within a sub-region in the Threatened Species Profile Database. The loss of seven stems predicted for the proposed modification is well below this threshold.

No other threatened flora have been recorded within the proposed modification area.

Fauna

Direct impacts to individual fauna species as a result of the proposed modification are unlikely to be greater than that predicted in the REF. Construction mitigation measures, such as pre-clearance surveys, would reduce the likelihood of direct mortality, and fauna fencing would reduce the occurrence of roadkill and associated collision risk for motorists during operation.

Loss of threatened species habitat

Flora habitat

Potential habitat for several threatened flora species was recorded within the study area, including:

- Sunshine Wattle *Acacia terminalis subsp. terminalis*
- Netted Bottle Brush *Callistemon linearifolius*
- *Darwinia biflora*
- Port Jackson Heath *Epacris purpurascens var. purpurascens*
- Camfield's Stringybark *Eucalyptus camfieldii*
- Bauer's Midge Orchid *Genoplesium baueri*
- Caley's Grevillea *Grevillea caleyi*
- *Haloragodendron lucasii*
- Deane's Paperbark *Melaleuca deanei*
- Angus's Onion Orchid *Microtis angusii*
- Hairy Geebung *Persoonia hirsuta*
- Curved Rice-flower *Pimelea curviflora var. curviflora*
- Seaforth Mintbush *Prostanthera marifolia*
- Glandular Pink-bell *Tetratheca glandulosa*

Despite the potential habitat, seasonally appropriate targeted surveys did not record these species within the proposed modification area. Although the loss of further potential habitat for these species is not consistent with their recovery, in the context of the availability of well protected, intact habitat in the surrounding study area, the potential impacts would be minor.

Fauna habitat

The proposed modification would result in the direct impact (removal) of 13.41 hectares of fauna habitat, which is 6.37 hectares more than assessed in the REF. Indirect impact has the potential to occur over an additional five metres which would include 3.39 hectares of vegetation (ie a total of 16.8 hectares would be impacted for the proposed modification, including ancillary facilities, maintenance access tracks, etc).

The vegetation types and associated habitat features that would be impacted are not unique to the study area. It is likely that within the more intact vegetation surrounding the broader study area (including Katandra Bushland Sanctuary, Ingleside Chase Nature Reserve and the two National Parks) that more complex and diverse fauna habitats are present.

The key direct impact associated with the proposed modification, including ancillary facilities and maintenance access tracks, include the loss of:

- 9.32 hectares of potential habitat for Eastern Pygmy-Possum
- 13.41 hectares of foraging habitat for threatened microbats
- 13.41 hectares of foraging habitat for Grey-headed Flying-fox
- potential habitat for Red-crowned Toadlet and Giant Burrowing Frog
- 60 hollow bearing trees which provide potential habitat for an array of hollow dependent fauna.

Eastern Pygmy-possums have been recorded at several locations within the study area. They use sandstone woodland and heath that adjoins Mona Vale Road, with their key habitat being the upslope and ridgeline vegetation. Survey records for this species suggest they are located in the study area between Ingleside Road and Lane Cove Road, on both sides of Mona Vale Road where this habitat is present. The proposed construction boundary has widened through this area to provide for maintenance access tracks, utilities relocations and rock fall zones. These modifications have impacted vegetation clearing in Eastern Pygmy-possum habitat.

Red-crowned Toadlet and Giant Burrowing Frog have been previously recorded downstream of the study area, within the Narrabeen Creek catchment. The proposed modifications include changes to cross drainage, road surface drainage and stormwater detention structures within this catchment. The modified proposal provides for operational flow volumes and water quality consistent with the existing hydraulic conditions. As such, no additional impact on the downstream receiving environments of Narrabeen Creek (Aurecon 2016) is expected.

Hollow-bearing trees are a key habitat resource for a variety of threatened fauna. The REF did not identify specifically how many hollow-bearing trees were likely to be removed. The proposed modification has defined the construction impact area that would directly impact 60 hollow-bearing trees. Full attribute data for these hollows has not been collected, however in the context of the bushland within the proposed modification area, it is likely that these hollow bearing trees contain an array of hollow sizes, shapes and aspects, suitable for most if not all hollow utilising fauna. Therefore, it is likely that the tree hollows that would be impacted by the proposed modification currently provide nesting and roosting habitat for threatened species.

Wildlife connectivity

The current road alignment presents a barrier to wildlife passage, with multiple instances of roadkill along this section of Mona Vale Road. Both the project and proposed modification involve widening the existing road with the potential to exacerbate wildlife connectivity issues and increase instances of roadkill.

The REF assessed the potential for upgrading an unfenced drainage culvert at Narrabeen Creek as a way to provide fauna safe passage under the road. In addition to the improvement of this culvert, a rope bridge to span the road between Katandra Bushland Sactuary and Ingleside Nature Reserve was proposed. Subsequent consultation with local stakeholder groups, advice from biodiversity experts and design development has led to modification of this wildlife connectivity strategy.

The proposed modification includes the removal of the canopy rope crossing (due to proximity of high voltage powerlines), provision of a dedicated dry fauna underpass near Ingleside Road and a dedicated fauna overpass (Figure 1-3). These fauna structures have been designed with the Eastern Pygmy-possum being the key target species, however a suite of other terrestrial and arboreal fauna would also benefit from these structures.

Roadkill presents not only an ecological impact but also a collision risk to road users. The Northern Beaches Roadkill – Advice on Reduction Options report (SMEC 2011) and local stakeholder groups have identified roadkill hotspots and problem areas. In addition to providing better connectivity measures, the proposed modification would include fauna fencing designed to prevent fauna access to the road corridor. Within about 100 metres of a connectivity structure, this fauna fencing would be designed to prevent the Eastern Pygmy-possum climbing or going through it.

Weeds

Designated noxious weeds have been identified within the project area. Recruitment of exotic species including noxious weeds presents the highest risk of edge effects within the indirect impact area. Potential impacts associated with weed introduction or exacerbation is consistent with that assessed in the REF.

Key threatening processes

The REF considered 11 Key Threatening Processes (KTPs) listed under the EPBC Act and/or TSC Act that would be exacerbated by the proposal. These include:

- removal of bushrock (TSC Act)
- clearing of native vegetation (TSC Act and EPBC Act)
- infection of frogs by amphibian *Chytrid* fungus causing the disease *Chytridiomycosis* (TSC Act and EPBC Act)
- infection of native plants by *Phytophthora cinnamomi* (TSC Act and EPBC Act)
- invasion and establishment of exotic vines and scramblers (TSC Act)
- invasion of native plant communities by exotic perennial grasses (TSC Act)
- invasion, establishment and spread of *Lantana camara* (TSC Act)
- invasion by escaped garden plants, including aquatics (TSC Act and EPBC Act)
- invasion of native plant communities by African olive Olea europaea subsp. cuspidata (TSC Act)
- removal of hollow-bearing trees (TSC Act)
- removal of dead wood and dead trees (TSC Act).

The proposed modification would further exacerbate some of these KTPs, such as clearing of native vegetation and removal of hollow-bearing trees. No additional KTPs would be brought into operation by the proposed modification.

Assessments of significance

The REF identified 40 species as having a moderate or high likelihood of occurrence within the study area based on the presence of individuals or potential habitat. Assessments of significance under both the EPBC Act and TSC Act were carried out for these species and it was determined that a significant impact was unlikely for all species.

The proposed modification would require additional clearing of native vegetation and fauna habitat. For some species, the additional potential impact requires further consideration to confirm whether the non-significant impact outcome is still valid. For other species, the impact associated with the proposed modification are broadly consistent with that assessed in the REF and no further assessment of the potential significance of impact would be required.

Table 5-4 outlines which species require further consideration of the proposed impacts in accordance with EPBC Act Policy Statement 1.1 Significant Impact Guidelines – MNES (DoE 2013) and/or Section 5A of the EP&A Act. The full significance tests for species determined to require further consideration are provided in Appendix B and Appendix C.

Table 5-4 Significance tests required for the proposed modification

Scientific name	Common name	EPBC status	TSC status	To be reassessed in the Addendum REF?	Justification
EPBC Act					
Eucalyptus camfieldii	Camfield's Stringybark	V	V	No	The species does not occur within the study area.
Genoplesium baueri	Bauer's Midge Orchid	E	E	No	The species does not occur within the study area.
Grevillea caleyi	Caley's Grevillea	E	CE	No	The species has not been recorded within the study are and there is no preferred habitat (Duffys Forest EEC) that would be impacted.
Microtis angusii	Angus's Onion Orchid	E	E	Yes	The concept design was modified to avoid these, despite it being unrealistic from a constructability perspective. The detailed design will have a direct impact on two populations (containing a combined total of seven stems).
Persoonia hirsuta	Hairy Geebung	E	E	No	The species has not been recorded within the study area the additional vegetation removal is unlikely to increase the significance of impacts to potential habitat.
Pimelea curviflora var. curviflora	Curved Rice-flower	V	V	No	The species has not been recorded within the study area the additional vegetation removal is unlikely to increase the significance of impacts to potential habitat.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Yes	The proposed modification would result in some additional loss of potential foraging habitat. There would be no additional loss of roosting habitat.
Heleioporus australiacus	Giant Burrowing Frog	V	V	Yes	The proposed modification will result in further removal of potential foraging habitat and potential localised changes to hydrology.
Lathamus discolor	Swift Parrot	E	E	No	The proposed modification will result in further removal of potential foraging habitat.

Scientific name	Common name	EPBC status	TSC status	To be reassessed in the Addendum REF?	Justification
Phascolarctos cinereus	Koala	V	V	No	The species was not recorded within the study area (including traces such as scats, urine stains and scratch marks). One preferred feed tree species and two supplementary feed tree species occur in the study area.
Dasyurus maculatus	Spotted-tailed quoll	E	V	No	The species has a very large home range and requires a diverse mosaic of habitat types. It is unlikely that the additional impacts associated with the proposed modification would result in additional habitat loss.
Anthochaera phrygia	Regent Honeyeater	E	CE	No	It is unlikely that the additional removal of vegetation would significantly reduce the availability of foraging resources for this species. The study area does not provide breeding habitat for the species.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	No	The study area does not support a roost camp and contains only marginal foraging habitat for the species.
Pseudomys novaehollandiae	New Holland Mouse	V		No	It is unlikely that the additional removal of vegetation would significantly reduce the availability of habitat for this species.
TSC Act					
Epacris purpurascens var. purpurascens	Port Jackson heath		V	No	The species has not been recorded within the study area the additional vegetation removal is unlikely to increase the significance of impacts to potential habitat.
Eucalyptus camfieldii	Camfield's Stringybark	V	V	No	The species has not been recorded within the study area the additional vegetation removal is unlikely to increase the significance of impacts to potential habitat.
Genoplesium baueri	Bauer's Midge Orchid	E	E	No	The species has not been recorded within the study area the additional vegetation removal is unlikely to increase the significance of impacts to potential habitat.
Grevillea caleyi	Caley's Grevillea	E	CE	No	The species has not been recorded within the study are and there is no preferred habitat (Duffys Forest EEC) that would be impacted.

Scientific name	Common name	EPBC status	TSC status	To be reassessed in the Addendum REF?	Justification
Microtis angusii	Angus's Onion Orchid	E	E	Yes	The concept design was modified to avoid these, despite it being unrealistic from a constructability perspective. The detailed design will have a direct impact on two populations (containing a combined total of seven stems).
Persoonia hirsuta	Hairy Geebung	E	E	No	The species has not been recorded within the study area the additional vegetation removal is unlikely to increase the significance of impacts to potential habitat.
Pimelea curviflora var. curviflora	Curved Rice-flower	V	V	No	The species has not been recorded within the study area the additional vegetation removal is unlikely to increase the significance of impacts to potential habitat.
Tetratheca glandulosa	Glandular Pink-bell		V	No	The species has not been recorded within the study area the additional vegetation removal is unlikely to increase the significance of impacts to potential habitat.
Heleioporus australiacus	Giant Burrowing Frog	V	V	Yes	The proposed modification will result in further removal of potential foraging habitat and potential localised changes to hydrology.
Pseudophryne australis	Red-crowned Toadlet		V	Yes	The proposed modification will result in further removal of potential foraging habitat and potential localised changes to hydrology.
Varanus rosenbergi	Rosenberg's Goanna		V	Yes	The proposed modification will result in further removal of potential foraging habitat, and potentially termite mounds that provide breeding habitat for this species, although none were identified in the construction footprint.
Anthochaera phrygia	Regent Honeyeater	E	CE	No	It is unlikely that the additional removal of vegetation would significantly reduce the availability of foraging resources for this species. The study area does not provide breeding habitat for the species.
Callocephalon fimbriatum	Gang-gang Cockatoo		V	Yes	The proposed modification will result in the removal of hollow bearing trees and potential foraging habitat for this species.
Calyptorhynchus lathami	Glossy black-Cockatoo		V	Yes	The proposed modification will result in the removal of hollow bearing trees and potential foraging habitat for this species.

Scientific name	Common name	EPBC status	TSC status	To be reassessed in the Addendum REF?	Justification
Lathamus discolor	Swift Parrot	E	E	No	The proposed modification would not result in any additional loss of breeding habitat for this species. The additional impacts would result in loss of only marginal foraging resources for the species.
Glossopsitta pusilla	Little Lorikeet		V	Yes	The proposed modification will result in further removal of potential foraging habitat.
Hieraaetus morphnoides	Little Eagle		V	No	This species has a large home range and the proposed modification would result in only a minor additional loss of foraging habitat for such a mobile species.
Ninox connivens	Barking Owl		V	Yes	The proposed modification will result in further removal of potential foraging habitat.
Ninox strenua	Powerful Owl		V	Yes	The proposed modification will result in further removal of potential foraging and roosting habitat.
Cercartetus nanus	Eastern Pygmy-possum		V	Yes	The proposed modification will result in the removal of hollow bearing trees and potential foraging habitat for this species.
Dasyurus maculatus	Spotted-tailed quoll	E	V	No	The species has a very large home range and requires a diverse mosaic of habitat types. It is unlikely that the additional impacts associated with the proposed modification would result in additional habitat loss.
Isoodon obesulus	Southern Brown Bandicoot	E	E	No	The species was not detected during surveys for the REF. The absence of any direct or indirect evidence of this species suggests the study area does not form part of the area of current occupancy for this species. The proposed modification is therefore unlikely to have additional impacts on this species relative to those assessed for the REF.
Phascolarctos cinereus	Koala	V	V	No	The species was not recorded within the study area (including traces such as scats, urine stains and scratch marks). One preferred feed tree species and two supplementary feed tree species occur in the study area.
Phascolarctos cinereus – endangered population	Koala in Pittwater local government area		E	No	The species was not recorded within the study area (including traces such as scats, urine stains and scratch marks). One preferred feed tree species and two supplementary feed

Scientific name	Common name	EPBC status	TSC status	To be reassessed in the Addendum REF?	Justification
					tree species occur in the study area.
Mormopterus norfolkensis	Eastern Freetail-bat		V	Yes	The proposed modification will result in the removal of hollow bearing trees and potential foraging habitat for this species.
Miniopterus australis	Little Bentwing-bat		V	No	This species roosts and breeds in caves. While the proposed modification could result in some additional loss of potential foraging habitat this species is unlikely to be present in large numbers in the study area, if at all.
Miniopterus orianae oceanensis	Eastern Bentwing-bat		V	No	The proposed modification would result in some additional loss of potential foraging habitat, but would not result in removal of additional roosting habitat.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Yes	While the study area does not support a roost camp, it contains foraging habitat that meets the Draft Recovery Plan criteria of critical foraging habitat.
Scoteanax rueppellii	Greater Broad-nosed Bat		V	Yes	The proposed modification will result in the removal of hollow bearing trees and potential foraging habitat for this species.
Myotis macropus	Southern myotis		V	Yes	The proposed modification would result in some additional loss of potential foraging habitat, but would be unlikely to result in removal of additional roosting habitat.
Chalinolobus dwyeri	Large-eared pied bat	V	V	No	The proposed modification would result in some additional loss of potential foraging habitat.There would be no additional loss of roosting habitat.

Conclusion on significance of impacts

Despite the proposed modification resulting in additional removal of vegetation and threatened species habitat, it is unlikely that it would result in a significant impact to threatened species, populations or ecological communities or their habitats, within the meaning of the TSC Act or FM Act and therefore an SIS would not be required.

The proposed modification is not likely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the EPBC Act.

5.2.4 Safeguards and management measures

The safeguards and management measures identified in Table 5-5 are those provided in the Submissions Report. Additional safeguards and management measures are required as a result of the proposed modification. The additional measures and changes to safeguards have been added in blue italics.

Table 5-5 Biodiversity safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
B1	Impact to biodiversity	A Biodiversity Management Plan (BMP) is to be prepared and included in within the Construction Environmental Management Plan. The BMP is to include (but not be limited to) the following: • a site walk with appropriate site personnel including Roads and Maritime representatives to confirm clearing boundaries and sensitive location prior to commencement of work • identification (marking) of the clearing boundary and identification (marking) of habitat features to be protected. Eg use of flagging tape • a map that clearly shows vegetation clearing boundaries and sensitive areas / no go zones • incorporation of management measures identified as a result of the pre-clearing survey report, completed by an ecologist, (G40, section 2.4) and nomination of actions to respond to the recommendations made. This should include details of the measures to be implemented to protect clearing limits and no go areas • a detailed clearing process in accordance with *RMS Biodiversity Guidelines (2011)* including requirements of Guide 1, 2, 4 & 9. • identify toolbox talks where biodiversity would be included such as vegetation clearing or work adjacent to sensitive locations • identify control / mitigation measures to prevent impact on sensitive locations or no go zones • a stop work procedure in the event of identification of unidentified species, habitats or populations • *a nest box strategy would be developed by an ecologist, in consultation with Roads and Maritime biodiversity specialists, to compensate for the loss of tree hollows. The number and size of tree hollows to be removed would be assessed prior to clearing, with at least 70% of nest boxes installed at least one month before clearing commences, in accordance with Roads and Maritime Biodiversity*	Construction contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		Guidelines		
B2	Removal or modification of native vegetation	Onsite measures; clearing limits will be enforced and cordoned off and signposted	Construction contractor	Pre-clearing and construction
B3	Removal of individuals of threatened species	Pre-clearing surveys for fauna will be undertaken in accordance with the Roads and Maritime Biodiversity Guidelines	Construction contractor	Pre-clearing
B4	Predation by domestic and/or feral animals	Fauna connectivity structures and approaches to be designed to provide protective features and/or refuges to reduce potential for predation of fauna using the structure	Design contractor	Detailed design
B5	Loss of native vegetation and fauna habitats adjacent to approved construction zone	Clearing limits will be accurately demarcated with assistance from a surveyor, and exclusion zones will be implemented beyond the demarcated area. A suitably qualified ecologist or experienced wildlife carer will be engaged to survey and handle any fauna.	Construction contractor	Pre-clearing and construction
B6	Increase in fauna fatality and injury	Pre-clearance procedures would be implemented during construction to prevent direct fauna mortality. Fauna fencing would be installed at strategic locations to reduce potential for fauna to access the road during operation, thereby reducing potential for roadkill. Should any termite mounds be encountered and require removal within the construction footprint, they would be checked for the presence of Rosenberg's Goanna eggs prior to clearing. Salvage of any eggs would be undertaken by appropriately experienced personnel.	Construction contractor	Detailed design and construction.
B7	Loss of habitat connectivity	A connectivity plan would be prepared by a suitably qualified and experienced ecologist during the detailed design. The plan would be developed in consultation with Roads and Maritime biodiversity specialists and would include: • identification of connectivity objectives for the project identification of target species for all measures • consideration of the specific connectivity requirements for each identified target species.	Construction contractor	Detailed design and construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		An ecologist would be engaged onsite to supervise the construction of temporary and permanent fauna mitigation measures, including, but not limited to, connectivity structures and fauna fencing. Post-construction monitoring in an adaptive management framework would be undertaken to determine the effectiveness of connectivity struc that would be actively managed to facilitate movement of fauna species, particularly the Eastern Pygmy-possum. A monitoring plan would be developed by a suitably qualified and experienced ecologist in consultation with Roads and Maritime's biodiversity specialists and Northern Beaches Council, and would include: • identification of monitoring objectives • identification of species to be monitored and suitable monitoring methods to be implemented to detect usage of connectivity structures by those species • a monitoring program for a period of up to five years following opening of the project.		
B8	Hydrological changes	Robust erosion and sediment control measures would be incorporated into the CEMP to prevent adverse impacts to Angus' Onion Orchid and threatened frog habitat from changes to run off	Construction contractor	Pre-clearing and construction
B9	Weed invasion	Declared noxious weeds are to be managed according to the requirements under the NW Act and Guide 6 (Weed Management) of the RTA Biodiversity Guidelines 2011	Construction contractor	Construction
B10	Spread of disease	Construction plant will be required to be certified clean, and a hygiene protocol will be implemented to ensure the proposed modification does not result in increased risk of spreading the *chytrid fungus*	Construction contractor	Construction
B11	Potential impact on threatened fauna	Targeted fauna fencing at strategic locations along the road to funnel toward ~~*underpasses*~~ *connectivity structures*. Fauna connectivity structures will consist of ~~*one underpass and one rope bridge to enable animals to move between Ingleside Chase Reserve and*~~	Construction contractor	Pre-construction and construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		~~*Katandra Bushland Sanctuary*~~ *one dedicated fauna underpass and one fauna overpass.* In areas that could contain the Eastern Pygmy-possum (woodland and sandstone heath) vegetation clearing would be undertaken as far as possible outside of the main breeding season (December – July). All vegetation clearing would be supervised by an appropriately qualified and experienced ecologist to ensure potential for harm to Eastern Pygmy-possums and other fauna is minimised. Vegetation would be planted along the overpass to ~~*connectivity to the underpass at Narrabeen Creek on the approaches and the deck of the overpass*~~ encourage crossing and reduce risk of predation. *Species planted would be in accordance with the Mona Vale Road Upgrade East 100% Detail Landscape Design Report and Landscape Plans.* Vegetation would be subject to ongoing maintenance by appropriately qualified bush regeneration contractors to ensure it establishes and provides suitable habitat for the Eastern Pygmy-possum and other threatened fauna. Installation and monitoring of nest boxes for up to five years, in accordance with a monitoring plan to be prepared in consultation with Roads and Maritime biodiversity specialists and Northern Beaches Council.		

5.2.5 Biodiversity offsets

The requirement for biodiversity offsets on Roads and Maritimes projects is identified by the Roads and Maritime Guideline for Biodiversity Offsets (2016). The guideline outlines a number of key thresholds that determine when Roads and Maritime would consider biodiversity offsets. Table 5-6 provides an assessment of the proposed modification against those thresholds.

Table 5-6: Consideration of the Roads and Maritime biodiversity offset triggers

Description of activity or impact	Consider offsets or supplementary measures	Relevance to the proposed modification
Activities in accordance with Roads and Maritime Services Environmental assessment procedure: Routine and Minor Works (RTA 2011)	No	Nil

Description of activity or impact	Consider offsets or supplementary measures	Relevance to the proposed modification
Work on cleared land, plantations, exotic vegetation where there are no threatened species or habitat present	No	Nil
Work involving clearing of vegetation planted as part of a road corridor landscaping program (this includes where threatened species or species comprising listed ecological communities have been used for landscaping purposes)	No	Nil
Work involving clearing of national or NSW listed critically endangered ecological communities (CEEC)	Where there is any clearing of an CEEC in moderate to good condition	Nil
Work involving clearing of nationally listed threatened ecological community (TEC) or nationally listed threatened species habitat	Where clearing >1 ha of a TEC or habitat in moderate to good condition	Nil
Work involving clearing of NSW endangered or vulnerable ecological community	Where clearing > 5 ha or where the ecological community is subject to an SIS	Nil
Work involving clearing of NSW listed threatened species habitat where the species is a species credit species as defined in the Office of Environment and Heritage (OEH) Threatened Species Profile Database (TSPD)	Where clearing > 1ha or where the species is the subject of an SIS	The Eastern Pygmy-possum and Rosenbergs Goanna are credit species that have been recorded within the study area. Approximately 9.32 hectares of potential habitat for these species would be removed.
Work involving clearing of NSW listed threatened species habitat and the species is an ecosystem credit species as defined in OEH's TSPD	Where clearing > 5ha or where the species is the subject of an SIS	The Glossy-black Cockatoo, Powerful Owl and Eastern Bent-wing Bat are ecosystem credit species that have been recorded within the study area. Approximately 9.32 hectares of potential habitat for these species would be removed. Habitat for the Southern Myotis, which has also been recorded, is likely to be less than one hectare given the lack of higher order waterways within the study area.
Type 1 or Type 2 key fish habitats (as defined by NSW Fisheries)	Where there is any net loss of habitat	Nil

As outlined in Table 5-6, Roads and Maritime should consider biodiversity offsets for the unavoidable, residual loss of habitat for a number of threatened species. There is an opportunity to consider supplementary measures as an alternative to in perpetuity conservation agreements. Roads and Maritime proposes to mitigate the impact of this project by supplementary measures (including construction of a fauna overpass and additional fauna underpass, installation of strategic

fauna fencing and targeted revegetation), that collectively provide a more effective long term solution for the region than trying to obtain species credits in a different location(s).

The supplementary measures aim to maintain habitat connectivity and reduce road strike for key fauna species including Rosenberg's Goanna and the Eastern Pygmy-possum. Given the presence of large expanses of good quality habitat for these species in the locality in national parks, these supplementary measures were considered the most important factor in maintaining threatened species populations in the area, particularly given that the current road does not provide any crossing structures or fencing.

5.3 Landform, geology and soils

5.3.1 Existing environment

The REF considered the potential for the project to impact landform, geology and soils. Section 6.2.2 of the REF outlined the existing environment. This existing environment information has been replicated below only where it is directly relevant to the changed impacts for the proposed modification.

Contaminated land

Several locations within the project area are potential sources of soil contamination. These are referred to as 'areas of environmental concern'. They include:

- former market garden sites - potential contamination issues relating to market garden operation include soil and water impacts from the application of fertilisers, spray drift from pesticides and herbicides. Historical aerial photography and field investigations suggest that land between Narrabeen Creek and Foley Street was used for agricultural activities (eg market gardens)
- truck incident area - there is a risk of hydrocarbon vapour exposure in the vicinity of truck incident site on Mona Vale Road near Samuel Street. In October 2013 a truck carrying 33,000 litres of fuel crashed, spilling hydrocarbons on the southern side of Mona Vale Road between Ponderosa Parade and Emma Street. While soil testing and remediation of the site was undertaken in October 2013, the results of validation sampling undertaken indicated some residual hydrocarbon impacts remain present
- uncontrolled fill material - imported fill material located opposite the corner of Mona Vale Road and Emma Street and the terminated intersection of Lane Cove Road and Mona Vale Road may contain uncontrolled fill materials. Asbestos Containing Material (ACM) may occur within the fill
- potential waste storage areas - potential waste storage areas have been identified from aerial photography adjacent to the Mona Vale Road alignment at the now closed Lane Cove Road intersection. Stored material may comprise construction and demolition waste, uncontrolled fill, plant, machinery and fuel / oil drums. Potential contamination issues associated include petroleum hydrocarbon impacts on soil and groundwater, pesticides and asbestos
- coal tar, bitumen and road base within the existing road surface of the determined project area.

The location of the areas of environmental concern are identified in the REF.

5.3.2 Potential impact

Construction

Earthwork

The REF described the project as requiring the construction of seven fill retaining walls up to six metres in height and the construction of five cuttings up to 16 metres in height. The proposed modification would result in a change to the proposed earthwork, including a new cutting resulting from a change to the project geometry and generally widened cuttings such as to allow for a rock fall safety zone. The cuttings and retaining walls have been designed to allow the necessary carriageway widths while maintaining slope stability and minimising the construction footprint. These changes would generally increase the volume of earthwork necessary to undertake the

proposed modification. However, these changes would not alter the existing topography at a regional scale.

For the proposed modifications, four major earthwork cuttings would be required on the northern side plus one cutting on the southern side of the project area. Cuttings for the proposed modification would be between 50 metres and 300 metres long and would be up to 16 metres high. About 181,000 cubic metres of material would be removed for the proposed modification.

Nine retaining walls would be provided along the length of the proposed modification to minimise the construction footprint. Retaining walls would range in length from about five metres long up to about 180 metres long. They would range in height between about 1.5 metres and 6.3 metres. The retaining walls for the proposed modification are shown in Figure 1-3.

Fill earthwork would also be required for the proposed modification. About 20,000 cubic metres of fill would be required. Overall, about 161,000 cubic metres of surplus material would be generated during construction of the proposed modification.

Contaminated land

Two proposed construction sites would be located adjacent to two known areas of contamination. These are the site compound at 30 Walana Crescent and the ancillary facility at 1-7 Walana Crescent. These are shown in Figure 1-4.

The site compound proposed at 30 Walana Crescent is located next to a site identified as a potential waste storage area. There is not expected to be any impact to the site compound as a result of any potential waste on the adjacent site. The site compound would also not have any impact to the adjoining site.

The ancillary facility proposed at 1-7 Walana Crescent is located on land where part of the site has been identified as an asbestos contaminated area. This was identified (NAA 2014) with patchy occurrences of Asbestos-Containing Materials (ACM) fragments identified throughout the majority of the site. A licensed Asbestos Removal Contractor was engaged to remediate the contaminated areas. Excavation and offsite disposal of the upper fill layers was undertaken. An asbestos clearance certificate walkover stated that no visible suspected asbestos fragments remained on the exposed ground at the conclusion of the inspection. However, asbestos formwork was found under a buried concrete pathway and it was not confirmed whether it had been removed. It is therefore possible that asbestos contamination extends onto the site.

Operation

There is no additional operational impact to those identified in the REF.

5.3.3 Safeguards and management measures

The safeguards and management measures identified in Table 5-7 are those provided in the Submissions Report. Additional safeguards and management measures are required as a result of the proposed modification. The additional measures and changes to safeguards have been added in blue italics.

Table 5-7: Landform, geology and soils safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
SO-1 Erosion and sedimentation	A Soil and Water Management Plan (SWMP) would be prepared as part of the CEMP prior to the commencement of construction. The SWMP would address the following: • the Roads and Maritime Code of Practice for Water Management.	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	• the Blue Book - Managing Urban Stormwater: Soils and Construction, Volume 1 and 2. • Roads and Maritime Technical Guidelines – Temporary Stormwater Drainage for Road Construction. The SWMP would include: • stockpile management plan • identification of catchment and sub-catchment area high risk areas and sensitive areas • sizing of each of the above areas and catchment • the likely run-off from each road sub-catchment. • direction of flow of onsite and offsite water • separation of onsite and offsite water • stockpiles will be designed, established, operated and decommissioned in accordance with the RTA Stockpile Site Management Guideline • 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 any sediment basins and sumps) • progressive site specific Erosion and Sedimentation Control Plans (ESCPs). The ESCP is to be updated at least fortnightly • a process to routinely monitor the Bureau of Meteorology weather forecasts • preparation of a wet weather (rain event) plan which includes a process for monitoring potential wet weather and identification of controls to be implemented in the event of wet weather • an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.		
SO-2 Erosion and sedimentation	A Principal Erosion and Sedimentation Control Plan would be prepared during detailed design. The Principal Erosion and Sedimentation Control Plan would include: • identifying site catchment and sub-catchments, high risk areas and sensitive areas • sizing of each of the above areas and catchments • proposed staging plans for the project to ensure appropriate erosion and sediment controls measures are possible • the likely volume of run-off from each catchment and subcatchment in accordance with the Managing Urban Stormwater: Soils and Construction, Volume 1 and 2 (Landcom, 2004) • direction of water flow, both off and on site • diversion of off-site water around or through the site or details of separation of on-site and off-	Roads and Maritime	Detailed design

Impact	Environmental safeguards	Responsibility	Timing
	site water • the direction of runoff and drainage points during each stage of construction • the locations and sizing of sediment basins / sumps as well as associated drainage to direct site water to the basin or sumps • a mapped plan identifying the above at all major construction stages • a review process by a soil conservationist and a process for updating the report to address any recommendations.		
SO-3 Erosion and sedimentation	A soil conservationist from the Roads and Maritime Erosion, Sedimentation and Soil Conservation Consultancy Services Register is to be engaged to review the proposed erosion and sedimentation controls and conduct routine inspections of the construction work.	Construction contractor	Construction
SO-4 Erosion and sedimentation	All stockpiles would be designed, established, operated and decommissioned in accordance with the Roads and Maritime Stockpile Management Procedures.	Construction contractor	Construction
SO-5 Erosion and sedimentation	Controls would be implemented at construction zone exit points to minimise the tracking of soil and particulates onto road surface surfaces.	Construction contractor	Construction
SO-6 Disturbance of contaminated land	Prior to the start of construction, additional environmental investigations will be undertaken to assess the current status of total petroleum hydrocarbon (TPH) impacted soils at the truck incident site and assess if recent lane adjustment work have affected this location. Additional testing would be carried out to assess if contaminated soils have been removed or if migration of impacted areas has occurred, impacting previously unaffected areas.	Construction contractor	Pre-construction
SO-7 Disturbance of contaminated land	A Contaminated Land Management Plan will be prepared for the determined project and will include procedures to: • identify potentially contaminated land through monitoring: o for discolouration or staining of soil o bare soil patches both onsite, and offsite adjacent to site boundary o visible signs of plant stress o presence of drums or other waste material o presence of stockpiles or fill material o odours • undertake further contamination assessment where necessary and advise on the need for remediation or other action. This includes further investigation of the truck roll over area and any unexpected contamination finds • divert surface run-off away from the contaminated land	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	• manage any surface run-off contaminated by exposure to the contaminated land • assess any requirement to notify relevant Authorities, including the NSW Environment Protection Agency (EPA) • manage any remediation and subsequent validation, including any certification required • review and update the plan. The Contaminated Land Management Plan will contain the following: • contaminated land legislation and guidelines including any relevant licences and approvals to be obtained • identification of locations of known or potential contamination and preparation of a map showing these locations • identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated land within the construction footprint • contamination management measures including waste classification and reuse procedures and unexpected finds procedures • *measures to identify and appropriately manage any residual asbestos containing material located on the 1-7 Walana Crescent ancillary site.*		
SO-8 Disturbance of asbestos containing materials	A classification system will be used to control the excavation, stockpiling and disposal of all potentially contaminated materials. Soils should be classified (where possible) in-situ prior to excavation or when stockpiled during excavation, depending on available time and room for stockpile areas. The same procedures will be followed for any unexpected finds.	Construction contractor	Construction
SO-9 Disturbance of Asbestos containing materials	An Asbestos Management Plan will be prepared and implemented. Work in any area where asbestos is newly identified will cease immediately. An investigation will be then be undertaken and report prepared to determine the nature, extent and degree of the asbestos contamination. The level of reporting will be in accordance with Guidelines for Consultants Reporting on Contaminated Sites (Office of Environment and Heritage, 2011), any relevant WorkCover Guidelines and will include the proposed methodology for the remediation of the asbestos contamination. Remediation activities will not take place until receipt of the investigation report by an	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	occupational health professional. Work will only recommence upon receipt of a validation report from a suitably qualified contamination specialist that the remediation activities have been undertaken in accordance with the investigation report and remediation methodology.		

5.4 Hydrology, hydraulics and water quality

Section 6.3 of the REF assessed the full hydrology and flooding impacts of the project. Further hydrology and flooding technical assessment for each of the catchments was undertaken during the detailed design leading to proposed modifications.

5.4.1 Existing environment

The hydrology assessment required refinement of Council's previous flood model to improve the representation of the road upgrade. Detailed survey data was included in the model to further delineate each sub-catchment. Due to this revision, the catchments assessed in this Addendum REF vary from those identified in REF.

The proposed modification falls within two regional creek catchments. These are Narrabeen Lagoon catchment and Cahill Creek catchment. These catchment areas are described below and are shown in Figure 5-5.

Narrabeen Lagoon catchment

The project area is located mostly within the Narrabeen Lagoon catchment. It intersects the upper reaches of Narrabeen Creek and tributaries of Fern Creek and Mullet Creek catchments, which are sub-catchments of Narrabeen Lagoon. The catchment drains across steep terrain in a south-easterly direction through semi-rural properties and areas of thick bushland.

Main creek lines to the south include Mullet Creek, Fern Creek and Narrabeen Creek which all eventually flow into the Narrabeen Lakes then outfall to the Tasman Sea.

Cahill Creek catchment

East of Boundary Street and north of the project area, the catchment drains northward and flows into Cahill Creek. The density of urban residential and commercial properties in the catchment is higher compared to the Narrabeen Lagoon catchment.

Drainage from the determined project would generally drain to the north via underground Council pipes and overland flow paths to Cahill Creek.

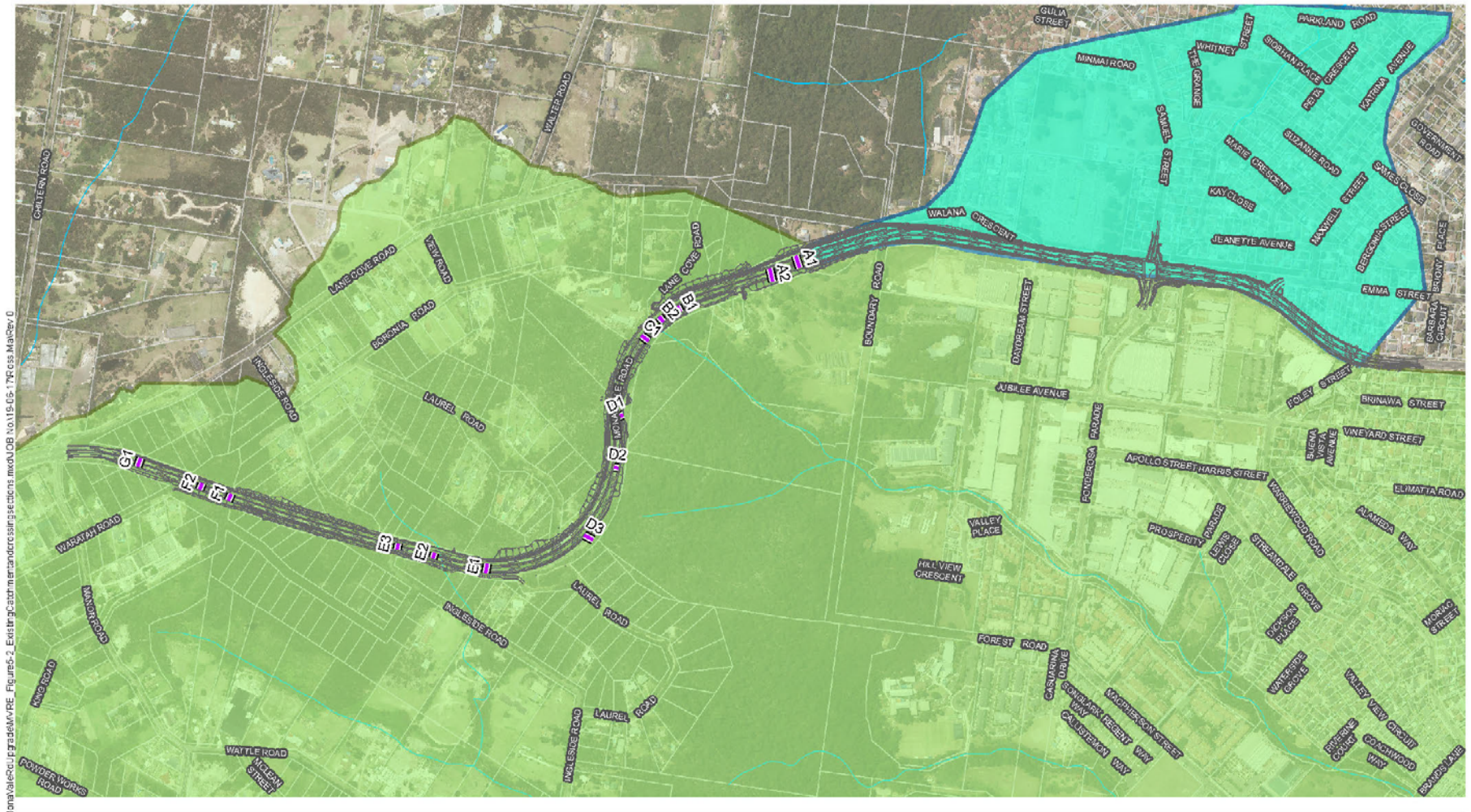
Existing flood areas

Several locations within the project area have the potential to flood, including existing sections of Mona Vale Road. These are low lying areas with evidence of trapped overland flow paths and stormwater surcharge. The locations where flooding would occur are generally at the:

- intersection of Mona Vale Road, Ponderosa Parade and Samuel Street
- southern side of Mona Vale Road between Samuel Street and Boundary Street
- upstream and downstream of Narrabeen Creek along Mona Vale Road.

Methodology

Hydrological modelling was done using XP-RAFTS and hydraulic modelling was undertaken using TUFLOW software. Modelling undertaken for the proposed modification assessed a number of flooding scenarios, however, the drainage strategy was to provide for flood immunity of Mona Vale Road in a 100 year ARI flood event.


Pre upgrade culverts configuration
Design
Cahill Creek catchment
Creek
Narrabeen Lagoon catchment
Lot
Source: Aurecon
1:11,000
0 100 200m
Projection: GDA 1994 MGA Zone 56
Mona Vale Road East Upgrade Addendum REF
FIGURE 5-5: Existing Catchment and Cross Drainage Locations

5.4.2 Potential impacts

The potential impacts on flooding and water quality due to the upgrade were considered.

Construction

Flooding

During construction three ancillary facilities and a site compound would be established. These are shown in Figure 1-4. One of the selection criterion for ancillary facilities is that, where possible, they would be located above the 1 in 100-year flood level. The main concern with placing ancillary facilities in a floodplain is the potential for materials, plant and equipment to be washed into watercourses during floods and the potential drowning risk to personnel working onsite.

The ancillary facility site at Waratah Road is currently subject to modest flooding during major storm events. The flooding risk at this site during construction would be removed by the introduction of temporary low earth bunds during construction. The modified design includes permanent channel diversions around the site to eliminate flooding risk on the site after construction has finished. The proposed flood risk management works for this property would have negligible impact on flooding risk at neighbouring properties. The Waratah Road ancillary facility site would not be subject to flooding following the completion of construction.

The site compound located at 30 Walana Crescent and ancillary facilities at 127 Mona Vale Road and 1-7 Walana Crescent are located outside of the 100-year flood level.

Water quality

The proposed modification would be constructed in accordance with a detailed erosion and sediment control plan. The modified proposal does not specifically require the construction of construction phase sediment basins, however does not preclude their use during construction. The predicted impacts related to sediment and erosion would be consistent with those identified and assessed in the REF.

Operation

Flooding

Hydraulic modelling refinements during the detailed design phase identified a number of adverse downstream impacts which were considered sufficient large to warrant the introduction of on-site detention facilities to mitigate the impacts. Initially, the detention storage was located in concrete structures beneath the road alignment however they were re-designed as above ground structures to overcome ongoing maintenance challenges.

Two storage facilitates are proposed. One of approximately 440m^3 located upstream of the culvert at E1 on Figure 1.5 and another located on the land to the north west of the Samuel Street/Mona Vale Road intersection with a storage volume of around 1000 m^3. Further, refinements to the cross drainage structures over the design process has resulted in changes to the sizes, and in some cases locations, of virtually every cross drainage structure identified in the REF. The new sizes are described in Table 5-8 below.

The revised culvert sizes, locations and on-site detention were all modelled in a two dimensional hydraulic model (TUFLOW) of the greater region which demonstrated either no impact on downstream lots or impacts so minor that, when discussed with the local council, they were considered to be of no consequence.

Table 5-8 Changes to cross drainage structures

Identification	Existing size and type	Proposed modification size and type
A1	375mm pipe	Removed

Identification	Existing size and type	Proposed modification size and type
A2	450mm pipe	900mm pipe
B1	450mm pipe	Removed
B2	450mm pipe	1200mm pipe
C1	2700mm x 1500mm box	2 x 2700mm x 1500mm box
D1	450mm pipe	750mm pipe
D2	450mm pipe	Remove
D3	450mm pipe	900mm pipe
E1	750mm pipe	Remove
E2	750mm pipe	1200mm pipe
E3	600mm pipe	900mm pipe
F1	450mm pipe	600mm pipe
F2	600mm pipe	1650mm pipe
G1	450mm pipe	Remove

The locations of cross drainage structures are shown in Figure 1-5.

Water quality

Potential impacts and risks to water quality are reduced as a result of the proposed modification. The proposed modification incorporates spill containment of at least 50,000 litres. This storage volume would generally be sufficient to contain hazardous substances that could be released in the event of a major spill, such as during a truck accident. The spill containment system would be located about 140 metres east (downhill) from the start of the truck arrestor bed.

The spill containment system has been specifically designed to capture spills from trucks that may arise in the unlikely event of a truck roll-over or truck accident. Although the likelihood of this type of incident is very low given the upgraded road design, the impact of a hazardous substances spill on the environment in this location would be high. This is largely due to the sensitivity of the Narrabeen Lagoon in the downstream receiving environment.

5.4.3 Safeguards and management measures

The safeguards and management measures identified in Table 5-9 are those provided in the Submissions Report. No additional safeguards and management measures are required as a result of the proposed modification.

Table 5-9: Hydrology, hydraulics and water quality safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
WQ-1 Concrete and other materials from construction vehicles entering waterways	Vehicle wash down will occur in a location that is bunded.	Construction contractor	Construction
WQ-2 Spills during	All fuels, chemicals and liquids will be	Construction	Construction

Impact	Environmental safeguards	Responsibility	Timing
construction	stored in an impervious bunded area and at least 50 metres from creek and other waterways and slopes with a gradient above 10 per cent.	contractor	
WQ-3 Spills during construction	Refuelling of plant and equipment will occur either offsite or on relatively level ground at least 50 metres from waterways, drainage lines and sensitive areas. The refuelling machinery will have spill management equipment and there will be a person attending during the refuelling process.	Construction contractor	Construction
WQ-4 Spills during construction	A Spill Management Plan would be prepared for the proposal. If a spill or incident occurs, the Roads and Maritime *Environmental Incident Classification and Management Procedure* (Roads and Maritime Services, 2014) will be followed and the Roads and Maritime Contract Manager notified immediately.	Construction contractor Roads and Maritime	Construction
WQ-5 Pollution from the road during operation	Consideration will be given to planting the level spreaders with suitable species to provide nominal water quality treatment prior to discharge.	Design contractor	Detailed design
WQ-6 Spills during operation	Opportunities to improve the management of spills (such as spill basins and/or suitable block/bund locations) for the truck arrester bed and Ponderosa Parade will be investigated during detailed design.	Design contractor Roads and Maritime	Detailed design

5.5 Traffic and transport

5.5.1 Existing environment

Section 9.4 of the REF assessed the project traffic and transport impacts. Additionally, Section 4 of the Submissions Report detailed updates to the road design including at the intersections of Mona Vale Road and Emma Street and Mona Vale Road / Ponderosa Parade / Samuel Street. The REF and Submissions Report did not nominate locations for, or assess, any construction ancillary facilities.

5.5.2 Potential impacts

Construction

During construction, up to three ancillary facilities would be established to assist in the construction of the project and a site compound area would be established. Ancillary facilities would be accessed off local roads and directly from Mona Vale Road. Access points for the proposed ancillary facilities would be:

- Waratah Road would be accessed directly off Mona Vale Road
- 1-7 Walana Crescent may be accessed directly from Mona Vale Road by heavy vehicles, however light vehicles such as cars may enter via Fazzolari Avenue and Wallaby Circuit

- 127 Mona Vale Road would be accessed directly from Mona Vale Road and/or from an existing adjacent services track
- 30 Walana Crescent may be accessed directly from Mona Vale Road by heavy vehicles, however light vehicles such as cars may enter via Fazzolari Avenue and Wallaby Circuit. A light vehicle access route would be provided connecting 1-7 Walana Crescent and 30 Walana Crescent.

These likely access locations for the proposed construction ancillary facilities and site compound are shown in Figure 1-4.

Throughout the construction period, light and heavy vehicles (where required) would access the construction ancillary facilities. This would temporarily increase traffic on Mona Vale Road and on local roads, which may interrupt residential traffic. The activities undertaken at each ancillary facility would determine the type and number of vehicles requiring to access each site.

A new access would need to be constructed to access the Waratah Road facility. This would be constructed in the area where a maintenance access track is proposed as part of the proposed modification. During normal operations, no impacts would occur to Mona Vale Road due to access to these sites. However, delivery using oversize vehicles may require temporary traffic controls to be implemented on Mona Vale Road which may have a short term impact on traffic.

Access to 1-7 Walana Crescent would be directly off Mona Vale Road for heavy vehicles however light vehicles would be permitted to enter via Fazzolari Avenue and Wallaby Circuit. The alternative would require heavy vehicles passing through residential areas. Access via Fazzolari Avenue would result in a localised traffic impact, as in some sections, the Avenue can only accommodate one vehicle.

Fazzolari Avenue provides the only access out for residents living in Whipbird Circuit, Walana Crescent, Wallaby Circuit and Harrier Place (around 60-70 properties). Impact from the additional construction traffic would be particularly pronounced on weekdays during peak periods. As such, it is proposed that heavy vehicles would avoid local road and only access the 1-7 Walana Crescent ancillary site directly from Mona Vale Road.

Operation

The proposed modification would not provide a shared use path along Lane Cove Road. The proposed modification would still provide a shared use path between Lane Cove Road, Ingleside and Mona Vale, but rather than stopping at Walana Crescent as described in the REF, the shared use path would go to Samuel Street. The three metre wide shared path on the south side of Mona Vale Road between Ponderosa Parade and Foley Street and the three metre wide shoulders along Mona Vale Road would still be constructed.

Cyclists would be able to use the road shoulder to travel along Mona Vale Road or along the shared use path from Samuel Street to Lane Cove Road. Pedestrian access would be located along Mona Vale Road to the east, in the commercial and residential area and extends along the northern side from Samuel Street to Lane Cove Road. Pedestrian access to the bus stop on Mona Vale Road outside the Pittwater RSL Club would be maintained.

Access tracks along the southern side of Mona Vale Road would be constructed for road maintenance purposes. These would allow Roads and Maritime maintenance staff to access areas to inspect culverts and retaining walls without obstructing traffic on Mona Vale Road. These access tracks could also potentially be used by utility authorities undertaking inspections or maintenance. These access tracks would have access restricted for safety and security purposes.

5.5.3 Safeguards and management measures

The safeguards and management measures identified in Table 5-10 are those provided in the Submissions Report. Additional safeguards and management measures are required as a result of the proposed modifications. Additional measures have been added in blue italics.

Table 5-10 Traffic and transport safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
TT-1 Construction traffic impacts	A traffic management plan (TMP) will be prepared prior to construction and would be included in the CEMP. The TMP would: • identify the traffic management requirements during construction • describe the general approach and procedures to be adopted when producing specific traffic control plans • determine temporary speed restrictions to ensure safe driving environment around work zones • provide for access to local roads and properties, including the use of temporary turnaround bays where appropriate • include methods for implementing the traffic management plan and minimising road user delays • provide for appropriate warning and advisory signposting • consider other developments in the wider area that may also be under construction, to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • *develop plans for the access to ancillary facilities and site compounds including any speed restrictions for vehicles around the sites* • *ancillary facilities and site compounds would not be accessed by heavy vehicles using local roads.*	Construction contractor	Pre-Construction
TT-2 Construction traffic impacts	Consultation on construction activities will occur with emergency service authorities including NSW Rural Fire Service and NSW Fire and Rescue.	Roads and Maritime	Detailed design
TT-3 Construction traffic impacts	A detailed construction staging plan will be developed to maintain existing peak flow capacity.	Construction contractor	Pre - Construction
TT-4 Access to bus services	Access to appropriate bus stop locations will be maintained during construction in consultation with bus operators. Any changes will be appropriately communicated to bus users.	Construction contractor	Construction
TT-5 Ancillary facilities and site compound access	*Surrounding residents and sensitive receivers are to be notified of access provisions for ancillary facilities and site compounds, times of operation and the expected duration of the construction period.*	*Construction contractor*	*Pre-Construction*

5.6 Historic heritage

Australian Museum Consulting prepared the heritage assessments for the project REF. AMBS Ecology and Heritage Pty Limited provided supplementary advice in regards to potential heritage impact on an additional item identified that would be affected by the proposed modification. A specialist heritage report was prepared for the addendum REF and is included in Appendix X. The heritage advice provided has been summarised below.

5.6.1 Existing environment

The REF assessed the potential impacts of the project on the historic heritage values of the study area. These included:

- Mona Vale Cemetery
- Mona Vale Cemetery gateposts
- potential archaeological site (well on Lot 26 DP 654262).

Additional archaeological field survey was undertaken to inform further project development planning. During these additional surveys a previously unidentified dry-stone sandstone wall was uncovered beneath dense vegetation. The dry-stone sandstone wall is located along the northern side of Mona Vale Road, west of Boundary Street adjacent to 119 Mona Vale Road. A photograph of the wall is shown in Figure 5-6.

Figure 5-6: Photograph of the dry-stone sandstone wall located near Mona Vale Road

It is likely that the dry-stone sandstone wall is associated with the alignment of Lane Cove Road, or the pre-1930s Mona Vale Road alignment. Dry-stone sandstone retaining walls were commonly constructed to support road development, particularly through difficult terrain. The construction of the wall supports the likelihood it is a retaining wall. The blocks fit together firmly, and its location is adjacent to the original alignment of the Mona Vale Road zig zag at Foley's Hill.

Figure 5-7 shows detail from the 1886 Parish of Narrabeen map with the relevant section of Mona Vale Road indicated. The approximate location of the dry-stone wall is arrowed in the inset.

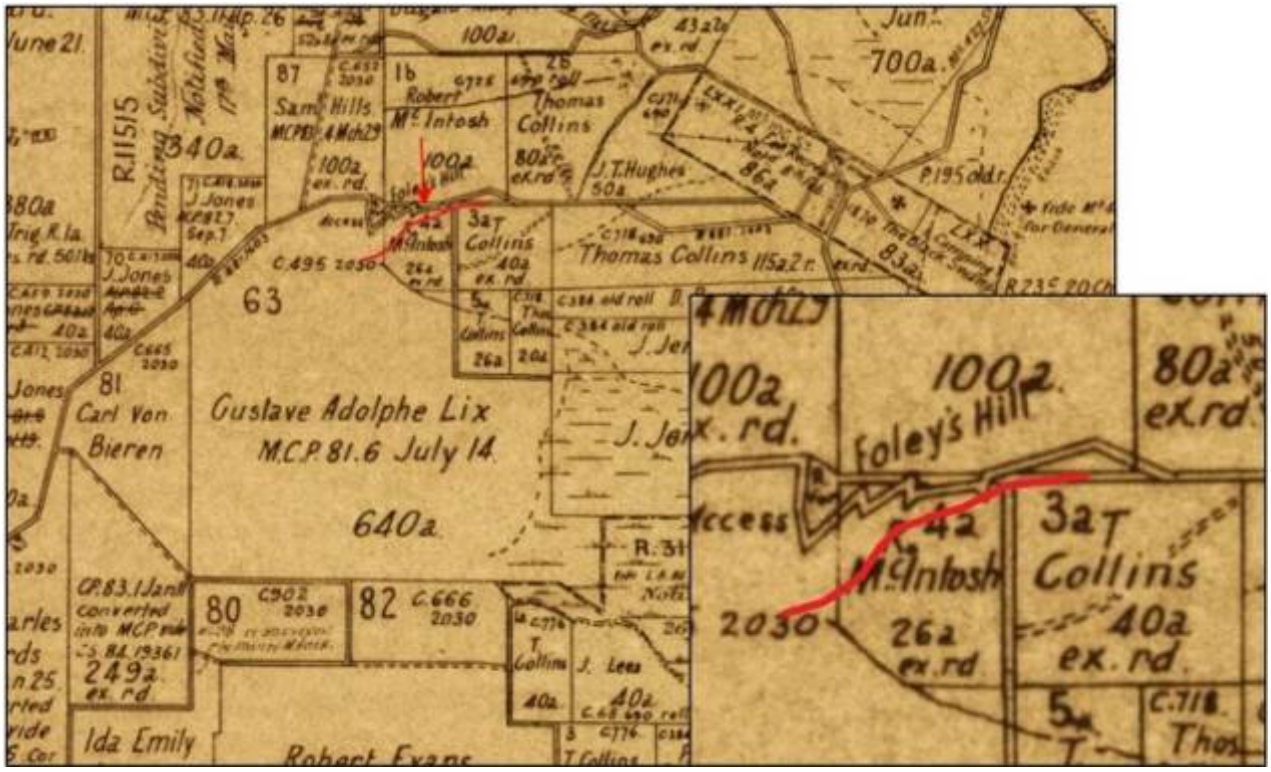


Figure 5-7: Location of the dry sandstone wall near to the zig zag at Foley's Hill

5.6.2 Potential impacts

Construction

The dry-stone sandstone wall is located at the toe of a proposed fill batter that would be constructed for the proposed modification. As such, the dry-stone sandstone wall would need to be demolished and removed.

The remnant dry-stone wall was assessed by AMBS Ecology and Heritage to have some historic interest; however, this would not be sufficient to warrant identification of the wall as a heritage item. As such, as the dry-stone sandstone retaining wall would not be identified as a heritage item, nor a relic. It may therefore be removed without seeking a statutory approval under the provisions of the *Heritage Act 1977*.

The potential impact to all other heritage items remains consistent with the REF.

5.6.3 Safeguards and management measures

The safeguards and management measures identified in Table 5-11 are those provided in the Submissions Report. No additional safeguards and management measures are required as a result of the proposed modification.

Table 5-11 Historic heritage safeguards

Impact	Environmental safeguards	Responsibility	Timing
HH-1 Impacts on known heritage values	Potential impacts of construction vibration on the Mona Vale Cemetery and the gateposts will be investigated prior to the commencement of construction. Construction methods will be selected and safeguards will be prescribed (including vibration monitoring) to ensure there are no impacts on	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	these items.		
HH-2 Impacts on known heritage values	The location and heritage significance of the Mona Vale Road Cemetery and gateposts and the potential presence of the well at Lot 26 DP 654262 will be discussed with staff during site inductions and tool box talks.	Construction contractor	Construction
HH-3 Unexpected finds	The Standard Management Procedure: Unexpected Archaeological Finds Procedure (Roads and Maritime Services, 2012) is to be followed in the event of uncovering a potential historic heritage item not considered by REF.	Construction contractor	Construction

5.7 Noise and vibration

The REF assessed the noise impact from the project considering year of opening (2019) and a design year (2031). Management measure NV2 from the REF identified that further investigations regarding noise mitigation options would need to be undertaken during the detailed design phase. This Addendum REF considers the noise impacts associated with the proposed modification.

5.7.1 Method

Construction noise assessment for the proposed modification was undertaken in accordance with the Roads and Maritime Construction Noise and Vibration Guideline Version 1.

Operational noise assessment for the proposed modification was undertaken in accordance with the Roads and Maritime Noise Mitigation Guideline.

5.7.2 Potential impacts

Construction

During construction the construction contractor would require temporary areas for construction compounds including storage facilities for material and equipment for a range of construction related activities. Detailed construction planning has identified the following potential construction ancillary sites and site compound:

- Waratah Road (ancillary site)
- 30 Walana Crescent (site compound)
- 127 Mona Vale Road (ancillary site)
- 1-7 Walana Crescent (ancillary site).

Site compounds would typically contain portable buildings with amenities (such as lunch facilities and toilets) and parking areas for light vehicles. Ancillary facilities would typically include secure and bunded storage areas for site materials, including fuel and chemicals, office space for onsite personnel, and associated parking. The loudest noise generating events are anticipated during delivery of site materials using trucks. Typical plant and equipment that would be used within construction ancillary facilities would include:

- light vehicles - typical sound power level of 106 $dB(A)_{Lw}$
- compressors - typical sound power level of 101 $dB(A)_{Lw}$
- delivery trucks - typical sound power level of 108 $dB(A)_{Lw}$.

The level of noise impact at each construction ancillary site would depend on the activities undertaken, the duration of those activities and the time of day (or night) that activities were undertaken. 30 Walana Crescent and 127 Mona Vale Road sites are generally located away from a small number of sensitive receivers and would be expected to result in negligible or minor noise impacts. They are likely to be suitable for most construction activities. Waratah Road and 1-7 Walana Crescent sites are located closer to a larger number of sensitive receivers. Depending on the activities proposed at these facilities by the construction contractor, the construction noise impacts are expected to be higher and would affect a greater number of receivers. The construction contractor would need to carefully manage the activities undertaken at these sites.

Upon completion of construction temporary site compounds, work areas and stockpiles would be removed, the sites would be cleared of all rubbish and materials and rehabilitated.

Operation

The REF noise assessment identified 11 sensitive receivers in noise catchment area. There are three sensitive receivers between Walana Crescent / Wallaby Circuit and Fazzolari Avenue that would exceed the day and night noise criteria when the Mona Vale Road upgrade is complete. These receivers were identified as potentially benefiting from a noise wall. The assessment recommended a noise barrier up to three metres high as well as at-house treatments to reduce operational road noise at some receivers.

Further operational noise assessment was undertaken for the proposed modification. In undertaking this further assessment, the proposed height of the recommended noise barrier was reassessed in accordance with the Roads and Maritime Noise Management Guidelines.

Eleven properties were assessed using a noise model. The modelling found that with a 4.5 metre high noise barrier, eight properties would experience minor noise exceedances over the adopted noise criteria. Most of these exceedances would be by less than one decibel. The assessment concluded that a noise barrier with a height of 4.5 metres would provide the most feasible and reasonable noise mitigation between Walana Crescent / Wallaby Circuit and Fazzolari Avenue. This height of noise barrier was assessed to provide the maximum noise mitigation to residences while considering urban design, shadowing and cost implications. The location of the noise barrier is shown in Figure 1-7.

A number of sensitive receivers were also found to require noise mitigation, but that the provision of a noise barrier for these locations would not be reasonable or feasible. This is due to a number of reasons including distance to noise source, topography, engineering constraints and cost. These properties were considered for at–house treatments. The sensitive receivers that are proposed to receive at-house noise mitigation treatments are identified in Table 5-12.

Table 5-12 At-house treatments recommended

Noise catchment area	Receivers qualifying for at-house treatments	Number of properties qualifying for at-house treatment
1	B1, B2, B4, B5, B8, B10	6
2	B45, B48, B312, B313	4
3	B55, B65, B68	3
4	B118, B119, B161	3
5	B161, B162, B163, B165, B166, B244, B245, B246, B247, B248, B249, B250, B251, B252, B253, B254, B255, B256, B257, B258, B259, B260	22

Noise catchment area	Receivers qualifying for at-house treatments	Number of properties qualifying for at-house treatment
6	B280, B281, B282, B283, B284, B285, B286	7
7	Bowling Club x 2, Childcare Centre, Place of worship	4
8	B327, B328, B330	3

5.7.3 Safeguards and management measures

The safeguards and management measures identified in Table 5-13 are those provided in the Submissions Report. Additional safeguards and management measures are required to address noise impacts for the proposed modification. The additional measure has been added in blue italics.

Table 5-13 Noise safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
NV1 Construction noise	Construction noise would be managed by a detailed Construction Noise and Vibration Management Plan (CNVMP) prepared prior to commencement of work. The management plan would consider the following as a minimum: • identify nearby residences and other sensitive land uses. • develop noise management levels consistent with the ICNG. • assess the potential impact from the proposed construction methods. • *assess the potential impact from any proposed construction ancillary facilities or site compound specific to the construction activities, timeframes and durations that are proposed.* • where management levels are exceeded examine feasible and reasonable noise mitigation. • develop reactive and proactive strategies for dealing with any noise complaints. • identify a site contact person to follow up complaints. • noise monitoring.	Construction contractor	Pre-Construction
NV2 Operational noise	During the detailed design stage of the proposal, further investigations of all feasible and reasonable mitigation options would be undertaken for affected receivers in accordance with the Road Noise Policy (DECCW 2011) and RMS's Environmental Noise Management Manual Practice Note 4 (RTA 2001).	Roads and Maritime	Detailed Design
NV3 Construction noise	Consider construction compound layout so that primary noise sources are at a maximum distance from sensitive receivers (primarily residential receivers), with solid structures (sheds and containers) placed between sensitive receivers and noise sources (and as close to the noise sources as	Construction contractor	Pre-Construction

Impact	Environmental safeguards	Responsibility	Timing
	is practical)		
NV4 Construction noise	Vehicle delivery times will be scheduled where feasible to the recommended construction hours to minimise noise impacts from heavy vehicle movements and deliveries.	Construction	Construction contractor
NV5 Construction noise	Any out of hours work would comply with G36 community notification requirements and the mitigation measures specified within the RMS Noise Management Manual – Practice Note VII.	Construction contractor	Construction
NV6 Construction noise	The environmental induction program will include specific noise and vibration issues awareness training including, but not limited to, the following: • avoiding use of radios during work outside normal hours. • avoiding shouting and slamming doors. • where practical, operating machines at low speed or power and switching off when not being used rather than left idling for prolonged periods. • minimising reversing. • avoiding dropping materials from height and avoiding metal to metal contact on material.	Construction contractor	Construction
NV7 Construction noise	Building condition surveys will be undertaken for buildings within identified in the NVMP. A copy of the report will be sent to the landholder.	Construction contractor	Pre-Construction
NV8 Construction noise	In the case that exceedances are detected for noise and vibration monitoring, the situation would be reviewed in order to identify means to minimise impacts to residents and the appropriate changes made and the NVMP updated accordingly.	Construction contractor	Construction
NV9 Operational noise	A post-construction noise monitoring program (including simultaneous traffic counts) will be undertaken in accordance with the RMS Environmental Noise Management Manual within 6 to 12 months of opening once traffic flows have stabilised in order to verify the noise assessment. This will include monitoring of maximum noise events ($_{Lmax}$).	Roads and Maritime	Post-Construction
NV10 Operational noise	*For all at-house treatment locations, a site inspection should be undertaken to assess the type and extent of at-house treatment. The inspection should consider the building construction and other aspects identified in the Roads and Maritime Noise Management Guidelines.*	*Roads and Maritime*	*Pre-Construction*

5.8 Urban design and visual amenity

5.8.1 Existing environment

Section 6.7 of the project REF considered the potential visual amenity impacts of the proposal. Existing environment information has only been replicated below where it is directly relevant to the changed impacts for the proposed modification.

Landscape character zones

The project REF identified eight different landscape character zones across the project area. The proposed modifications that may have an impact to visual amenity and landscape character fall within five of these landscape character zones. These are detailed in Table 5-14.

Table 5-14 Landscape character zones

No	Name and description	Sensitivity
3	Ingleside Plateau The topography along the plateau varies and includes the high point of the ridge line to the north of Mona Vale Road, the south facing slopes to Mullet Creek and the upper reaches of the catchment for Narrabeen Creek. Native vegetation covers most of the area interspersed with clearings in less steep areas for residential properties with large gardens. Laneways enclosed by tall trees and shrubs provide access to long driveways to these properties. Low voltage power lines follow these alignments.	Moderate
4	Warriewood Escarpment The Warriewood Escarpment runs north to south across the project area forming a significant geological feature in the Mona Vale area. The topography along the east facing escarpment varies from steep to very steep in places, with occasional areas flat enough to allow for residential development. The steep terrain has ensured most of the area has been retained as native bushland. Lanes enclosed by tall trees and shrubs provide access to long driveways to the residential properties. Low voltage power lines follow these alignments.	High
5	Lower escarpment and future residential development Zone 5 is a transitional area at the base of the escarpment and adjacent to the commercial areas on the edge of Mona Vale to the east. Facing east the lower edge or the escarpment is varied and steep in places. The existing Mona Vale Road alignment passes through substantial sandstone cuttings through this area and is enclosed by remnant tall vegetation in places. Beyond the immediate road corridor the land has been cleared and is currently open pasture and “marginal” land. Glimpses of views are possible from the existing road corridor across this zone. Driveways provide access to individual residential properties setback from the road corridor. Most of the zone to the south of Mona Vale Road is proposed to be developed for a residential subdivision. Overhead power lines follow the Mona Vale Road alignment.	Low
6	Mona Vale commercial Zone 6 is gently undulating with some steeper areas to the western edge of the zone closer to the escarpment. Commercial development present from Foley Street in the east to Boundary Street in the west. The commercial development includes offices, retail, fast food outlets, warehousing, small unit businesses and workshops and the large entertainment and sports complex of the Pittwater RSL. Formal streets provide access to these large lots with on street and off street parking areas. Grassed verges, formed concrete footpaths and a mix of formal and informal street tree planting define the street character. Street lighting and overhead powers lines	Low

No	Name and description	Sensitivity
	are also present. The roundabout at the junction between Mona Vale Road and Ponderosa Parade forms the main formal entrance to the commercial development. Formal landscapes often sit between the street edge and the modern office buildings. Some vacant lots exist and some areas of remnant native vegetation remain between buildings or on areas too steep for commercial development. The Pittwater RSL defines the eastern edge with its flag pole, field artillery piece and signage dominating the view from Mona Vale Road when travelling west. A landscaped edge screens the building, tennis courts and bowling greens from most of Mona Vale Road. A large blockwork-lined detention basin located west of Daydream Street forms an edge to Mona Vale Road.	
7	Mona Vale Residential The topography this landscape character zone varies from gently undulating to steep terrain. The residential subdivision and street pattern reflects the varied topography found in this zone. Properties along the eastern section of Mona Vale Road face the road and have driveway access. Further west properties back onto the road with high back fences accessed from local roads and cul-de-sacs. Most streets have concrete footpaths and grassed verges with street trees and overhead power lines. A tree lined edge exists along Mona Vale Road with over mature Camphor laurel trees that require replacement. Drainage swales form part of this edge.	Moderate

5.8.2 Potential impact

Construction

The proposed construction ancillary facilities would impact the localised temporary visual amenity. Each of the facility locations have different levels of exposure to surrounding local roads and receivers. All ancillary facilities would be visible from Mona Vale Road. Any impact from ancillary facilities would be temporary and would include views of large earthmoving and construction equipment, construction site activities, materials storage and stockpiles.

If any construction ancillary facilities or the site compound require access out-of-hours work, associated lighting may result in some light spill impacts into adjoining properties. 30 Walana Crescent and 127 Mona Vale Road sites are generally located away from a small number of sensitive receivers and would be expected to result in negligible or minor light spill impacts. These sites are likely to be suitable for out-of-hours work. Waratah Road and 1-7 Walana Crescent sites are located closer to a larger number of sensitive receivers. Depending on the activities proposed at these facilities by the construction contractor, light spill impacts could affect a greater number of receivers. The construction contractor would need to carefully manage any out-of-hours activities at these sites.

Operation

Fauna connectivity overpass

The proposed modification includes a new fauna bridge spanning Mona Vale Road. The bridge would connect Katandra Bushland Sanctuary to Ingleside Nature Reserve. The location of the fauna bridge would be about 300 metres east of Laura Road East. The structure would join the elevated landform of Katandra Bushland Sanctuary on the northern side of Mona Vale Road, would span Mona Vale Road in a single span where Mona Vale Road is constructed within a cutting and would join to the southern side of Mona Vale Road into a reinforced soil retaining wall. From the southern abutment, the crossing would grade back towards the south to connect with Ingleside Nature Reserve natural ground levels at the southern edge of the project area.

Due to its location, the fauna bridge would not be directly visible to any sensitive receiver. The main visibility of the structure would be from traffic passing beneath the structure on Mona Vale Road in both directions. Figure 5-9 shows a visualisation of the structure based on preliminary designs with the fauna bridge depicted in pink.

The fauna bridge would be constructed in the landscape character zone of Warriewood Escarpment (4). Table 5-15 describes and assesses the visual impacts of the proposed fauna bridge.

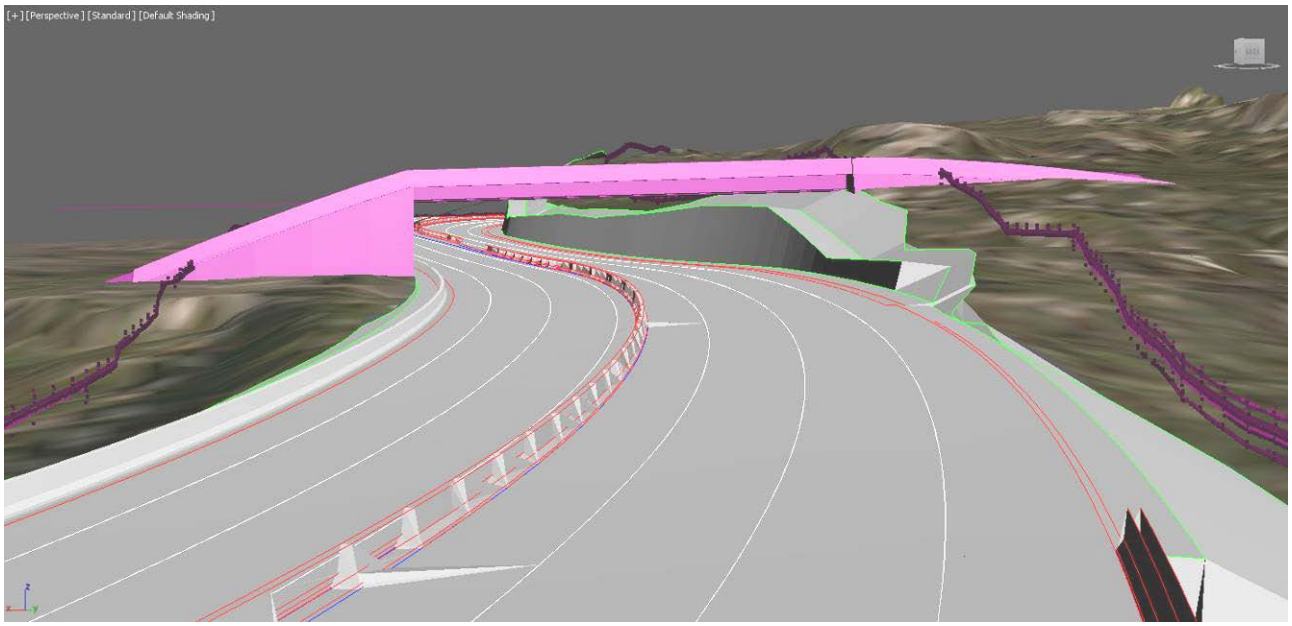


Figure 5-8: Visualisation of fauna bridge – preliminary design

Table 5-15 Fauna bridge visual impacts

Visual impacts on Mona Vale residential receivers	Sensitivity	Magnitude	Impact
The magnitude of the change is low as it is a localised change. The fauna bridge would only be visible in the near vicinity of the structure. No residences are predicted to have views directly onto the fauna bridge given that the bridge would be surrounded by Ingleside Chase Reserve and Katandra Bushland Sanctuary. Road users in both directions would observe the bridge as they pass underneath it. The affected project area is already visually affected by road upgrade and a deep cutting with a high retaining wall. The addition of on overbridge in this location would not significantly change the character or visual nature of the area. The bridge itself would be vegetated to provide for fauna habitat and to encourage fauna use. This would reduce the overall visual impact of the proposed modification from elevated perspectives. Considering these issues together, there would only be a low impact to the residences and a moderate impact overall.	High	Low	Moderate

Noise barrier

An acoustics assessment was undertaken to assess the operational noise impacts that would result from the proposed modification. This assessment concluded that a noise barrier would be

required for the proposed modification to mitigate traffic noise impacts for existing residences. The proposed noise barrier would have a height of 4.5 metres and be about 240 metres long. The noise barrier would be located on the northern side of Mona Vale Road, between Mona Vale Road and residents located along parts of Walana Crescent and Wallaby Circuit. Local residents have been consulted about the proposed noise barrier. The location of the proposed noise barrier is shown in Figure 1-7.

This noise barrier would be constructed in the landscape character zone of Mona Vale Residential (7). The impact to visual amenity and landscape character from the proposed noise barrier is considered in Table 5-16. Sensitivity, magnitude and impact ratings are also identified, however the sensitivity rating is unchanged from that assessed in the project REF.

Table 5-16 Noise barrier visual impact

Visual impacts on Mona Vale residential receivers	Sensitivity	Magnitude	Impact
The magnitude of the change is moderate as it is a localised change. The noise barrier would only be visible in the near vicinity of the structure. Some residences on Walana Crescent and Wallaby Circuit would have views directly onto the noise barrier. Travellers would also glimpse it as they pass by. The noise barrier is set back from the nearest residences by around 40 to 50 metres across Walana Crescent and Wallaby Circuit on vacant land. While the barrier would be highly visible to around 10 residences, there is established vegetation between the residences and the barrier. This vegetation would be retained wherever possible in consultation with the Council and it would reduce the extent of visibility of the barrier to the residences. The noise barrier is located to the south of the residences and is located sufficiently away that there would be no overshadowing impact on residences. Considering these issues together, there would only be a moderate impact to the residences. This is consistent with the assessment made in the project REF.	Moderate	Low	Low[1]

Access tracks

The modified proposal includes access tracks that would be constructed along the southern side of Mona Vale Road between Boundary Street, Mona Vale and Manor Road, Ingleside. Access tracks would be three metres wide and would cater for routine maintenance and inspection. The access tracks for the proposed modification would be located within the landscape character zone of Ingleside Plateau (3) and Warriewood Escarpment (4).

The impact to visual amenity and landscape character from proposed access tracks is considered in Table 5-17. Sensitivity, magnitude and impact ratings are also identified (sensitivity is unchanged from the REF).

Table 5-17 Access tracks visual impact

Visual impact	Sensitivity	Magnitude	Impact

[1] Impact considered the cumulative impact of the noise barrier and the change to the landscaping outside the Pittwater RSL.

Visual impact	Sensitivity	Magnitude	Impact
Ingleside Plateau (3) Access tracks would be constructed in close proximity of the road upgrade in areas of undulating topography, heavy vegetation and few sensitive receivers. The access tracks may be visible to travellers along Mona Vale Road. The magnitude of the change is low. Visual impact from the access tracks alone would be low. This impact is lower than that assessed in the project REF.	Moderate	Low	Low
Warriewood Escarpment (4) Access tracks would be constructed in close proximity of the upgrade in areas of undulating topography, heavy vegetation and few sensitive receivers. The access tracks may be visible to travellers along Mona Vale Road. The magnitude of the change is low. Visual impacts from the access tracks alone would be low. This impact is lower than that assessed in the project REF.	High	Low	Low

Changes to landscaping

Landscaping along Mona Vale Road near the Pittwater RSL Club would be undertaken as part of the proposed modification. This change would impact on the landscape character zone of Mona Vale Residential (7). The impact to visual amenity and landscape character is considered in Table 5-18. Sensitivity, magnitude and impact ratings are also identified (sensitivity is unchanged from the project REF).

Table 5-18 Changes to landscaping visual impact

Visual impact on Mona Vale Residential	Sensitivity	Magnitude	Impact
The changes to the landscaping outside the Pittwater RSL Club are to change the planting of a memorial tree avenue to low shrubs. The visual change of this would be noticeable to viewers, however, the magnitude of change is low. The viewers are residential properties to the north of Mona Vale Road which would mean that any visual impact would be minor.	Moderate	Low	Low[2]

[2] Impact considered the cumulative impact of the noise barrier and the change to the landscaping outside the Pittwater RSL.

5.8.3 Safeguards and management measures

The safeguards and management measures identified in Table 5-19 are those provided in the Submissions Report. No additional safeguards and management measures are required for landscape character and visual impact assessment as a result of the proposed modification.

Table 5-19 Traffic and transport safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
VA-1 Landscape character and visual impacts	Detailed design of the determined project will incorporate the design vision, objectives and mitigation measures outlined in the Landscape Character, Visual Impact Assessment and Urban Design Report where feasible. This will include consideration of screen plantings, feature plantings and design refinements for each of assessed viewpoints.	Roads and Maritime Design Contractor	Detailed design
VA-2 Landscape Character and visual impacts	An urban design contractor from the Roads and Maritime panel will be engaged for the detailed design phase to ensure adequate consideration of urban design principles and objectives, and to ensure appropriate mitigation of identified impacts.	Roads and Maritime Design contractor	Detailed design
VA-3 Landscape character and visual impacts	The footprint for construction work will be kept to a minimum to ensure existing stands of vegetation remain intact wherever possible and to screen adjoining sensitive receivers.	Construction contractor	Construction
VA-4 Construction related visual impacts	The work site will be maintained so as to minimise contractor construction related visual clutter.	Construction	Construction

5.9 Air quality

5.9.1 Existing environment

A qualitative air quality assessment was undertaken in Section 6.9 of the project REF. The proposed modification would result in potential changes to air quality during construction. There would be no change to the impact to air quality during operation.

5.9.2 Potential impact

Construction

Ancillary facilities could result in localised increases to air quality impacts from:

- stockpiling activities
- vehicle movement and material transportation.

While the amount of dust generated would be dependent on soil and atmospheric conditions, localised dust generation could be visible from travellers along Mona Vale Road. Receivers located close to ancillary facilities (such as at the Waratah Road sites) may be impacted by dust generation and air pollution impacts, particularly if the construction ancillary sites were used for stockpiling.

The requirement to remove and replace the existing road surface along Mona Vale Road, could result in an increase in dust generation and / or an increase in odour generation.

Mitigation measures identified in the project REF would limit dust generation and air pollution impacts.

5.9.3 Safeguards and management measures

The safeguards and management measures identified in Table 5-20 are those provided in the Submissions Report. No additional safeguards and management measures are required for air quality as a result of the proposed modification.

Table 5-20 Air quality safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
AQ-1 Dust and emissions	An Air Quality Management plan (AQMP) would be prepared as part of the CEMP. The plan would include but not be limited to: • a map identifying locations of sensitive receivers Identification of potential risks / impacts due to the work / activities as dust generation activities • management measures to minimise risk including a progressive stabilisation plan • a process for monitoring dust on site and weather conditions • a process for altering management measures as required.	Construction contractor	Pre-construction
AQ-2 Dust and emissions	The management measures within the AQMP would include but not limited to the following: • vehicles transporting waste or other materials that have a potential to produce odours or dust are to be covered during transportation. • dust will be suppressed on stockpiles and unsealed or exposed areas using methods such as water trucks, temporary stabilisation methods, soil binders or other appropriate practices. • disturbed areas will be minimised in extent and rehabilitated progressively. • speed limits will be imposed on unsealed surfaces. • stockpiles will be located as far away from residences and other sensitive receivers. • work (including the spraying of paint and other materials) will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely. • plant, vehicles and equipment will be maintained in good condition and in accordance with manufacturer's specifications. • plant and machinery will be turned off when not in use. • no burning of any timbers or other combustible materials will occur on site. • visual monitoring of air quality will be undertaken to verify the effectiveness of controls and enable early intervention • work activities will be reprogrammed if the management measures are not adequately	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	restricting dust generation.		

5.10 Socio economic

5.10.1 Existing environment

The socio-economic impacts of the project were assessed in Section 6.11 of the project REF.

Ingleside Draft Land Use and Infrastructure Strategy

The draft Ingleside Land Use and Infrastructure Strategy has recently been released which, when implemented would change the socio-economic characteristics of the project area and its surrounds.

The structure plan would deliver 3,400 dwellings adjacent to the determined project area. The plan considers environmental constraints and hazards including ecology, bushfire risk and infrastructure servicing. The area to the south of Mona Vale Road is likely to be developed first, due to its proximity to existing infrastructure. The area to the north of Mona Vale Road is likely to be developed later when essential infrastructure has been constructed.

The draft strategy identifies that the upgrade of Mona Vale Road would provide improved access (including public transport) and enhance opportunities for urban development. The draft strategy also identifies that the development of the Ingleside precinct will be co-ordinated with the upgrade of the Mona Vale Road East upgrade, estimated for completion in 2021.

The proposed modification has been developed with consideration of the draft strategy and in consultation with the Department of Planning and Environment.

5.10.2 Potential impact

The proposed modification would change the property acquisitions required to construct the determined project and may result in an amenity impact to existing social infrastructure.

During operation the proposed modification may have a socio-economic impact relating to amenity and travel behaviour.

Construction

Property impact and access

The modified proposal includes construction boundary changes for the project, and a number of changes to the acquisition of properties. There are no changes to any access for properties. Table 2-3 details the changes in acquisition from those identified in the project REF.

The property acquisitions for the proposed modification comprise:

- four properties identified for part acquisition in the REF which no longer require acquisition, comprising two government owned and two privately owned properties
- 12 new properties that would be affected by acquisition which were not previously identified, comprising six government owned and six privately owned properties
- 35 properties affected overall by acquisition, including:
  - 21 government owned properties with a total acquisition impact of about 1.53 hectares
  - 14 privately owned properties with a total acquisition impact of about 1.37 hectares
- 33 part-property acquisitions of which 13 are privately owned
- two whole-property acquisitions of which one is a private property

- a total acquisition area of about 2.9 hectares, being about 0.79 hectares less than was previously identified under the REF.

All property valuations and acquisitions would be carried out in accordance with the Roads and Maritime Services Land Acquisition Information Guide and the *Land Acquisition (Just Terms Compensation) Act 1991*.

Social infrastructure

The project REF identified that the function centre of the Mona Vale General Cemetery, located on Fazzolari Avenue would not be impacted by the proposal. The proposed modification would include establishment of a construction ancillary site at 1-7 Walana Crescent. This site would support access by light vehicles (not trucks) via Samuel Street and Fazzolari Avenue. There would be no direct impact on the function centre or the cemetery due to the use of this access. However, during construction, there would be a minor increase in vehicle traffic past the cemetery and the function centre which could result in an increase in traffic noise levels and would increase traffic numbers in the vicinity of the cemetery and function centre entry. This impact would be short term and intermittent through the construction period.

Operation

Amenity

Changes to amenity as a result of the proposed modification have been discussed in noise and urban design impacts (Section 5.7 and Section 5.8 of this addendum REF). These mostly relate to the construction of a noise barrier, which would result in a positive amenity impact, with the retention of existing mature trees to provide an immediate screen for the barrier from residences.

Travel behaviour

The proposed modification would no longer provide a shared use path along Lane Cove Road. However, a three metre wide shared use path would be constructed on the northern side of Mona Vale Road connecting Lane Cove Road East to Samuel Street. Cyclists would also still be able to still use Lane Cove Road, however no off-road facilities would be provided.

5.10.3 Safeguards and management measures

The safeguards and management measures identified in Table 5-21 are those provided in the Submissions Report. No additional safeguards and management measures are required for socio economic issues as a result of the proposed modification.

Table 5-21 Socio-economic safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
SE-1 Property acquisition	All property valuations and acquisitions will be carried out in accordance with the Roads and Maritime Services Land Acquisition Information Guide (Roads and Maritime Services, 2014b) and the Land Acquisition (Just Terms Compensation) Act 1991.	Roads and Maritime	Detailed design
SE-2 Property acquisition	A complaint handling procedure and register will be included in the Contractor's Environmental Management Plan.	Roads and Maritime	Detailed design
SE-3 Construction related disruption	Affected people will be notified of all aspects of the determined project prior to commencement of construction. This will include notification of time and duration of the determined project provision of a contact name and number.	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
SE-4 Construction related disruption	Potentially affected residents and businesses will be notified of the progress of the work and advised in advance (eg by letterbox drop, meetings with individuals, etc.) of any anticipated changes in noise emissions prior to critical stages of the work, and to explain complaint procedures and response mechanisms.	Construction contractor	Construction
SE-5 Construction related disruption	Potentially affected residents and businesses will be notified of the progress of the work and advised in advance (eg by letterbox drop, meetings with individuals, etc.) of any anticipated changes in noise emissions prior to critical stages of the work, and to explain complaint procedures and response mechanisms.	Construction contractor	Construction
SE-6 Construction related disruption	Access to residences and business will be maintained during construction. Where temporary changes to access arrangements are necessary, the contractor will advise owners and tenants and consult with them in advance with regard to alternative access arrangements.	Construction contractor	Construction
SE-7 Relocation costs	Roads and Maritime will cover the costs of relocating specific items on the Pittwater RSL Club site, in consultation with club management.	Roads and Maritime	Construction

5.11 Hazards and risks

5.11.1 Existing environment

Potential hazards and risks were discussed in Section 6.12 of the project REF. this included discussions on vehicle crashes, stability of rock cuttings and bushfire zones. The proposed modification would only result in a change in the potential hazards and risks of the project in relation to the stability of rock cuttings.

It was identified that stability of rock cuttings is of concern in the hilly area on the western end of the project area. Periodic assessment and remediation work (such as engineering stabilisation methods) were identified as methods to reduce the risk.

5.11.2 Potential impacts

Rock falls from cuttings can result in a hazard during construction and operation of the proposal. In particular, rocks falling from cuttings onto the road could result in vehicle accidents. In acknowledgement of the potential issue of rock cutting stability and on receipt of further geotechnical investigations, the design of rock cuttings have been revised to further reduce the potential for rock fall.

Cuttings in the west of the project area on the north side of Mona Vale Road have been set back from the road to provide a rock fall zone between the base of the cutting and the travel lane. Should any rocks fall from the cuttings, this would reduce the risk of falling rocks interacting with travel lanes. However, this mitigation measure cannot entirely eliminate the risk and further management measures, as already contained in the project REF of periodic assessments and remediation work would still need to be carried out throughout the operational life of the constructed project.

No further impacts on hazards and risks from those identified in the project REF are anticipated.

5.11.3 Safeguards and management measures

The safeguards and management measures identified in Table 5-22 are those provided in the Submissions Report. No additional safeguards and management measures are required for hazards and risks as a result of the proposed modification.

Table 5-22 Hazards and risks safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
HR-1 Construction hazards and risks	Emergency response plans will be incorporated into the CEMP. This will include a bushfire risk and response plan.	Construction contractor	Construction
HR-2 Debris build up on road shoulder during operation	Roads and Maritime maintenance contractors will be required to maintain the road including the road shoulders.	Roads and Maritime	Operation
HR-3 Bushfire hazard during operation	Planning for Bush Fire Protection (NSW Rural Fire Service, 2006) will be considered in finalising the landscape plan for the proposal.	Roads and Maritime	Detailed design

5.12 Other impacts

5.12.1 Existing environment and potential impacts

Environmental factor	Existing environment	Potential impacts
Aboriginal heritage	The existing environment with regards to Aboriginal heritage is described in the project REF.	No changes to the potential impacts described in the project REF are predicted as a result of the modified proposal.
Climate change and greenhouse gases	The existing environment with regards to climate change and greenhouse gases is described in the project REF.	No changes to the potential impacts described in the project REF are predicted as a result of the modified proposal.
Waste management and resource use	The existing environment with regards to waste management and resource use is described in the project REF.	The earth work balance for the modified proposal will remain broadly consistent with that described in the project REF. Additional waste asphalt material is likely to be generated as a result of the modified proposal. The project REF estimated a milled asphalt volume of about 23,700 cubic metres would be generated. The modification increases the estimated milled asphalt volume to about 45,000 cubic metres. It is likely that the majority of this material would be suitable for reuse or recycling.
Cumulative impacts	The existing environment with regards to cumulative impacts is described in the project REF.	No changes to the potential cumulative impacts described in the project REF are predicted as a result of the modified proposal.

5.12.2 Safeguards and management measures

The safeguards and management measures identified in Table 5-22 are those provided in the Submissions Report. No additional safeguards and management measures are required for hazards and risks as a result of the proposed modification.

Table 5-23 Other safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
AH-1	Fencing and signage will be used to establish exclusion areas around nearby Aboriginal sites.	Construction contractor	Pre-construction
AH-2	During site inductions and toolbox talks, all site staff will be made aware of the location of known Aboriginal sites and associated responsibilities under the *National Parks and Wildlife Act 1974*.	Construction contractor	Construction
AH-3	Potential impacts of construction vibration on nearby Aboriginal sites will be investigated prior to the commencement of construction. Construction methods would be selected and safeguards would be prescribed. Monitoring would occur where necessary.	Construction contractor	Pre-construction and construction
AH-4	The Standard Management Procedure: Unexpected Archaeological Finds Procedure (Roads and Maritime Services, 2012) will be followed in the event of uncovering a potential Aboriginal heritage item.	Construction contractor Roads and Maritime	Construction
GG-1	The use of alternative fuels and power sources for construction plant and equipment will be investigated and implemented, where appropriate.	Construction contractor	Construction
GG-2	The energy efficiency and related carbon emissions will be considered in the selection of vehicle and plant equipment.	Construction contractor	Construction
GG-3	Materials will be delivered as full loads and local suppliers would be used where possible to reduce construction transport emissions	Construction contractor	Construction
GG-4	Equipment will be properly maintained to ensure they are operating efficiently.	Construction contractor	Construction
WR-1	The following resource management hierarchy principles will be followed: • avoid unnecessary resource consumption as a priority. • avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery). Disposal will be undertaken as a last resort (in accordance with the Waste Avoidance and Resource Recovery Act 2001).	Construction contractor	Construction
WR-2	A Resource and Waste Management Plan (RWMP) would be prepared, which will include the following (as a minimum): • the type, classification and volume of all materials to be generated and used on site including identification of recyclable and non- recyclable	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	waste in accordance with the EPA's Waste Classification Guides 2014 • quantity and classification of excavated material generated as a result of the determined project (Refer to Roads and Maritime's Waste Management Fact sheets 1-6, 2012) • interface strategies for cut and fill on site to ensure re-use where possible • strategies to 'avoid', 'reduce', 'reuse' and 'recycle' materials • classification and disposal strategies for each type of material • destinations for each resource / waste type either for on-site reuse or recycling, offsite reuse or recycling, or disposal at a licensed waste facility • details of how material would be stored and treated on-site • identification of available recycling facilities on and off site • identification of suitable methods and routes to transport waste • procedures and disposal arrangements for unsuitable excavated material or contaminated material • site clean-up for each construction stage.		
WR-3	Housekeeping at construction sites will be addressed regularly. This will include collection and sorting of recycling, general waste and green waste. Waste will be disposed regularly at a licensed waste facility or recycling where available.	Construction contractor	Construction
WR-4	Prepare and implement a design resource plan. As a minimum, the plan is to include the following information: • outline the quantities and type of material that will be produced by the project. • outline the quantities and type of material that can be used during the detailed design. • steps taken during detailed design to minimise the generation of materials such as excavated material. • how the design maximises the on-site re-use of any excavated materials. • how the design maximises the opportunities for the use of recycled materials (ensuring that the materials are fit for purpose and meet engineering performance standards). Detail the quantities and type that cannot be re-used on site	Detailed design contractor	Detailed design
WR-5	Procurement will endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.	Construction contractor	Construction
WR-6	Excavated material will be reused onsite for fill where feasible to reduce demand on resources.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
CU-1	The CEMP will be revised to consider potential cumulative impacts from surrounding development activities as they become known.	Construction contractor	Pre-construction and construction

6 Environmental management

6.1 Environmental management plans

As part of the project REF, a number of safeguards and management measures were detailed to manage the identified environmental issues from the proposal. These safeguards and management measures formed a framework for managing the identified potential impacts with reference to environmental management plans and relevant Roads and Maritime QA specifications. The environmental safeguards and management measures for the determined project are presented in Table 5-1 of the Submissions Report.

As a result of the proposed modification, most of the safeguards and management measures identified in the Submissions Report would still be required. However, some additional measures would also be required and a small number of measures required in the Submissions Report would change. The consolidated set of safeguards and management measures for the proposed modification are provided in Table 6-1.

The Project Environmental Management Plan (PEMP) and the Contractors Environmental Management Plan (CEMP) would be prepared to describe safeguards and management measures identified in both the REF and this addendum REF. These plans would provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The plans would be prepared prior to construction of the proposed modification and must be reviewed and certified by the Roads and Maritime Environmental Officer, Greater Sydney Project Office, before commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

6.2 Summary of safeguards and management measures

Environmental safeguards and management measures for the Mona Vale Road East upgrade project are summarised in Table 6-1. Additional safeguards and management measures identified in this addendum REF are included in bold and italicised font. The safeguards and management measures will be incorporated into the detailed design phase of the proposed modification and the CEMP. They would be implemented during construction and operation of the proposed modification, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment.

Table 6-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing

1	General	• All environmental safeguards must be incorporated within the following:
		  • Project Environmental Management Plan
		  • Detailed design
		  • Contract specifications for the proposal
		  • Contractor's Environmental Management Plan
			Roads and Maritime Project manager	Pre-construction

2	General	• A risk assessment must be carried out on the proposal in accordance with the Roads and Maritime Project Pack and PMS risk assessment procedures to determine an audit and inspection program for the work. The recommendations of the risk assessment are to be implemented. • A review of the risk assessment must be undertaken after the initial audit or inspection to evaluate is the level of risk chosen for the project is appropriate. • Any work resulting from the proposal and as covered by the REF may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.	Project manager and regional environmental staff	Pre-construction After first audit
3	General	• The environmental contract specification G36 – Environmental Protection (Management System) must be forwarded to the Roads and Maritime Senior Environmental Officer for review at least 10 working days prior to the tender stage. • A contractual hold point must be maintained until the CEMP is reviewed by the Roads and Maritime Senior Environmental Officer.	Roads and Maritime Project manager	Pre-construction
4	General	The Roads and Maritime Project Manager must notify the Roads and Maritime Environment Officer (Sydney Region) at least five days prior to work commencing.	Roads and Maritime Project manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
5	General	All businesses and residences likely to be affected by the proposed work must be notified at least five working days prior to the commencement of the proposed activities.	Project manager	Pre-construction
6	General	Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.	Construction contractor	Pre-construction and during construction as required.
B1	Impact to biodiversity	A Biodiversity Management Plan (BMP) is to be prepared and included in within the CEMP. The BMP is to include (but not be limited to) the following: • a site walk with appropriate site personnel including RMS representatives to confirm clearing boundaries and sensitive location prior to commencement of work • identification (marking) of the clearing boundary and identification (marking) of habitat features to be protected. Eg. use of flagging tape • a map which clearly shows vegetation clearing boundaries and sensitive areas/no go zones • incorporation of management measures identified as a result of the pre-clearing survey report, completed by an ecologist, (G40, section 2.4) and nomination of actions to respond to the recommendations made. This should include details of the measures to be implemented to protect clearing limits and no go areas • a detailed clearing process in accordance with *RMS Biodiversity Guidelines (2011)* including requirements of Guide 1, 2, 4 & 9. • identify toolbox talks where biodiversity would be included such as vegetation clearing or work adjacent to sensitive locations • identify control/mitigation measures to prevent impacts on sensitive locations or no go zones • a stop work procedure in the event of identification of unidentified species, habitats or populations • *a nest box strategy would be developed by an ecologist, in consultation with Roads and Maritime Biodiversity specialists, to compensate for the loss of tree hollows. The number and size of tree hollows to be removed would be assessed prior to clearing, with at least 70% of nest boxes installed at least one month before clearing commences, in accordance with Roads and Maritime Services Biodiversity Guidelines*	Construction contractor	Pre-construction
B2	Removal or modification of	On-site measures; clearing limits will be enforced and cordoned off and signposted	Construction contractor	Pre-clearing and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
	native vegetation			
B3	Removal of individuals of threatened species	Pre-clearing surveys for fauna will be undertaken in accordance with the Roads and Maritime Services Biodiversity Guidelines	Construction contractor	Pre-clearing
B4	Predation by domestic and/or feral animals	Fauna connectivity structures and approaches to be designed to provide protective features and/or refuges to reduce potential for predation of fauna using the structure	Design contractor	Detailed design
B5	Loss of native vegetation and fauna habitats adjacent to approved construction zone	Clearing limits will be accurately demarcated with assistance from a surveyor, and exclusion zones will be implemented beyond the demarcated area. A suitably qualified ecologist or experienced wildlife carer will be engaged to survey and handle any fauna.	Construction contractor	Pre-clearing and construction
B6	Increase in fauna fatality and injury	Pre-clearance procedures would be implemented during construction to prevent direct fauna mortality. Fauna fencing would be installed at strategic locations to reduce potential for fauna to access the road during operation, thereby reducing potential for roadkill. Should any termite mounds be encountered and require removal within the construction footprint, they would be checked for the presence of Rosenberg's goanna eggs prior to clearing. Salvage of any eggs would be undertaken by appropriately experienced personnel.	Construction contractor	Detailed design and construction.
B7	Loss of habitat connectivity	A connectivity plan would be prepared by a suitably qualified and experienced ecologist during the detailed design. The plan would be developed in consultation with RMS Biodiversity specialists and would include: • identification of connectivity objectives for the determined project • identification of target species for all measures Consideration of the specific connectivity requirements for each identified target species *An ecologist would be engaged on site to supervise the construction of temporary and permanent fauna mitigation measures, including, but not limited to, connectivity structures and fauna fencing.*	Construction contractor	Detailed design and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		Post-construction monitoring in an adaptive management framework would be undertaken to determine the effectiveness of connectivity structures, which would be actively managed to facilitate movement of fauna species, particularly the Eastern Pygmy-possum. A monitoring plan would be developed by a suitably qualified and experienced ecologist in consultation with Roads and Maritime Services' biodiversity specialists and Northern Beaches Council, and would include: • identification of monitoring objectives • identification of species to be monitored and suitable monitoring methods to be implemented to detect usage of connectivity structures by those species a monitoring program for a period of up to five years following opening of the project		
B8	Hydrological changes	Robust erosion and sediment control measures would be incorporated into the CEMP to prevent adverse impacts to Angus' onion orchid and threatened frog habitat from changes to run off	Construction contractor	Pre-clearing and construction
B9	Weed invasion	Declared noxious weeds are to be managed according to the requirements under the *Noxious Weeds Act 1993* and Guide 6 (Weed Management) of the RTA Biodiversity Guidelines 2011	Construction contractor	Construction
B10	Spread of disease	Construction plant will be required to be certified clean, and a hygiene protocol will be implemented to ensure the proposed modification does not result in increased risk of spreading the chytrid fungus	Construction contractor	Construction
B11	Potential impact on threatened fauna	Targeted fauna fencing at strategic locations along the road to funnel toward ~~*underpasses*~~ *connectivity structures*. Fauna connectivity structures will consist of ~~*one underpass and one rope bridge to enable animals to move between Ingleside Chase Reserve and Katandra Bushland Sanctuary*~~ *one dedicated fauna underpass and one fauna overpass.* In areas that could contain the eastern pygmy-possum (woodland and sandstone heath) vegetation clearing would be undertaken as far as possible outside of the main breeding season (December – July). All vegetation clearing would be supervised by an appropriately qualified and experienced ecologist to ensure potential for harm to eastern pygmy-possums and other fauna is minimised.	Construction contractor	Pre-construction and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		Vegetation would be planted ~~*connectivity to the underpass at Narrabeen Creek on the approaches and the deck of the overpass to*~~ encourage crossing and reduce risk of predation. *Species planted would be in accordance with the Mona Vale Road Upgrade East 100% Detail Landscape Design Report and Landscape Plans.* Vegetation would be subject to ongoing maintenance by appropriately qualified bush regeneration contractors, to ensure it establishes to provide suitable habitat for the eastern pygmy-possum and other threatened fauna. Installation and monitoring of nest boxes for up to five years, in accordance with a monitoring plan to be prepared in consultation with Roads and Maritime Services biodiversity specialists and Northern Beaches Council.		
SO-1	Erosion and sedimentation	A Soil and Water Management Plan (SWMP) would be prepared as part of the CEMP prior to the commencement of construction. The SWMP would address the following: • the Roads and Maritime Code of Practice for Water Management. • the Blue Book - Managing Urban Stormwater: Soils and Construction, Volume 1 and 2. • Roads and Maritime Technical Guidelines – Temporary Stormwater Drainage for Road Construction. The SWMP would include: • stockpile management plan • identification of catchment and sub-catchment area high risk areas and sensitive areas. • sizing of each of the above areas and catchment. • the likely run-off from each road sub-catchment. • direction of flow of on-site and off-site water. • separation of on-site and off-site water. • stockpiles will be designed, established, operated and decommissioned in accordance with the RTA Stockpile Site Management Guideline. • 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 any sediment basins and sumps). • progressive site-specific Erosion and Sedimentation Control Plans (ESCPs). The ESCP is to be updated at least fortnightly. • a process to routinely monitor the Bureau of Meteorology weather forecasts. • preparation of a wet weather (rain event) plan which includes a process for monitoring potential wet weather and identification of controls to be implemented in the event of	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		wet weather. • an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.		
SO-2	Erosion and sedimentation	A Principal Erosion and Sedimentation Control Plan would be prepared during detailed design. The Principal Erosion and Sedimentation Control Plan would include: • identify site catchment and sub-catchments, high risk areas and sensitive areas • sizing of each of the above areas and catchments • proposed staging plans for the project to ensure appropriate erosion and sediment controls measures are possible • the likely volume of run-off from each catchment and subcatchment in accordance with the Managing Urban Stormwater: Soils and Construction, Volume 1 and 2 (Landcom, 2004). • direction of water flow, both off and on site • diversion of off-site water around or through the site or details of separation of on-site and off-site water • the direction of runoff and drainage points during each stage of construction. • the locations and sizing of sediment basins / sumps as well as associated drainage to direct site water to the basin or sumps. • a mapped plan identifying the above at all major construction stages • a review process by a soil conservationist and a process for updating the report to address any recommendations.	Roads and Maritime	Detailed design
SO-3	Erosion and sedimentation	A soil conservationist from the Roads and Maritime Erosion, Sedimentation and Soil Conservation Consultancy Services Register is to be engaged to review the proposed erosion and sedimentation controls and conduct routine inspections of the construction work.	Construction contractor	Construction
SO-4	Erosion and sedimentation	All stockpiles would be designed, established, operated and decommissioned in accordance with the Roads and Maritime Stockpile Management Procedures.	Construction contractor	Construction
SO-5	Erosion and sedimentation	Controls would be implemented at construction zone exit points to minimise the tracking of soil and particulates onto road surface surfaces.	Construction contractor	Construction
SO-6	Disturbance of contaminated land	Prior to the start of construction, additional environmental investigations will be undertaken to assess the current status of the TPH impacted soils at the truck incident site and assess	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		if recent lane adjustment work have affected this location. Additional testing would be carried out to assess if contaminated soils have been removed or if migration of impacted areas has occurred, impacting previously unaffected areas.		

SO-7	*Disturbance of contaminated land*	A Contaminated Land Management Plan will be prepared for the determined project and will include procedures to:
		• identify potentially contaminated land through monitoring:
		  • for discolouration or staining of soil
		  • bare soil patches both on-site, and off-site adjacent to site boundary
		  • visible signs of plant stress
		  • presence of drums or other waste material
		  • presence of stockpiles or fill material
		  • odours
		• undertake further contamination assessment where necessary and advise on the need for remediation or other action. This includes further investigation of the truck roll over area and any unexpected contamination finds.
		• divert surface runoff away from the contaminated land.
		• manage any surface runoff contaminated by exposure to the contaminated land.
		• assess any requirement to notify relevant Authorities, including the EPA.
		• manage any remediation and subsequent validation, including any certification required.
		• review and update the plan.
		The Contaminated Land Management Plan will contain the following:
		• contaminated land legislation and guidelines including any relevant licences and approvals to be obtained.
		• identification of locations of known or potential contamination and preparation of a map showing these locations.
		• identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated land within the construction footprint.
		• contamination management measures including waste classification and reuse procedures and unexpected finds procedures
		• *measures to identify and appropriately manage any residual asbestos containing material located on the 1-7 Walana Crescent ancillary site.*
			Construction contractor	Pre-construction

SO-8	Disturbance of asbestos containing materials	A classification system will be used to control the excavation, stockpiling and disposal of all potentially contaminated materials. Soils should be classified (where possible) in-situ prior to excavation or when stockpiled during excavation, depending on available time and room	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		for stockpile areas. The same procedures will be followed for any unexpected finds.		
SO-9	Disturbance of Asbestos containing materials	An Asbestos Management Plan will be prepared and implemented. Work in any area where asbestos is newly identified will cease immediately. An investigation will be then be undertaken and report prepared to determine the nature, extent and degree of the asbestos contamination. The level of reporting will be in accordance with Guidelines for Consultants Reporting on Contaminated Sites (Office of Environment and Heritage, 2011), any relevant WorkCover Guidelines and will include the proposed methodology for the remediation of the asbestos contamination. Remediation activities will not take place until receipt of the investigation report by occupational health professional. Work will only recommence upon receipt of a validation report from a suitably qualified contamination specialist that the remediation activities have been undertaken in accordance with the investigation report and remediation methodology.	Construction contractor	Pre-construction
WQ-1	Concrete and other materials from construction vehicles entering waterways	Vehicle wash down will occur in a location that is bunded.	Construction contractor	Construction
WQ-2	Spills during construction	All fuels, chemicals and liquids will be stored in an impervious bunded area and at least 50 metres from creek and other waterways and slopes with a gradient above 10 per cent.	Construction contractor	Construction
WQ-3	Spills during construction	Refuelling of plant and equipment will occur either off-site or on relatively level ground at least 50 metres from waterways, drainage lines and sensitive areas. The refuelling machinery will have spill management equipment and there will be a person attending during the refuelling process.	Construction contractor	Construction
WQ-4	Spills during construction	A Spill Management Plan would be prepared for the proposal. If a spill or incident occurs, the Roads and Maritime *Environmental Incident Classification and Management Procedure* (Roads and Maritime Services, 2014) will be followed and the Roads and Maritime Contract	Construction contractor Roads and Maritime	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		Manager notified immediately.		
WQ-5	Pollution from the road during operation	Consideration will be given to planting the level spreaders with suitable species to provide nominal water quality treatment prior to discharge.	Design contractor	Detailed design
WQ-6	Spills during operation	Opportunities to improve the management of spills (such as spill basins and/or suitable block / bund locations) for the truck arrester bed and Ponderosa Parade will be investigated during detailed design.	Design contractor Roads and Maritime	Detailed design
TT-1	*Construction traffic impacts*	A traffic management plan (TMP) will be prepared prior to construction and would be included in the CEMP. The TMP would: • identify the traffic management requirements during construction • describe the general approach and procedures to be adopted when producing specific traffic control plans • determine temporary speed restrictions to ensure safe driving environment around work zones • provide for access to local roads and properties, including the use of temporary turnaround bays where appropriate • include methods for implementing the traffic management plan and minimising road user delays • provide for appropriate warning and advisory signposting • consider other developments in the wider area that may also be under construction, to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • *develop plans for the access to ancillary facilities and site compounds including any speed restrictions for vehicles around the sites* • *ancillary facilities and site compounds would not be accessed by heavy vehicles using local roads.*	Construction contractor	Pre-Construction
TT-2	Construction traffic impacts	Consultation on construction activities will occur with emergency service authorities including NSW Rural Fire Service and NSW Fire and Rescue.	Roads and Maritime	Detailed design
TT-3	Construction traffic impacts	A detailed construction staging plan will be developed to maintain existing peak flow capacity.	Construction contractor	Pre - Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
TT-4	Access to bus services	Access to appropriate bus stop locations will be maintained during construction in consultation with bus operators. Any changes will be appropriately communicated to bus users.	Construction contractor	Construction
TT-5	*Ancillary facilities and site compound access*	*Surrounding residents and sensitive receivers are to be notified of access provisions for ancillary facilities and site compounds, times of operation and the expected duration of the construction period.*	*Construction contractor*	*Pre-Construction*
HH-1	Impacts on known heritage values	Potential impacts of construction vibration on the Mona Vale Cemetery and the gateposts will be investigated prior to the commencement of construction. Construction methods will be selected and safeguards will be prescribed (including vibration monitoring) to ensure there are no impacts on these items.	Construction contractor	Construction
HH-2	Impacts on known heritage values	The location and heritage significance of the Mona Vale Road Cemetery and gateposts and the potential presence of the well at Lot 26 DP 654262 will be discussed with staff during site inductions and tool box talks.	Construction contractor	Construction
HH-3	Unexpected finds	The Standard Management Procedure: Unexpected Archaeological Finds Procedure (Roads and Maritime Services, 2012) is to be followed in the event of uncovering a potential historic heritage item not considered by REF.	Construction contractor	Construction
NV1	*Construction noise*	Construction noise would be managed by a detailed Construction Noise and Vibration Management Plan (CNVMP) prepared prior to commencement of work. The management plan would consider the following as a minimum: • identify nearby residences and other sensitive land uses • develop noise management levels consistent with the ICNG • assess the potential impact from the proposed construction methods • *assess the potential impact from any proposed construction ancillary facilities or site compound specific to the construction activities, timeframes and durations that are proposed* • where management levels are exceeded examine feasible and reasonable noise mitigation • develop reactive and proactive strategies for dealing with any noise complaints • identify a site contact person to follow up complaints	Construction contractor	Pre-Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• noise monitoring.		
NV2	Operational noise	During the detailed design stage of the proposal, further investigations of all feasible and reasonable mitigation options would be undertaken for affected receivers in accordance with the Road Noise Policy (DECCW 2011) and Roads and Maritime's Environmental Noise Management Manual Practice Note 4 (RTA 2001).	Roads and Maritime	Detailed Design
NV3	Construction noise	Consider construction compound layout so that primary noise sources are at a maximum distance from sensitive receivers (primarily residential receivers), with solid structures (sheds and containers) placed between sensitive receivers and noise sources (and as close to the noise sources as is practical)	Construction contractor	Pre-Construction
NV4	Construction noise	Vehicle delivery times will be scheduled where feasible to the recommended construction hours to minimise noise impacts from heavy vehicle movements and deliveries.	Construction	Construction contractor
NV5	Construction noise	Any out of hours work would comply with G36 community notification requirements and the mitigation measures specified within the Roads and Maritime's Noise Management Manual – Practice Note VII.	Construction contractor	Construction
NV6	Construction noise	The environmental induction program will include specific noise and vibration issues awareness training including, but not limited to, the following: • avoiding use of radios during work outside normal hours • avoiding shouting and slamming doors • where practical, operating machines at low speed or power and switching off when not being used rather than left idling for prolonged periods • minimising reversing • avoiding dropping materials from height and avoiding metal to metal contact on material.	Construction contractor	Construction
NV7	Construction noise	Building condition surveys will be undertaken for buildings within identified in the CNVMP. A copy of the report will be sent to the landholder.	Construction contractor	Pre-Construction
NV8	Construction noise	In the case that exceedances are detected for noise and vibration monitoring, the situation would be reviewed in order to identify means to minimise impacts to residents and the	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		appropriate changes made and the CNVMP updated accordingly.		
NV9	Operational noise	A post-construction noise monitoring program (including simultaneous traffic counts) will be undertaken in accordance with the Roads and Maritime's Environmental Noise Management Manual within 6 to 12 months of opening once traffic flows have stabilised in order to verify the noise assessment. This will include monitoring of maximum noise events (L_{max}).	Roads and Maritime	Post-Construction
NV10	*Operational noise*	*For all at-house treatment locations, a site inspection should be undertaken to assess the type and extent of at-house treatment. The inspection should consider the building construction and other aspects identified in the Roads and Maritime Noise Management Guidelines.*	*Roads and Maritime*	*Pre-Construction*
VA-1	Landscape character and visual impacts	Detailed design of the determined project will incorporate the design vision, objectives and mitigation measures outlined in the Landscape Character, Visual Impact Assessment and Urban Design Report where feasible. This will include consideration of screen plantings, feature plantings and design refinements for each of assessed viewpoints.	Roads and Maritime Design Contractor	Detailed design
VA-2	Landscape Character and visual impacts	An urban design contractor from the Roads and Maritime panel will be engaged for the detailed design phase to ensure adequate consideration of urban design principles and objectives, and to ensure appropriate mitigation of identified impacts.	Roads and Maritime Design contractor	Detailed design
VA-3	Landscape character and visual impacts	The footprint for construction work will be kept to a minimum to ensure existing stands of vegetation remain intact wherever possible and to screen adjoining sensitive receivers.	Construction contractor	Construction
VA-4	Construction related visual impacts	The work site will be maintained so as to minimise contractor construction related visual clutter.	Construction	Construction
AQ-1	Dust and emissions	An Air Quality Management plan (AQMP) would be prepared as part of the CEMP. The plan would include but not be limited to: • a map identifying locations of sensitive receivers Identification of potential risks / impacts due to the work / activities as dust generation activities • management measures to minimise risk including a progressive stabilisation plan	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• a process for monitoring dust on site and weather conditions • a process for altering management measures as required.		
AQ-2	Dust and emissions	The management measures within the AQMP would include but not limited to the following: • vehicles transporting waste or other materials that have a potential to produce odours or dust are to be covered during transportation • dust will be suppressed on stockpiles and unsealed or exposed areas using methods such as water trucks, temporary stabilisation methods, soil binders or other appropriate practices • disturbed areas will be minimised in extent and rehabilitated progressively • speed limits will be imposed on unsealed surfaces • stockpiles will be located as far away from residences and other sensitive receivers as possible • work (including the spraying of paint and other materials) will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely • plant, vehicles and equipment will be maintained in good condition and in accordance with manufacturer's specifications • plant and machinery will be turned off when not in use • no burning of any timbers or other combustible materials will occur onsite • visual monitoring of air quality will be undertaken to verify the effectiveness of controls and enable early intervention • work activities will be reprogrammed if the management measures are not adequately restricting dust generation.	Construction contractor	Pre-construction
SE-1	Property acquisition	All property valuations and acquisitions will be carried out in accordance with the Roads and Maritime Services Land Acquisition Information Guide (Roads and Maritime Services, 2014b) and the *Land Acquisition (Just Terms Compensation) Act 1991*.	Roads and Maritime	Detailed design
SE-2	Property acquisition	A complaint handling procedure and register will be included in the CEMP.	Roads and Maritime	Detailed design
SE-3	Construction related disruption	Affected people will be notified of all aspects of the project prior to commencement of construction. This will include notification of time and duration of the project provision of a contact name and number.	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SE-4	Construction related disruption	Potentially affected residents and businesses will be notified of the progress of the work and advised in advance (eg by letterbox drop, meetings with individuals, etc) of any anticipated changes in noise emissions prior to critical stages of the work, and to explain complaint procedures and response mechanisms.	Construction contractor	Construction
SE-5	Construction related disruption	Potentially affected residents and businesses will be notified of the progress of the work and advised in advance (eg by letterbox drop, meetings with individuals, etc) of any anticipated changes in noise emissions prior to critical stages of the work, and to explain complaint procedures and response mechanisms.	Construction contractor	Construction
SE-6	Construction related disruption	Access to residences and business will be maintained during construction. Where temporary changes to access arrangements are necessary, the contractor will advise owners and tenants and consult with them in advance with regard to alternative access arrangements.	Construction contractor	Construction
SE-7	Relocation costs	Roads and Maritime will cover the costs of relocating specific items on the Pittwater RSL Club site, in consultation with club management.	Roads and Maritime	Construction
HR-1	Construction hazards and risks	Emergency response plans will be incorporated into the CEMP. This will include a bushfire risk and response plan.	Construction contractor	Construction
HR-2	Debris build up on road shoulder during operation	Roads and Maritime maintenance contractors will be required to maintain the road including the road shoulders.	Roads and Maritime	Operation
HR-3	Bushfire hazard during operation	Planning for Bush Fire Protection (NSW Rural Fire Service, 2006) will be considered in finalising the landscape plan for the proposal.	Roads and Maritime	Detailed design
AH-1	Damage to known Aboriginal sites	Fencing and signage will be used to establish exclusion areas around nearby Aboriginal sites.	Construction contractor	Pre-construction
AH-2	Damage to known Aboriginal sites	During site inductions and toolbox talks, all site staff will be made aware of the location of known Aboriginal sites and associated responsibilities under the *National Parks and Wildlife Act 1974*.	Construction contractor	Construction
AH-3	Damage to known Aboriginal sites	Potential impacts of construction vibration on nearby Aboriginal sites will be investigated prior to the commencement of construction. Construction methods would be selected and	Construction contractor	Pre-construction and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		safeguards would be prescribed. Monitoring would occur where necessary.		
AH-4	Unexpected impacts on Aboriginal heritage	The Standard Management Procedure: Unexpected Archaeological Finds Procedure (Roads and Maritime Services, 2012) will be followed in the event of uncovering a potential Aboriginal heritage item.	Construction contractor Roads and Maritime	Construction
GG-1	Greenhouse gas emissions	The use of alternative fuels and power sources for construction plant and equipment will be investigated and implemented, where appropriate.	Construction contractor	Construction
GG-2	Greenhouse gas emissions	The energy efficiency and related carbon emissions will be considered in the selection of vehicle and plant equipment.	Construction contractor	Construction
GG-3	Greenhouse gas emissions	Materials will be delivered as full loads and local suppliers would be used where possible to reduce construction transport emissions	Construction contractor	Construction
GG-4	Greenhouse gas emissions	Equipment will be properly maintained to ensure they are operating efficiently.	Construction contractor	Construction
WR-1	Construction waste management	The following resource management hierarchy principles will be followed: • avoid unnecessary resource consumption as a priority • avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery). Disposal will be undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*).	Construction contractor	Construction
WR-2	Construction waste management	A Resource and Waste Management Plan (RWMP) would be prepared, which will include the following (as a minimum): • the type, classification and volume of all materials to be generated and used onsite including identification of recyclable and non-recyclable waste in accordance with the EPA's Waste Classification Guides 2014 • quantity and classification of excavated material generated as a result of the determined project (Refer to Roads and Maritime's Waste Management Fact sheets 1-6, 2012)	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		• interface strategies for cut and fill on site to ensure re-use where possible • strategies to 'avoid', 'reduce', 'reuse' and 'recycle' materials • classification and disposal strategies for each type of material • destinations for each resource/ waste type either for onsite reuse or recycling, offsite reuse or recycling, or disposal at a licensed waste facility • details of how material would be stored and treated onsite • identification of available recycling facilities on and offsite • identification of suitable methods and routes to transport waste • procedures and disposal arrangements for unsuitable excavated material or contaminated material • site clean-up for each construction stage.		
WR-3	Construction waste management	Housekeeping at construction sites will be addressed regularly. This will include collection and sorting of recycling, general waste and green waste. Waste will be disposed regularly at a licensed waste facility or recycling where available.	Construction contractor	Construction
WR-4	Design waste management	Prepare and implement a design resource plan. As a minimum, the plan is to include the following information: • outline the quantities and type of material that will be produced by the project • outline the quantities and type of material that can be used during the detailed design • steps taken during detailed design to minimise the generation of materials such as excavated material • how the design maximises the on-site re-use of any excavated materials • how the design maximises the opportunities for the use of recycled materials (ensuring that the materials are fit for purpose and meet engineering performance standards) • detail the quantities and type that cannot be re-used onsite.	Detailed design contractor	Detailed design
WR-5	Construction waste management	Procurement will endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.	Construction contractor	Construction
WR-6	Construction waste management	Excavated material will be reused onsite for fill where feasible to reduce demand on resources.	Construction contractor	Construction
CU-1	Cumulative impacts	The CEMP will be revised to consider potential cumulative impacts from surrounding development activities as they become known.	Construction contractor	Pre-construction and construction

6.3 Licensing and approvals

All relevant licenses, permits, notifications and approvals needed for the Mona Vale Road East Upgrade project and when they need to be obtained are listed in Table 6-2. Additional or changed licenses and approval requirements identified in this Addendum REF are indicated by underlined and/or struck out font.

Table 6-2: Summary of licensing and approval required

Instrument	Requirement	Timing
Section 138 of the *Roads Act 1993*	An applicable road occupancy licence would be required. A road occupancy licence allows the proponent to use a specified road space at approved times, provided certain conditions are met. The licence applies to the occupation of the "road space" only and does not imply permission or approval for the actual (physical) work being undertaken.	An applicable road occupancy licence would need to be in place prior to the commencement of construction.
Section 91F of the *Water Management Act 2000*	If groundwater extraction is required, an aquifer interference approval would be required for the work under Section 91F of the *Water Management Act 2000*.	Prior to construction commencement or during construction as required.
Section 48 of the *Protection of the Environment Operations Act 1997*	The determined project would be a scheduled activity under the *Protection of the Environment Operations Act 1997*. An environment protection licence (EPL) would be required under Section 48 of this act to authorise the carrying out of scheduled development.	An EPL would be required prior to undertaking the scheduled work. Each period of 12 months (commencing from the issue of a licence) is a licence fee period for a licence. The administrative fee for any licence fee period of a licence must be paid not later than 60 days after the beginning of that licence fee period.

7 Conclusion

7.1 Conclusion

This Addendum 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 TSC Act, wilderness areas, critical habitat, impact on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impact to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposed modification have been avoided or reduced during the design development and options assessment. The proposed modification as described in the Addendum REF best meets the project objectives, but would still result in some impact on biodiversity, noise, traffic and transport, visual and urban amenity, air quality, socio-economic, soils, hydrology and flooding. Safeguards and management measures as detailed in this Addendum REF would ameliorate or minimise this expected impact. The proposed modification would also deliver improved road safety, additional capacity, reduced congestion and would provide for future population and employment growth. On balance the project is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposed modification would be unlikely to cause a significant impact on the environment. Therefore it is unnecessary for an environmental impact statement to be prepared and approval is not required from the Minister for Planning under Part 5.1 of the EP&A Act. A SIS is not required. The project is subject to assessment under Part 5 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposed modification is not likely to have a significant impact on matters of national environmental significance within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.

8 Certification

This addendum review of environmental factors provides a true and fair review of the proposed modification 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 proposed modification.

Peter Fawcett
Principal, Environment Leader
Aurecon Australasia Pty Ltd
Date: December 2017

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

Con Lambous
Environment Manager]
Roads and Maritime Services Greater Sydney Project Office
Date:

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10 Terms and acronyms used in this Addendum REF

Term / Acronym	Description
AHD	Australian height datum
AQMP	Air quality management plan
ARI	Average Recurrence Interval
ASS	Acid sulphate soils
BMP	Biodiversity management plan
CEMP	Construction environmental management plan
DP&I	Department of Planning and Infrastructure (now the Department of Planning and Environment)
EEC	Endangered Ecological Community
EIA	Environmental impact assessment
EPA	Environment Protection Authority
EPL	Environment Protection Licence
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW).
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESCP	Erosion and sediment control plan
ESD	Ecologically sustainable development
FM Act	*Fisheries Management Act 1994* (NSW)
Heritage Act	*Heritage Act 1977* (NSW)
ISEPP	Infrastructure State Environmental planning Policy
LEP	Local Environment Plan
LGA	Local government area
NES	National Environmental Significance
NCA	Noise catchment area
NW Act	*Noxious Weeds Act 1993* (NSW)
NPW Act	*National Parks and Wildlife Act*
REF	Review of environmental factors
Roads and Maritime	NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy
TfNSW	Transport for New South Wales

Term / Acronym	Description
TPH	Total petroleum hydrocarbons
TSC Act	*Threatened Species Conservation Act 1999* (NSW)

Appendix A

Consideration of clause 228(2) factors and matters of national environmental significance

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* (1995/1996) guideline and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the Addendum REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impact of the proposed modification on the natural and built environment.

Factor	Impact
Any environmental impact on a community? No significant changes in impact to that were assessed in the REF.	Short-term negative Long-term positive
Any transformation of a locality? No significant changes in impact to that were assessed in the REF.	Short-term negative Long-term positive
Any environmental impact on the ecosystems of the locality? No significant changes in impact to that were assessed in the REF.	Minor long term negative impact
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? No significant changes in impact to that were assessed in the REF.	Long-term moderate negative
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? No significant changes in impacts that were assessed in the REF.	Neutral
Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act* 1974)? No significant changes in impacts that were assessed in the REF.	Long-term minor negative
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? No significant changes in impacts that were assessed in the REF.	Long-term minor negative
Any long-term effects on the environment? No significant changes in impacts that were assessed in the REF.	Long-term positive
Any degradation of the quality of the environment? No significant changes in impacts that were assessed in the REF.	Long-term minor negative Short-term negative
Any risk to the safety of the environment? No significant changes in impacts that were assessed in the REF.	Short-term negative Long-term positive
Any reduction in the range of beneficial uses of the environment? No significant changes in impacts that were assessed in the REF.	Long-term negative
Any pollution of the environment? No significant changes in impacts that were assessed in the REF.	Short-term negative
Any environmental problems associated with the disposal of waste? No significant changes in impacts that were assessed in the REF.	Short-term negative
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? No significant changes in impacts that were assessed in the REF.	Short-term negative

Factor	Impact
Any cumulative environmental effect with other existing or likely future activities? No significant changes in impacts that were assessed in the REF.	Short-term negative Long-term positive
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? No significant changes in impacts that were assessed in the REF.	Neutral

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the following matters of national environmental significance and impact on Commonwealth land are required to be considered to assist in determining whether the proposed modification should be referred to the Australian Government Department of the Environment.

Under the EPBC Act strategic assessment approval, a referral is not required for proposed road actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. Impacts on these matters are assessed in detail as part of this Addendum REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
a. Any impact on a World Heritage property? The proposed modification would not impact on any World Heritage properties.	Nil
b. Any impact on a National Heritage place? The proposed modification would not impact on a National Heritage place.	Nil
c. Any impact on a wetland of international importance? The proposed modification would not impact on any wetlands of international importance.	Nil
d. Any impact on a listed threatened species or communities? The proposed modification would result in removal of Angus Onion Orchid individuals and an increased area of clearing of potential habitat for the Giant Burrowing Frog relative to the clearing assessed in the REF. that	Yes
e. Any impact on listed migratory species? The proposed modification impact would be similar to that described in the REF.	Nil
f. Any impact on a Commonwealth marine area? The project would not impact on a Commonwealth marine area.	Nil
g. Does the project involve a nuclear action (including uranium mining)? The project would not involve a nuclear action or uranium mining.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The project would not impact on Commonwealth land.	Nil

Appendix B

EPBC Act Significant Impact Criteria Assessments

EPBC Act Significant Impact Criteria Assessments

The following section considers the significance of the impacts associated with the proposed modification by applying the factors outlined in the Matters of National Environmental Significance Significant Impact Guidelines 1.1 (DoE 2013). This has been conducted for all EPBC listed species considered to have a moderate or higher likelihood of occurrence within the study area and that would be subject to an additional impact than that assessed in the REF. These include:

- Angus' Onion Orchid *Microtis angusii*
- Giant Burrowing Frog *Heleioporus australiacus*

Angus' Onion Orchid *Microtis angusii*

Angus' Onion Orchid is listed as an endangered species under the TSC Act and EPBC Act. It is a terrestrial orchid that grows to about 25-60 centimetres tall and flowers between May and October. The species tends to occupy highly disturbed road side and track edges, usually associated with an adjacent sealed surface and diffuse drainage. The species appears to have an association with exotic perennial grasses.

Angus' Onion Orchid has been recorded within the study area and two populations would be impacted by the Mona Vale Road upgrade. These two populations combined contain a total of seven stems. This assessment assumes that both locations of Angus' Onion Orchid recorded within the study area would be removed for construction Mona Vale Road East. There is currently some taxonomic uncertainty regarding relationship of Angus' Onion Orchid to a number of other onion orchids, particularly *Microtis parvifolia*. Surveys undertaken to inform the Ingleside planning determined project (EcoLogical 2016) have substantially increased the understanding of the current Angus' Onion Orchid population across the Mona Vale, Ingleside and Terry Hills area and elsewhere in NSW and Australia, with a threefold increase in its population estimate as a result.

The species is subject to ongoing genetic investigation to resolve taxonomic uncertainty and confirm its conservation status, but at the time of writing, this species is listed as endangered under both the EPBC Act and TSC Act.

Would the action lead to a long-term decrease in the size of a population of the species?

There are two recorded locations of the species within the study area. Records collected by EcoLogical, historical records from OEH, surveys by Niche and Ecosure and historical counts by the Royal Botanic Gardens confirm that there is a viable population of Angus' Onion Orchid within the locality.

The proposed modification would result in the removal of seven stems of Angus' Onion Orchid. This represents 0.16 per cent of the 4276 estimated remaining population within the local area (EcoLogical 2016). The species is known to occur within disturbed roadside vegetation, particularly lateritic and sandstone derived soils that once contained Duffy's Forest EEC and sandstone ridgetop woodland. Mona Vale Road East is at the eastern extent of the preferred habitat for this species as the lateritic soils are typically higher in the landscape, to the west, in the suburbs of Ingleside and Terry Hills.

The Angus' Onion Orchid has been updated as a species that can withstand a loss of 150 individuals within a sub-region in the Threatened Species Profile Database. The loss of 7 stems predicted for the proposed modification is well below this threshold. Based on the small proportion of known Angus' Onion Orchid population that would be impacted by the project and the association of the species with disturbed habitats, the project is unlikely to lead to a long-term decrease in the size of the population.

Would the action reduce the area of occupancy of the species?

Within the study area, Angus' Onion Orchid was found by Niche and Ecosure at two locations in the north west of the study area. At one location one stem was recorded and at the other location six stems were recorded. Detailed survey for the species across the locality (EcoLogical Australia 2016) has identified that the distribution of the species is centered on Ingleside. At a fine scale, the proposed modification would reduce the area of occupancy of the species. At a broader scale, the distribution of the species across the locality would not be affected by the project as records occur to the east of the populations within the study area.

Would the action fragment an existing population into two or more populations?

The project would entirely remove the two populations that were recorded within the study area. Preferred habitat for the species is comprised of disturbed roadside vegetation, predominantly on lateritic soils. Such habitats are more common to the west of the study area, between Ingleside and Terry Hills. There are no populations of Angus' Onion Orchid that span the existing road that would be further fragmented or isolated by the proposal.

Would the action adversely affect habitat critical to the survival of a species?

To date, no areas of critical habitat have been listed for Angus' Onion Orchid under the EPBC Act

Would the action disrupt the breeding cycle of a population?

Angus' Onion Orchid exists largely as a subterranean tuber for most of the year, producing leaves and then flowering in late winter and spring. They reproduce vegetatively by the formation of daughter tubers from the main tuber, and the species is predominantly self-pollinated. Flowering is thought to be related to rainfall. The two populations of Angus' Onion Orchid within the study area would be removed by the proposed modification therefore no breeding cycle for these individuals would remain. No individuals occur elsewhere within the study area therefore indirect impact of the proposed modification, including road surface drainage and cross drainage, are likely to disrupt the breeding cycle of the species. The operational impacts of the proposed modification are likely to be minimal.

Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Potential habitat for Angus' Onion Orchid within the study area includes disturbed environments which are influenced by diffuse drainage, clearing and weed infestation. There is approximately 3.28 hectares of appropriate habitat within the study area. Only two occurrences of the species have been recorded within the study area. Since the species thrives in disturbed environments, the proposed modification is unlikely to result in a net decrease in the extent of habitat available for this species. Therefore the project is unlikely to modify, destroy, remove, isolate or decrease the availability, or quality, of habitat to the extent that the species is likely to decline.

Would the action result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat?

Angus' Onion Orchid is found in areas that are disturbed and influenced by exotic species recruitment. This is demonstrated by the 'type' population (at Kimbriki Road) being colonised by *Acacia saligna* and Coolatai Grass *Hyparrhenia hirta*. Nevertheless, any increase in invasive species could adversely impact this species. Mitigation measures would be implemented to minimise the potential for introduction or expansion of invasive species, including control of noxious weeds.

Would the action introduce disease that may cause the species to decline?

Currently, Angus' Onion Orchid is not known to be affected by any diseases which may cause it to decline.

Would the action interfere with the recovery of the species?

A National Recovery Plan for Angus' Onion Orchid has been prepared by the Department of Environment, Climate Change and Water (DECCW, 2010). The overall aim of this plan is to prevent the extinction of Angus' Onion Orchid through maintaining self-sustaining populations in the wild long term. The recover objectives and actions detailed include:

1. Coordinate recovery of the species
2. Protect the known population by minimising the loss and fragmentation of habitat using conservation planning mechanisms
3. Conduct research into genetics, ecology and biology of the species in order to provide information to assist future management decisions
4. Develop and implement a survey program that would provide information on the extent and viability of *Microtis angusii* populations and habitat
5. Identify and minimise threats to *Microtis angusii*
6. Raise awareness of the species with public authorities, and provide public authorities with information to assist conservation
7. Implement a monitoring program for *Microtis angusii*
8. Consider the need for ex situ conservation

A total of seven stems from two populations would be removed as a result of the proposed modification and measures would be in place to avoid indirect impacts. In addition, Roads and Maritime is currently providing funding to carry out objectives 3, 4, 7 and 8. Therefore the proposed road upgrade is unlikely to significantly interfere with the objectives of the recovery plan.

Conclusion
Based on the above assessment, the proposed modification would not result in a significant impact to Angus' Onion Orchid populations.

Genetic studies by the Royal Botanic Gardens and Domain Trust (2015) indicate that the *Microtis angusii* present within and close to the study area may be a genetic variant of the more geographically widespread *Microtis uniflora*. EcoLogical have subsequently provided further information and formally applied for the delisting of the threatened status of *Microtis angusii* in October 2016. It is likely that once impact occurs on this population, the listing status of this species is unlikely to be the same as at the time of authoring this assessment of significance.

Giant Burrowing Frog *Heleioporus australiacus*

The Giant Burrowing Frog is listed as vulnerable under the TSC Act and EPBC Act. It is a large, burrowing frog which occupies a range of habitats and soil types, except for clay-based soils. They are not known to inhabit cleared environments. The species breeds and calls from spring to autumn, with the peak breeding period in NSW being from November to February.
About 9.32 hectares of potential foraging habitat in the form of sandstone heath and woodland areas would be removed as part of the proposed modification. A very large amount of similar habitat occurs within 10km of the study area.

Would the action lead to a long-term decrease in the size of an important population of a species?

The proposed modification would result in the clearing of 9.32 hectares of potential foraging habitat. Changes to drainage features along the road alignment have potential to impact downstream breeding areas. The key area of potential habitat for Giant Burrowing Frog within the study area is the Narrabeen Creek riparian corridor, downstream of Mona Vale Road. The proposed modification would replace the existing Narrabeen Creek drainage culvert. The hydrology and hydraulics assessment for the project proposed modification determined that the quality downstream of Mona Vale Road would not be adversely affected by the project in operation, while there would be increased flows ranging between 0.2 to 1.8 cubic metres per second. Level spreaders would be installed at drainage outlets, to dissipate the flow of run off from drainage channels and thereby reduce flow velocity and the potential for scouring of waterway banks as flow is discharged. Consideration will be given to planting the level spreaders with suitable species to provide nominal water quality treatment prior to discharge. During construction, erosion and sediment control measures would be in place to minimise any potential indirect impact to downstream creeks. Following completion of construction, rehabilitation of exposed areas where vegetation and/or impervious surfaces have been removed would be undertaken to ensure there would be minimal risk of soil erosion and transport of eroded sediments and weeds to receiving waterways.

No known or potential breeding habitat would be removed. It is therefore unlikely that the proposed road upgrade would lead to a long-term decrease in the size of a population of this species.

Would the action reduce the area of occupancy of an important population of the species?

Giant Burrowing Frogs breed in vegetated waterbodies, dispersing up to 300 metres into surrounding wet and dry sclerophyll forest during non-breeding periods. Giant Burrowing Frog has been recorded approximately 670 metres downstream of the study area on Narrabeen Creek. Approximately 9.32 hectares of potential foraging habitat for the Giant Burrowing Frog would be removed as part of the proposed modification. This would be mostly removed from areas adjacent to the existing road and is therefore of lower quality. It is unlikely that Giant Burrowing Frog would breed in the sections of Narrabeen Creek that would be impacted during construction. This is due to the more degraded nature and lack of permanent water upstream of the existing road and the high flow velocities immediately downstream. The vegetation that may be removed for the proposed modification is only considered to provide marginal potential habitat for Giant Burrowing Frog since it is relatively edge affected and typically greater than 300 metres from potential breeding habitat.

In operation, the Giant Burrowing Frog habitat downstream of the study area would not be impacted by the project such that the area of occupancy of the resident population is reduced. While the proposed modification would result in some increased flows, level spreaders would be installed at drainage outlets, to dissipate the flow of run off from drainage channels and thereby reduce flow velocity and the potential for scouring of waterway banks as flow is discharged. Consideration will be given to planting the level spreaders with suitable species to provide nominal water quality treatment prior to discharge. During construction, erosion and sediment control measures would be in place to minimise any potential indirect impacts to downstream creeks.

Following completion of construction, rehabilitation of exposed areas where vegetation and/or impervious surfaces have been removed, would be undertaken to ensure there would be minimal risk of soil erosion and transport of eroded sediments and weeds to receiving waterways.

Would the action fragment an existing important population into two or more populations?

The proposed modification would remove marginal potential non-breeding habitat, which is largely confined to areas around the existing road. It is likely that the existing road already acts as a barrier to the species therefore the proposed additional clearing would be unlikely to further significantly fragment the population. Despite none of the fauna connectivity measures specifically targeting this species, it is possible that they could use the bridge or underpass structures to disperse. Therefore any existing population is unlikely to be further fragmented by the proposed modification.

Would the action adversely affect habitat critical to the survival of a species?

To date, no critical habitat has been listed for the Giant Burrowing Frog under the EPBC Act.

Would the action disrupt the breeding cycle of an important population?

Giant Burrowing Frogs breed in vegetated pools during spring, and disperse up to 300 metres into surrounding sclerophyll forest outside of this period. Potential breeding habitat for the Giant Burrowing Frog occurs downstream of the study area, in the Narrabeen Creek riparian corridor. The proposed modification would not remove any potential breeding habitat. Measures will be implemented to protect local waterways, including Narrabeen Creek, during construction and operation of the proposed modification. Level spreaders would be installed at drainage outlets, to dissipate the flow of run off from drainage channels and thereby reduce flow velocity and the potential for scouring of waterway banks as flow is discharged. Consideration will be given to planting the level spreaders with suitable species to provide nominal water quality treatment prior to discharge. During construction, erosion and sediment control measures would be in place to minimise any potential indirect impacts to downstream creeks. Following completion of construction, rehabilitation of exposed areas where vegetation and/or impervious surfaces have been removed, would be undertaken to ensure there would be minimal risk of soil erosion and transport of eroded sediments and weeds to receiving waterways.

The proposed modification would therefore be unlikely to adversely impact on breeding habitat for the Giant Burrowing Frog (refer to Section 5.4.2 of the Addendum REF). The vegetation that would be removed by the proposed modification is considered to provide only marginal potential habitat for the species as it is more edge affected and typically greater than 300 metres from breeding habitat. It is therefore unlikely that the proposed modification would disrupt the breeding cycle of and important population of the Giant Burrowing Frog.

Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The proposed modification would result in the loss of some marginal potential foraging habitat, which is largely confined to areas around the existing road. It is unlikely that the sections of Narrabeen Creek within the construction boundary would provide potential breeding habitat for the species based on current edge affects and downstream flow velocities. The species was recorded within the Narrabeen Creek riparian corridor, downstream of Mona Vale Road. The construction phase impacts to this habitat would be managed through the implementation of suitable mitigation measures. In operation, the proposed Narrabeen Creek drainage structure has been designed to maintain the existing quality and quantity of downstream flows. Despite the proposed modification resulting in additional clearing of non-breeding habitat for the species, it is unlikely that the proposed modification would impact habitat in a way that causes the species to decline.

Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Invasive and aggressive native species that pose a threat to Giant Burrowing Frogs include:

- Mosquito Fish *Gambusia holbrookii* (low risk)
- European Red Fox V*ulpes vulpes* (low risk)

It is considered unlikely that the proposed modification would introduce or increase the impacts associated with a resident Mosquito Fish or European Red Fox population.

Would the action introduce disease that may cause the species to decline?

The proposed modification may result in a small increase in the risk of exposure to chytrid fungus, due to the presence of construction plant and personnel upstream of potential breeding habitat for the species. However it is generally recognised that most populations of frogs have already been exposed to this disease and it is therefore unlikely to be a significant new threat. Nevertheless, construction plant will be required to be certified clean, and a hygiene protocol will be implemented to ensure there is no increased risk of spreading the disease, and therefore it is unlikely that the proposed road upgrade would introduce disease to the extent that it may cause the species to decline.

Would the action interfere substantially with the recovery of the species?

To date no national recovery plan has been developed for the Giant Burrowing Frog. However, it has been identified on the OEH's landscape management stream under the Saving our Species Program. Key actions identified to assist in the recovery of this species relevant to the determined project include:

- promote water sensitive design which minimises run-off containing phosphates or other pollutants into stormwater
- protect key areas of habitat within state forests from disturbance
- promote the retention of vegetation and minimise disturbances within 300 metres of streams in areas of known populations
- establish monitoring programs for chytrid fungus to improve understanding of the spread of the disease throughout the species' range
- conduct targeted fine scale survey, habitat mapping and breeding monitoring to inform assessments and to prioritise areas for management and protection.

The project is not likely to interfere with these actions.

Conclusion

Based on the above assessment, the removal of 9.32 hectares of potential foraging habitat would not result in a significant impact to Giant Burrowing Frog populations.

Appendix C

TSC Act Assessments of Significance

TSC Act Assessments of Significance

The following section considers the significance of the impact associated with the project by applying the factors outlined in Section 5A of the EP&A Act. This has been conducted for all TSC listed species considered to have a moderate or higher likelihood of occurrence within the study area, including:

- Angus's Onion Orchid *Microtis angusii*
- Giant Burrowing Frog *Heleioporus australiacus*
- Red-crowned Toadlet *Pseudophryne australis*
- Rosenberg's Goanna *Varanus rosenbergi*
- Cockatoos
    - Gang-gang cockatoo *Callocephalon fimbriatum*
    - Glossy black-cockatoo *Calyptorhynchus lathami*
- Little Lorikeet *Glossopsitta pusilla*
- Forest owls
    - Barking owl *Ninox connivens*
    - Powerful owl *Ninox strenua*
- Eastern Pygmy Possum *Cercartetus nanus*
- Hollow dependant microbats
    - Eastern freetail-bat *Mormopterus norfolkensis*
    - Little bentwing-bat *Miniopterus australis*
    - Greater broad-nosed bat *Scoteanax rueppellii*
    - Southern myotis *Myotis macropus*
    - Large-eared pied bat *Chalinolobus dwyeri*

Angus' Onion Orchid *Microtis angusii*

Angus' Onion Orchid has been recorded within the study area and two populations would be impacted by the Mona Vale Road upgrade. These two populations combined contain a total of seven stems. This assessment assumes that both locations of Angus' Onion Orchid recorded within the study area, would be removed for the proposed modification.

There is currently some taxonomic uncertainty regarding relationship of Angus' Onion Orchid to a number of other onion orchids, particularly *Microtis parvifolia*. Surveys undertaken to inform the Ingleside planning project (EcoLogical 2016) have substantially increased the understanding of the current Angus' Onion Orchid population across the Mona Vale, Ingleside and Terry Hills area and elsewhere in NSW and Australia, with a threefold increase in its population estimate as a result.

The species is subject to ongoing genetic investigation to resolve taxonomic uncertainty and confirm its conservation status, but at the time of writing, this species is listed as endangered under both the EPBC Act and TSC Act.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

There are two recorded locations of the species within the study area. Recent records collected by EcoLogical, historical records from OEH, surveys by Niche and Ecosure and historical counts by the Royal Botanic Gardens confirm that there is a viable population of Angus' Onion Orchid within the locality.

Since the preparation of the REF, substantial additional survey for this has been undertaken across the locality. It was previously considered that the two populations within the study area were at the far eastern extent of the species' range, however this has subsequently been disproven (EcoLogical 2016).

The proposed modification would result in the removal of seven stems of Angus' Onion Orchid. This represents a very small percentage of the 4276 estimated remaining population within the local area (EcoLogical 2016). Indirect impacts would be managed through control measures identified in the REF. The species is known to occur within disturbed roadside vegetation, particularly lateritic soils that once contained Duffy's Forest EEC. Mona Vale Road East is at the eastern extent of the preferred habitat for this species as the lateritic soils are typically higher in the landscape, to the west, in the suburbs of Ingleside and Terry Hills. The sandstone ridgetop woodland vegetation within the study area also provides potential habitat for this species.

The Angus' Onion Orchid has been updated as a species that can withstand a loss of 150 individuals within a sub-region in the Threatened Species Profile Database. The loss of 7 stems predicted for the proposed modification is well below this threshold. Based on the small proportion of known Angus' Onion Orchid population that would be impacted by the determined project and the association of the species with disturbed habitats, proposed modification it is unlikely that a viable local population would be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

Potential habitat for Angus' Onion Orchid within the study area includes disturbed environments which are influenced by diffuse drainage, clearing and weed infestation. There is approximately 3.28 hectares of appropriate habitat within the study area. Two populations of Angus' Onion Orchid have been recorded within the study area. These are within the construction boundary and would be removed by the proposed modification.

Populations of the species across the locality are concentrated in the disturbed edges of native vegetation. As such, the species has a scattered distribution, typically separated by roads, residences and other land disturbances. The proposed modification would not exacerbate the existing level of habitat fragmentation and isolation for this species.

It was previously considered that the habitat within the study area was highly important to the survival of the species. Considerable additional survey has been recently undertaken (EcoLogical Australia 2016) which has increased the understanding of the population size and distribution of the species within the locality. The populations that would be removed are not at the limit of the distribution for the species and represent a small proportion of the remaining population of 4276 (EcoLogical 2016). The habitat that would be removed as a part of the proposed modification is therefore considered to be of moderate importance to the survival of the species.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

To date, no critical habitat has been declared for Angus' Onion Orchid.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A National Recovery Plan for Angus' Onion Orchid has been prepared by the Department of Environment, Climate Change and Water (DECCW, 2010). The overall aim of this plan is to prevent the extinction of Angus' Onion Orchid through maintaining self-sustaining populations in the wild long term. The recover objectives and actions detailed include:

1. Coordinate recovery of the species
2. Protect the known population by minimising the loss and fragmentation of habitat using conservation planning mechanisms
3. Conduct research into genetics, ecology and biology of the species in order to provide information to assist future management decisions
4. Develop and implement a survey program that would provide information on the extent and viability of *Microtis angusii* populations and habitat
5. Identify and minimise threats to *Microtis angusii*
6. Raise awareness of the species with public authorities, and provide public authorities with information to assist conservation
7. Implement a monitoring program for *Microtis angusii*
8. Consider the need for ex situ conservation

Two populations containing seven stems would be removed as a result of the proposed modification. In addition, Roads and Maritime has provided funding to carry out objectives 3, 4, 7 and 8. Therefore the proposed road upgrade is unlikely to interfere with the objectives of the recovery plan.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are 38 KTPs listed on the TSC Act. Of these, the following are likely to be exacerbated by the proposed modification, relevant to Angus' Onion Orchid:

- alteration to the natural flow regimes of rivers, streams, floodplains and wetlands
- clearing of native vegetation
- invasion and establishment of exotic vines and scramblers
- invasion, establishment and spread of Lantana
- invasion of native plant communities by exotic perennial grasses.

Other than (2), it is anticipated that the KTPs would be mitigated through implementation of appropriate safeguards. Increased disturbance and edge effects have the potential to create Recruitment opportunities for this species which is known to thrive on disturbed bushland edges.

Conclusion

Two populations containing seven stems would be removed as a result of the proposed modification. In addition, approximately 3.48 hectares of potential habitat would be permanently removed. It is considered unlikely that this would result in a significant impact on Angus' Onion Orchid as:

- the proposed modification is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species would be placed at risk of extinction
- the species is associated with the disturbed margins of Duffys Forest EEC and Sandstone Ridgetop Woodland the latter being widely available throughout the locality
- the removal of seven stems represents a small proportion of the estimated remaining population
- the project is unlikely to isolate or fragment known or potential habitat for the species.
- the project is unlikely to significantly interfere with any recovery objectives

- he determined project is unlikely to substantially affect the KTPs as they relate to the survival of Angus' Onion Orchid.

Therefore the project would not have a significant impact on the endangered Angus' Onion Orchid and an SIS is not required.

Giant Burrowing Frog *Heleioporus australiacus*

The Giant Burrowing Frog is listed as vulnerable under the TSC Act and EPBC Act. It is a large, burrowing frog which occupies a range of habitats and soil types, except for clay-based soils. They are not known to inhabit cleared environments. The species breeds and calls from spring to autumn, with the peak breeding period in NSW being from November to February.
About 9.32 hectares of potential foraging habitat in the form of sandstone heath and woodland areas would be removed as part of the proposed modification. A large amount of similar habitat occurs within 10km of the study area.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Giant Burrowing Frog has previously been recorded within the locality and was recorded as a part of the REF investigation (Ecosure 2015). Potential breeding habitat for the species occurs within the Narrabeen Creek riparian corridor, downstream of the study area, and potential non-breeding habitat occurs within the study area. The proposed modification would not remove any potential breeding habitat but would remove 9.32 hectares of potential foraging habitat. Erosion and sediment control measures would be in place during construction to minimise any potential indirect impacts to downstream creeks which could provide breeding habitat for the species. Level spreaders would also be installed at drainage outlets, to dissipate the flow of run off from drainage channels and thereby reduce flow velocity and the potential for scouring of waterway banks as flow is discharged. Consideration will be given to planting the level spreaders with suitable species to provide nominal water quality treatment prior to discharge.

Following completion of construction, rehabilitation of exposed areas where vegetation and/or impervious surfaces have been removed, would be undertaken to ensure there would be minimal risk of soil erosion and transport of eroded sediments and weeds to receiving waterways. It is therefore unlikely that the proposed modification would disrupt the life cycle of and important population of the Giant Burrowing Frog.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The study area is likely to contain only marginal potential foraging habitat given that adults do not tend to move further than 300m from breeding sites. Potential breeding sites within the locality are all more than 300m from the proposed road upgrade alignment. The existing road is likely to represent a barrier to movement and the proposed modification would not significantly increase this. Fauna underpass and drainage culverts which would be installed as part of the proposed modification would be available for this species and so the proposed modification is unlikely to significantly increase isolation or fragmentation of any existing populations.

The habitat to be removed is primarily along the road side and therefore edge effected and of lower value than that of the remaining habitat surrounding the project area. Therefore the habitat to be removed is not considered important for the long term survival of the local population.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

To date, no critical habitat has been declared for the Giant Burrowing Frog.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

To date no state recovery plan has been developed for the Giant Burrowing Frog. However, it has been identified on the OEH's landscape management stream under the Saving our Species Program. Key actions identified to assist in the recovery of this species relevant to the project include:

- promote water sensitive design which minimises run-off containing phosphates or other pollutants into stormwater
- protect key areas of habitat within state forests from disturbance
- promote the retention of vegetation and minimise disturbances within 300m of streams in areas of known populations
- establish monitoring programs for chytrid fungus to improve understanding of the spread of the disease throughout the species' range
- conduct targeted fine scale survey, habitat mapping and breeding monitoring to inform assessments and to prioritise areas for management and protection.

The project is not likely to significantly interfere with these actions.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are 38 KTPs listed on the TSC Act. Of these, the following are likely to be exacerbated by the proposed modification and are relevant to the Giant Burrowing Frog:

- alteration to the natural flow regimes of rivers, streams, floodplains and wetlands
- clearing of native vegetation
- anthropogenic climate change.

The minor increase in these KTPs is unlikely to significantly impact populations of Giant Burrowing Frog. In particular appropriate control measures would be in place to manage flow regimes.

Conclusion

Approximately 9.32 hectares of potential foraging habitat would be removed as a result of the proposed modification. This represents a small amount of disturbed habitat that is unlikely to be used regularly by this species. No breeding habitat would be directly affected and indirect risks would be managed through appropriate management measures. Further fragmentation is unlikely and fauna fencing and crossing structure would reduce risks of traffic related impacts. It is therefore unlikely that the project would cause a significant impact to the Giant Burrowing Frog and so an SIS is not required.

Red-crowned Toadlet *Pseudophryne australis*

The Red-crowned Toadlet is listed as vulnerable under the TSC Act. It has a restricted distribution and is associated with Sydney Sandstone Ridgetop Woodland complex, which occurs throughout the study area. The species has been previously recorded multiple times within the locality, but not within the impact footprint of the proposed modification. Red-crowned Toadlet is reliant on ephemeral water flow and is sensitive to changes in pH and pollution.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

About 9.32 hectares of potential habitat for the Red-crowned Toadlet would be removed as a result of the proposed modification. It is unlikely that this small amount of clearing would place the local population at risk of extinction. There is the chance that the project would result in some localised hydrology changes immediately adjacent to the road upgrade. Measures would be in place to minimise this. It is not expected that this would cause a significant impact on a local population, such that it would be put at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The proposed modification would result in the removal of up to 9.32 hectares of potential foraging habitat. The species has a small home range and is therefore unlikely that populations on either side of the road would interact. In addition the existing road alignment is likely to act as a barrier to movement already and the proposed upgrade would not significantly increase this. There is sufficient supply of similar suitable habitat which would be retained within the study area, and therefore the proposed modification is not expected to impact the long term survival of the species.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

To date, no critical habitat has been declared for the Red-crowned Toadlet.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

To date no recovery plan has been developed for the Red-crowned Toadlet. However, it has been identified on the OEH's landscape management stream under the Saving our Species Program. Key actions identified to assist in the recovery of this species relevant to the determined project include:

- promote water sensitive design which minimises run-off containing phosphates or other pollutants into stormwater
- raise awareness among local residents of the potential impacts of pollutants in stormwater and run-off
- raise awareness of the importance of bush rock to the species habitat
- conduct before and after monitoring of populations that are affected by planned or unplanned fires to better understand the species' fire response
- when maintaining fire trails, tracks and roads in the vicinity of these species, minimise damage to substrate by ensuring bulldozers have lifted blades when not in use, and avoid additional damage to ground layer vegetation and soil structure wherever possible.

The project is not likely to significantly interfere with these actions.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are 38 KTPs listed on the TSC Act. Of these, the following are likely to be exacerbated by the proposed modification and are relevant to the Red-crowned Toadlet:

- alteration to the natural flow regimes of rivers, streams, floodplains and wetlands
- clearing of native vegetation
- anthropogenic climate change
- bush rock removal.

The minor increase in these KTPs is unlikely to significantly impact populations of the Red-crowned Toadlet. In particular appropriate control measures would be in place to manage natural flow regimes and removal of bush rock.

Conclusion

Approximately 9.32 hectares of potential foraging habitat would be removed as a result of the proposed modification. This represents a small amount of disturbed habitat that is unlikely to be used regularly by this species. Indirect risks associated with changes in water quality would be managed through appropriate management measures. Further habitat fragmentation is unlikely. It is therefore unlikely that the project would cause a significant impact to the Red-crowned Toadlet and so an SIS is not required.

Rosenberg's Goanna *Varanus rosenbergi*

Rosenberg's Goanna is listed as vulnerable under the TSC Act. Within NSW, Rosenberg's Goanna occurs on Sydney sandstone communities including heath, open forest and woodland. They are generally associated with the presence of terrestrial termite mounds as these are essential breeding structures for this species. Individuals are highly mobile and require large tracts of habitat for foraging. It relies on terrestrial shelters in the form of hollow logs, rock crevices and burrows. Rosenberg's Goanna has been previously recorded multiple times within the study area. The study area contains habitat for this species in the form of woodland and heath communities, approximately 9.32 hectares of which would be removed as part of the proposed modification.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Evidence of this species breeding and foraging within the study area has been collected confirming that a viable population utilises the study area. Rosenberg's Goanna have large home ranges and it is likely that only a small number of the species utilise the study area and surrounds. It is unlikely that they would rely on the small area that is being removed by the proposed modification. The proposed modification would not require the removal of any identified terrestrial termite mounds that are relatively common in ridgetop and upper slope locations on sandy, shallow or skeletal soils. Should any termite mounds be identified in the construction footprint, they would be checked for the presence of eggs prior to clearing, and any eggs present would be salvaged by appropriately experienced personnel.

The project would involve the widening of an existing road corridor presenting a barrier to movement. The existing structure is likely to be affecting the lifecycle of the species, both by preventing animals from finding a mate and also by limiting the movement of genetic material between populations. Fauna fencing and connectivity measures would endeavour to mitigate the impacts of road widening and improve the existing level of connectivity across Mona Vale Road. Based on the required clearing of foraging and breeding habitat in the context of the broader locality, it is considered unlikely that the project would place a viable local population at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The proposed modification would result in the removal of up to 9.32 hectares of potential foraging habitat for Rosenberg's Goanna, however it is not anticipated that any terrestrial termite mounds that provide potential breeding habitat for the species would be removed. Similar habitat exists throughout the study area, including in the surrounding Garigal and Ku-ring-gai National Parks. The existing road alignment is already a barrier to Rosenberg's Goanna. The proposed modification would increase the width of this barrier, however the inclusion of a fauna underpass and overpass would provide a safer link to the habitat on each side of the road. Should any termite mounds be identified in the construction footprint, they would be checked for the presence of eggs prior to clearing, and any eggs present would be salvaged by appropriately experienced personnel. Therefore the proposed modification is not expected to impact the long term survival of this species.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

To date, no critical habitat has been declared for the Rosenberg's Goanna.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

To date no recovery plan has been developed for Rosenberg's Goanna. However, it has been identified on the OEH's landscape management stream under the Saving our Species Program. Key actions identified to assist in the recovery of this species relevant to the determined project include:

- in areas of key habitat, install warning signs to indicate species presence and significance, particularly to motorists and investigate underpass options where appropriate
- undertake investigations into taxonomic and genetic differences between various populations
- negotiate conservation agreements to protect known habitat
- initiate community education programs with a focus on important habitat elements such as termite mounds and fallen timber.

The proposed modification includes a fauna underpass and so is supporting the recovery actions. The project is unlikely to interfere with any of the other actions.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are 38 KTPs listed on the TSC Act. Of these, the following are likely to be exacerbated by the proposed modification and are relevant to the Rosenberg's Goanna:

- clearing of native vegetation
- removal of dead wood and dead trees.

The minor increase in these KTPs is unlikely to significantly impact populations of Rosenberg's Goanna. In particular appropriate control measures would be in place to manage removal of dead wood and dead trees. No termite mounds have been identified in the construction footprint, so it is not anticipated that any would be cleared. However, should any be identified, they would be

checked for the presence of eggs prior to clearing, and any eggs present would be salvaged by appropriately experienced personnel.

Conclusion

Approximately 9.32 hectares of potential foraging habitat would be removed as a result of the proposed modification. Terrestrial termite mounds would be retained and protected and a fauna underpass, overpass and fauna fencing would assist in protecting the species and facilitate movement. It is therefore unlikely that the action would cause a significant impact to Rosenberg's Goanna and so an SIS is not required.

Cockatoos – Gang-gang cockatoo (*Callocephalon fimbriatum)* and Glossy black-cockatoo (*Calyptorhynchus lathami)*

Gang-gang Cockatoo and Glossy Black-Cockatoo (henceforth referred to as threatened Cockatoos) are listed as Vulnerable under Schedule 3 of the TSC Act. These species have been considered together for this assessment based on the similar availability of foraging and roosting resources within the study area for both species.

Glossy Black-Cockatoos feed almost exclusively on *Allocasuarina sp* (she-oaks) and *Casuarina sp* trees. Glossy black cockatoos prefer sclerophyll woodlands dominated by she-oaks or forests with a middle stratum of she-oaks. This has been previously recorded multiple times within the study area, and was also recorded during detailed field surveys.

Gang-gang Cockatoos are more generalist and feed mainly on the seeds of eucalypts and acacias, but would also feed on other flowers, seeds and fruits, such as *Callistemon* and *Casuarina* species. Gang-gang cockatoos inhabit heavily timbered, eucalypt dominated forests and woodlands. This has been previously recorded within the study area but was not recorded during detailed field surveys.

Both species nest in large hollow-bearing eucalypt trees. Approximately 9.32 hectares of potential foraging habitat and 60 hollow bearing trees would be removed (although considerably less than 60 are suitable for cockatoo use). These trees do not generally contain hollows large enough to support nesting activities for these species.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Both threatened Cockatoo species have been previously recorded within the locality and have potential foraging resources within the study area. The proposed modification would require the removal of 9.32 hectares of potential foraging resources for these species, in addition to a number of hollow bearing trees. It is unlikely that either species would breed within the study area, since the breeding locations of Gang-gang Cockatoo are relatively well known and the study area does not contain a large number of suitably sized tree hollows. While it is likely that the study area contains potential foraging resources for a viable population of these species, it is unlikely that the proposed action would place it at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The project would involve the removal of 9.32 hectares of potential foraging habitat for threatened Cockatoos. Despite the study area containing vegetation communities that are associated with these species, it does not contain a high proportion of preferred feed tree species for Glossy-black Cockatoo. The study area does not contain important breeding habitat for the species. The proposed modification would increase the width of the existing road, however given the highly mobile nature of these species this would not present a significant impact. The locality contains a large amount of alternative potential foraging and breeding habitat for these species therefore the vegetation within the study are is considered to be of relatively low importance. Therefore the long term survival of these species would not be significantly impacted by the proposed modification.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

To date, no critical habitat has been declared for the threatened Cockatoos.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No formal recovery plans exist for either Cockatoo species. However, they are listed in the landscape species management stream under the Saving our Species program. The following activities to assist the species and that are relevant to the determined project have been identified by OEH:

- Retain large old trees (living and dead) which provide roosting habitat and important hollow resources
- Encourage retention of sheoak food species

Whilst the determined project is not consistent with these activities, the extent to which habitat would be removed is such that it is unlikely to significantly impact the threatened cockatoos.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

KTPs are listed in Schedule 3 of the TSC Act. Of these, the following are relevant to the determined project relating to woodland birds:

- Clearing of native vegetation
- Loss of hollow-bearing trees
- Removal of dead wood and dead trees
- Infection by *psittacine circoviral* (beak and feather) disease affecting endangered *psittacine* species and populations.

The determined project would involve some of these KTP's in the clearing of 9.32 hectares of native vegetation and removal of hollow bearing trees, however would not have a significant impact on any local populations of these species. The determined project is unlikely to exacerbate or bring into effect the other KTPs listed above

Conclusion

Approximately 9.32 hectares of potential foraging habitat would be removed as a result of the proposed modification as well as 60 hollow bearing trees (although considerably less are suitable for cockatoo use). Based on the above assessment it is unlikely that the action would cause a significant impact to the cocaktoos therefore an SIS is not required.

Little Lorikeet *Glossopsitta pusilla*

Little Lorikeet is listed as vulnerable under the TSC Act. The Little Lorikeet is distributed across much of NSW, however breeding does not occur in the vicinity of Sydney. The bird forages primarily in the canopy of open forest and woodland, feeding on nectar from *Eucalyptus, Corymbia, Angophora, Melaleuca* and other tree species with abundant flowers. They tend to roost in treetops in small hollows, with roost trees often being located in riparian areas.

Little Lorikeet has been previously recorded in the study area and was also recorded during recent detailed surveys. The study area contains approximately 9.32 hectares of marginal potential foraging habitat which would be impacted by the proposed modification. No breeding habitat would be impacted.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet has been previously recorded in the study area and was also recorded during detailed surveys (Ecosure 2014). The species has not been recorded breeding in or near the study area, and is unlikely to. The proposed modification would remove 9.32 hectares of woodland that contains flowering eucalypts and therefore provides potential foraging habitat. The species is highly mobile and nomadic and would therefore not be impacted by the loss of a small amount of existing roadside vegetation. Overall the proposed modification is unlikely to impact on breeding ecology or migration movements of the species and therefore any local population would not be placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

Approximately 9.32 hectares of potential foraging habitat would be removed or modified as a result of the proposed modification. The study area does not contain any breeding habitat for the species.

This is a small proportion of the available habitat within the locality. The proposed modification would increase the width of the existing road, however given the highly mobile nature of the little lorikeet this would not result in additional fragmentation or isolation of potential habitat. Some hollow bearing trees would be removed, however given that no breeding occurs within the study area this is unlikely to result in a significant impact for the long-term survival of the species. Based on the presence of considerable alternative foraging resources in the locality, the habitat that would be lost is considered to be of low importance for the long term survival of the species.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

To date, no critical habitat has been declared for the little lorikeet.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

To date no recovery plan has been developed for Little lorikeet. However, it has been identified on the OEH's landscape management stream under the Saving our Species Program. Key actions identified to assist in the recovery of this species relevant to the determined project include:

- raise public awareness of the importance of large old trees, including hollow-bearing trees, live or dead
- encourage landholders to protect ground layer and midstorey vegetation, and promote retention of floristically and structurally diverse understorey
- target removal of weeds significantly compromising habitat values and restore native vegetation
- measure the abundance and impact of noisy miners on species populations, and implement appropriate management actions
- identify sites where tree hollows are limiting and develop and implement a nest box strategy
- undertake revegetation using a mix of locally appropriate native species.

The proposed modification is not entirely consistent with these actions as it involves the removal of native vegetation and small hollow bearing trees. However in the context of that available in the locality this amount is considered minor.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are 38 KTPs listed on the TSC Act. Of these, the following are likely to be exacerbated by the proposed modification and are relevant to the Little Lorikeet:

- clearing of native vegetation
- loss of hollow-bearing trees
- removal of dead wood and dead trees
- aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners *Manorina melanocephala.*
- infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species.

The minor increase in the clearing of vegetation and loss of hollow bearing trees is unlikely to significantly impact populations of little lorikeet. Appropriate control measures would be in place to manage removal of dead wood and dead trees and to prevent spread of disease.

Conclusion

Approximately 9.32 hectares of potential foraging habitat would be removed as a result of the proposed modification as well as hollow bearing trees. Based on the above assessment it is unlikely that the action would cause a significant impact to Little Lorikeet and so an SIS is not required.

Forest owls - Barking Owl *Ninox connivens,* Powerful Owl *Ninox strenua*

The Barking Owl and Powerful Owl (henceforth referred to as the forest owls) are listed as Vulnerable under Schedule 3 of the TSC Act. These species have been considered together for this assessment based on their similar habitat requirements (ie they roost in large tree hollows). Both species require large tracts of forest or woodland habitat with abundant hollows supporting high densities of arboreal marsupial prey species. Nesting sites tend to occur in proximity to streams and drainage lines.

The barking owl has been previously recorded within the study area, however was not identified during field surveys undertaken for the REF proposal. Potential foraging habitat occurs throughout the study area, and potential breeding habitat is likely restricted to nearby riparian areas such as along Narrabeen Creek.

The Powerful Owl has been previously recorded within the study area, and was also identified during recent field surveys. Potential foraging habitat occurs within the study area, and suitable roosting and nesting habitat was also identified.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Multiple previous records of the forest owl species occur within the locality suggest there is likely to be a viable local population within and around the study area. The study area does contain trees with hollows large enough to support these species, however they would not be removed by the proposed modification. The majority of the study area contains potential foraging habitat for this species since it would support potential prey species such as possums, flying-foxes and birds. These species have a large home range and forage over a mixture of dry and wet sclerophyll forest and woodland. Despite there being suitable breeding hollows within the study area, it is likely that these species would breed in the more intact vegetation of Ingleside Chase Nature Reserve or Katandra Bushland Sanctuary, or the two National Parks to the west.

Approximately 13.41 hectares of potential foraging habitat would be lost, however this is a small amount of marginal habitat, being adjacent to the existing road, and there is sufficient habitat in the wider locality, particularly within surrounding reserves (Ku-ring-gai Chase and Garigal National Parks). It is unlikely that the proposed modification would impact on any breeding activities, and the loss of some marginal foraging habitat is not to an extent that would cause the extinction of a local population.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The proposed modification would result in the removal of approximately 13.41 hectares of potential foraging habitat. While some bearing trees would be lost, these are typically too small to support breeding forest owls. Larger hollow bearing trees near Narrabeen Creek are outside the construction footprint and would not be impacted. In addition the habitat to be cleared is already of lower quality, being adjacent to the existing road and far from nearby waterways. The project would increase the width of the existing road alignment, however this would not cause fragmentation issues for these species given their highly mobile nature. Likewise, based on the presence of vast areas of more suitable habitat for these species in the locality, it the vegetation to be removed is considered to be of relatively low importance.

As such, a local population is not likely to be impacted to the extent that the long-term survival of these species is compromised.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

To date, no critical habitat has been declared for the forest owls.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A formal approved NSW Recovery Plan exists for the Large Forest Owls (including Powerful Owl). This recovery plan identifies a number of actions that need to be undertaken in order to ensure their long-term conservation.

- **Objective 1:** Assess the distribution and amount of high quality habitat for each owl species across public and private lands to get an estimate of the number and proportion of occupied territories of each species that are, and are not, protected.
- **Objective 2:** To monitor trends in population parameters (numbers, distribution, territory fidelity and breeding success) across the range of the three species and across different land tenures and disturbance histories.
- **Objective 3:** To assess the implementation and effectiveness of forest management prescriptions designed to mitigate the impact of timber-harvesting operations on the three owl species and, (if necessary), to use this information to refine the prescriptions so that forestry activities on state forests are not resulting in adverse changes in species abundance and breeding success.
- **Objective 4:** Ensure the impacts on large forest owls and their habitats are adequately assessed during planning and environmental assessment processes.
- **Objective 5:** Minimise further loss and fragmentation of habitat by protection and more informed management of significant owl habitat (including protection of individual nest sites).
- **Objective 6:** To improve the recovery and management of the three large forest owls based on an improved understanding of key areas of their biology and ecology.
- **Objective 7:** To raise awareness of the conservation requirements of the three large forest owls amongst the broader community, to involve the community in owl conservation efforts and in so doing increase the information base about owl habitats and biology.
- **Objective 8:** To coordinate the implementation of the recovery plan and continually seek to integrate actions in this plan with actions in other recovery plans or conservation initiatives.

The draft NSW recovery plan for the Barking Owl (NPWS 2003) has the primary objective to recover the species to a position of viability in nature in NSW. The proposed modification is unlikely to lead to a significant impact on or loss of the local population in the study area or wider region.

Objective 3 of the recovery plan seeks to undertake threat abatement and mitigation. Specifically the plan seeks to protect nest sites and surrounding habitats, and to protect habitats from developments and activities. The proposed road upgrade would lead to the loss of a small amount of potential foraging habitat, which is not consistent with the objectives of the recovery plan.

While the project is not entirely consistent with the objectives of the two recovery plans in that it requires the clearing of native vegetation and hollow bearing trees, the extent to which habitat would be removed is such that it is unlikely to significantly impact the species. The project would therefore be unlikely to affect the recovery of these species.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are 38 KTPs listed on the TSC Act. Of these, the following are relevant to the determined project relating to Large Forest Owls:

- clearing of native vegetation
- loss of hollow-bearing trees
- removal of dead wood and dead trees.

The project would involve clearing of 13.41 hectares of native vegetation that provides foraging habitat for forest owls, as well as the removal of 60 hollow bearing trees. These trees are not preferred breeding habitats and so impacts would be minimised. There is however the potential to reduce habitat for favoured arboreal mammal prey species in the study area.

Conclusion

The proposed modification would result in the loss of approximately 13.41 hectares of potential foraging and roosting habitat for forest owls. It is unlikely that breeding habitat would be impacted; it is considered these species would be more likely to breed in the more intact vegetation of Ingleside Chase Nature Reserve or Katandra Bushland Sanctuary, or the two National Parks to the west. While some bearing trees would be lost, these are typically too small to support breeding forest owls. Larger hollow bearing trees near Narrabeen Creek are outside the construction footprint and would not be impacted. In addition the habitat to be cleared is of relatively poor quality, being adjacent to the existing road. The impacts of the proposed modification are considered small in the context of the surrounding retained habitat within the locality. Two KTP's would be exacerbated by the proposed modification however it is not likely to have a significant impact on the species. Therefore an SIS is not required.

Eastern Pygmy-possum *Cercartetus nanus*

The Eastern Pygmy-possum is listed as vulnerable under the TSC Act. The species is found in a variety of habitats and requires tree hollows or other structures such as rotten stumps, abandoned nests or dreys for shelter. They feed on mostly nectar and pollen from banksias, eucalypts and bottlebrushes. There have been multiple records of the species within the study area, both historically and from recent targeted survey efforts. Approximately 9.32 hectares of potential suitable habitat, and 60 hollow bearing trees would be removed as a result of the proposed modification.

The species has been previously recorded within the study area during surveys associated with the REF (Ecosure 2014, SMEC 2016). One Eastern Pygmy-possum was detected within the survey area in December 2013 during preliminary surveys and two more were detected in November 2014. Seventeen individuals were recorded during trapping and nest box surveys for this species approximately three kilometres to the west of the proposed construction footprint.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Recent targeted surveys undertaken for the former Pittwater Council have confirmed the presence of a substantial local population of Eastern Pygmy-possum within the locality (Law 2013). The species favours heath and woodland communities with abundant flowering trees – particularly banksia species. Approximately 9.32 hectares of potential suitable habitat, and 60 hollow bearing trees would be removed as a result of the proposed modification. This habitat type is however abundant throughout the study area and the amount to be removed is minor.

The increased road width and increased traffic volumes that would result from the proposed modification could adversely affect the population by leading to increased roadkill and increased isolation of habitats north and south of the existing road. This could result in both reduced population size and reduced genetic flow between individuals north and south of the existing road. In order to mitigate this, the proposed modification includes two dedicated fauna connectivity structures, in combination with targeted fauna fencing within a minimum of 100 metres of each structure, to facilitate movement from north to south.

An unknown number of small tree hollows that provide potentially important nesting habitat for the Eastern Pygmy-possum would be removed by the proposed modification. These habitat features take considerable time to form, but are likely to be common in the surrounding bushland. Through timing vegetation clearing to take place as far as possible between August and November, ie outside of the breeding season of this species, it is unlikely that the construction phase impacts would lead to reduced breeding success for the species. In operation, the loss of 9.32 hectares of potential habitat and 60 hollow bearing trees is unlikely to have an adverse effect on the lifecycle of the species such that the viable local population is placed at risk of extinction. Fauna connectivity structures, fauna fencing and other safeguards that would be implemented including pre-clearing procedures, a nest box strategy and post-construction monitoring would minimise the impacts of the proposal.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The project would involve the removal of 9.32 hectares of potential foraging and sheltering habitat for the Eastern Pygmy-possum. This habitat type is common throughout the study area and it is unlikely that this amount of removal would significantly impact the population.

The proposed modification would increase the width of the existing road which presents an existing barrier to movement. The current, unfenced, road corridor presents a high risk of vehicle strike due to the presence of potential habitats for the species on either size. The small size of the species make it likely that available roadkill data for Mona Vale Road underrepresents the impact of the existing road on this species. The combination of fauna fencing to prevent road corridor access and the positioning of a dedicated fauna overpass and fauna underpass to facilitate movement between the most intact habitats would assist in mitigating this impact.

The habitat that would be removed is currently used by a resident population and is therefore of high importance to the species. Notwithstanding, a large amount of alternative habitat resources occur within the locality and are well protected (as National Parks, Nature Reserves and a bushland sanctuary). In operation, the loss of 9.32 hectares of potential habitat for the species would have a minor impact in the context of the surrounding bushland.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

To date, no critical habitat has been declared for the Eastern Pygmy-possum.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

To date, no recovery plan has been prepared for the Eastern Pygmy-possum. This species has however been assigned to the landscape species management stream, under the OEH Saving our Species program. The following activities to assist the species and that are relevant to the determined project have been identified by OEH:

- negotiate conservation agreements to protect known habitat, targeting areas with hollow bearing trees and an abundance of flowering proteaceous and myrtaceous species
- undertake community education around reducing the use of firewood
- in known habitat areas, investigate options for safer road crossings such as underpasses and overpasses.

While the project does involve the removal of habitat, the inclusion of a dedicated overpass and underpass is consistent with the recovery actions for this species.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are 38 KTPs listed on the TSC Act. Of these, the following are relevant to the project relating to the Eastern Pygmy-possum:

- clearing of native vegetation
- loss of hollow bearing trees
- predation by dogs
- predation by the European red fox (*Vulpes vulpes*).

The project would involve clearing of 9.32 hectares of native vegetation and the removal of 60 hollow bearing trees that provides foraging habitat for the species. The project is unlikely to exacerbate or bring into effect the other KTPs listed above.

Conclusion

The proposed modification would result in the loss of approximately 9.32 hectares of potential foraging and breeding habitat for the Eastern Pygmy-possum, including 60 hollow bearing trees. The impact is considered small in the context of the surrounding retained habitat within the locality. The key risk associated with the proposed modification for this species is potential for isolation and vehicle strike caused by widening of the existing road. The inclusion of targeted fauna fencing and a dedicated overpass and underpass provides the potential for a safe crossing for the species. Two KTP's would be exacerbated by the proposed modification.

With the implementation of safeguards, including pre-clearing procedures, a nest box strategy, fauna habitat connectivity structures, strategic fauna fencing and post-construction monitoring, the determined project is unlikely to have a significant impact on the species. Therefore an SIS is not required.

Hollow dependant microbats - Eastern Freetail-bat *Mormopterus norfolkensis,* Little Bentwing-bat *Miniopterus australis,* Greater Broad-nosed Bat *Scoteanax rueppellii* and Southern Myotis *Myotis macropus*

Eastern Freetail Bat, Little Bentwing-bat, Greater Broad-nosed Bat and Southern Myotis (henceforth referred to as the mirobats) are all listed as vulnerable under the TSC Act. These species have been considered together for this assessment based on their similar habitat requirements – they all roost in small hollows and require similar foraging habitat.

Eastern Freetail-bat is usually found in moist environments and roost in tree hollows as well as under bark and in man-made features. They forage in open gaps in the forest. The species has been previously recorded within the study area, however it was not detected during targeted surveys.

Little Bentwing-bats form large colonies in caves in summer months, but disperse to tree hollows and other structures during winter. They consume insects, foraging between shrubs and canopy layers. This species has been previously recorded in the study area. Targeted surveys recorded a possible call from this species.

Greater Broad-nosed Bat is usually found in tall wet forest environments. They roost in tree hollows and consume insects preferring to forage along waterways. This species has been previously recorded within the study area however it was not noted during targeted surveys.

Southern Myotis is found along streams and waterways, roosting in nearby tree hollows, caves, bridges and other similar structures. They feed on insects and small aquatic species. The species has been previously recorded within the study area, and was captured during recent targeted surveys.

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed modification would result in the removal of approximately 13.41 hectares of native vegetation and 60 hollow bearing trees which provide potential foraging and roosting habitat for hollow-dependant microbats. Microbats use a number of roost sites and may not return to a single roost for several days. The number of hollow-bearing trees to be removed is relatively small in the context of those available outside of the impact area. In addition the highly mobile nature of these species means that removal of these marginal resources is unlikely to significantly impact any local population to the point that it is placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

Approximately 13.41 hectares of potential foraging habitat which contains small hollow bearing trees, would be removed as part of the proposed modification. However the area to be removed is small in comparison to the remaining habitat in the locality.

The proposed modification would increase the width of the existing road, decreasing connectivity between areas of bushland on either side of the road. These species are highly mobile and so are unlikely to be significantly impacted by the relatively small decrease in connectivity. Vehicle strike due to increase road traffic presents a risk to microbats, amongst other fauna groups. Although additional vehicle strike is possible, it is unlikely to result in a significant impact to the species.

Based on the presence of additional foraging resources and potential roost sites (in the form of small tree hollows) in the locality, the habitat that would be removed is considered of low importance for the survival of the species. Overall it is unlikely that the habitat to be removed is important for the long term survival of these species in the area.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

To date, no critical habitat has been declared for the microbats.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There are currently no recovery plans for these microbats in NSW, however OEH have identified all of these species in the landscape species management stream of the Saving our Species program. The following activities to assist the species and that are relevant to the determined project have been identified by OEH:

- raise awareness among landholders about the importance of retaining large live and standing dead hollow-bearing trees in the landscape as habitat for the species
- protect and maintain high quality foraging habitat, particularly within 10km of roosts
- promote the retention, connectivity and restoration of suitable habitat including remnant vegetation and forested areas with hollow-bearing trees
- minimise the use of pesticides in foraging and breeding areas

Although the project is not entirely consistent with the activities to assist the microbats, it is unlikely that it would interfere with the recovery of these species.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are 38 KTPs listed on the TSC Act. Of these, the following are relevant to the determined project relating to the microbats:

- clearing of native vegetation
- competition from feral honey bees (*Apis mellifera*)

- loss of hollow bearing trees
- anthropogenic climate change

The project would involve clearing of 13.41 hectares of native vegetation that provides foraging habitat for the microbats and 60 hollow bearing trees providing potential roosting habitat. The project is unlikely to exacerbate or bring into effect the other KTPs listed above.

Conclusion

The proposed modification would result in the loss of approximately 13.41 hectares of potential foraging and roosting habitat for hollow-dependant microbats, including 60 hollow bearing trees. The impact is considered small in the context of the surrounding retained habitat within the locality. Two KTP's would be exacerbated by the proposed modification however is not likely to have a significant impact on the species. Therefore an SIS is not required.

Appendix D

Assessment of heritage significance addendum

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