

Mona Vale Road West Upgrade McCarrs Creek Road, Terrey Hills to Powder Works Road, Ingleside

Submissions Report

Roads and Maritime Services | December 2017

Roads and Maritime Services

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December 2017

Prepared by SMEC Australia and Roads and Maritime Services

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Accepted on behalf of Roads and Maritime NSW by	Matty Mathivanar Project Development Manager
Signed	
Dated	

Executive summary

Roads and Maritime Services (Roads and Maritime) proposes to upgrade and widen about 3.4 kilometres of Mona Vale Road between McCarrs Creek Road, Terrey Hills, and Powder Works Road, Ingleside, from a two lane (one in each direction) undivided road to a four lane (two lanes in each direction) divided road. The main features of the proposal are outlined in Chapter 1 of this report.

Roads and Maritime prepared a Review of Environmental Factors (REF) and a Species Impact Statement (SIS) to assess the potential environmental impacts of the proposal. The REF and SIS were publicly displayed between Friday 10 February and Monday 13 March 2017 at Northern Beaches Council, Dee Why and Mona Vale Library, Mona Vale. A community information session was held on 18 February 2017 at the Terrey Hills Community Hall. Roads and Maritime representatives also displayed the proposed upgrade at three community information sessions held during February 2017 by the Department of Planning and Environment and the Northern Beaches Council on the proposed Ingleside Precinct Plan.

A total of 87 submissions were received in response to the display of the REF and SIS including submissions from the NSW Office of Environment and Heritage (OEH) and Northern Beaches Council. About five per cent of the submissions supported the proposal, eight per cent objected to the proposal and the remainder (87 per cent) did not offer a position but raised individual issues related to the proposal.

The main issues raised by the OEH related to the SIS and included:

- clarifications on flora and fauna survey methodologies
- impact on aquatic habitats associated with changes in hydrological regime and water quality
- assessment of cumulative impacts of Mona Vale Road East and Mona Vale Road West upgrades
- design details for the proposed fauna connectivity measures, their effectiveness and consideration of an additional connectivity measure
- the effectiveness of the proposed fauna underpass at the proposed Harvey Road extension and need for additional environmental assessment on the impacts in this area
- adequacy of offsetting of biodiversity impacts and compensatory measures.

The issues raised in the Northern Beaches Council submission included:

- aspects of the road design, including intersection configurations and performance
- impacts on amenity from traffic using local roads, including the proposed Harvey Road extension
- aspects of the drainage design, including impacts on sensitive downstream environments and consideration of treatment of drainage flows prior to discharge
- flooding impacts on downstream properties in the Wirreanda Valley
- biodiversity impacts, including a reduction in the area available for environmental conservation associated with vegetation clearing for the Harvey Road extension, and offsetting of these impacts

- assessment of cumulative biodiversity impacts, particularly those associated with the Mona Vale Road East upgrade project, and offsetting of these impacts
- impacts on historical heritage items, including identification of additional items recommended for assessment
- recommendations to minimise landscape and visual impacts associated with the proposal
- matters relating to land use planning, particularly with regard to potential inconsistencies with the draft Ingleside Precinct Plan, and future development within the precinct.

The main issues raised in submissions from community groups and members of the public included:

- Kimbriki Road intersection, particularly with regard to configuration and performance of the intersection and the effect of this on traffic flow and safety
- Ingleside Precinct Plan, with concern expressed about the timing of the road upgrade in relation to development of the precinct, and concerns over the capacity of Mona Vale Road to accommodate additional traffic
- Powder Works Road intersection, including existing performance, intersection configuration and capacity, and traffic flow through the intersection
- Harvey Road corridor, including impacts on amenity for local residents, safety associated with increased traffic, particularly heavy vehicles, and impacts on property and biodiversity
- Tumburra Street intersection, with suggestions/requests made on aspects of the design; a number of submissions expressed support for the previous grade-separated intersection design
- mitigation of impacts on biodiversity, particularly fauna, and requests for Roads and Maritime to commit to implementation of the fauna connectivity measures identified in the REF.

Subsequent to receipt of OEH's and Northern Beaches Council submissions, Roads and Maritime met with OEH and Council officers to clarify aspects of the proposal with regard to the range of issues raised in their submissions. The responses provided in this report are consistent with the advice provided in the meetings. Roads and Maritime has also provided further information in this submissions report addressing the issues raised by the community.

Additional biodiversity and Aboriginal heritage assessments have been undertaken for the proposed changes to the Harvey Road extension and are included in Appendix B and Appendix E respectively of this report.

Following the display of the REF and SIS, Roads and Maritime has also made the following changes to the proposal:

- removing the proposed retaining walls along part of the Harvey Road extension, and replacing them with batters to provide better access to adjoining properties and improve visual amenity
- moving the Harvey Road alignment in the vicinity of the Addison Road intersection to more equitably distribute the impacts on adjoining properties
- providing an additional right turn lane from Mona Vale Road into Powder Works Road to improve the level of service at this intersection
- relocating the westbound bus stop at Kimbriki Road intersection further west along Mona Vale Road to provide safer and better delineation for merging traffic.

A description of these design changes, assessment of potential impacts and identification of any additional mitigation measures proposed are provided in Chapter 4 of this report.

The issues raised during the public display of the REF have been adequately summarised and responded to. All potential environmental impacts have been assessed adequately with appropriate safeguards and management measures identified to avoid, minimise and mitigate impacts. The implementation of the safeguards and management measures identified in the submissions report would appropriately manage and mitigate the potential impacts.

Additional management measures are shown underlined in Table 5-1 of this report and are summarised below:

- Pre-clearing surveys will include inspection for Heath Monitor eggs of all termite mounds proposed to be removed. Salvage of any eggs would be undertaken by appropriately experienced personnel.
- Roads and Maritime will provide a copy of the draft CEMP to OEH.
- The design of the fauna underpass at the Harvey Road extension will be re-examined during detailed design to maximise use by target fauna species in consultation with Roads and Maritime Biodiversity specialists, OEH and Northern Beaches Council.
- Fauna furniture in crossing structures will be designed to maximise use by target fauna species in consultation with OEH and Northern Beaches Council.
- Additional measures to minimise pollutant loads to discharge areas through the use of gross pollutant traps and options for incorporation of grass swales will be investigated as part of the detailed design phase in consultation with OEH and Northern Beaches Council.
- Further investigations into opportunities for fauna-exclusion fencing and fauna furniture along Harvey Road would be investigated in detailed design in consultation with OEH and Council.
- Fauna-exclusion fencing targeted specifically for the Eastern Pygmy Possum would be installed for 100 metres either side of the crossing structures.
- Where feasible, topsoil from the local area will be used on the fauna overpass that will contain a seedbank of local species so to maximise the effectivity of revegetation
- Planting guides will be developed as part of the detailed design, using indigenous species. Detailed design will be undertaken in consultation with OEH and Northern Beaches Council.
- During detailed design and as part of the pre-clearing surveys, targeted amphibian surveys will be completed in the Wirreanda Creek area of the proposal. If required, additional mitigation measures will be implemented in this location to minimise any impacts to threatened amphibians. Key performance indicators of the mitigation measures and remedial actions will be included in the Flora and Fauna Management Sub-plan.
- If any change in impact on Aboriginal heritage items is identified during detailed design, confirmation of the need for an Aboriginal Heritage Impact Permit (AHIP) would be sought from the Roads and Maritime Environment Manager.
- If an AHIP is required, a Management Plan would be developed prior to submission of the AHIP and/or commencement of works. The plan would identify all measures to avoid all direct and indirect impacts to Aboriginal heritage sites within and in proximity to the construction area and would include appropriate considerations to address subsurface archaeological potential of the proposal area.
- An AHIP would include documentary evidence of consultation with the Aboriginal community in accordance with clause 80C of the National Parks and Wildlife Regulation 2009 and the Aboriginal cultural heritage consultation requirements for proponents (2010).

- The rock engravings identified in the Statement of Heritage Impact (SoHI) would be inspected and assessed by an archaeologist suitably qualified in Aboriginal heritage prior to the submission of an AHIP application and/or commencement of works.
- Opportunities to investigate the feasibility of the relocation of the heritage listed Monterrey Pines would be explored during detailed design.
- A photographic archival record of the Monterrey Pines to be removed would be made prior to the commencement of any works.
- If the proposal footprint in the vicinity of local heritage items changes during detailed design, confirmation of any change in potential heritage impacts would be undertaken.
- Opportunities to develop interpretive signage along the realigned access road to the Baha'i House of Worship would be investigated during detailed design.
- Consideration of an elevation sign at Tumbledown Dick will be included as part of the detailed design.
- Appropriate landscaping, including planting of screening vegetation, would be carried out on the two embankments on the Harvey Road extension.

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1. Introduction and background

1.1 The proposal

Roads and Maritime Services (Roads and Maritime) proposes to upgrade and widen about 3.4 kilometres of Mona Vale Road between McCarrs Creek Road, Terrey Hills, and Powder Works Road, Ingleside, from a two lane (one lane in each direction) undivided road to a four lane (two lanes in each direction) divided road (refer Figure 1.1).

Key features of the proposal as described in the REF include:

- widening to provide four lanes (two lanes in each direction) on Mona Vale Road between McCarrs Creek Road and Powder Works Road by:
 - widening on the southern side of the existing carriageway between McCarrs Creek Road and Kimbriki Road
 - deviation of the entire four lane road to the north of a rock outcrop having cultural heritage significance between Kimbriki Road and Tumburra Street
 - widening on the northern side of the existing carriageway from about 700 metres west of Tumburra Street to Addison Road
 - widening on both sides of the existing carriageway between Addison Road and Powder Works Road.
- provision of a new traffic signal intersection at Kimbriki Road including additional dedicated turning lanes and a truck climbing lane
- restricting traffic movements at the intersection of Mona Vale Road and Tumburra Street to left-in and left-out only
- relocating the Mona Vale Road and Tumburra Street intersection to the west by about 40 metres to improve the existing steep grade on Tumburra Street
- providing a new local road connection between Bungendore Street and Powder Works Road using the existing Harvey Road corridor and extending the new local road east of Addison Road to meet with the intersection of Mona Vale Road and Powder Works Road
- removing bus stops on either side of the intersection at Tumburra Street and re-directing bus services along the new local road connection and Tumburra Street to serve existing and future land uses
- relocating the existing access to the National Baha'i Centre
- improving fauna connectivity across Mona Vale Road between Ku-ring-gai Chase National Park and Garigal National Park by:
 - providing a 40 metre wide fauna bridge over Mona Vale Road, east of Kimbriki Road
 - providing a fauna underpass at Mona Vale Road to the west of the intersection with Tumburra Street
 - providing a fauna underpass between Bungendore Street and Addison Road
- closing the existing intersection at Mona Vale Road and Addison Road to general traffic and restricting future access at this intersection to emergency vehicles only

- minor widening of Powder Works Road for a distance of about 160 metres east from the intersection with Mona Vale Road
- constructing retaining walls and/or sandstone cuttings at various locations along the alignment
- providing 3.0 metre wide outer shoulders in each direction to allow for on-road cyclists and vehicle breakdowns
- constructing a shared use path on the northern side of Mona Vale Road from McCarrs Creek Road to around 300 metres west of Mona Vale Road and Powder Works Road intersection before transitioning to a 1.5 metre wide footpath along the frontage of the Baha'i Temple
- constructing a shared use path on the northern side of the new local road between Addison Road and Powder Works Road intersection
- relocating and and/or adjusting underground and above ground utilities where required including the upgrade of street lighting
- upgrading of the existing pavement and cross drainage structures including the construction, reconstruction and extension of pavement drainage lines
- landscaping over the length of the proposal
- installing traffic monitoring cameras at all signalised intersections to assist with traffic management.

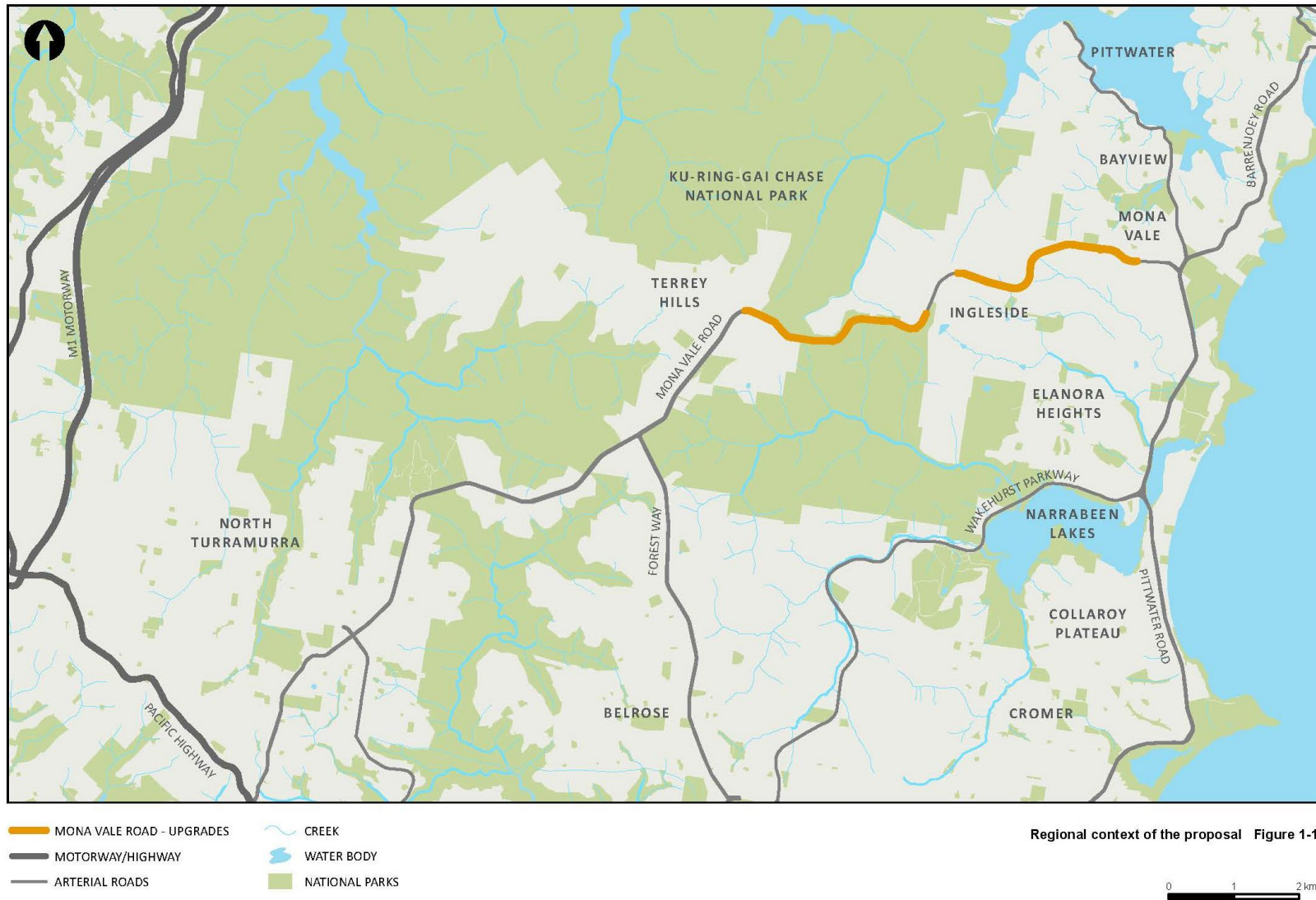
These key features are shown in Figures 1.2 to 1.6. Subsequent to the public exhibition of the REF, the following changes were made in response to community concerns:

- removal of the proposed retaining walls along part of the Harvey Road extension, and replacing them with batters to provide better access to adjoining properties and improve visual amenity
- moving the Harvey Road alignment in the vicinity of the Addison Road intersection to more equitably distribute the impacts on adjoining properties
- provision of additional right turn lane from Mona Vale Road into Powder Works Road to improve the level of service at this intersection
- relocation of the westbound bus stop at Kimbriki Road intersection further west along Mona Vale Road to provide safer and better delineation for merging traffic.

The following design development changes are also to be completed during detailed design:

- final location of Baha'i Temple Way access to be determined during detailed design in consultation with landowners.

A description of these design changes and assessment of potential impacts and identification of any additional mitigation measures proposed is provided in Chapter 4 of this report.



Regional context of the proposal Figure 1-1

Figure 1-1 Regional context of the proposal

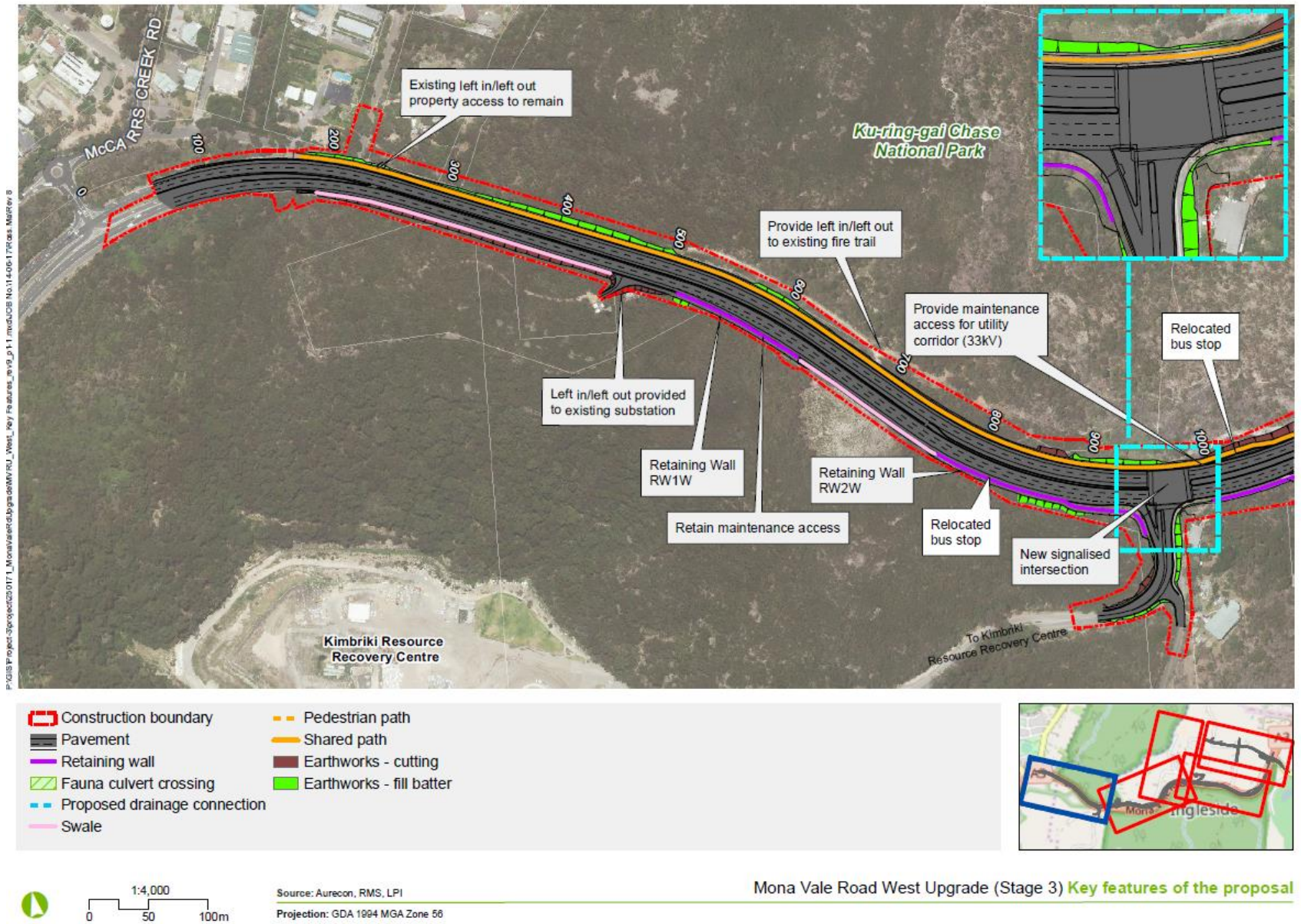
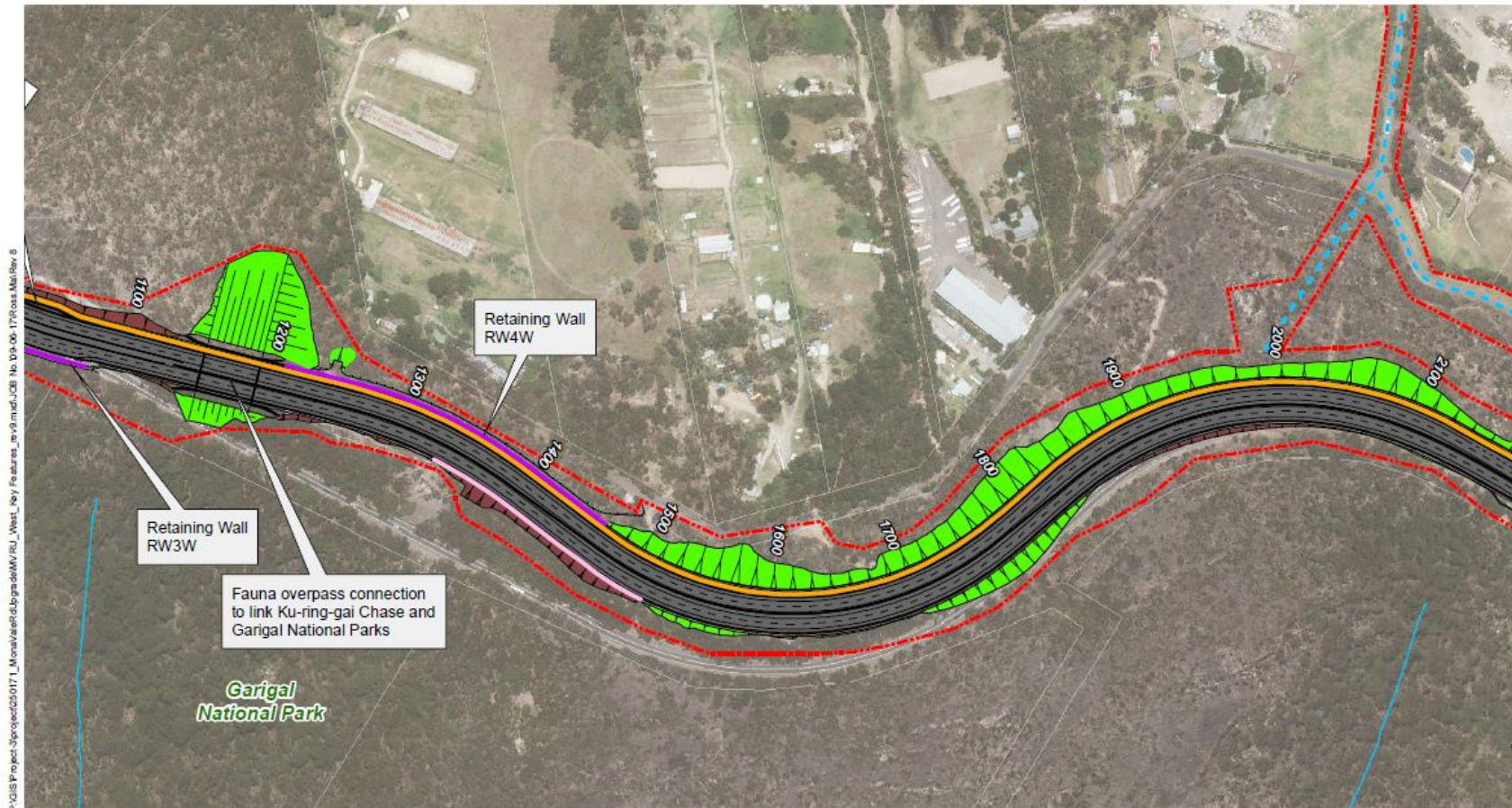
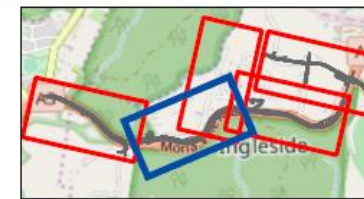


Figure 1-2 Key features of the proposal



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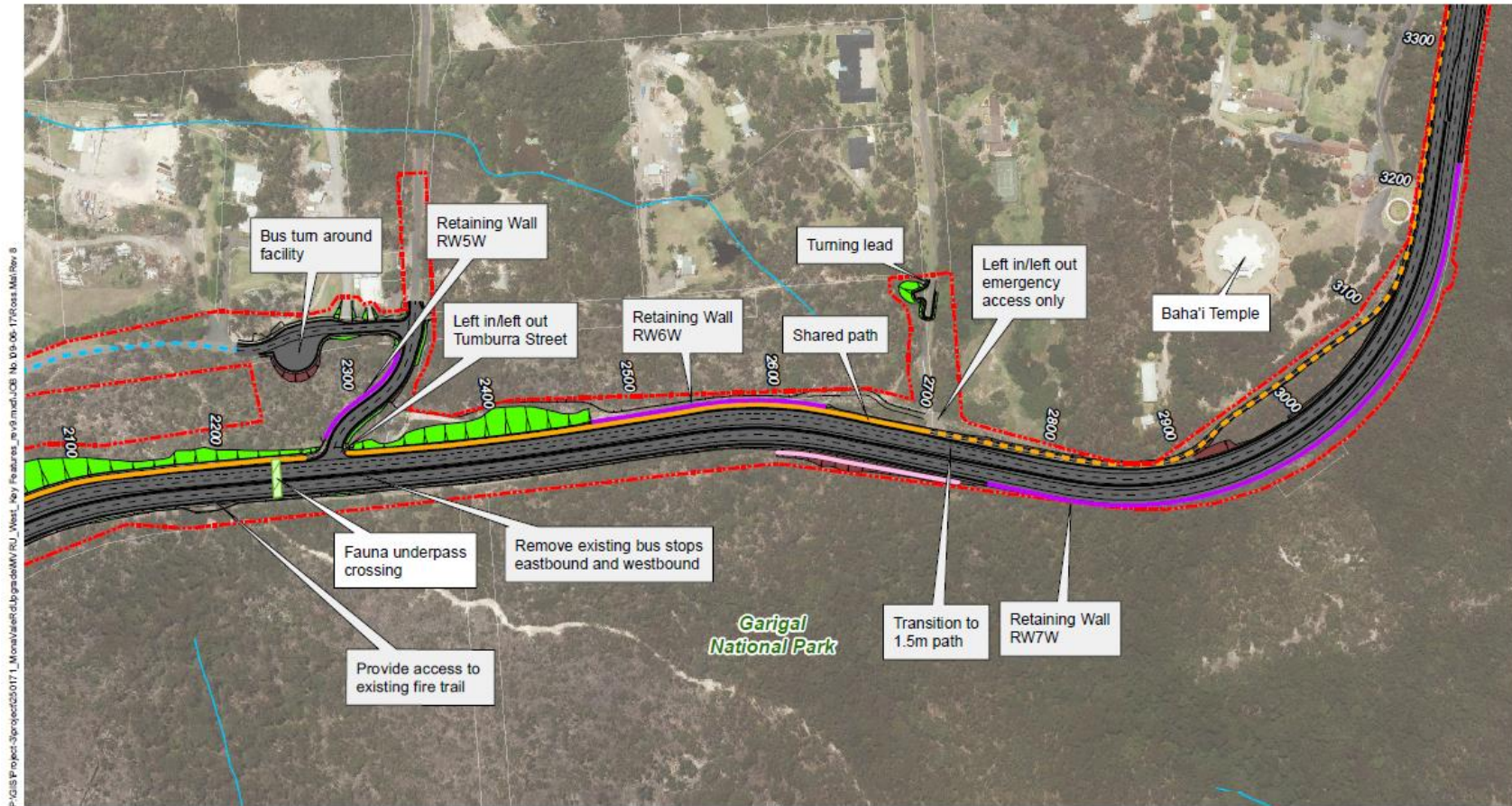
- - - Construction boundary
- Pavement
- Retaining wall
- Fauna culvert crossing
- Proposed drainage connection
- Swale
- Pedestrian path
- Earthworks - cutting
- Earthworks - fill batter



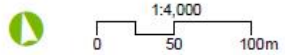
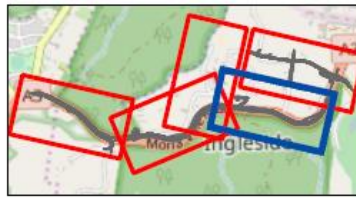
Source: Aurecon, RMS, LPI
Projection: GDA 1994 MGA Zone 58

Mona Vale Road West Upgrade (Stage 3) **Key features of the proposal**

Figure 1-3 Key features of the proposal



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Source: Aurecon, RMS, LPI
Projection: GDA 1994 MGA Zone 56

Mona Vale Road West Upgrade (Stage 3) **Key features of the proposal**

Figure 1-4 Key features of the proposal

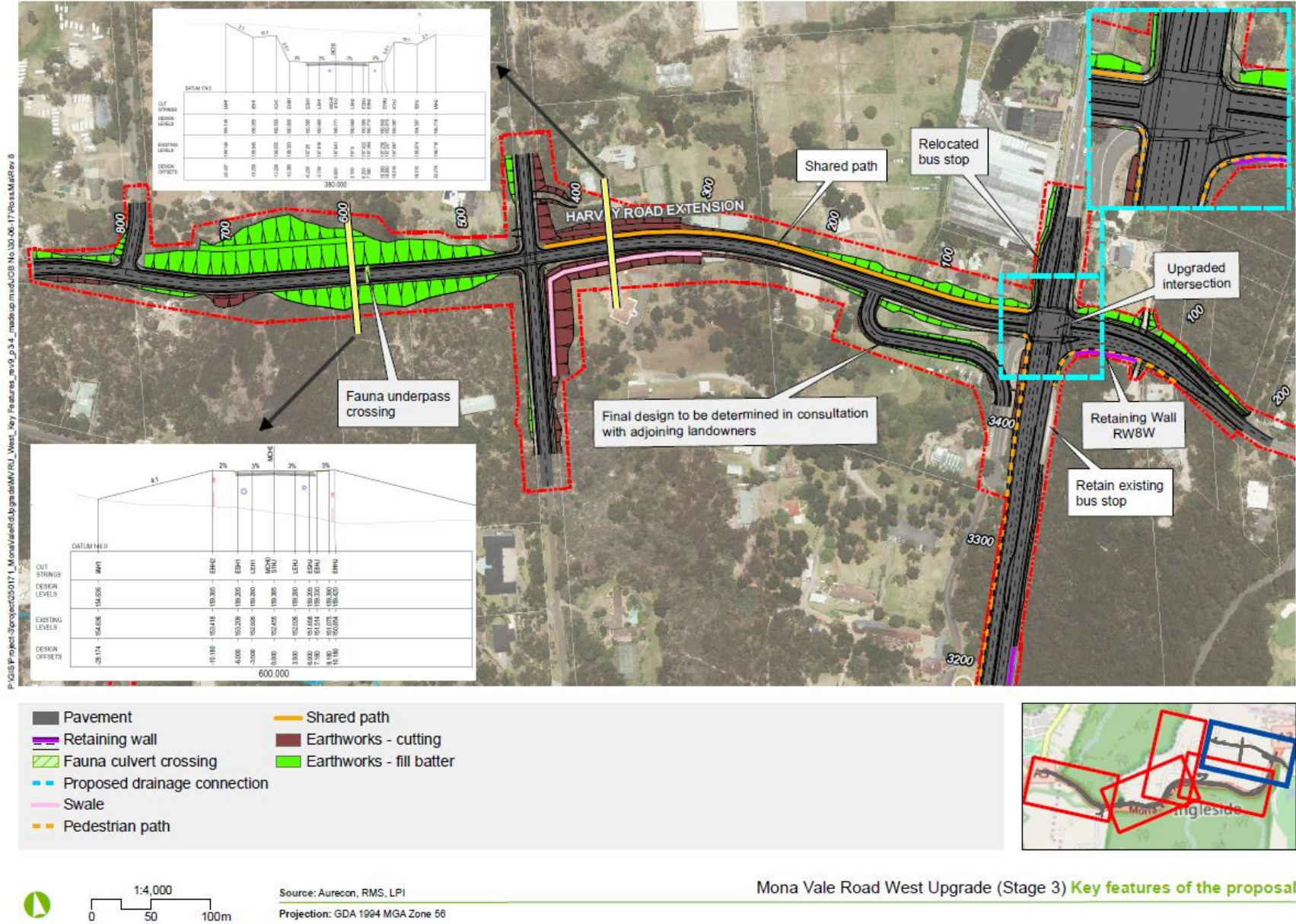
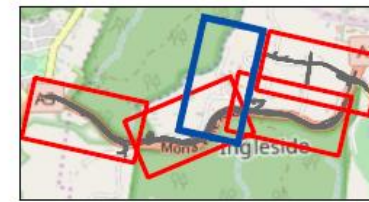
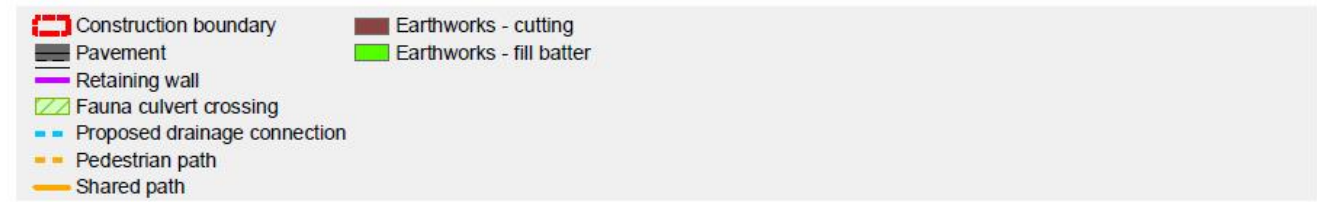
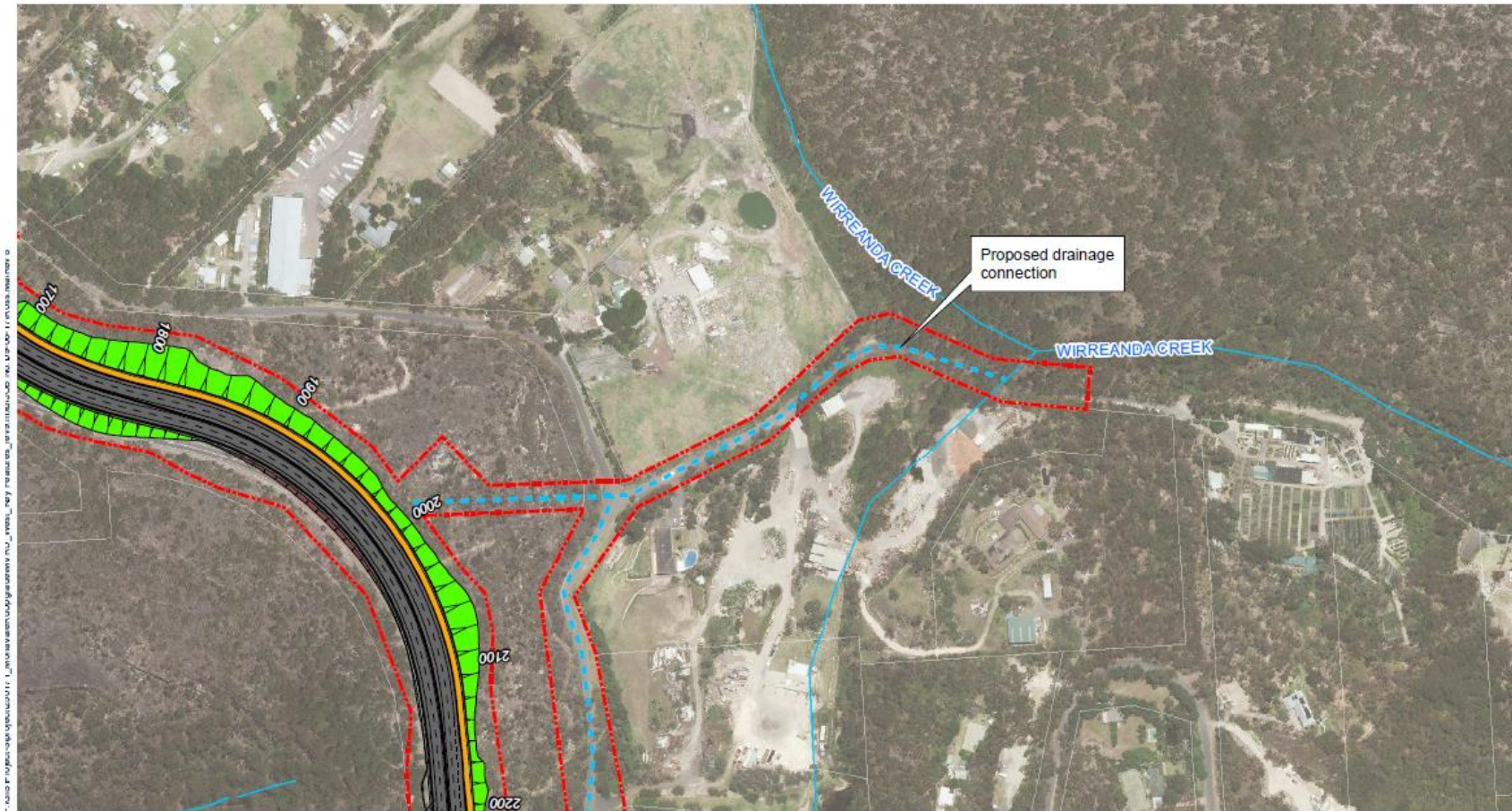


Figure 1-5 Key features of the proposal



Mona Vale Road West Upgrade (Stage 3) **Key features of the proposal**

Figure 1-6 Key features of the proposal

1.2 REF display

Roads and Maritime prepared an REF and a Species Impact Statement (SIS) to assess the potential environmental impacts of the proposal. The REF and SIS were publicly displayed for 32 days between Friday 10 February and Monday 13 March 2017 at two locations, as detailed in Table 1-1. The REF and SIS were placed on the Roads and Maritime project website and made available for download. The display locations and website link were advertised in the Sydney Morning Herald, the Daily Telegraph and the Manly Daily.

In addition to the above public display, an invitation to comment and copy of the REF and SIS was sent directly to the Pittwater Natural Heritage Association and the office of the Hon Rob Stokes, Member for Pittwater.

A Community Update was distributed to approximately 19,000 residents, businesses and stakeholders on the Northern Beaches peninsula, advising of the REF display and consultation period and inviting the community to make submissions.

A community information session was held on Saturday 18 February at Terrey Hills Community Hall, Yulong Avenue, Terrey Hills. Roads and Maritime representatives were also in attendance at three additional community information sessions relating to the Draft Structure Plan for Ingleside, held by the Department of Planning and Environment (DPE) and the Northern Beaches Council in February 2017.

Consultation was carried out with affected property owners along the proposed road alignment via doorknocking and meetings, prior to and during the consultation period.

Table 1-1 Display locations

Location	Address
Northern Beaches Council	725 Pittwater Road, Dee Why
Mona Vale Library	1 Park Street, Mona Vale

1.3 Purpose of the report

This submissions report relates to the REF and SIS prepared for the proposed upgrade of Mona Vale Road between McCarrs Creek Road, Terrey Hills, and Powder Works Road, Ingleside, and should be read in conjunction with those documents.

The REF and SIS were placed on public display and submissions relating to the proposal, the REF and the SIS were received by Roads and Maritime. This submissions report summarises the issues raised and provides responses to each issue (Chapter 2). It details investigations carried out since finalisation of the REF (Chapter 3), describes and assesses the potential environmental impact of changes to the proposal (Chapter 4) and identifies new or revised environmental management measures (Chapter 6). OEHL provided a detailed submission regarding the accompanying SIS. The issues raised by OEHL and the responses to each issue have been addressed separately in Chapter 5.

No project changes are proposed that would require the preparation of a preferred infrastructure report. Some additional measures have been added to the safeguards and mitigation measures

identified in the REF in response to community and government submissions. The revised safeguards and mitigation measures are provided in Section 6.2 of this report.

2. Response to issues

Roads and Maritime Services received 87 submissions, accepted up until 12 April 2017. The extension was granted only to OEH and property owners affected by potential acquisition. A list of respondents and each respondent's allocated submission number is provided in Appendix A. The table also indicates where the issues from each submission have been addressed in this chapter.

2.1 Overview of issues raised

A total of 87 submissions were received in response to the display of the REF and SIS. This included submissions from OEH, Northern Beaches Council, three from community groups, and 82 from the community.

Each submission has been examined individually to understand the issues being raised. The issues raised in each submission have been extracted and collated, and corresponding responses to the issues have been provided. Where similar issues have been raised in different submissions, only one response has been provided. The issues raised and Roads and Maritimes' response to these issues forms the basis of this chapter.

Of the 87 submissions received, five per cent supported the proposal, eight per cent objected to the proposal, and the remainder (87 per cent) did not offer a position on the proposal.

The OEH submission provided comment on a number of matters related to the SIS. These broadly related to:

- clarifications on flora and fauna survey methodologies
- impact on aquatic habitats associated with changes in hydrological regime and water quality
- assessment of cumulative impacts of Mona Vale Road East and Mona Vale Road West upgrades
- design details for the proposed fauna connectivity measures, their effectiveness and consideration of an additional connectivity measure
- the effectiveness of the proposed fauna underpass at the proposed Harvey Road extension and need for additional environmental assessment on the impacts in this area
- adequacy of offsetting of biodiversity impacts and compensatory measures.

The OEH issues raised in relation to biodiversity and the SIS are addressed separately in Chapter 5. The OEH submission also provided comment on a number of issues related to Aboriginal heritage. These included preparation of a management plan, matters for further investigation, and consideration of the potential of subsurface archaeological finds. The submission included recommendations to manage identified Aboriginal heritage issues. Subsequent to the receipt of the OEH submission, Roads and Maritime met with OEH officers to clarify aspects of the proposal with regard to the range of issues raised in the submission. The responses provided in this report are consistent with the advice provided in the meetings.

Issues raised in the Northern Beaches Council submission related to:

- aspects of the road design, including intersection configurations and performance
- impacts on amenity from traffic using local roads, including the proposed Harvey Road extension

- aspects of the drainage design, including impacts on sensitive downstream environments and consideration of treatment of drainage flows prior to discharge
- flooding impacts on downstream properties in the Wirreanda Valley
- biodiversity impacts, including a reduction in the area available for environmental conservation for the Draft Structure Plan for Ingleside, associated with vegetation clearing for the Harvey Road extension, and offsetting of these impacts
- assessment of cumulative biodiversity impacts, particularly those associated with the Mona Vale Road East upgrade project, and offsetting these impacts
- impacts on historical heritage items, including identification of additional items recommended for assessment
- recommendations to minimise landscape and visual impacts associated with the proposal
- matters relating to land use planning, particularly potential inconsistencies with the Draft Structure Plan for Ingleside, and future development within the precinct.

Subsequent to receipt of the Northern Beaches Council submission, Roads and Maritime met with Council officers to clarify aspects of the proposal with regard to the range of issues raised in the submission. The responses provided in this report are consistent with the advice provided in the meetings.

The main issues raised in submissions from community groups and members were as follows:

- Kimbriki Road intersection, particularly with regard to the proposed configuration, performance of the intersection and the effect of this on traffic flow and safety
- the Draft Structure Plan for Ingleside, with concern expressed about the timing of the road upgrade in relation to development of the precinct, and concerns over the capacity of Mona Vale Road to accommodate additional traffic
- Powder Works Road intersection, including the existing performance, intersection configuration, capacity and traffic flow through the intersection
- Harvey Road corridor, including impacts on amenity for local residents, safety associated with increased traffic, particularly heavy vehicles, and impacts on property and biodiversity
- Tumburra Street intersection, alternative design options were proposed by the community; a number of submissions expressed support for the previous proposal that included a grade-separated intersection design
- mitigation of impacts on biodiversity, particularly fauna, and confirmation sought for Roads and Maritime to commit to implementation of the fauna connectivity measures identified in the REF.

No form letters were received as submissions.

Response

Roads and Maritime thanks everyone who provided comments and to the community and stakeholders for considering the proposal.

2.2 Justification for the proposal

Submission number(s)

17, 66

Issue description

- There does not appear to be a need to upgrade Mona Vale Road between Powder Works Road and Tumburra Street
- The proposal should give greater consideration to Goal 4 of 'A Plan for Growing Sydney' (A sustainable and resilient city that protects the natural environment and has a balanced approach to the use of land and resources).

Response

Mona Vale Road to the immediate east of Powder Works Road is currently a four lane road (two traffic lanes in each direction) reducing to two lanes about 100 metres to the east of Manor Road.

It is likely that construction of the Mona Vale Road East upgrade would precede the Mona Vale Road West upgrade. When completed, this would provide four lanes from Foley Street through to Manor Road. Continuation of the four traffic lanes through to McCarrs Creek Road is required to allow efficient movement of traffic. The retention of a short section of four traffic lanes, three lanes and two lanes between Powder Works Road and Tumburra Street would restrict the efficient movement of traffic and could also create safety issues for traffic merging and diverging.

Goal 4 of 'A Plan for Growing Sydney' relates to developing a sustainable and resilient city that protects the natural environment and has a balanced approach to the use of land and resources. The Goal is supported by the following three directions:

- Direction 4.1: Protect our natural environment and biodiversity
- Direction 4.2: Build Sydney's resilience to natural hazards
- Direction 4.3: Manage the impacts of development on the environment.

Of these three Directions, 4.1 and 4.3 are most relevant to the proposal, and principally in relation to the minimisation of impacts and protection of high conservation native vegetation and biodiversity.

The proposal acknowledges the high biodiversity values of the adjoining National Parks lands, and the design has sought to minimise direct and indirect impacts on these lands. The design includes three fauna connectivity structures including a fauna land bridge between the two national parks which. These structures, in conjunction with fauna-exclusion fencing, will provide safe north-south movement between the two parks and contribute to the long-term persistence of local and regional biodiversity. The current design has sought to minimise the amount of native vegetation to be cleared, and landscaping will include replanting of suitable native species which will also support biodiversity values.

Other measures taken to avoid or minimise the impacts on the environment of the proposal include:

- deviating the road from its current alignment east of Kimbriki Road to completely avoid any direct impacts on an adjacent rocky outcrop that has considerable Aboriginal cultural heritage value stormwater flows into the local creek would be designed to mimic the existing flows to minimise the impacts on frog habitat and other sensitive areas

- implementing an urban design strategy for the proposal which aims to integrate the widened Mona Vale Road sensitively into the Hawkesbury sandstone bush landscape.

2.3 General design of the proposal

Submission number(s)

1, 27, 52, 60

Issue description

- The upgrade should include LED street lighting
- The current proposal is simpler than the original proposal and provides an improved solution for the upgrade. What is the black dotted line on the eastbound carriageway between Tumburra Street and Addison Road (REF Figure 3.3) referring to? Similarly, what is the dotted line on the westbound carriageway west of Kimbriki Road?
- How was the design for the proposal developed? The maps do not show a lot of detail present
- Noise barriers are a costly solution to mitigate traffic noise; has this been considered for the proposal?
- Inclusion of a concrete barrier along the centre of the road is a poor idea.

Response

The provision of LED street lighting would be considered during detailed design. The revised design is considered to provide a number of improvements over the previous proposal, particularly with regard to the greatly simplified intersection arrangement at Tumburra Street, with a considerably reduced construction footprint.

The black dotted line on the eastbound carriageway between Tumburra Street and Addison Road (REF Figure 3.3) and the dotted line on the westbound carriageway west of Kimbriki Road (REF Figure 3.2) identify a merging lane for traffic turning left out of Tumburra Street and Kimbriki Road respectively.

The design for the proposal was developed from an analysis of the required functionality for effective traffic movement taking into account existing and future land use, and consideration of engineering and environmental constraints. Aspects of the design have been revised during design development; the principal changes for the current design from the previous design relate to the reconfiguration of the Tumburra Street intersection and the inclusion of the Harvey Road extension.

The noise and vibration assessment for the proposal (refer REF Appendix I Noise and Vibration Assessment) considered the impacts of traffic noise associated with the upgraded road in accordance with applicable guidelines and Roads and Maritime policy. Section 5.4 of the noise and vibration assessment report considers three types of noise mitigation measures (quieter road pavement surfaces, noise mounds and barriers, and at-property treatments) and criteria for their implementation for a proposal. The report identified that quieter road pavement surfaces, and noise mounds and barriers would not provide effective noise mitigation for residents and were therefore not considered for the proposal.

The posted speed limit for the upgraded Mona Vale Road would be 80 kilometres per hour. The concrete median barrier is provided as part of the design for safety reasons, principally to remove the risk of head-on collisions between vehicles travelling toward each other. Further development of the concrete median design would be considered during detailed design.

2.4 Harvey Road extension

Submission number(s)

1, 6, 61, 73, 87

Issue description

- A proposed road network is identified for Ingleside under the Draft Structure Plan for Ingleside. A number of roads intersect with or connect with the proposed Harvey Road extension. The new intersections on the Harvey Road Extension would benefit from being rationalised into a single intersection. The extended Harvey Road should function as a collector road, designed with minimum trafficable lanes 3.7 metre wide in each direction, shared path 3.0 metre wide on the northern side, and road pavement constructed to support existing heavy vehicle traffic associated with the existing uses in Wirreanda Valley. The proposed extension of Harvey Road does not consider the road layout in the Draft Structure Plan for Ingleside
- There is potential for future traffic conflicts between the Harvey Road extension and a proposed new collector road at the rear of 165/167 Mona Vale Road as identified for Ingleside under the Draft Structure Plan for Ingleside
- The Harvey Road extension will add 4000+ vehicles in peak hour periods and these will not be able to be accommodated. Part of the Harvey Road extension is located on former Government-owned land that was sold recently
- The proposed extension of Harvey Road between Bungendore Street and Powder Works Road using the existing Harvey Road corridor and extending the new local road east of Addison Road to meet with the intersection of Mona Vale Road and Powder Works Road is not supported. Harvey Road should only be extended from Powder Works Road to Addison Street to meet the needs of the Ingleside Precinct
- It is requested that the proposed Harvey Road extension be realigned by shifting the proposed road to the south to be located wholly on the Baha'i site at 20 Addison Road, Ingleside to avoid impacts to businesses to the north.

Response

The Harvey Road extension presented in the concept design has been developed in consultation with Northern Beaches Council and DPE, and has considered the additional traffic and access requirements associated with the future development of the Ingleside precinct. Roads and Maritime would continue to liaise with Council and DPE during detailed design to ensure appropriate consideration is given to traffic increases, alignment and intersection issues raised during consultation.

Typical cross section adopted for the Harvey Road extension has two 3.5 metre wide lanes, three metre wide shoulders on each side and footway reservation of 3.5 metre wide on each side. The above cross section fits within the 20 metre wide road reservation.

The Draft Structure Plan for Ingleside has been updated to reflect the proposal. Connectivity into the Ingleside Precinct would be achieved through the two intersections provided along the Harvey Road extension at Addison Road and Bungendore Street. The hand-drawn marks ups of proposed collector roads for the Ingleside Precinct (Figure 1 of the submission) referred to in the submission have also been considered in terms of options to rationalise intersections along Harvey Road.

Roads and Maritime note that distances provided between the Mona Vale Road/Harvey Road intersection and the proposed collector roads¹ would not provide adequate stopping and turning distance in line with Guide to Road Design (Austroads, 2009), hence design safety would not be achieved. At this location best practice design standards would require about 120 metres distance between the Mona Vale Road intersection and any proposed local roads to allow safe entry and exit movements.

Section 5.7 of the Traffic and Transport Assessment Report (Appendix E to the REF) discusses the redistribution of traffic associated with the changed intersection arrangements at Tumburra Street and Addison Road. The assessment identified that the Harvey Road extension would carry in the order of 1,000-2,000 vehicles per day, with the majority of this being redistributed local traffic.

VISSIM microsimulation modelling was undertaken for the Mona Vale Road/Harvey Road/ Powder Works Road intersection for both 2021 and 2031 with the proposal operational. The modelling showed that the intersection would operate at Level of Service (LoS) B for both years, as such the volume of traffic associated with the redistribution (as well as growth from surrounding developments) would be readily accommodated by the proposal.

Roads and Maritime confirms that part of the Harvey Road extension is located on former Government-owned land that was recently divested by the Department of Education and Training.

The changed intersection arrangements at Tumburra Street (left in, left out only) and Addison Road (closure to all vehicles except for emergency vehicles) would result in changes to access to the Wirreanda Valley for vehicles travelling west along Mona Vale Road. The changes would also prevent vehicles travelling from the Wirreanda Valley to turn right from Tumburra Street to travel west along Mona Vale Road. The Harvey Road extension provides an alternative connection from Mona Vale Road to the local road network. Alternative access routes to the Wirreanda Valley would result in an increased travel distance of up to 2.5 kilometres (depending on destination). Although the increased distance may result in a minor increase in travel time for some residents, this consideration should be balanced against the substantial improvements in road safety that would be experienced by all road users as a consequence of the proposal. Road safety improvements are achieved by re-distributing traffic accessing the Wirreanda Valley and proposed Ingleside Precinct to the Mona Vale Road/Harvey Road signalised intersection. Furthermore, travel time improvements for through traffic along Mona Vale Road are achieved through the removal of any stop/start requirements at the intersection of Tumburra Street, providing an overall improvement to through traffic on Mona Vale Road.

During design development, Roads and Maritime considered other options for the intersection at Tumburra Street as an alternative to the Harvey Road extension, such as traffic signals or a grade separated intersection. However, these options are not considered feasible or reasonable for a variety of reasons including steep grades on Mona Vale Road and Tumburra Street approaches affecting road safety for motorists and pedestrians, interrupting traffic flows along Mona Vale Road, significant environmental impacts, as well as cost. During design development, Roads and Maritime considered alignment options aimed to reduce the extent of impacts to properties both north and south of the alignment on Harvey Road near the Baha'i site.

¹ Collector roads serve to move traffic from local streets to arterial roads

2.5 Intersection design and related issues

2.5.1 Kimbriki Road

Submission number(s)

1, 3, 6, 9, 11, 12, 14, 15, 27, 29, 30, 52, 60, 63, 67, 78

Issue description

- Oppose the introduction of traffic signals at Kimbriki Road as they would create safety and through traffic flow issues for vehicles (including heavy vehicles) travelling on Mona Vale Road
- Careful attention should be paid to the sequencing of the Kimbriki Road traffic signals to optimise the flow of traffic, particularly during peak periods. Consideration for two (eastbound) through lanes should be given to by-pass the traffic lights for eastbound vehicles
- Concerned about removal of dedicated left turn lane from Mona Vale Road into Kimbriki Road. This may also impact traffic turning left out of Kimbriki Road where currently there is an approved arrangement of a left turn slip lane into a dedicated climbing lane Confirmation sought that the current right turn lane from Mona Vale Road (eastbound) into Kimbriki Road will be retained
- The right hand turn from Mona Vale Road (eastbound) into Kimbriki Road should be removed
- Alternative design options of a roundabout or an underpass were proposed for consideration in place of providing traffic lights at Kimbriki Road
- Northern Beaches Council is currently working to provide two outbound lanes and one inbound lane at the intersection. This is required for operation of the Kimbriki facility.

Response

The traffic signals would also provide safe passage for pedestrians wishing to cross Mona Vale Road. Roads and Maritime will consider suitable warning signs/lights on the approach to the intersection, consistent with road safety standards.

A dedicated left turn auxiliary lane (buses excepted) would be provided for westbound movements from Mona Vale Road into Kimbriki Road. For westbound traffic, the intersection will have two through lanes, a dedicated left turn lane (buses excepted) and three departure lanes. The intersection design also provides for a dedicated right turn lane into Kimbriki Road from Mona Vale Road eastbound traffic. During detailed design, suitable treatments will be developed to discourage westbound traffic from accessing the kerb side lane on the departure side of the intersection, providing it as a climbing lane for buses and heavy vehicles exiting Kimbriki Road as intended by the design.

A dedicated right turn lane would be provided for continued access to Kimbriki Road from Mona Vale Road (eastbound). Safe stopping distances for the dedicated right turn lane will be provided in the design. In addition, Roads and Maritime will consider suitable warning signs/lights on the approach to the intersection, consistent with road safety standards.

2.5.2 Powder Works Road

Submission number(s)

1, 6, 9, 11, 23, 30, 32, 67, 68, 81

Issue description

- The design of the intersection needs to accommodate the growing number of vehicles accessing Mona Vale Road from both the northern beaches region and local (feeder) roads (including Powder Works Road) to reduce ongoing pressure on the intersection
- Support to maintain right turn lane from Mona Vale Road into Powder Works Road with appropriate storage provided for turning vehicles. If the right turn lane from Mona Vale Road into Powder Works Road is to be removed from the plans provided in the February 2017 community update, this is a significant change that should have been communicated more clearly
- Alternative designs proposed to improve performance at the intersection at Mona Vale Road/ Harvey Road/Powder Works Road include grade separation and a cloverleaf intersection (Note: a cloverleaf intersection is a term not used in NSW. For the purposes of consideration in this submissions report, it is assumed the term describes a two-level interchange in which right turns are handled by ramp roads – description based on USA / United Kingdom terminology)
- Powder Works Road should have a dedicated left turn lane on approach to the intersection, and a slip lane provided on Mona Vale Road (westbound) to alleviate congestion at the intersection. The phasing of the traffic signals at Powder Works Road contributes to traffic congestion.
- Concerned that Powder Works Road intersection will not be upgraded. Do not believe that traffic travelling from Elanora Heights will use Manor Road rather than Powder Works Road. The proposal does not address the existing traffic congestion to the east of the Baha'i Temple
- Powder Works Road, and not Manor Road, must be maintained as the primary route for vehicles travelling eastbound from Mona Vale Road.

Response

Travel demand scenarios for Mona Vale Road traffic modelling purposes have been based on the land use assumptions as proposed by A Plan for Growing Sydney. In addition to the Government land use projections, there are specific development proposals that are expected to have direct impacts to the Mona Vale Road study area. These developments have been considered specifically in terms of trip generation and impacts to the Mona Vale Road study area. These developments include Ingleside Release Area and the Northern Beaches Hospital. During detailed design, further consultation would be undertaken with Northern Beaches Council and DPE with regard to population growth associated with precinct development in the locality to ensure the proposal continues to align with projected growth in the area. The Traffic and Transport Assessment (REF Appendix E) included an assessment of intersection performance for AM and PM peak periods for 2021, 2031 and 2036 for the Mona Vale Road West build scenario showing a gradual decline in intersection performance from 2021 to 2036. The intersection design shown in the REF resulted in a LoS B for both the 2021 AM and PM peaks, declining to LoS E for the 2036 AM peak and LoS C for PM peak.

Following receipt of submissions, Roads and Maritime carried out further investigations to identify opportunities to improve the intersection performance to 2036. The preferred design (refer to Section 4.3), includes an additional 55 metre right turn lane from Mona Vale Road (eastbound) to

Powder Works Road. A 70 metre two lane section will be provided on the Powder Works Road exit to facilitate a merge back to one lane at the proposal extent.

Given intersection performance improvements to LoS B in 2036 (AM and PM peaks) have been achieved through the revised design, further investigation into alternative designs would not be required, including those noted of provision of a grade-separated intersection or clover-leaf intersection. Options to provide designs with a greater footprint are not preferred at this location due to land use, heritage, and biodiversity constraints in the vicinity of this intersection. Traffic modelling carried out for the Mona Vale Road East upgrade proposal identified that the Manor Road/Mona Vale Road intersection would have LoS B or better for both AM and PM peaks for all scenarios considered. It is anticipated that given performance improvements would be achieved at the intersection, there would be a gradual shift for vehicles wishing to travel east to the Manor Road route, avoiding the additional distance required to travel east from the Powder Works Road intersection. It is expected that westbound traffic on Mona Vale Road would continue to use dual left turns provided at Powder Works Road intersection.

2.5.3 Tumburra Street

Submission numbers

1, 12, 23, 26, 61, 70

Issue description

- Tumburra Street will function as the main access point into Wirreanda Valley and should be upgraded to the intersection with Harvey Road, designed as a local road and constructed to a pavement strength sufficient to cater for existing heavy vehicle traffic, including the widening of curves to facilitate the safe negotiation of this road by such vehicles
- Request the Mona Vale Road/Tumburra Street intersection be closed like Addison Road
- Propose traffic lights be provided at the Mona Vale Road/Tumburra Street intersection The intersection at Tumburra Street should be grade separated to provide more immediate access between the Wirreanda Valley and Mona Vale Road, also to ease increased congestion at the Powder Works Road intersection resulting from the alternate access route
- Removal of the grade separated intersection at Tumburra Street for environmental reasons is not considered sufficient justification for rejection of this option
- Support the removal of the grade separated intersection at Tumburra Street and the new design will have a lesser impact on flora and fauna.

Response

The section of Council-owned road on Tumburra Street between Mona Vale Road and Harvey Road that falls outside of the assessed Mona Vale Road West upgrade construction impact area, does not form part of the current proposal. Roads and Maritime will consult further with Council with regard to upgrading Tumburra Street from Mona Vale Road to Harvey Road. This would include consultation with the DPE to align on an appropriate road classification considering future development of the Ingleside Precinct. Road pavement within the proposal area would be designed to carry heavy vehicles.

Closure of Tumburra Street and Addison Road at Mona Vale Road would result in reduced connectivity and reduced emergency access to the Wirreanda Valley. While the primary access route is proposed through the Harvey Road extension, secondary access through the left in left out

at Tumburra Street, and emergency access at Addison Road, provides improved connectivity and safety access (or egress under emergency controlled conditions as managed by emergency services) to valley residents.

The intersection of Tumburra Street with Mona Vale Road would be reconfigured as left in, left out to improve performance for through traffic on Mona Vale Road and would raise safety standards at this location. The proposal does not include traffic lights at this location for the following reasons:

- the steep grades in excess of 10 per cent at the approaches to the intersection with Tumburra Street together with the steep grade on Tumburra Street do not meet road safety standards for traffic signals at this intersection. The alternative route to the Wirreanda Valley (via the proposed Harvey Road extension) is considered a reasonable diversion of around 2.5 kilometres
- the proposed left in left out only would reduce the risk of crashes by removing the need for through traffic to stop for traffic signals at the bottom of the descent
- the proposal would allow improved opportunities to safely overtake slower vehicles descending and ascending the hills
- the proposal would improve safety by dividing directional traffic flows with a central barrier at this location.

Provision of traffic signals at this intersection would reduce travel speed along Mona Vale Road as vehicles would be required to stop at the bottom of the descent, and would result in continued risk of collision (predominantly rear-end as vehicles slow on the approach to traffic lights on the 80 kilometre per hour speed limit at this location).

Environmental considerations were only part of a range of issues that resulted in the review and revision of the previous grade separated intersection design. Benefits of the proposed design against the proposal objectives include:

- left in left out at Tumburra Street provide for *'a safe road environment aimed to reduce the frequency and severity of crashes'* (see above) meeting proposal objective 1
- the revised design for Tumburra Street and the Harvey Road/Powder Works Road intersection greatly simplifies the access to the Wirreanda Valley and the Ingleside Precinct. The revised access arrangements to the Wirreanda Valley, including the Harvey Road extension and the revised intersection configuration at Powder Works Road (refer to Section 4) are considered a suitable design outcome against project objectives. The Powder Works Road intersection has been modelled to provide a LoS B up to 2036, achieving positive access outcomes for the Wirreanda Valley against project objective 3 *'to deliver infrastructure that provides effective network performance for at least the minimum term of 10 years'*
- modelling suggests 1,000-2,000 vehicles per day would use the Harvey Road extension for both entering the Wirreanda Valley via Tumburra Street as well as for access to the Ingleside Precinct. Based on these total vehicles, it is assumed that a total of 200 movements during peak hours would use the Tumburra Street intersection. As such, the numbers of vehicles utilising the grade separated intersection option were not considered to *'provide the best economic outcome'*, nor would it deliver a *'positive benefit-cost ratio'* (proposal objective 6)
- the design is less complex and substantially reduces the footprint of the proposal in this locality. *'Environmental impact is minimised'* (project objective 7) through the proposed design option as opposed to the grade separated option, including reduced impact to threatened species as well as a reduced footprint (in steep topography) minimising water quality impacts as much as possible at this location.

2.5.4 Other intersections

Submission number(s)

6, 31, 76, 22, 68, 80

Issue description

- The intersection at Forest Way is at capacity and should be designed as a full clover-leaf intersection to accommodate traffic
- The intersection of Mona Vale Road and Forest Way is overloaded and work needs to be carried out to improve the flow of westbound traffic on Mona Vale Road
- The intersection of Mona Vale Road and Barrenjoey Road is overloaded and it is doubtful whether the proposal to increase the right turn to Pittwater Road/Barrenjoey Road would adequately address this. When will a proper set of traffic lights be provided at the intersection of Mona Vale Road and Booralie Road to avoid the need to merge with speeding traffic?
- The existing merge arrangements for westbound traffic at McCarrs Creek Road reduce safety for road users and could be addressed by including this intersection as part of the proposal
- There are extensive delays for traffic using McCarrs Creek Road to get to Mona Vale Road with this being one of only two accesses to/from Terrey Hills. One option could be to re-open Kanangra Road to allow a left turn for vehicles travelling east to Ingleside. This may also be of benefit for buses that are unable to turn left from the merge lane.

Response

The intersection of Mona Vale Road and Forest Way is outside the scope of this proposal. Upgrades to this intersection are proposed as part of Roads and Maritime Pinch Point Program. The performance of this intersection would not affect traffic on the upgraded section of Mona Vale Road.

The intersection of Mona Vale Road and Barrenjoey Road is outside the scope of this proposal. The performance of this intersection would not affect traffic on the upgraded section of Mona Vale Road.

There are currently no plans to change the existing traffic signals at McCarrs Creek Road/Booralie Road. The sequencing of the traffic signals along Mona Vale Road would be reviewed as part of design development to identify any opportunities to improve the performance of the intersection, and associated safety issues. Roads and Maritime is currently carrying out additional investigations in this regard, and the findings would be considered separately to the proposal.

Kanangra Road is outside the scope of this proposal. Connection of Kanangra Road to Mona Vale Road via a left turn out only for buses is not supported for safety reasons, particularly with regard to the potential for conflicts between fast moving vehicles on Mona Vale Road and much slower vehicles turning out of Kanangra Road.

2.6 Funding

Submission number(s)

1, 18, 31

Issue description

- Funding of the Mona Vale Road upgrade should not be levied against the Ingleside release area development. The upgrading of Mona Vale Road is to resolve an existing problem and is not a circumstance of the Ingleside release area Council requests that Tumburra Street up to Harvey Road should form part of the Mona Vale Road West upgrade and must be committed for funding and delivery as part of the proposal
- Does 'subject to funding' mean the upgrade may not proceed?
- Funding for the full Mona Vale Road Upgrade should be made available immediately and should also allow for works at the Forest Way intersection.

Response

Funding for the construction of the Mona Vale Road West upgrade has not been announced. However it is not expected that the proposed road upgrade would be funded through levies applied to developments in the Ingleside release area.

The upgrading of the full extent of Tumburra Street (a Council-owned road) from Mona Vale Road to Harvey Road is outside the scope of this proposal and has not been investigated.

Road project development is typically undertaken in stages. The concept design for the proposal has been completed. Following completion of the detailed design Roads and Maritime will seek construction funding.

Funding for the Mona Vale Road upgrade is subject to numerous factors including development of a final business case based on the detailed design costs and benefits analysis, construction timing, other competing transport projects and availability of funds.

The intersection of Forest Way is outside the scope of this proposal. Upgrades to this intersection are proposed as part of Roads and Maritime Pinch Point Program, and will be planned and approved separately.

2.7 Construction timing

Submission number(s)

4, 5, 8, 13, 16, 18, 28, 84

Issue description

- Confirmation sought on the timing for the start of construction. Construction of the upgrade should start as soon as possible
- The Harvey Road extension must be delivered either before development in Ingleside exceeds the capacity of Mona Vale Road or before changes are made to the intersection of Tumburra Street and Mona Vale Road
- Mona Vale Road West should be built first to relieve congestion at Powder Works Road and to address traffic associated with the development of the Ingleside Precinct.

Response

Indicative construction staging is provided in Section 3.3.2 of the REF. The scope of work for each stage would be subject to review and potential revision during detailed design and pre-construction planning. Construction is expected to follow after the Mona Vale Road East Upgrade which is expected to commence construction in 2018. The proposal development process is driven by multiple considerations and takes into account the long time period necessary in developing complex road upgrade projects.

On Tuesday 1 October 2013, a fatal tanker crash occurred on Mona Vale Road just east of the roundabout at Ponderosa Parade/Samuel Street. The clean-up of this crash took more than 24 hours and resulted in total closure of Mona Vale Road at this location. A combination of the community concern and the crash history in this area resulted in Roads and Maritime elevating the priority of further road upgrades for the Mona Vale Road East Upgrade project.

In addition, Mona Vale Road West project contains complex design components that will take time to develop through to construction, as well as more complex regulatory approval processes (revocation and adjustment of National Parks land and Aboriginal Heritage sites requiring consultation and management) that must be resolved prior to construction commencing. These include the impacts on species and ecological communities that are listed under the NSW *Threatened Species Act 1995* and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Roads and Maritime has worked closely with DPE with regard to the development of the Mona Vale Road Upgrade proposals (East and West) and the proposed Ingleside Precinct. Traffic assessments, and subsequent design development processes, have taken into account the available projections for the future population in the precinct, noting that the land release is expected to happen over a long period of time.

Consideration will be given to the construction staging plan during detailed design to investigate the appropriate timing for the upgrade of the Powder Works Road intersection and Harvey Road extension as part of the Mona Vale Road West Upgrade proposal.

2.8 Consultation

Submission number(s)

25, 62, 85

Issue description

- The February 2017 Community Update does not show any increase in the number of traffic lanes. This appears to be inconsistent with previous public announcements
- As we have been identified as a 'sensitive receiver' we would have expected to be notified personally on all updates and on the community consultation process
- Request for continued community consultation and opportunities to provide feedback at each decision-making point for the proposal.

Response

As stated in the REF and the February 2017 Community Update, the proposal would comprise two lanes in each direction, with a central median and a shared path along the northern (eastbound) side of Mona Vale Road. This is consistent with previous public announcements.

As detailed in Chapter 5 of the REF, there have been numerous community updates and consultation activities over the development of the proposal to date, including community information sessions, letterbox drops, door knocks and email notifications. All owners of identified affected properties have been contacted by the Roads and Maritime project team including those identified as 'sensitive receivers'.

Roads and Maritime is committed to putting our customers first, which includes the local community, businesses and other road users, as outlined in our Customer Charter. The community is encouraged to contact the project team at any stage to provide feedback or ask questions about the proposal. The engagement with the community and key stakeholders will be ongoing throughout the design development of the proposal to ensure community feedback and views are considered at all stages of the proposal.

2.9 Traffic and transport

2.9.1 Road safety

Submission number(s)

7, 9, 12, 19, 21, 23, 27, 52, 61, 62, 70

Issue description

- Larger animals on the carriageway would be a hazard for vehicles travelling at speed
- Advertising vehicles should be banned from parking along Mona Vale Road as they are a safety hazard
- Alternative access to 199 Mona Vale Road could be provided from Kanangra Road, improving road user safety
- Installation of traffic lights at Kimbriki Road may create traffic safety issues for road users and residents, particularly for rear-end crashes for eastbound traffic which would have to stop on a downhill gradient
- To avoid delays during construction, vehicles will use alternative routes including McCarrs Creek Road. This may pose a safety issue so could consideration be given to temporarily banning cyclists on McCarrs Creek Road during peak periods
- The changed access arrangements at Tumburra Street will require heavy vehicles to travel through residential streets and cause safety issues
- The current 70 km/h speed limit on Mona Vale Road should be retained
- Relocation of the westbound bus stop to the west of the intersection may cause congestion for traffic turning left out of Kimbriki Road and may also create a safety issue for both bus users and road users. An overpass is essential for the Ingleside development to allow children to safely cross Mona Vale Road. This could also be used by wildlife. Bridging Mona Vale Road at the Tumburra Street intersection would create a safer road
- Vehicles accelerate downhill to the Tumburra Street intersection, and the need to make a 90 degree turn is unsafe. There have been past fatalities at this intersection.

Response

The proposal includes the installation of fauna-exclusion fencing to prevent fauna from entering the carriageway (and to direct fauna to the land bridge and underpasses). This aims to reduce the likelihood of animals crossing the carriageway and presenting a hazard to vehicles.

Restricting parking of advertising vehicles along Mona Vale Road for safety reasons is a matter for Northern Beaches Council to manage and does not form part of this proposal.

Roads and Maritime is not aware of any specific accident/incident risk associated with the existing access to 199 Mona Vale Road. It is noted that the signalised intersection at McCarrs Creek Road regulates the speed of traffic travelling along Mona Vale Road which contribute to lessening the risk of incidents associated with access to and from this property. The existing access to the property from Mona Vale Road would remain unchanged.

Traffic signals have been provided at the Kimbriki Road intersection to allow safe movement for all vehicles through the intersection, particularly for vehicles turning into and out of Kimbriki Road. With

the proposed expansion of the Kimbriki Resource Recovery Centre, there would be an increase in the number of heavy vehicles accessing the facility, and an increased potential for accidents associated with turning vehicles. The traffic signals would also provide safe passage for pedestrians wishing to cross Mona Vale Road. Roads and Maritime will consider suitable warning signs/lights on the approach to the intersection, consistent with road safety standards.

Management of construction traffic would be carried out through a Construction Traffic Management Plan which would form part of the overall Construction Environmental Management Plan that would be prepared by the works contractor. Preparation of the plan would include a risk assessment of likely and potential routes that could be used by construction vehicles. It is considered unlikely that McCarrs Creek Road would be used by construction vehicles as construction materials would likely be sourced from the areas to the south and west. There is an existing level of use of the local road network by heavy vehicles, with the roads used dependent on where vehicles are travelling to and from. The changed intersection arrangements at Tumburra Street and Addison Road would result in a redistribution of local traffic including heavy vehicles travelling to and from locations within the Wirreanda Valley. Roads and Maritime would carry out a road safety audit to better characterise the risk and to identify opportunities to manage any identified risk through detailed design.

The proposed 80 kilometres per hour speed limit reflects the improved level of safety associated with the upgraded Mona Vale Road, and the various design elements that would reduce the risk of vehicle collision and other incidents. The increased speed limit would also allow for the more efficient movement of vehicles through the corridor.

The concerns regarding the westbound bus stop on Mona Vale Road near Kimbriki Road have been noted. The proposal has been modified since the REF was placed on display and it is now proposed to be relocated to a location around 100 metres west of the intersection. This design change is discussed further in Section 4.4.

The proposal will provide upgraded safe, signalised pedestrian crossings of Mona Vale Road at the Powder Works Road intersection, the closest intersection to the Ingleside Precinct. A fauna overpass is not proposed in this vicinity as there would be limited connectivity benefits at this location. The redevelopment that would occur under the proposed Draft Structure Plan for Ingleside would reduce the need for fauna connectivity in this area.

The existing slip lane into Tumburra Street on the eastbound carriageway would be extended to allow vehicles to safely decelerate before turning into Tumburra Street. The existing uncontrolled right turns at this intersection would be removed. These two features would greatly improve safety at this intersection.

2.9.2 Public transport

Submission number(s)

20, 61

Issue description

- Insufficient consideration has been given to public transport opportunities on this and the Mona Vale East Upgrade project
- The proposal will increase the distance travelled for westbound buses which will not be efficient nor environmentally friendly.

Response

While there are currently no specific new public transport proposals for Mona Vale Road, Transport for NSW is currently looking for opportunities to improve public transport on the Northern Beaches (e.g. the Northern Beaches B-Line proposal). This would encourage changes in travel behaviour which may alleviate some travel demands along the Mona Vale Road corridor in the future. The improved travel times on Mona Vale Road for all vehicles, including buses, from the proposal, would present an opportunity for bus operators to consider upgrades to existing services. Roads and Maritime would continue to encourage bus operators to consider new public transport proposals in the area.

The proposal would result in changes to the routes for buses that currently service the Wirreanda Valley area and an increase in travel distance would occur. The relocation of the bus stops to the new bus turnaround facility off Tumburra Street would provide a safer location for bus stops away from the arterial road, closer to residential properties and remove the risk of pedestrians attempting to cross Mona Vale Road.

2.9.3 Active transport

Submission number(s)

1, 6, 12, 14, 23, 62, 82

Issue description

- The provision of pedestrian facilities as part of the proposal is not supported
- The location of the shared path is supported, subject to this being a minimum width of three metres
- Is there safe pedestrian access planned from Kimbriki Road to Terrey Hills?
- The proposal does not adequately provide for bicycle access. Sections of the existing bike lane are steep and not particularly safe for cyclists
- Can access for bushwalkers, mountain bike riders and horse riders be provided on the fauna land bridge? Could similar access be provided at the Tumburra Street fauna underpass?
- Consideration should be given to upgrading the trail from Kimbriki to Narrabeen Lagoon.

Response

Roads and Maritime is committed to addressing the needs of all road users, including pedestrians and cyclists, on road upgrade projects. Contributing to safe and effective pedestrian and cycling

infrastructure, that supports local and State Government initiatives for active transport, is one of the identified objectives for the proposal. The pedestrian and cyclist infrastructure proposed as part of the upgrade addresses the network deficiency in the existing active travel network as identified in the *Warringah Bike Plan 2010-2015* and provides for improved safety for pedestrians and cyclists.

Council's support of the shared path is acknowledged. As described in Section 3.2.12 of the REF, the shared path along the northern side of Mona Vale Road would generally be three metres in width up to Addison Road. It is proposed that shared path would continue along Addison Road before joining the proposed shared path along the Harvey Road extension. A narrow concrete footpath would continue east from Addison Road to join with a 1.5 metre wide footpath in the vicinity of the Baha'i Temple in order to minimise the impacts to the threatened flora species (*Grevillea caleyi*) along the existing path.

Improvements to cycle infrastructure is an integral part of the proposed design. Steepness of the local terrain is acknowledged and where possible detailed design of shared path would aim to reduce the grade as much as practicable and in line with the proposed road alignment. In addition to three metre wide shoulders which could be used by cyclists, the proposal would improve access and amenity for pedestrians and cyclists through contributing to construction of a three metre wide shared path between Terrey Hills and Ingleside along Mona Vale Road and along the proposed Harvey Road extension to Addison Road.

Fauna connectivity between the national parks and wildlife corridors would be facilitated through the proposed fauna crossings (overpass and underpasses). The primary objective of the fauna crossings is to enable connectivity of fauna species in the region, and as such will not be accessible to humans or horses. For the fauna crossings to be successful, it is important to minimise disturbances that would discourage wildlife from using them. Further, the fauna bridge design will require the planting of vegetation to encourage target species such as pygmy possums to use the crossing. Including access to pedestrians or horses would discourage use by these target species. Pedestrians would be able to cross Mona Vale Road at the signalised pedestrian crossing at the intersections with Kimbriki Road and Powder Works Road, and use the shared path on the northern side of Mona Vale Road through to Terrey Hills.

Walking trails in the national park or on private land are outside the scope of this proposal and would be the responsibility of Council and National Parks and Wildlife Service to develop as appropriate.

2.9.4 Traffic modelling

Submission number(s)

32, 32, 67

Issue description

- Traffic modelling does not represent actual conditions because it is based on traffic data collected during periods when there is less traffic on the roads. A new traffic study should be done at a time more representative of the true usage. Existing roads in the Wirreanda Valley will not be able to accommodate the increased volume of traffic.

Response

The traffic model was built based on AM and PM peak traffic counts from 2014, which was established as the base year in the Traffic and Transport Assessment (AECOM, 2017). Traffic data was collected between 06:00–09:00 and 15:00–18:00, from which peak hours were determined. Traffic data collected provided a base case of the existing traffic along Mona Vale Road. Traffic modelling for the proposal was undertaken using the traffic counts undertaken in 2014, and incorporated projected increases to population and travel demands for the Ingleside Precinct in consultation with DPE. For further details on traffic modelling assumptions, refer to the REF and the Traffic and Transport Assessment (AECOM, 2017).

Changes to access arrangements on local roads are proposed to improve safe access for vehicles both travelling on Mona Vale Road and those vehicles entering the Wirreanda Valley. The changed access conditions would result in a redistribution of local traffic, and would not result in an increase in traffic volume, above that already using the local roads.

2.9.5 Other traffic and transport-related issues

Submission number(s)

1, 2, 9, 17, 30, 61, 85

Issue description

- Mona Vale Road should be upgraded to a ‘minor’ motorway standard, not a regular arterial road
- The section of Mona Vale Road to the west of Ponderosa Parade should be given priority for upgrading
- Heavy vehicles using local roads will cause further deterioration in the road surface which, in some sections, is already degraded. The narrowness of the roads will also make it difficult for large trucks to pass each other. It is requested that Roads and Maritime model performance of the intersections immediately beyond the West and East proposals to identify whether upgrades are necessary. Further modelling is being undertaken for the proposed upgrade of the Manor Road/Mona Vale Road intersection as part of the Ingleside Precinct where an intersection upgrade is anticipated.

Table 2-1 Functional classification of roads

Functional classification	
Motorways	<ul style="list-style-type: none"> • Highest form of arterial road that is considered separately due primarily to traffic function and strict access control via grade separated interchanges. • Major inter-regional traffic movement in a safe and operationally efficient manner. • Traffic movement function and related aspects of capacity, congestion, speed and safety dominate network management.
Arterial roads	<ul style="list-style-type: none"> • Major regional and inter-regional traffic movement in a safe and operationally efficient manner. • Provide connection between motorways and sub-arterial roads. • Commercial, industrial access requirements and public transport initiatives need special consideration in developing network management strategies. On modern arterial roads, where possible, access to land should be limited. • Balance between traffic function and access should favour traffic movement, focusing on capacity and congestion management. • Planning and design of new arterials should consider the desired balance in terms of types of abutting land-use, land-use interactions, level of access control and encourage developments that are compatible with road function.

Source: Adapted from Austroads (2007, p10)

The existing and future use of Mona Vale Road meets the arterial road classification and does not justify upgrading Mona Vale Road to a motorway.

The Harvey Road extension is anticipated to carry in the order of 1000-1200 vehicles per day, with the majority being redistributed local traffic. The proposal would not contribute to an increase in heavy vehicles accessing local roads in the Wirreanda Valley, above that already using the local streets to access existing businesses or residential properties.

The Manor Road/Mona Vale Road intersection is part of the Ingleside Precinct and does not form part of this proposal. However, traffic and transport modelling for the West project included an assessment based on a full upgrade to both the Mona Vale Road East and West projects, which incorporated the approved intersection configuration of the Manor Road/Mona Vale Road intersection. Any future proposals to change the Manor Road/Mona Vale Road intersection would need to be undertaken in consultation with Roads and Maritime, and would be subject to future planning approvals.

Since the display of the REF Roads and Maritime has undertaken traffic analysis at the intersection of Mona Vale Road and McCarrs Creek Road to look at potential options for relieving traffic congestion at this intersection during peak times. These options would be further considered under other RMS programs for easing congestion on the road network.

2.10 Biodiversity

2.10.1 Impacts on wildlife

Submission number(s)

1, 39, 43, 58, 59, 79

Issue description

- Termite mounds proposed to be removed should be inspected for Heath Monitor eggs as part of pre-clearing surveys. Salvage of any eggs should include consultation with appropriately experienced personnel
- Will trees to be cleared be inspected prior to felling? What is the process for removal of any fauna found to be present?
- Will ecologists be on site during vegetation clearing and if so, who will be appointed? Please make animal safety a top priority when upgrading Mona Vale Road
- Concerned about the impacts of the proposal on Duffys Forest EEC and endangered flora and fauna. Option 1 (widening within the existing road corridor) is considered the best option to minimise impacts on endangered flora and fauna
- Concerned the proposed upgrades of Mona Vale Road and alternative routes through to the Wirreanda Valley will lead to more traffic and congestion and greater potential harm to wildlife
- Oppose the proposed upgrade because of the impact on the local habitat.

Response

Guide 1 of the Roads and Maritime *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) details the pre-clearing process. It includes actions to confirm the location of biodiversity features identified during the environmental assessment, including fauna habitat such as hollow-bearing trees, nests and termite mounds. Guide 4 details the process of clearing vegetation and removal of bush rock. In particular it details a two-stage clearing process for habitat features to minimise fauna injury.

Pre-clearing surveys will include inspection for Heath Monitor Eggs of all termite mounds proposed to be removed. Salvage of any eggs would be undertaken by appropriately experienced personnel.

As described in the REF and SIS, vegetation that requires removal will be done so in a two-stage process under the supervision of a suitably qualified ecologist. All vegetation clearing will be conducted in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011).

The proposal has sought to reduce the road footprint widening to the extent possible while meeting road safety and road design standards. As identified in Section 2.4 of the REF, the option to widen within the existing corridor presented a number of geotechnical and constructability issues and the construction footprint requirements would have a greater impact on vegetation than the proposal presented in the REF. It would also limit the opportunities for fauna connectivity.

The proposed dedicated fauna crossings and the installation of fauna-exclusion fencing will reduce the risk of fauna crossing the road and being harmed. The residual unavoidable impacts on Duffys Forest EEC has been identified in both the REF and the accompanying SIS. The SIS, which is subject to the concurrence of OEH, includes a commitment to secure biodiversity offset sites for the loss of Duffys Forest ECC that results from the proposal.

The proposal has considered a number of feasible options to minimise the impact on habitat for native fauna. The SIS includes commitments to securing biodiversity offsets for the residual unavoidable impacts.

The proposal includes a fauna underpass on the Harvey Road extension and fauna-exclusion fencing to restrict access by animals to the carriageway and to direct them to the connectivity structures. It is proposed that a fauna connectivity strategy would be prepared during detailed design, which will detail the location and extent of fauna-exclusion fencing for the proposal.

2.10.2 Impacts on endangered ecological communities and other vegetation

Submission number(s)

1, 7, 35, 36, 37

Issue description

- Flood impacts on the EEC in Deep Creek have not been assessed
- There needs to be consideration of the ongoing impacts of stormwater quantity and quality from the proposal on downstream ecosystems, not just on threatened frog habitat
- The areas of vegetation clearing required for the Harvey Road extension will reduce the area available for environmental conservation
- It is unfortunate that the proposal will involve the loss of adjoining bushland in the national parks and other areas
- Concerned about the large area of Duffys Forest EEC being removed.

Response

The Hydrology and Flooding Assessment Report (Aurecon, 2017) appended to the REF identified minimal changes to hydrology flow rates as a result of the proposal. As such, flood impacts are not anticipated to occur as a result of the proposal in Deep Creek.

The surface water strategy informing the pavement drainage design aims to ensure there will be minimal impacts to hydrology (including minimising impacts on downstream flora and fauna) as a

result of the proposal. During detailed design, the pavement drainage design will be refined to (as far as practicable) meet the existing flow rates in drainage lines and creeks both to the south of the proposal to the Narrabeen Lagoon catchment, and to reduce peak flows to the north into Wirreanda Creek to a maximum increase of five per cent from pre-upgrade flows.

The assessment undertaken has reviewed the impacts of the proposal on the downstream receivers, and identified that flows and pollutant loading to McCarrs Creek and Deep Creek catchments will be designed to reduce or be consistent with existing flow rates and water quality indicators.

At the time of preparation of the REF, access to some properties along the Harvey Road extension was not possible, including some areas zoned as E2 Environmental Conservation. Ecological investigations have subsequently been conducted in these areas and the findings as to the condition and value of these areas is reported in Chapter 3 of this Submission Report. The proposal would result in some reduction in Environmental Conservation land identified in the Draft Structure Plan for Ingleside, however the design has sought to minimise the footprint to the greatest extent possible. Roads and Maritime has sought to meet the proposal objectives while avoiding major technical, social and environmental constraints where possible. An iterative process was used to develop several route options based on a number of inputs, including field investigations, engineering designs, community submissions and technical workshops. The ridgeline habitat of the route supports approximately six hectares of Duffys Forest EEC and approximately three hectares of this habitat will be retained. The alignment has been chosen to minimise the impacts to Duffys Forest EEC where possible. The SIS, which is subject to the concurrence of OEH, includes a commitment to secure biodiversity offset sites for the loss of Duffys Forest ECC that results from the proposal.

2.10.3 Fauna connectivity

Submission number(s)

1, 7, 12, 34, 35, 36, 37, 38, 39, 40, 41, 42, 44, 45, 46, 47, 48, 49, 50, 51, 53, 54, 55, 56, 57, 58, 63, 64, 65, 66, 67, 69, 70, 71, 72, 74, 75, 77, 83

Issue description

- General support was given for the proposed fauna connectivity and fauna-exclusion fencing. Council has requested that there be further consultation with them when finalising the designs for the fauna passage crossings. Concern that the proposed fauna connectivity and fauna-exclusion fencing will be omitted from the final design
- Numerous comments on the adequacy of the design of fauna connectivity structures and whether the number of fauna connectivity structures is sufficient. Also comments about the height of fauna underpasses (various suggestions that they should be at least 2.4, 2.1 or 1.8 metres high), the need to provide dry passages, and the installation of 'fauna furniture' in the underpasses. The adequacy of the height of the proposed fauna-exclusion fencing was also raised. The need to provide connectivity for the Eastern Pygmy-possum. Also, the size of the mesh used for the fauna-exclusion fencing needs to be of a size to prevent small mammals such as Eastern Pygmy-possum from passing through the fence
- Connectivity is also required between Ingleside Chase Reserve and Katandra Bushland Sanctuary to the east of the proposed Mona Vale West upgrade. Additional fauna connectivity measures were also requested at St Ives

- Fencing is also needed at Garigal National Park and Powder Works Road to direct wildlife to Ingleside Chase Reserve
- Crossings should also be provided linking green corridors in the Ingleside Precinct to Ku-ring-gai Chase National Park.

Response

Currently there are no fauna crossings on Mona Vale Road and the proposal to construct two new underpasses and the new overpass is considered a significant improvement in fauna connectivity.

As detailed in Section 3.2.11 of the REF, the proposal would provide for fauna connectivity across the upgraded Mona Vale Road and the Harvey Road extension as follows:

- vegetated fauna crossing over Mona Vale Road comprising a 40 metre wide bridge structure, about 160 metres east of Kimbriki Road and exclusion fencing along both sides of the upgraded section of Mona Vale Road to restrict access to the roadway and to direct fauna to the overpass
- a fauna underpass on Mona Vale Road, about 25 metres west of Tumburra Street
- a fauna underpass on the proposed Harvey Road extension about 100 metres west of Addison Road.

Roads and Maritime has data that demonstrates the effectiveness of crossing structures in other areas of NSW. These structures have been shown to be used by a wide variety of fauna including antechinus, dunnart, bandicoots, echidnas, wallabies, pademelons, snakes, frogs, possums, and spotted tailed quoll.

The proposed locations for fauna connectivity structures have been determined in consultation with research scientists, species experts, ecologists and the Pittwater Natural Heritage Association. The final design of the fauna crossing structures, including height, width and the vegetation to be planted will consider the target species that will use the crossings and be subject to further consultation with ecologists, Roads and Maritime Biodiversity Specialists, OEH and Northern Beaches Council. Vegetation planting will be based on that proposed in the Mona Vale Road East overpass as shown in Appendix D.

Fauna furniture will be provided within both underpasses to ensure dry passage for mammals. An indicative design, which has been used by Roads and Maritime for crossings on the Woolgoolga to Ballina section of the Pacific Highway upgrade and has previously been approved by the EPA and OEH, is included as an example in Appendix C.

Installation of fauna-exclusion fencing either side of these purpose-built structures will reduce wildlife road mortality and funnel fauna to the crossing structures, minimising the barrier effect of the road. Fauna-exclusion fencing targeted specifically for the Eastern Pygmy Possum would be installed for 100 metres either side of the crossing structures.

Roads and Maritime are committed to incorporating all biodiversity mitigation measures described in the REF, SIS, as updated and provided in full in Section 6 of this submissions report. The provision of fauna crossings and fauna-exclusion fencing will be included in construction contracts as part of the package of works to be delivered.

Powder Works Road, Garigal National Park, Ingleside Precinct and Ingleside Chase Reserve, Katandra Bushland Sanctuary and St Ives are outside the Mona Vale Road West Upgrade proposal area and, as such, no biodiversity mitigation measures are proposed for these areas as part of this proposal. However, detailed design of the Mona Vale Road East Upgrade project is currently underway and two underpasses and a vegetated fauna overpass will be incorporated into the

proposal. The overpass will connect vegetation to the north-west of Ingleside Chase Reserve and the west of Katandra Bushland Sanctuary.

All mitigation measures proposed including the fencing, fauna underpasses and overpasses will be monitored as part of the proposal pre-construction, during and post-construction as outlined in the SIS. The final details of the monitoring including the key performance indicators of the mitigation measures and remedial actions will be described in the Flora and Fauna Management Sub-plan.

Opportunities for fauna-exclusion fencing and fauna furniture along Harvey Road would be investigated in detailed design.

2.10.4 Offsetting impacts through BioBanking

Submission number(s)

1, 36, 37

Issue description

- No offsets have been identified for the removal of habitat associated with Mona Vale Road East which will require the removal of approximately 10 ha of vegetation (including 6.59 ha of native vegetation)The cumulative biodiversity impacts of both Mona Vale Road Upgrade proposals should be considered and offset accordingly
- No offsets are identified in the SIS for the Heath Monitor or the Eastern Pygmy-possum which is not consistent with the Roads and Maritime *Biodiversity Offset Guidelines*
- It is recommended that the proposal include species credit offset requirements for both Eastern Pygmy-possum and Heath Monitor
- Can the proposal include other mitigation measures such that purchasing BioBanking credits is not required?
- Priority should be given to offsetting biodiversity impacts locally in preference to offsetting through the BioBanking process.

Response

No offsets were proposed for Mona Vale Road East as the identified impacts did not reach the threshold required under the Roads and Maritime *Biodiversity Offset Guidelines* (2011) that were in place at the time of project approval. As detailed in the REF for Mona Vale Road East Upgrade, Roads and Maritime proposes to mitigate the impacts of that project by supplementary measures (eg fauna land bridge, additional fauna culverts, strategic fauna-exclusion fencing and targeted revegetation) which collectively provide a more effective long term solution for the region than trying to obtain species credits in a different location(s).

Cumulative impacts for the proposal have been assessed as part of the impact assessment on threatened species and ecological communities associated with this proposal. Proven successful mitigation measures have been implemented to provide a better outcome for species in the local area for Mona Vale Road West. This includes supplementary measures such as the provision of a vegetated overpass, underpasses and associated fauna-exclusion fencing to maintain connectivity and reduce road strike for key fauna species including the Heath Monitor and the Eastern Pygmy-possum. Given the presence of large expanses of good quality habitat for these species in the locality in national parks estate, 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.

The proposed offsets are therefore focused on residual impacts after mitigation and supplementary measures. These have been focused on residual significant impacts to species and communities for which impacts cannot be adequately mitigated including:

- Duffys Forest EEC
- *Grevillea caleyi*
- Red-crowned Toadlet
- *Microtis angusii*.

As stated in Section 7.1.2 of the SIS, Roads and Maritime has already identified a number of candidate sites within the local area that would be suitable for BioBanking Agreements to be placed on them to offset the impacts of the proposal on the above biodiversity values. Roads and Maritime has been actively working on an offset package which combines the offset requirements for all regional project impacts, and have identified and assessed key sites to progress BioBanking Agreements.

2.10.5 Other biodiversity issues

Submission number(s)

1, 43, 60

Issue description

- The biodiversity impacts associated with the Harvey Road extension should be assessed as part of the proposal rather than through the assessment for the Ingleside Precinct development
- Will there be regular reporting on the environmental impact throughout the upgrade? If so, and it is found to be doing more damage than anticipated, will adaptations be made to construction plans?
- What value is the information from the environmental surveys?

Response

The Harvey Road extension, including the revision to the design developed subsequent to the REF exhibition, has been considered as part of the biodiversity assessment for the proposal (refer to the REF and SIS, and Section 3.1 for the additional area not able to be assessed in the REF and SIS due to property access restrictions). Impacts have been assessed and quantified using the OEH *Framework for Biodiversity Assessment* (2014) and the Roads and Maritime *Guideline for Biodiversity Offsets* (2016).

As detailed in Chapter 7 of the REF, a contractor's environmental management plan (CEMP) would be required under the construction contract for the proposal. This would include monitoring and auditing requirements in accordance with Roads and Maritime standards and procedures and relevant NSW and Commonwealth environmental legislation. It is standard practice for adjustments to be made to practices and procedures in light of findings from monitoring and auditing activities.

The proposal would require an environment protection licence (EPL) which would provide an additional layer of environmental monitoring for the construction of the proposal.

The environmental surveys and investigations completed to support the proposal have been undertaken in accordance with Roads and Maritime and OEH guidelines. They provide detailed scientific basis on which to make informed decisions in evaluating the existing environment,

understanding the likely impacts of the proposal and developing appropriate safeguards to minimise impacts.

2.11 Land use planning and development

Submission number(s)

1, 23, 31, 32, 49, 76

Issue description

- Council confirms that the upgrade of the Mona Vale Road corridor must form part of the NSW Government's infrastructure commitment as part of any rezoning of the Ingleside Precinct
- Council requests Roads and Maritime provide the construction boundary for the Harvey Road extension to allow revision of the BioBanking calculations for the Ingleside Precinct
- The proposed drainage connection from Mona Vale Road to Wirreanda Creek via Wirreanda Road may affect the next iteration of the Draft Structure Plan for Ingleside. Council requests Roads and Maritime provides suitable information to allow it to conduct an assessment of this
- Roads and Maritime should consult with DPE regarding identification of required future road reservations on Mona Vale Road
- Development of the Ingleside Precinct will contribute to traffic congestion and the proposed upgrade does not adequately allow for traffic associated with future development in Ingleside and Mona Vale. Concerned that given the existing traffic volumes on Mona Vale Road, the proposed upgrade would not occur in time to accommodate the traffic associated with the development of the Ingleside Precinct. There should be no land releases in the Ingleside Precinct until Mona Vale Road is fully upgraded. Additional access routes should be provided to/from the western part of the Ingleside Precinct
- The existing fire trail at Terrey Hills should be upgraded to improve connectivity with the Ingleside Precinct. This would also improve safety for users of the shared path
- The St Ives shopping area is heavily congested and this needs to be addressed if development is to occur in the Ingleside area.

Response

Roads and Maritime acknowledges Council's emphasis on the importance of upgrading Mona Vale Road in supporting the future Ingleside land release precinct. Roads and Maritime would continue to work closely with DPE and Council to co-ordinate planning and construction activities.

Roads and Maritime has been working closely with Council to develop the proposal and will continue to share information and design details as they become available, including the construction boundary to allow Council to review the Biobanking calculations for the Ingleside Precinct.

Future travel demand scenarios for the traffic modelling were based on the land use assumptions presented in *A Plan for Growing Sydney* (DPE, 2014). Construction of the proposal is expected to commence, at the earliest, in the second half of 2020 following completion of the Mona Vale Road East Upgrade project. Timing of the release of the Ingleside Precinct for development is not yet confirmed, and in any case would be completed in stages over the next 30 years. Roads and Maritime would continue to work closely with DPE and Council to co-ordinate planning and construction activities.

DPE is responsible for land use planning for the Ingleside Precinct, including identifying the proposed location of any future transport infrastructure requirements within the Precinct. The Draft Structure Plan for Ingleside was placed on display in early 2017 and the Department's website currently states that the final structure plan will be released later in 2017.

Fire trails in the national park are the responsibility of National Parks and Wildlife Service and are outside the remit of Roads and Maritime.

The St Ives shopping area is well outside the study area for this proposal, however Roads and Maritime's Clearways Program has recently introduced new weekday and weekend clearways along Mona Vale Road at Pymble and St Ives to reduce congestion and delays through the area. Roads and Maritime has an ongoing range of projects under development and congestion and hotspot priorities are consistently being re-evaluated and ranked in order of priority.

2.12 Drainage and flooding

2.12.1 Drainage design and impacts

Submission number(s)

1

Issue description

Northern Beaches Council identified a number of drainage and flooding questions and issues, including the following:

- The Mona Vale Road West corridor is to contain no trapped sag points with the road to be regraded to distribute any overland flows not captured by the road drainage system to the adjoining local road system.
- Where adopted flood levels cannot be met, the drainage design should be revised to achieve the acceptable downstream property impacts.
- The discharge point for Outlet P16 is upstream of Garigal National Park (NPWS land) so there is to be no increase in flow volumes or speeds and water quality needs to be a priority at this discharge location.
- Outlets P12 and P13 on Powder Works Road should be combined to allow for the construction of a suitable bio-retention basin discharging to the Monash Country Club irrigation dam. The basin should direct overflow back to the Powder Works Road corridor to minimise adverse effects on the golf course and residential properties further downstream.
- Where the upstream catchment is a developed urban area, the cross corridor culverts can be provided with treatment devices or GPT type devices to provide beneficial outcomes for the downstream receiving waters.
- There should be negligible impact on water quality and water quantity for the pre-development and post-development stages of the upgrade at the catchment outlets. The drainage design does not provide adequate water quality treatment measures which would result in increased pollutant loads in downstream ecosystems. Where the drainage design is not able to achieve negligible impact on water quality and quantity, the proposal should incorporate appropriate water management features. All basins and OSD devices should have a primary spill containment cell of 25,000 litres minimum with the remainder of the basin designed to be

bunded in a major spill by emergency services. Any proposed pollutant control device or bio-retention basin should be designed for ease of future maintenance inclusive of vehicle access for the adjoining road corridor. The drainage and hydrology study does not take account of the development of the Ingleside Precinct and its water management objectives.

- Outlet P7 on the Harvey Road extension directs flow towards the proposed town centre development area and proposed playing fields. Appropriate consideration needs to be given to the future land use.
- The changes in road drainage and potential impacts on the drainage system in the Kimbriki recycling facility have not been assessed.

Response

Roads and Maritime has met several times with Council since receiving Council's submission to discuss and respond to its issues regarding the drainage design and potential impacts. Roads and Maritime has assured Council of the rationale and reasoning behind the design and Council has acknowledged their acceptance of the current design. In addition to the following actions, Roads and Maritime will continue to work with Council during the detailed design stage to address drainage concerns with regards to the proposal.

The proposal would not cause any trapped sags as it will be designed in accordance with best practice with transverse drainage provided to drain low points.

As part of the risk assessment process to be undertaken during detailed design, flood impacts to properties in the Wirreanda Valley would be further considered (note, negligible impact has been identified as part of the concept design modelling as shown in Appendix D of the REF) and should increases be identified, investigations to provide on-site detention (OSD) system would be undertaken. Any requirement for OSD at this location will be sized to achieve a minimum reduction in peak flows such that the change in peak flowrate post upgrade at the discharge point of Wirreanda Creek will be as close to 0% as possible in the 2 year ARI flood event and a maximum 5% increase in the 100 year ARI flood event, consistent with the approach being developed by DPE for the Ingleside release area.

In addition to consideration for discharge into Wirreanda Creek, opportunities to reduce the peak flow rate downstream of the release area into Kur-ring-gai Chase National Park and Garigal National Park (including Outlet P16) to a maximum of five per cent would be further investigated during detailed design.

The pavement drainage design objectives as detailed in the Hydrology assessment are to as far as practicable maintain existing flows from pre-development and post-development. The design of kerb and gutters along Powder Works Road will be refined during detailed design. Should an increase in flows be identified at the tie in of the proposal and the existing road, consideration would be given to the need to incorporate retention measures at this location to minimise impacts to downstream properties. Roads and Maritime note that the Monash County Club is outside of the proposal area and would not be considered a suitable location or measure for water retention of road pavement drainage.

The Mona Vale Road alignment and Harvey Road extension are located on ridgelines and as such, there is no developed area located in a catchment upstream of the proposal. Cross corridor culverts would be designed to enable existing overland flows to cross without discharge from the proposal, and as such cross corridor flows would not require treatment resulting from impacts of the proposal.

During detailed design, further opportunities to incorporate water quality treatment devices, such as grassed swales, into the design that will minimise any increase of Total Nitrogen (TN) and Total Phosphorus (TP), into downstream catchments will be investigated.

A risk assessment will be conducted as part of the detailed design process to further consider risks associated with Total Suspended Solids (TSS), Gross Pollutants (GP) and spill containment resulting from the proposal. To date, the assessment carried out has not identified a level of risk sufficient to warrant provision of such structures. The proposal would greatly improve road geometry and reduce the potential for traffic incidents giving rise to major spill events. Each drainage outlet would provide a suitable point for the bunding of the drainage system in the event of a spill event. Should the risk assessment identify any new risks associated with TSS, GP, or the need for spill containment, further work would be undertaken for the design to maximise the removal of TSS and GP.

Where water quality treatment elements are incorporated into the detailed design, suitable and safe access for maintenance would be provided.

Development of the Mona Vale Road West upgrade proposal has included regular consultation with DPE and has been mindful of the water cycle management objectives for the precinct. Discharge of flows has been aligned to discharge to the Wirreanda Creek catchment which does not flow through the future precinct. The objectives and targets outlined in the precinct planning documents are those for the development of land and not the road upgrade project. As such, they target pollutants associated with an urban development project; these are not typically the same as those associated by road projects. Roads and Maritime would continue to identify opportunities within the corridor to further mitigate the impacts of the proposal on the downstream environment.

Outlet P7 is provided as the discharge point into the future drainage reserve identified in the Draft Structure Plan for Ingleside. It is also noted that this section of the Harvey Road extension would form one of the roads within the Ingleside Precinct; as such, measures to manage drainage flows and water quality would be addressed through the water management measures for the precinct.

The assessment for the drainage design has considered the topography of the Kimbriki Resource Recovery Centre and its surrounds. The impacts are presented and discussed in the Surface Water Strategy, Hydrology and Hydraulics Report (REF Appendix D) and show that runoff from the upstream catchment is diverted around the site by the road embankment. Accordingly, the impacts of the proposal are considered negligible and would not impact on the site.

2.12.2 Flooding

Submission number(s)

1

Issue description

- The level of acceptable flooding impacts (levels) adopted for the hydrology and drainage study is less than Council's typical requirements and does not take into account future development and rezoning of the Ingleside Precinct. Where adopted flood levels cannot be met, the drainage design should be revised to achieve the acceptable downstream property impacts
- Roads and Maritime should review the adopted flood tolerances with reference to Council's criteria and if required, incorporate additional management measures to avoid/minimise downstream impacts on properties and biodiversity.

Response

It is Roads and Maritime's understanding that the land use zoning for areas that the proposal would discharge to would not change based on the land uses shown in the map for the Draft Structure Plan for Ingleside.

Further consultation between Roads and Maritime and Council identified the principal area of concern to be the area between Tumburra Street and Wirreanda Road. Flooding impacts in this area will be avoided by developing the pavement drainage design with a discharge point downstream of the affected area. It is noted that the 2, 10, 50 and 100 year post-upgrade flood extents as noted in the REF Surface Water Strategy, Hydrology and Hydraulics Report (Appendix D) would be fully contained within the riparian corridor for Wirreanda Creek as identified on the DPE plans, with changes in peak flood levels modelled as less than 0.1 millimetre increase across all four scenarios.

Roads and Maritime will investigate opportunities to incorporate on-site detention into the detailed design of the Mona Vale Road West upgrade proposal to reduce post-upgrade peak flows in Wirreanda Creek by a maximum of five per cent, consistent with the flow change targeted within DPE's *Draft Water Cycle Management and Flooding Assessment*.

2.13 Water quality

Submission number(s)

1, 60

Issue description

- Assessment of water quality impacts focusses primarily on frog habitats, and gives insufficient attention to other areas, particularly with regard to holistic management of impacts. The proposed water quality management measures would not adequately mitigate the impacts of nutrients on potential frog habitat areas and other downstream receiving environments. Suitable water quality treatment measures should be provided to achieve negligible pollutant impact (TP, TN) on all downstream ecosystems, including McCarrs Creek catchment and Deep Creek catchments
- Runoff from the road will cause water pollution. Has any consideration been given to local residents not on town water supply?

Response

The surface water strategy (Appendix D of the REF) provided a water quality assessment which assessed local water quality impacts resulting from changes to the existing pavement drainage regime and subsequent flow rates. Modelling included an assessment of water quality for those locations known to provide habitat to the Giant Burrowing Frog (GBF) and Red-crowned Toadlet (RCT) in the Deep Creek catchment, as well as impacts to Wirreanda Creek (McCarrs Creek Catchment).

The water quality strategy and pavement drainage design aimed to result in negligible changes to the annual pollutant loads (TP, TN, TSS), in particular on downstream ecosystems and GBF and RCT habitats identified in the REF and SIS. Modelling results, as documented in the REF, identified that with the exception of outlet P4-1-1 and outlet P3-1-1, water quality impacts show a net decrease in pollutant loading downstream of discharge points as a result of the proposal.

The ability to provide water quality treatment devices that adequately remove the nitrogen and phosphorus load increases anticipated from the proposal is constrained by the existing topography and presence of constraints such as, GBF and RCT habitats, Aboriginal heritage sites, the presence of endangered flora, and national park boundaries. The mitigation strategy has provided oil and grit separators to address the anticipated increase in TSS, GP, and oil. These devices are not designed to remove nitrogen and phosphorous.

In response to Council's submission, and following further consultation with Council, Roads and Maritime has commenced investigations into design refinements to reduce modelled increases in TP and TN discharged at outlet P4 (into Deep Creek catchment). During detailed design further investigations would be undertaken with the objective of maintaining negligible changes in TP and TN into areas of known GBF and RCT habitat from outlet P4. This will include consideration of redirecting flows toward the north, as well as development of a swale to the north of Mona Vale Road to provide adequate mitigation to manage water quality discharged to Wirreanda Creek. Run-off from the road would be collected and piped into the local drainage network as described in the REF. Roads and Maritime is not aware of any connection between road runoff and water supply to properties in the area.

2.14 Property impacts

Submission number(s)

52, 62, 85, 87

Issue description

- The proposal should include gutters along both Mona Vale Road and Kimbriki Road to prevent sediment washing onto adjoining residential properties, which occurs at present
- How close is the revised Kimbriki Road coming to our property? From the plans it appears to be crossing our front doorstep and with the turning circle, there appears to be a major impact on our property
- If the road is on embankments along this new section of Harvey Road, these would have an impact on an adjacent property and therefore retaining walls would be preferred instead
- Concerned that excess spoil from the Mona Vale East upgrade will be used for the Harvey Road extension, and that excess slurry could impact adjoining property

- The proposed Harvey Road extension would impact two buildings used as business premises. Any property acquisition would need to include appropriate compensation for relocation of the business to another suitable site
- Object to the possible acquisition of part of the property along the Addison Road frontage and the full length of the southern boundary. This, in conjunction with the proposed acquisition of part of the property by Sydney Water for a water reservoir, would severely limit/prevent any future residential development of the remaining northern portion of the property
- The proposed Harvey Road extension and the proposed upgrading of Addison Road will involve extensive earthworks and construction of retaining walls to both road frontages, requiring considerable amounts of property acquisition. This, in conjunction with the proposed water reservoir, would severely restrict vehicle and pedestrian access to the property
- It is requested that the detailed design of the proposed Harvey Road extension, as well as the proposed upgrading of Addison Road minimise the amount of land required for proposed road works within the site including the extent of retaining walls and that provision is to be made for suitable vehicular and pedestrian access to the site.

Response

The proposal currently includes an upgraded pavement drainage system, including kerb and gutter, to convey and discharge stormwater from the road pavement to the existing drainage swale beyond the extents of the proposal.

The design in the REF proposed retaining walls along the Harvey Road extension in order to minimise the road footprint. However design refinements since the display have identified that batters would be a better outcome for properties in this area as these would allow access onto the properties. These proposed changes to the proposal are described in Section 4.1. The detailed design would be finalised in consultation with affected property owners.

If spoil is reused between projects it would be subject to controls and spoil classification in accordance with Roads and Maritime and EPA guidelines, as detailed in Section 6.13 of the REF. It is not proposed to utilise the spoil from Mona Vale Road East along Harvey Road. There would be enough fill generated from the construction of Addison Road and the Harvey Road extension to provide fill in this area.

As stated in the REF, impacts to properties would be confirmed through detailed design in consultation with affected landowners. Acquisition would be undertaken 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 acknowledges the submissions made by residents along the proposed Harvey Road extension and the concerns that were raised regarding vehicle and pedestrian access to properties through this section. Additional design development has occurred in response to these submissions and an alternative design solution has been identified for this location. The description of these changes and the associated impact assessment is provided in Section 4.

2.15 Amenity

Submission number(s)

1, 9, 52, 61, 62, 70, 79, 85

Issue description

- As part of the detailed design for the west section of the Mona Vale Road Upgrade, Roads and Maritime should address the noise and future amenity within the Harvey Road corridor, rather than through the Draft Structure Plan for Ingleside as the Harvey Road corridor is an essential part of the Mona Vale Road West upgrade
- Request further details of the type of retaining wall proposed for Kimbriki Road
- Advertising vehicles should be banned from parking along Mona Vale Road as they detract from the beauty of the bushland
- Access to our property is often blocked due to cars parking in front of the property and in the driveway. Will parking be provided as part of the proposal?
- The encroachment of the proposal on to our property on Kimbriki Road will decrease the liveability of our home with regard to safety, overshadowing, use of front yard including garden and parking, noise impacts, and will greatly reduce our privacy. Concerned about a loss of privacy and reduced amenity from increased noise and pollution. Suggest that privacy and amenity concerns could be addressed by lowering the level of the road and/or the provision of screening vegetation
- Confirmation sought that noise and shading impacts on the adjacent residences at Kimbriki Road have been considered. Concern that the removal of the large rock between Mona Vale Road and properties on Kimbriki Road would expose the residence to greater noise levels
- Two properties on the corner of Kimbriki Road and Mona Vale Road were concerned about the proximity of the house to Mona Vale Road and the current levels of traffic compared to when the houses were built around 1952
- The increase in heavy vehicles will greatly affect amenity and this would reduce the value of properties
- The proposal will direct traffic through the Wirreanda Valley and the increased traffic, air and noise pollution will greatly reduce amenity. Due to the gradient of the Harvey Road extension, trucks will need to use exhaust brakes which will create additional noise, vibration, and pollution affecting our property.

Response

The impact assessment for the proposed Harvey Road extension has been assessed as part of the REF for the Mona Vale Road West Upgrade as it is an integral part of the proposal.

The proposed retaining wall at Kimbriki Road will be developed in the detailed design but is currently proposed as a retained soil wall (RSW), 80 metres in length and a maximum height of 5.5 metres high. Surface finishes would be confirmed during detailed design and opportunities for landscaping and plantings to soften the appearance of the wall would also be confirmed.

No parking is permitted along Mona Vale Road and this would continue under the proposed upgrade. Parking on local roads is the responsibility of Council. Policing of illegal vehicle parking is the responsibility of Council and the NSW Police.

Changes to amenity for residents along the proposed upgrade have been assessed in the REF. It is acknowledged that some properties will experience a higher degree of impacts than others. Opportunities to minimise impacts have been adopted where possible and further opportunities will be investigated during detailed design. Property impacts and any property adjustments would be carried out in accordance with the *Roads and Maritime Services Land Acquisition Information Guide* (Roads and Maritime Services, 2014) and the *Land Acquisition (Just Terms Compensation) Act 1991*.

During detailed design a landscaping strategy would be developed to implement the landscape and urban design objectives identified in the REF. This would include planting schedules and identify opportunities for screening and other measures to minimise the visual impact of the proposal.

Noise impacts have been assessed in Section 6.8 of the REF. A number of properties in the vicinity of Powder Works Road and the intersection with Mona Vale Road were identified as likely to experience noise levels above the relevant criteria as a result of the proposal. These properties would be eligible for consideration of at-property noise mitigation treatments, subject to the relevant suitability criteria being met. The proposal is not expected to have overshadowing impacts.

The noise and vibration impact assessment included consideration of the change in traffic noise that would be experienced by receivers as a consequence of the road moving closer to residential properties.

The level of the Harvey Road extension is determined by the levels of the existing connecting roads (Bungendore Road Harvey Road and Addison Road) and has been designed to achieve a consistent and safe road grade.

The proposal is not expected to attract additional heavy vehicles to the Wirreanda Valley. The changes to access arrangements on local road is proposed to improve safe vehicle access onto and off Mona Vale Road, however the changes would result in a redistribution of local traffic, not attract new vehicles that were not already using the area. The air quality changes from the proposal are expected to be negligible.

The noise and vibration assessment identified that there would be some additional traffic noise generated by the Harvey Road extension, compared to the existing quiet, natural environment. Properties eligible for noise mitigation treatments have been identified in the REF. Roads and Maritime would continue to consult with affected property owners regarding noise mitigation measures during the detailed design phase and construction phases.

2.16 Non-Aboriginal heritage

Submission number(s)

1

Issue description

- Council supports the recommendation for an arborist's assessment of the feasibility of relocation of the affected Monterey Pines to a new location close to the original location as well as the viability of propagation using cuttings from the said original tree(s). In the event that the pines are removed, Council requests that a photographic archival record of the trees to be removed should be made prior to the commencement of any works
- Minimal or no assessment has been made in regard to the heritage significance of other Monterey Pines in the vicinity. Further assessment on these trees is requested
- Council considers the potential impacts on the heritage values of the Baha'i House of Worship to be minor provided the landscape setting is retained and an adequate exclusion zone is maintained during construction of the road corridor(s)
- The heritage assessment has not considered two heritage items: Laterite Site (SHI 227513) and Addison Trigonometrical Station (SHI 2270504).

Response

Council's support for the proposal to investigate the feasibility of the relocation of the heritage listed Monterey Pines is noted. This would be undertaken during detailed design.

A photographic archival record of the trees to be removed would be made prior to the commencement of any works.

Baha'i House of Worship to be minor, providing the identified measures are implemented.

2.17 Aboriginal cultural heritage

Submission number(s)

86

Issue description

- OEH supports the recommendation in the Kelleher Nightingale Consulting report that future detailed design should ensure identified Aboriginal archaeological sites be avoided and conserved during and post road construction. If avoidance and conservation is not possible, then an Aboriginal Heritage Impact Permit (AHIP) will be required to mitigate harm to Aboriginal objects, sites and values
- Those parts of the proposal area not assessed as part of the Kelleher Nightingale Consulting report will require assessment (including survey) prior to an AHIP and commencement of works to effectively identify, assess and mitigate potential Aboriginal heritage objects, sites and values which may be harmed through the proposal. The assessment should identify the nature, extent and potential of Aboriginal Cultural Heritage (ACH) sites and values across the area. A Management Plan should be developed prior to submission of an AHIP and/or commencement of works. The plan should identify all measures to avoid all direct and indirect impacts to Aboriginal heritage sites within and in proximity to the construction area

- The Aboriginal archaeological assessment does not address subsurface archaeological potential. Prior to submission of an AHIP application and/or commencement of works, the subsurface archaeological potential of the proposal area should be assessed
- The rock engravings identified in the SoHI should be inspected and assessed by an archaeologist suitably qualified in Aboriginal heritage prior to the submission of an AHIP application and/or commencement of works
- Submission of an AHIP shall include documentary evidence of consultation with the Aboriginal community in accordance with clause 80C of the *National Parks and Wildlife Regulation 2009* and the *Aboriginal cultural heritage consultation requirements for proponents 2010*.

Response

OEH's support of the recommendation to avoid and conserve identified Aboriginal archaeological sites during construction and operation is noted. If any change in impact on Aboriginal heritage items is identified during detailed design, an Aboriginal Heritage Impact Permit (AHIP) may be required.

The additional Aboriginal heritage assessment for the parts of the proposal area that were not assessed as part of the Kelleher Nightingale Consulting have been assessed subsequent to the public display and are discussed in Section 3.2. If an AHIP is required, a Management Plan would be developed prior to submission of the AHIP and/or commencement of works. The plan would identify all measures to avoid all direct and indirect impacts to Aboriginal heritage sites within and in proximity to the construction area and would include appropriate considerations to address subsurface archaeological potential of the proposal area. The AHIP would include documentary evidence of consultation with the Aboriginal community in accordance with clause 80C of the *National Parks and Wildlife Regulation 2009* and the *Aboriginal cultural heritage consultation requirements for proponents 2010*.

The rock engravings identified in the Aboriginal Cultural Heritage Constraints Mapping and Archaeological Survey Report for the proposal would be inspected and assessed by an archaeologist suitably qualified in Aboriginal heritage prior to the submission of an AHIP application and/or commencement of works.

2.18 Landscape and visual

Submission number(s)

1

Issue description

- Works along Mona Vale Road in the vicinity of the Baha'i House of Worship should be minimised to retain the associated vista and landscape setting
- The urban design and landscape strategy for the proposal should incorporate heritage-related elements along the Harvey Road corridor and along the section of the shared path adjacent to the Baha'i House of Worship. Interpretive signage should be installed along realigned access road (Baha'i Temple Way) leading to the Baha'i House of Worship.

Response

Every effort has been made to maintain valued views and outlooks. However, some changes to the visual landscape associated with the proposal are unavoidable due to the change in road levels and

road width. Opportunities to mitigate the visual impact of the proposal, particularly in the vicinity of the Baha'i Temple have been identified in the Landscape and Urban Design Strategy and further development of these concepts and principles would occur during detailed design when a planting strategy would be prepared. As stated in the REF, the bushland buffer zone between Mona Vale Road and the temple would be maintained.

Opportunities to develop interpretive signage along the realigned access road to the Baha'i House of Worship would be investigated during detailed design.

2.19 Air quality

Submission number(s)

60

Issue description

- Areas in the valley below the ridgeline will be subject to air pollution.

2.20 Other matters

Submission number(s)

1, 6, 14, 16, 33, 52, 60, 62

Issue description

- The redundant sections of road to the south of the land bridge may deter fauna from using the land bridge. Redundant sections of Mona Vale Road, particularly in the vicinity of the land bridge should be rehabilitated
- Independent audits should be conducted for the proposal with regard to the technical soundness of the design and the time taken to get to this stage of project development
- Insufficient consideration has been given to effects of the proposal, particularly to the west in suburbs such as St Ives and Macquarie. Could an elevation sign be provided in the Tumbledown Dick locality? Are there any updates on upgrading the section of Mona Vale Road to the west of Ponderosa Parade? The full upgrade of Mona Vale Road is required. Concerned that some trucks are currently entering the resource recovery centre between midnight and 4 am
- There is a possible loss of infrastructure for people living along Wirreanda Road. Will trucks transporting excess spoil from the Mona Vale East upgrade for use in the earth fill platform near Kimbriki Road travel along Harvey Road?

Response

Roads and Maritime will be handing the redundant section of Mona Vale Road to NPWS for incorporation into Garigal National Park. Roads and Maritime will consult with NPWS about the rehabilitation works required for this parcel of land during the detailed design phase of the proposal. Opportunities for rehabilitation of redundant sections of Mona Vale Road would be investigated in detailed design.

All of Roads and Maritime's road projects are subject to peer reviews by internal specialists in the areas of road design, structures, geotechnical and pavements at concept design and detailed

design stages. The Mona Vale Road West project has taken more time than usual to develop as it could not be completed until details of the draft strategy for the Ingleside Precinct was released.

The proposal has been evaluated using a Sydney wide strategic traffic planning model. This model is able to calculate the benefits accruing to current users of Mona Vale Road as well as the effects of any traffic redistribution that may take place throughout the broader road network. Consideration of an elevation sign at Tumbledown Dick will be included as part of the detailed design.

The Mona Vale East Upgrade Project Manor Road, Ingleside to Foley Street, Mona Vale received project approval in August 2015 and Roads and Maritime is currently completing the detailed design for the road upgrade. Construction is expected to commence in the first half of 2018. Further details can be found on the Roads and Maritime website. In 2009, Roads and Maritime prepared a corridor strategy for the area from Mona Vale to Macquarie Park. The strategy identified short and long term priorities for Mona Vale Road, to address congestion and safety issues, including the east and west upgrades. Upgrade projects are announced to the community as they are developed and Roads and Maritime will continue to keep the community informed of new proposals to upgrade important arterial roads on the Northern Beaches.

Routes for construction vehicles would be confirmed by the construction contractor for the Mona Vale East project when it is awarded. The REF for the Mona Vale Road East Upgrade project identified that there would be an increase in truck movements on Mona Vale Road during construction and that around 50 construction vehicles per day are expected.

3. Additional assessment

3.1 Biodiversity

3.1.1 Summary

Since the preparation of the REF and SIS, a section of the Harvey Road extension was revised to replace retaining walls with earth embankments (batters). This resulted in a larger construction footprint to that initially assessed (Section 4.1) requiring additional biodiversity assessments. This presented an opportunity to assess several private properties that were not able to be accessed during the field investigations for the REF and SIS, and to ground truth areas previously identified through desktop searches as an endangered ecological community (EEC).

The biodiversity assessment comprised:

- targeted threatened flora searches
- characterisation of vegetation communities
- fauna habitat assessment.

A technical note summarising the findings is provided in Appendix B.

Suitable habitat for ten threatened flora species (the same as those identified in the REF and SIS) was observed within the revised construction footprint; however, these species were not identified during the targeted survey. The additional survey was, however, conducted outside the known flowering period (required for positive identification) of two of these species – *Microtis angusii* and *Tetratheca glandulosa*. As these species were not identified during targeted surveys undertaken for the REF and SIS, it is unlikely that they occur in the revised construction footprint.

Vegetation communities within the revised construction footprint were identified through both desktop assessment and ground truthing, and were observed to be commensurate with those observed in the area assessed for the REF and SIS. No threatened ecological communities were identified in the enlarged construction footprint.

Since no threatened species or communities were identified within the revised construction footprint, and the area comprises the same vegetation communities as those observed in the REF, the assessment of impacts to these, as described in the SIS, remains valid. Specifically, that there will be minimal impacts to biodiversity within the area.

In addition to the revised construction footprint, an area tentatively identified in the SIS as equivalent to the Duffys Forest Ecological Community (DFEC) was also ground-truthed during the biodiversity assessment. This ground truthing found that the dominant floristics and structure of the community did not conform to the scientific determination of DFEC. As such, the predicted extent of impacts to DFEC was reduced by approximately 0.35 hectares, resulting in a reduction in the total area of impact to DFEC to 3.01 hectares.

The biodiversity assessment of the revised construction footprint identified additional extents of suitable habitat and associated vegetation communities for 12 threatened fauna species (the same as those identified in the REF and SIS). Targeted fauna searches were not undertaken within the enlarged construction footprint; however, habitat assessments found that the habitat extent was similar to that observed in the area assessed for the REF. As such, impacts were considered commensurate with those described in the REF and SIS, with only minor increases to some fauna

habitats identified. These additional impacts to fauna habitat as a result of the revised construction footprint include:

- an increase in impacts to Open Woodland habitat by about 1.25 hectares to a total area of 18.55 hectares
- an increase in impacts to Sandstone Heath habitat by 0.15 hectares to a total area of 0.35 hectares
- an increase to disturbed habitat by 1.39 hectares to a total area of 3.19 hectares.

These increases are not expected to change the outcomes of the Assessments of Significance completed as part of the SIS.

The Harvey Road extension design changes and revised construction footprint also encompass the fauna underpass, proposed to run north-south under Harvey Road between Bungendore Street and Addison Road. This fauna underpass is cited within the SIS (SMEC, 2017b) as an ameliorative measure that will facilitate fauna movement underneath the proposed Harvey Road extension. The re-design of the Harvey Road extension means that the fauna underpass will need to be lengthened to around 80 metres to accommodate the additional width of the road and batter footprint. However, it is not anticipated that the efficacy of the fauna underpass would be compromised because of this.

Fauna furniture would be provided within the underpass to ensure dry passage for mammals. The final arrangement of the fauna underpass and other fauna crossing structures will be determined during detailed design through consultation with OEH and Northern Beaches Council. An indicative fauna furniture design, used by Roads and Maritime for the Woolgoolga to Ballina upgrade of the Pacific Highway, and approved by the EPA and OEH, is included as an example in Appendix C.

3.1.2 Additional management and mitigation measures

Impact	Environmental safeguard	Responsibility	Timing
Road corridor widening changes will require the fauna underpass at Harvey Road to be redesigned	The design of the fauna underpass at the Harvey Road extension will be re-examined during detailed design to maximise use by target fauna species in consultation with Roads and Maritime Biodiversity specialists, OEH and Council.	Design contractor	Detailed design
Impacts on native fauna	A monitoring program will be drafted in accordance with the requirements of Table 41 of the SIS. The program will be prepared in consultation with Roads and maritime Biodiversity specialists, Northern Beaches Council and OEH to ensure it aligns with conservation work and research in the area.	Roads and Maritime, Construction Contractor	Pre-construction,- Construction, Post-construction

3.2 Aboriginal heritage

3.2.1 Summary

Since the preparation of the REF and SIS, a section of the Harvey Road extension was revised to replace retaining walls with earth embankments (batters). This resulted in a larger construction footprint to that initially assessed. This presented an opportunity to assess several private properties that were not able to be accessed during the field investigations for the REF and SIS.

The revised construction footprint required Aboriginal cultural heritage constraints mapping and an archaeological assessment. The assessment included:

- a desktop search of relevant information from the AHIMS and other heritage registers and databases
- a review of previous archaeological investigations
- an assessment of the landscape context, regional character and site predictions
- an archaeological survey.

Search results from the Aboriginal Heritage Information Management System (AHIMS) database identified that none of the previously identified sites within the proposal area are located within the boundaries of the revised construction footprint. Similarly, a review of other heritage registers and databases did not identify any further listed or registered items of Aboriginal heritage within the revised construction area. The search results did, however, further demonstrate that the local area retains archaeological evidence of past Aboriginal landscape use.

A review of previous archaeological investigations conducted within and in the vicinity of the revised construction footprint identified several Aboriginal archaeological sites that, through spatial distribution and the artefacts present at each site, aid in assessing the archaeological character of the region. This assessment determined that engraving, shelter, and grinding groove sites, as well as open artefact scatters or isolated finds have the potential to occur in the revised construction area. An archaeological assessment was therefore conducted within the revised construction footprint.

The archaeological assessment identified no Aboriginal archaeological sites, objects or potential archaeological deposits occur within the revised construction footprint. The survey identified that the area exhibited substantial ground disturbance with no potential for natural ground surface or intact buried surfaces containing Aboriginal objects. Rock platforms were observed within the road easement between Bungendore Street and Addison Road; however, no engravings were identified. As such, the assessment of the revised construction area determined that there are no Aboriginal archaeological heritage constraints to the proposed upgrade works.

3.2.2 Additional management and mitigation measures

No additional management and mitigation measures are recommended.

4. Changes to the proposal

Subsequent to public exhibition of the REF and SIS, design changes have occurred in response to further geotechnical information being available, to address submissions received on the REF, and in response to further consultation with government agencies and community members. Changes to the proposal, as illustrated in Figures 1-2 to 1-6, are discussed, assessed, and additional mitigation measures provided where required in this section.

Changes to the proposal comprised:

- removal of the proposed retaining walls along part of the Harvey Road extension, and replacing them with batters to provide better access to adjoining properties and improve visual amenity
- moving the Harvey Road alignment in the vicinity of the Addison Road intersection to more equitably distribute the impacts on adjoining properties
- provision of additional right turn lane from Mona Vale Road into Powder Works Road to improve the level of service at this intersection
- relocation of the westbound bus stop at Kimbriki Road intersection further west along Mona Vale Road to provide safer and better delineation for merging traffic.

The final proposal is illustrated in

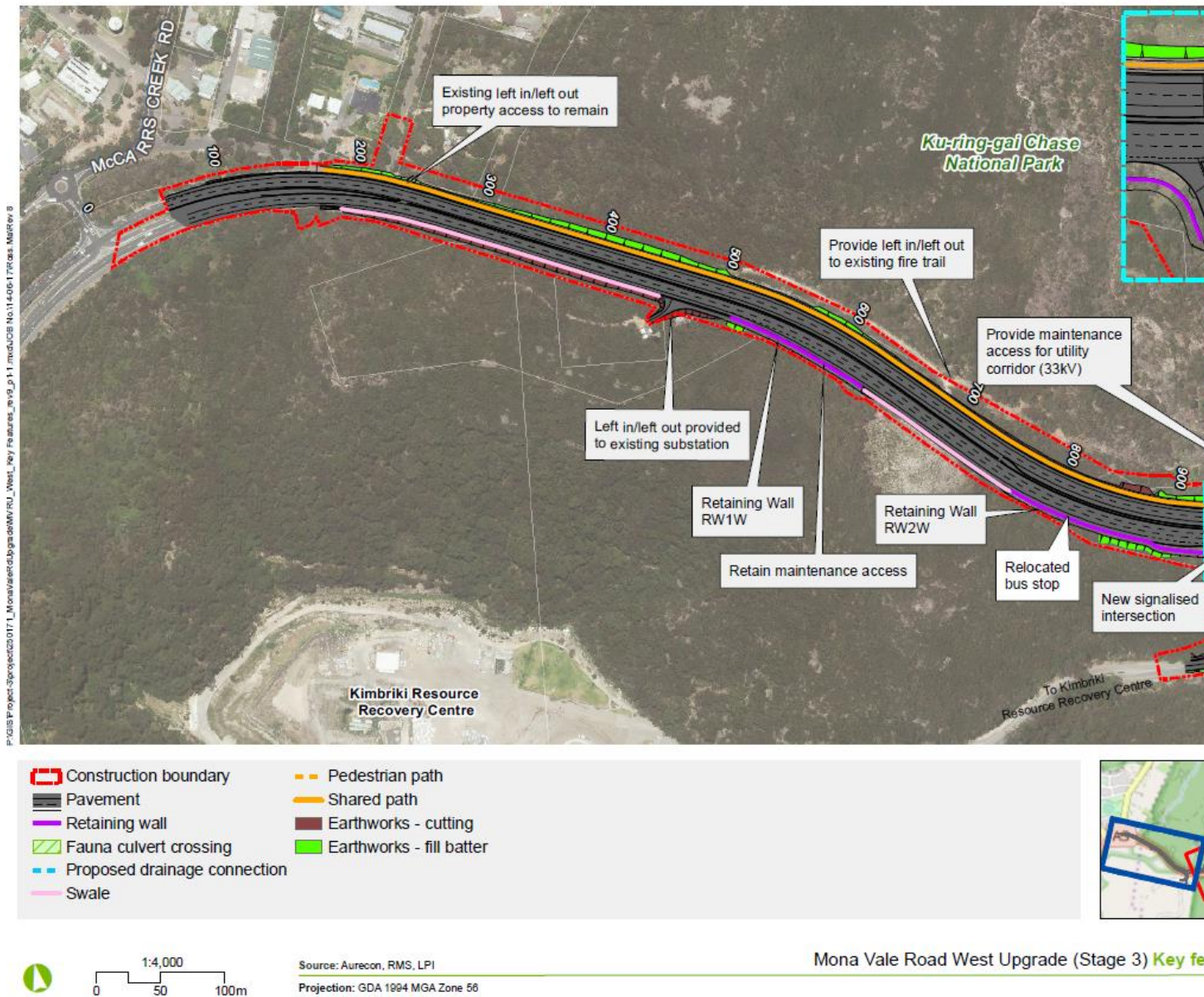


Figure 1-2 to

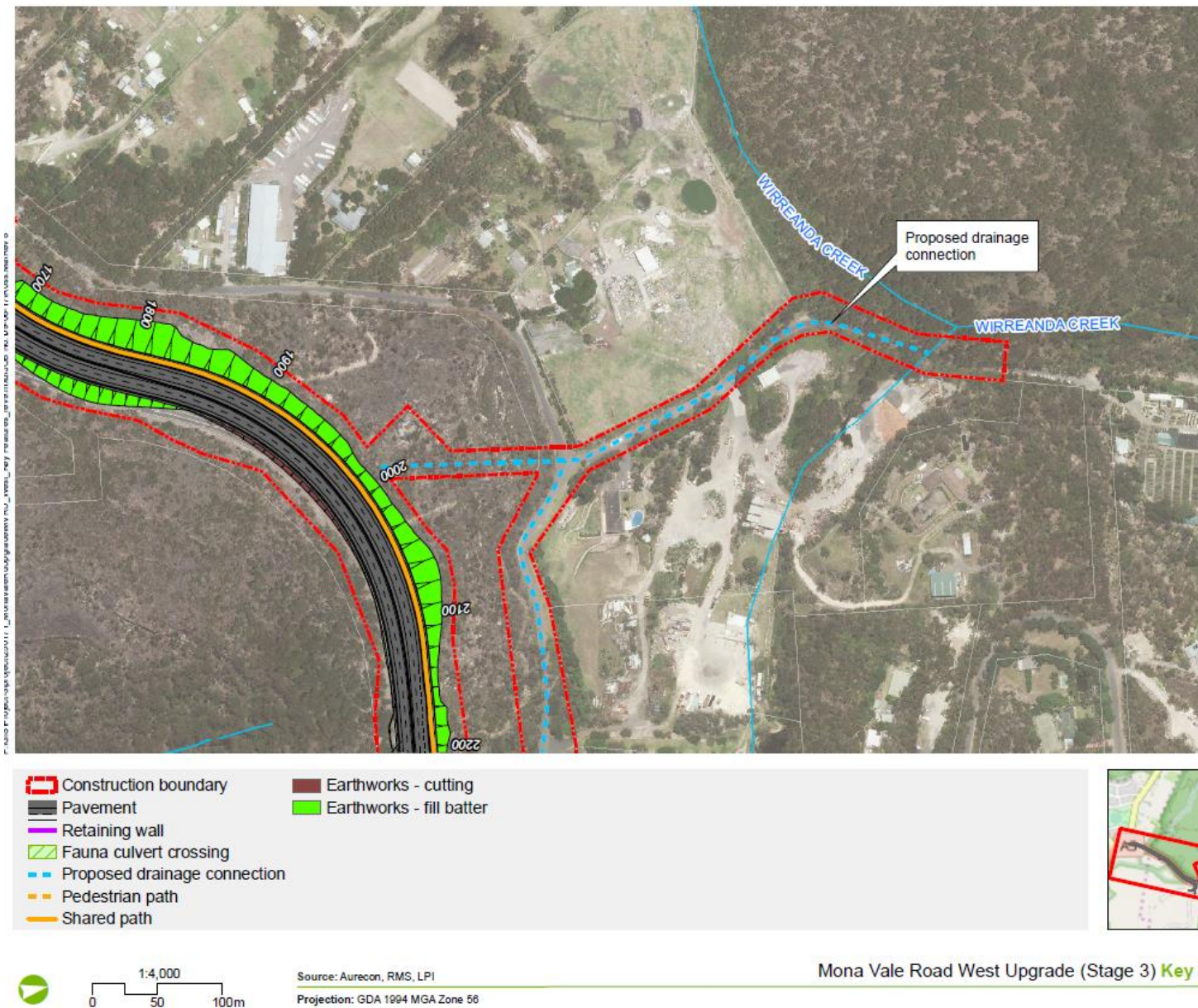


Figure 1-6.

4.1 Removal of retaining walls on Harvey Road extension

4.1.1 Description

The design for the Harvey Road extension presented in the REF included retaining walls in the vicinity of the intersection with Addison Road (RW11W – south, RW12W – north), and to the east of Addison Road (RW10W – north, RW9W – south). This reflected the highly variable topography through and either side of this area with retaining walls RW11W and RW12W incorporated to minimise direct impacts on adjoining properties and to constrain the design to the footprint of the existing paper road (Crown Land).

The resulting difference in levels between the road and adjoining properties ranges up to eight metres fill retaining wall and up to nine metre cut, with the largest level difference being in relation to the Harvey Road extension to the east of Addison Road.

The existing access to the residence at 31 Addison Road, which is located in the road reservation, would be directly impacted (removed) by the inclusion of retaining walls at this location of the Harvey Road extension. Provision of alternative access from Addison Road to the residence is problematic due to the differences in levels between the road and the property. Access would therefore need to be provided from the Harvey Road extension. However, with the retaining wall design, this would present a potential safety issue associated with the safe movement of vehicles into and out of the property. Management of this issue would require provision of a slip lane and merge lane, which would add significantly to the costs of the retaining wall and an associated increase in property acquisition.

In view of this, the design of the Harvey Road extension through the section west of Addison Road has been revised to remove the retaining walls and instead locate the road on embankment, these having a 4:1 slope. The embankments would be refined during detailed design, and would extend up to maximum of 30 metres into the adjoining properties between CH600 and CH700. The revised design for this section of the Harvey Road extension is shown in Figure 1-5.

The proposed design change provides access to a vacant parcel of land to the west of 21 Addison Road that is currently land locked. The proposed change also provides an opportunity to minimise visual impacts of the proposal for adjoining property owners. The retaining walls would be visible from the residences on both properties, particularly for 31 Addison Road where the existing residence is about 30 metres from its southern property boundary. The residence on 21 Addison Road is about 95 metres from its northern property boundary and views of the retaining wall would be filtered through intervening vegetation on the property.

In consideration of submissions regarding property impacts associated with the Harvey Road extension east of Addison (refer to Section 2.4) the road alignment as shown in the REF has been moved slightly to the south to reduce impact to the property on the north of Addison Road. In addition, further geotechnical assessment has been undertaken of the sub strata indicating rock likely to be encountered at relatively shallow depth. As such, the retaining wall proposed at the REF stage has been replaced with cut batters at this location. The cut batter would be refined during detailed design, and would extend about 25 metres into the adjoining properties. The profile of the cut batter will be finalised during detailed design, and would include approximately the top two metres of the cut laid back at 2:1 and the remainder cut in rock at 0.5:1.

4.1.2 Environmental assessment

The principal impacts associated with the proposed design change relate to:

- increased property impacts through the need for partial acquisition of areas of land for construction of the embankments and establishment of a road reserve
- increased impacts on vegetation and fauna habitat
- potential impacts on Aboriginal heritage
- impacts on the visual amenity of adjoining residents.

Consideration of these impacts is provided as follows. The proposed design change is not considered to have any additional material impacts on other environmental aspects.

Property

The revised design with the embankments would impact both properties with the embankments needing to be located within the properties. The required acquisitions and the extent of these relative to the respective properties is summarised in the following table.

Table 4-1 Required property acquisitions

Property	Property size	Acquisition area	% reduction in area
21 Addison Road	Approx. 20,195 m ²	4,200 m ²	21
31 Addison Road	Approx. 31,481 m ²	6,800 m ²	21

Final acquisitions required would be confirmed through detailed design in consultation with the affected landowners. Acquisition would be undertaken 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*.

Construction of the northern embankment would require the removal of a small outbuilding adjacent to the southern property boundary. The nature of the use of this building is currently unknown. The existing vegetation along the southern boundary would also need to be removed.

Construction of the southern embankment would not affect any existing buildings with impact being limited to clearing of vegetation along the northern property boundary.

Construction of the embankments would temporarily affect the amenity of the occupants of 21 and 39 Addison Road where construction plant would be slightly closer to the residence than for construction of a retaining wall. The mitigation and management measures identified in Section 6.8.4 of the REF with regard to construction noise and vibration would adequately manage these impacts.

During detailed design development, Roads and Maritime will consider the final alignment at this location in continued consultation with affected property owners.

Biodiversity

The biodiversity assessment for the REF included investigation of biodiversity impacts associated with the Harvey Road extension. Additional investigation and assessment has been undertaken for the section affected by the design change, with the findings documented in a technical note (Appendix B to this report) and summarised in Section 3.1.

The design footprint in this location is wider than previously indicated in the REF. The increase in length of the embankment would result in a greater distance of fauna passage at this location. The approximate distance between the toes of the embankment is about 80 metres. Opportunities to reduce the fauna passage length would be considered during detailed design and may include a consideration of the fauna passages vertical positioning in the embankment. Further design considerations of fauna passage at this location would be undertaken in consultation with Roads and Maritime Biodiversity specialists, OEH and Northern Beaches Council.

Aboriginal heritage

The REF included preparation of a specialist Aboriginal heritage assessment that included consideration of potential impacts associated with the Harvey Road extension. The assessment did not identify any matters of concern with regard to the Harvey Road extension.

During the investigation, access was not available for the section of the Harvey Road extension to the east of Addison Road. Additional field investigation has been carried out and this has also included the section of Harvey Road where the embankments would be constructed. The field investigations included participation by Aboriginal stakeholders. No matters of concern were identified.

Visual amenity

There would be changed visual impacts for properties on Addison Road. Existing residences would experience a change in existing views, and a greater level of visual impact as the retaining wall would have been a prominent feature for viewers. The embankment would be similarly prominent, however, there would be greater opportunities to soften its appearance through appropriate landscaping and plantings, including screening vegetation which would mitigate the impact on visual amenity.

4.1.3 Revised management and mitigation measures

No additional mitigation measures or revisions to current proposed measures would be required with regard to biodiversity impacts associated with the replacement of the retaining walls with earth embankments.

No additional mitigation measures or revisions to current proposed measures would be required with regard to impacts Aboriginal heritage.

The following additional mitigation measure is proposed regarding visual amenity from the design changes at the Harvey Road extension.

Table 4-2 Additional environmental safeguards

Impact	Environmental safeguard	Responsibility	Timing
Visual amenity	Appropriate landscaping, including planting of screening vegetation, would be carried out on the two embankments.	Construction contractor	Construction

4.2 Shift in alignment of Harvey Road (between Mona Vale Road and Addison Road)

4.2.1 Description

Following consultation with property owners impacted by the Harvey Road extension, and in consideration of submissions received, the alignment of Harvey Road between Mona Vale Road and Addison Road will be shifted south (to a location within the construction impact area as assessed in the REF) to reduce the extent of acquisition required from properties to the north.

4.2.2 Environmental assessment

During design development Roads and Maritime considered alignment options aimed to reduce the extent of impacts to properties, and share impact extents, both north and south of the alignment on Harvey Road near the Baha'i site. An assessment of construction and operation impacts of the proposal was provided for the alignment as located within the defined construction impact area. Refinements of the road alignment, to be considered in consultation with property owners during detailed design, will remain within the extents of the construction impact area. Impacts resulting from the design refinement are consistent with those assessed in the REF at this location.

4.2.3 Revised management measures

During detailed design development, Roads and Maritime will consider the final alignment at this location in continued consultation with affected property owners.

4.3 Provision of additional right turn lane into Powder Works Road

4.3.1 Description

Additional 55 metre right turn lane will be provided from Mona Vale Road (eastbound) to Powder Works Road. A 70 metre two lane section will be provided on the Powder Works Road exit to facilitate a merge back to one lane at the proposal extent.

4.3.2 Environmental assessment

A revised model of intersection performance inclusive of the design changes was undertaken (with associated phasing optimisation). Modelling has shown with the additional right turn lane at the Mona Vale Road/Harvey Road/Powder Works Road intersection will achieve a Level of Service B during AM and PM 2036 peak periods. This performance level is considered appropriate to accommodate anticipated traffic demand to 2036, and includes the introduction of safer phasing (than that of the existing intersection) for Harvey Road and Powder Works Road.

A nominal increase in construction impact area (3.5 metre lane width x 55 metres on Mona Vale Road, and 3.5 metre lane width x 70 metres on Powder Works Road) would be required at this location to facilitate construction of an additional right turn lane.

Impacts resulting from the design refinement are consistent with those assessed in the REF at this location.

4.3.3 Revised management measures

No additional mitigation measures or revisions to current proposed measures would be required with regard to impacts associated with the design refinement.

4.4 Relocation of westbound bus stop near Kimbriki Road

4.4.1 Description

To address concerns on the location of the bus stop west of Kimbriki Road, the proposal will be revised as follows:

- signage would be provided to prohibit the westbound 'through' movement from using the nearside lane.
- the bus stop on Mona Vale Road, near the Kimbriki Road intersection, will be relocated to a location about 100 metres west of the intersection

The design refinements would aim to improve safety and merge distance at the intersection when buses are stopped.

4.4.2 Environmental assessment

Updates to prohibit the westbound 'through' movement from using the nearside lane and apply additional traffic volumes as per the development are considered to have minimal detrimental impact, with the intersection remaining at Level of Service B during AM and PM 2036 scenarios.

Impacts resulting from the design refinement are consistent with those assessed in the REF at this location.

4.4.3 Revised management measures

No additional mitigation measures or revisions to current proposed measures would be required with regard to impacts associated with the design refinement.

5. Species Impact Statement

As noted in Section 1.2, an SIS was prepared to assess the potential impacts of the Mona Vale Road West Upgrade proposal on endangered ecological communities, threatened species, and their habitats. This section of the submissions report provides clarifications to issues raised by OEH on biodiversity matters detailed in the SIS, and to related matters discussed in the REF and supporting documents, such as the Surface Water Strategy, Hydrology and Hydraulics Report (Appendix D to the REF).

As discussed in Section 3.1, since the SIS was prepared and exhibited, there has been some design refinements in the area of Harvey Road. In addition, the Wirreanda Creek catchment pipeline and outlet was added after biodiversity surveys were completed for the SIS.

Table 6-2 provides the mitigation measures detailed in the SIS (measures B-1 to B-24) and proposed additional amelioration measures that will be incorporated into the proposal to minimise any additional adverse impacts (measures B-25 to B-32).

5.1 Biodiversity

5.1.1 Survey effort

Issue description

- Total survey effort for each individual species is difficult to ascertain
- Further information is required to demonstrate how survey effort for the Red-crowned Toadlet and Giant Burrowing Frog fulfils the requirements of the SIS DGRs
- OEH questions whether any surveys for Red-crowned Toadlet or Giant Burrowing Frog or their habitats have been carried out in the part of the Wirreanda Creek catchment.

Response

Details of the survey effort undertaken for the SIS are described in Section 4.3 of the SIS. Ecosure's survey effort can be viewed on figures in the report appended to the SIS. It was considered combining the Ecosure and SMEC survey effort into one figure would be difficult to view.

Infra-red camera surveillance for the Southern Brown Bandicoot is mapped in Figure 12 in the SIS as 'Infrared baited camera (SMEC)'. Elliot traps for the Eastern Pygmy-possum were not mapped due to their close proximity to each other and to nest boxes.

Habitat surveys were undertaken by SMEC to map breeding and non-breeding habitat for both Red-crowned Toadlet and Giant Burrowing Frog. As required by the DGRs, habitat in drainage lines that may be impacted was included, except at Wirreanda Creek.

Amphibian surveys undertaken by Ecosure considered areas below the ridgeline and both threatened species were identified. Opportunistic sightings by SMEC identified the Red-crowned Toadlet near Harvey Road, an area that was not part of the investigations conducted by Ecosure.

Including habitat surveys by SMEC and surveys undertaken by Ecosure, it is considered all suitable habitat for threatened amphibians has been identified and mapped in line with the requirements of the DGRs for the proposal.

Wirreanda Creek catchment pipeline was added after surveys were completed. Given the flow rates and volume of water during rain events it is unlikely that these species live within Wirreanda Creek itself although they are known to exist in the tributaries that lead into it. The tributaries of Wirreanda Creek were surveyed by Ecosure between Mona Vale Road and Wirreanda Road.

During detailed design and prior to construction, targeted amphibian surveys will be completed in the Wirreanda Creek area of the proposal. If required, additional mitigation measures will be designed in this location to minimise any impacts to threatened amphibians. Key performance indicators of the mitigation measures and remedial actions will be included in the Flora and Fauna Management Sub-plan.

5.1.2 Impact assessment

Issue description

- Adoption of a 20 metre buffer for the assessment study area is not considered adequate to address biodiversity impacts beyond this limit
- The SIS acknowledges the potential for cumulative impacts on threatened fauna but does not provide adequate consideration of these impacts
- Cumulative impacts, particularly of the Mona Vale Road East Upgrade, should have been taken into account in determining appropriate compensatory measures for residual impacts to threatened species, ecological communities and their habitats
- Coastal Upland Swamp EEC is considered to occur in the study area
- Impacts on Coastal Upland Swamp EEC should have been considered as part of the assessment
- OEH questions the conclusion that with the implementation of identified ameliorative measures, there would not be a significant residual impact on the Eastern Pygmy-possum
- There is little evidence to support connectivity between the Eastern Pygmy-possum populations in Ku-ring-gai Chase National Park and Garigal National Park. There is no discussion provided as to whether individual records might constitute smaller local populations or whether the two populations are connected. The SIS mentions DNA sampling of captured individuals which may clarify this issue, however, this information has not been included
- The discussion on modelled hydrological and water quality changes is difficult to follow, and appears to contain some errors and omissions. Further explanation is requested
- It is unclear whether the mitigation measures identified in Sections 6.3.2 and 7.1.5 of the hydrology report have been adopted for the proposal
- There is limited discussion of the modelled impacts of hydrological changes, particularly on threatened flora and fauna
- There is no assessment of impacts on Wirreanda Creek, particularly in the upper reaches with regard to Red-crowned Toadlet and Giant Burrowing Frog
- Roads and Maritime must ensure that design of any monitoring programs is scientifically rigorous and will detect changes in the variables required
- OEH and Northern Beaches Council should be consulted to ensure the monitoring programs align with existing monitoring and research programs

- The monitoring program should include sufficient sampling and rigour to answer the questions they are designed to answer.

Response

Study area

The study area for the proposal comprises the road design plus a six metre buffer for direct impacts and a further 20 metre buffer for indirect impacts. For fauna the study area included habitat up to 500 metres from the construction footprint.

The study area was established based on a reasonable area for the expected level of impact from the proposal. During the course of the assessment process, when the proposal impacts were more fully known, the study area boundary was re-examined and confirmed as being adequate.

Cumulative impacts

Cumulative impacts for the proposal have been assessed as part of the impact assessment on threatened species and ecological communities associated with the proposed upgrade. Proven successful mitigation measures have been implemented to provide a better outcome for species in the local area. This includes supplementary measures such as the provision of a vegetated overpass, underpasses and associated fauna-exclusion fencing to maintain connectivity and reduce road strike for key fauna species including the Heath Monitor and the Eastern Pygmy-possum. Given the presence of large expanses of good quality habitat for these species in the locality in national parks estate, these supplementary measures were considered the most important factor in maintaining threatened species populations in the wider area. Particularly given that the current road does not provide any dedicated crossing structures or fencing.

No offsets were proposed for Mona Vale Road East as the identified impacts did not reach the threshold required under the Roads and Maritime *Biodiversity Offset Guidelines* (2011) that were in place at the time of project approval. As detailed in the REF for Mona Vale Road East Upgrade, Roads and Maritime proposes to mitigate the impacts of that project by supplementary measures (eg fauna land bridge, additional fauna culverts, strategic fauna-exclusion fencing and targeted revegetation) which collectively provide a more effective long term solution for the region than trying to obtain species credits in a different location(s).

Coastal Upland Swamp EEC

The Coastal Upland Swamp areas previously identified by Ecosure at Addison Road were revisited by SMEC in 2016 and flora surveys conducted at that time found that the area does not meet the determination for Coastal Upland Swamp. No other areas of Coastal Upland Swamp were found within the study area (proposed upgrade including a six metre direct impact buffer and an additional 20 metres indirect impact buffer) and, as such, Coastal Upland Swamp impacts were not assessed as part of the REF or SIS.

Hornsby Sandstone Heath Woodland

Hornsby Sandstone Heath Woodland' was a vegetation community described within *The Native Vegetation of the Sydney Metropolitan Catchment Management Authority* (DECC, 2009). However, this community was split in the updated versions 2.0 and 3.0 of *The Native Vegetation of the Sydney Metropolitan Catchment Management Authority* (OEH 2013 & 2016) and now fits into:

- Sydney North Exposed Sandstone Woodland (S_DS11)
- Coastal Sandstone Heath Mallee (S_HL08).

Both these communities were described within SMEC (2017) as their plant community type (PCT) equivalents:

- PCT ME106 – Red Bloodwood – Scribbly Gum / Old-man Banksia open forest on sandstone ridges of northern Sydney and Central Coast (Sydney North Exposed Sandstone Woodland (S_DSF11))
- PCT ME100 Mallee – Banksia – Tea-tree – Hakea heath woodland of the coastal sandstone plateaus of the Sydney Basin (Coastal Sandstone Heath Mallee (S_HL08)).

The recommendations in the Landscape Strategy (KI Studio, 2017) would be updated to include the more recent PCT descriptions.

Eastern Pygmy-possum

There is currently no evidence that the Eastern Pygmy-possum can cross the current Mona Vale Road. Given the small home ranges of the species, it is considered likely that two separated local populations exist to the north and south of the road and that there would be no connectivity between the two populations, given the current lack of crossing structures.

The species was recorded once in 1999 using a 10 metre Bebo arch under the F3 freeway (RTA, 2009). It is considered that the provision of two underpasses and an overpass containing key foraging plants for the Eastern Pygmy-possum on Mona Vale West will improve connectivity for the species in the locality. This may assist with the long-term viability of local populations(s). An indicative planting guide based on that used for the Mona Vale Road East upgrade overpass has been provided in Appendix D.

Eastern Pygmy-possums are known to exist widely across the Northern Beaches. Suitable habitat for the species exists in areas adjacent to the proposal site that will not be impacted by the proposal. Mitigation measures have been proposed for the Eastern Pygmy-possum and pre-, during and post-approval monitoring of mitigation and local populations will occur. The monitoring plan will consider remedial actions to declines over the period of monitoring in the local population following construction. As proposed in the SIS, the Eastern Pygmy-possum monitoring program may incorporate DNA sampling to determine whether distinct genetically separate sub-populations occur within the area for the purposes of maintaining these sub-populations in the longer term.

Hydrology and water quality impacts

The hydrology and flooding assessment report (Aurecon, 2017) prepared for the proposal anticipates no significant changes to hydrology flow rates as a result of the works. Work has been incorporated into the design to ensure that there will be minimal impacts to hydrology on water-dependent flora and fauna. This includes investigating design to minimise the flows through the south of the alignment to the Narrabeen Lagoon catchment and work to reduce peak flows to the north into Wirreanda Creek to a maximum increase in five per cent of pre-upgrade flows through detention of water collected from the additional road surface. Additional measures to minimise pollutant loads to discharge areas through the use of gross pollutant traps and options for incorporation of grass swales will be investigated as part of the detailed design phase in consultation with OEH.

As discussed above, the vegetation communities present within the study area are not listed as groundwater dependent ecosystems and mapped Upland Swamps are not downstream of the road catchments and proposed drainage outlets. As a result, the current study area is considered to more than encapsulate direct and indirect impacts associated with the proposal as assessed within the SIS. Mitigation measures proposed in the Aurecon report have been considered as part of the

biodiversity impact assessment. As a result, further discussion is not considered necessary for the hydrology and water quality impacts on biodiversity values.

Wirreanda Creek

Given the high flow rates and volume of water during rain events it is unlikely that Red-crowned Toadlet or Giant Burrowing Frog breed within Wirreanda Creek itself although they are known to exist in the tributaries that lead into it. However, targeted amphibian surveys will be completed in this area as part of the detailed design for the proposal. If required, additional mitigation measures will be designed in this location to minimise any impacts to these species.

During the detailed design phase, investigations into the feasibility of reducing post-upgrade peak flows to a maximum increase in five per cent of pre-upgrade flows within the Wirreanda Creek will be investigated and incorporated into the detailed design.

During the detailed design, opportunities to incorporate water quality improvement devices such as gross pollutant traps, grassed swales and buffer strips will be investigated to minimise the impact of the road upgrade on downstream nutrient loads within the Wirreanda Creek catchment.

Monitoring

A monitoring program in accordance with the SIS will be provided in the Flora and Fauna Management Sub-plan for the proposal that will detail the key performance indicators over time and remedial action triggers for the mitigation measures proposed. The plan will be prepared in consultation with Roads and Maritime Biodiversity specialists, Northern Beaches Council and OEH to ensure it aligns with conservation work and research in the area.

5.1.3 Fauna connectivity measures

Issue description

- OEH supports the measures to improve fauna connectivity between the two national parks, however, there is virtually no useful detail provided in the REF or SIS about the design of these features. Specifically:
 - would the depth of substrate on the land bridge and width of vegetation be sufficient to provide adequate habitat for the safe movement of target fauna?
 - what fauna species is the fauna underpass design for, will the size and location be adequate. Will the fauna underpass be designed with ledges or other 'furniture' to assist fauna movement and what is proposed to direct fauna into it?
- No details have been provided on the location or extent of fauna-exclusion fencing, particularly with regard to directing the diverse types of fauna to the connectivity structures.
- Further explanation and justification of the design, location and likely efficacy of these structures is required in order to ensure that the proposed overpass will be effective for facilitating fauna crossing. It is recommended that:
 - details be provided to OEH on the extent, full location and design of the exclusion fencing along Mona Vale Road that demonstrate how fauna will effectively be directed away from the roadway and onto the overpass.
 - details be provided to OEH regarding the extent of planting for the overpass to demonstrate that it will be able to be effectively vegetated and function for the purpose of a fauna crossing.

- There is no provision for safe fauna movements across Tumburra Street in an east-west direction. An additional underpass should be provided under Tumburra Street to facilitate fauna movement in an east-west direction with suitable means to direct fauna towards it, and be of appropriate sizing and design for target species.

Response

As described in the REF and SIS, extensive measures to improve fauna connectivity have been included in the proposal. As detailed in Section 3.2.11 of the REF, the proposal would provide for fauna connectivity across the upgraded Mona Vale Road and the Harvey Road extension as follows:

- a vegetated fauna crossing over Mona Vale Road comprising a 40 metre wide bridge structure, about 160 metres east of Kimbriki Road
- fauna exclusion fencing along both sides of the upgraded section of Mona Vale Road to restrict access to the roadway and to direct fauna to the overpass and underpasses
- a fauna underpass on Mona Vale Road, about 25 metres west of Tumburra Street
- a fauna underpass on the proposed Harvey Road extension about 100 metres west of Addison Road.

Fauna-exclusion fencing will be provided either side of these purpose-built structures, which will reduce wildlife road mortality in these areas and direct fauna to the crossing structures, minimising the barrier effect of the road. Further investigations into opportunities for fauna-exclusion fencing and fauna furniture along Harvey Road would be investigated in detailed design in consultation with Roads and Maritime Biodiversity specialists, OEH and Council.

The overpass will be a minimum of 40 metres wide. During detailed design, opportunities to maximise the width for fauna passage will be identified, including fencing requirements and detailed planting guides.

Where feasible, topsoil from the local area will be used on the overpass that will contain a seedbank of local species so to maximise the effectivity of revegetation. All areas associated with the land bridge will be revegetated with species consistent with the vegetation communities of the local area. An indicative plant list for the overpass being designed for Mona Vale Road East as described in Appendix D. The vegetation to be planted only requires a shallow substrate and will be managed to maximise the success of the planting. This is supported by the Wildlife Roadkill Prevention Association, previously known as the Northern Beaches Road Kill Prevention Committee.

The underpasses as proposed in the REF will be a minimum of 1.8 x 1.8 metres which has been proven successful for most of the fauna species likely to use this area for movement (RTA, 2009). Fauna furniture will be provided within both underpasses to ensure dry passage for fauna with the final arrangement of the crossing structures determined during detailed design in consultation with Roads and Maritime Biodiversity specialists, OEH and Northern Beaches Council. An indicative design which has been used by Roads and Maritime for the Woolgoolga to Ballina upgrade of the Pacific Highway, and has been approved by the EPA and OEH, is included as an example in Appendix C.

5.1.4 Consistency with Draft Structure Plan for Ingleside and potential impacts of the Harvey Road extension (Mona Vale Road to Harvey Road)

Issue description

- In January 2017, OEH provided comment on the Draft Structure Plan for Ingleside and Biodiversity Assessment Report which made reference to a 'Fauna Connectivity on Local Roads Strategy' that was to be prepared to support the Biodiversity Certification application for the release area. At the date of OEH's submission, this strategy had not yet been prepared
- The Harvey Road extension would bisect the north-south ecological corridor in this area that was identified in the Draft Structure Plan for Ingleside. While the proposal includes a fauna underpass, the REF/SIS have not demonstrated that this would be effective for all fauna or would provide an adequate connection
- Given the Fauna Connectivity on Local Roads Strategy has not yet been prepared, and there appears to be inadequate consideration of the associated fauna impacts of this proposal, OEH does not support the Harvey Road extension at this stage and considers it requires further environmental impact assessment, particularly the impacts on the proposed ecological corridor.

Response

The Draft Structure Plan for Ingleside and proposed biodiversity certification are being prepared by DPE. Roads and Maritime have consulted with, and will continue to consult with DPE regarding the proposal and the interrelationship with planning for the Ingleside Precinct.

The proposed Harvey Road was included in and assessed under the SIS and REF for the proposal. However, the construction footprint in this area has widened since the exhibition of the SIS and REF. In addition, access to properties along some areas adjacent to the proposed Harvey Road extension was only achieved after submission of the SIS. An additional biodiversity assessment has been undertaken for the proposed changes to the Harvey Road extension. It is included as Appendix B and summarised in Section 3.1.

The proposed Harvey Road extension uses an existing paper road owned by Roads and Maritime. It was considered to be the least impact option to address the design issues in the proposal. Opening up of this road extension has allowed for the provision of a fauna underpass, providing north-south connectivity in the area. It also provides a better solution for local road connectivity, providing a better economic outcome as well as reducing the environmental impact when compared to the grade separated option at Tumburra Street. Additional mitigation measures have been proposed in the REF and SIS to mitigate potential impacts on fauna that may be present in the area.

The specifics of the fauna underpass and associated fencing in this area will be investigated in consultation with DPE, OEH and Northern Beaches Council as part of the detailed design. The underpass as proposed in the REF will be a minimum of 1.8 x 1.8 metres which has been proven successful for most of the fauna species likely to use this area for movement (RTA, 2009).

5.1.5 Proposed compensatory measures for unavoidable losses

Issue description

- Roads and Maritime proposes to limit offsets to only the threatened ecological community and species that meet or exceed the thresholds, i.e. Duffys Forest Ecological Community, *Grevillea*

caleyi, *Microtis angusii* (subject to taxonomic revision and conservation status), and Red-crowned Toadlet

- OEH considers that all species that meet the thresholds specified in the Roads and Maritime guidelines need to be considered for offsetting and that these would require offsets quantified in accordance with the following recommendation:
 - any offsetting measures should conform to the OEH Principles for the Use of Biodiversity Offsets in NSW. OEH prefers and recommends that biodiversity losses be quantified using a best-practice bio-metric, such as the BioBanking Assessment Methodology, to determine the type and quantum of offsets required to compensate for the direct and indirect impacts of the proposal
- Biodiversity credits are recommended to be purchased and retired before construction commences. If it is not possible, Roads and Maritime could voluntarily enter into an agreement or a contract with the consent authority prior to the granting of consent that specifies the offset requirements that will be met and the timeframe in which it will occur
- Determination of appropriate compensatory measures for unavoided losses of threatened species, ecological communities and their habitats should account for cumulative impacts, particularly of the Mona Vale East Upgrade proposal.

Response

No offsets were proposed for Mona Vale Road East as the identified impacts did not reach the threshold required under the Roads and Maritime *Biodiversity Offset Guidelines* (2011) that were in place at the time of project approval. As detailed in the REF for Mona Vale Road East Upgrade, Roads and Maritime proposes to mitigate the impacts of that project by supplementary measures (eg fauna land bridge, additional fauna culverts, strategic fauna-exclusion fencing and targeted revegetation) which collectively provide a more effective long term solution for the region than trying to obtain species credits in a different location(s).

Roads and Maritime have considered supplementary measures for species determined not to be significantly impacted by the proposal in accordance with their guidelines and have determined that the extensive mitigation measures proposed and monitoring outcomes for non-significantly impacted species have already been suitably addressed. This is in accordance with the Roads and Maritime *Biodiversity Offset Guidelines* (2016).

Proven successful mitigation measures have been proposed to be implemented to provide a better outcome for species in the local area. This includes supplementary measures such as the provision of a vegetated overpass, underpasses and associated fauna-exclusion fencing to maintain connectivity and reduce road strike for key fauna species including the Heath Monitor and the Eastern Pygmy-possum. Given the presence of large expanses of good quality habitat for these species in the locality in national parks estate, 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.

The proposed offsets are therefore focused on residual significant impacts after mitigation and supplementary measures. These have been focused on residual impacts to species and communities for which impacts cannot be adequately mitigated including:

- Duffy Forest EEC
- *Grevillea caleyi*
- Red-crowned Toadlet

- *Microtis angusii* (subject to taxonomic revision and conservation status).

As stated in Section 7.1.2 of the SIS, Roads and Maritime has already identified a number of candidate sites within the local area that would be suitable for BioBanking Agreements to be placed on them to offset the impacts of the proposal on the above biodiversity values. Roads and Maritime has been actively working on an offset package which combines the offset requirements for all regional project impacts, and have identified and assessed key sites to progress BioBanking Agreements.

As stated in Section 2.10.4, cumulative impacts have been assessed as part of the impact assessment on threatened species and ecological communities associated with this proposal. Proven successful mitigation measures have been implemented to provide a better outcome for species in the local area for Mona Vale Road West. These include supplementary measures such as the provision of a vegetated overpass, underpasses and associated fauna-exclusion fencing to maintain connectivity and reduce road strike for key fauna species including the Heath Monitor and the Eastern Pygmy-possum. Given the presence of large expanses of good quality habitat for these species in the locality in national parks estate, 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 dedicated crossing structures or fencing.

5.2 Impacts on adjoining park areas

Issue description

- The Construction Environmental Management Plan (CEMP) should be provided to OEH for review and comment to ensure impacts on National Park lands would be adequately managed
- Revegetation in front of retaining walls and of construction impact area is supported and should consist of appropriate locally indigenous natives in accordance with the CEMP and rehabilitation/landscape management plan developed with input from OEH
- The report does not address the potential for increased spread of weed seeds either during construction or operation, or identify mitigation measures
- Concerned about the impacts of proposed early works earth platform to the north of the existing Mona Vale Road carriageway between Tumburra Street and the location of the proposed fauna land bridge. How long will the fill be in place and how will it be managed?

Response

All safeguard measures proposed in the REF and SIS will be included in a CEMP by the construction contractor, which will be approved by Roads and Maritime prior to the commencement of construction. Roads and Maritime will provide a copy of the draft CEMP to OEH.

The Landscaping and Revegetation Plan, including planting guides, will be developed as part of the detailed design in consultation with OEH and Northern Beaches Council, using indigenous species, where suitable.

Spread of invasive species and pathogens has already been addressed in the REF. Mitigation measures D1-D4 in Section 7.1 of the REF specifically address this.

The proposed earth platform was included in the construction footprint that was assessed in the REF. Timing of the staging of the two projects is not currently known. All stockpiling activities would be required to be undertaken in accordance with *Managing urban stormwater: soils and construction* ('The Blue Book') and Roads and Maritime procedures and policies.

5.3 Water quality impacts

Issue description

- It is recommended as a condition of approval that all outlets discharging to national park be fitted with a spill containment structure as impacts from a spill are applicable to the whole of the watercourse and surrounds, not just to frog breeding habitat
- Mitigating impacts discharges by installation of oil and grit separators will not reduce nutrient levels. Increased nutrient levels are of concern with regard to impacts on frog habitats and Narrabeen Lagoon. An increase in overall pollutant loads is not acceptable simply because Point P 3-1-2 is downstream of sensitive frog habitat. OEH disagrees that the net increase in pollutant levels downstream should be considered acceptable, and requires further mitigation to be proposed
- There is an apparent error under McCarrs Creek Catchment (7.1.5, p. 23) referring to diversion of flows from catchment P 6-1 -1 bifurcation pits (in Garigal National Park, downstream of Mona Vale Road West on the south side) to P 3-1-1 (in Ku-ring-gai Chase National Park on the north side of Mona Vale Road)
- Details of treatment devices or control measures for construction are required. Diversion drains should be provided for the three locations identified as being near thresholds.

Response

A risk assessment will be conducted as part of the detailed design process to further consider risks associated with Total Suspended Solids (TSS), Gross Pollutants (GP) and spill containment resulting from the proposal. To date, the assessment carried out has not identified a level of risk sufficient to warrant provision of such structures. The proposal would greatly improve road geometry and reduce the potential for traffic incidents giving rise to major spill events. Each drainage outlet would provide a suitable point for the bunding of the drainage system in the event of a spill event. Should the risk assessment identify any new risks associated with TSS, GP, or the need for spill containment, further work would be undertaken for the design to maximise the removal of TSS and GP. Where water quality treatment elements are incorporated into the detailed design, suitable and safe access for maintenance would be provided.

The surface water strategy (Appendix D of the REF) provided a water quality assessment which assessed local water quality impacts resulting from changes to the existing pavement drainage regime and subsequent flow rates. Modelling included an assessment of water quality for those locations known to provide habitat to the Giant Burrowing Frog (GBF) and Red-crowned Toadlet (RCT) in the Deep Creek catchment, as well as impacts to Wirreanda Creek (McCarrs Creek Catchment).

The water quality strategy and pavement drainage design aimed to result in negligible changes to the annual pollutant loads (TP, TN, TSS), in particular on downstream ecosystems and GBF and RCT habitats identified in the REF and SIS. Modelling results, as documented in the REF, identified that with the exception of outlet P4-1-1 and outlet P3-1-1, water quality impacts show a net decrease in pollutant loading downstream of discharge points as a result of the proposal.

The ability to provide water quality treatment devices that adequately remove the nitrogen and phosphorus load increases anticipated from the proposal is constrained by the existing topography and presence of constraints such as, GBF and RCT habitats, Aboriginal heritage sites, the presence of endangered flora, and national park boundaries. The mitigation strategy has provided oil and grit

separators to address the anticipated increase in Total Suspended Solids (TSS) Gross Pollutants (GP), and oil. These devices are not designed to remove nitrogen and phosphorus.

In response to Council's submission, and following further consultation with Council, Roads and Maritime has commenced investigations into design refinements to reduce modelled increases in TP and TN discharged at outlet P4 (into Deep Creek catchment). During detailed design further investigations would be undertaken with the objective of maintaining negligible changes in TP and TN into areas of known GBF and RCT habitat from outlet P4. This will include consideration of redirecting flows toward the north, as well as development of a swale to the north of Mona Vale Road to provide adequate mitigation to manage water quality discharged to Wirreanda Creek. Roads and Maritime confirms the diversion of flows as described in the REF at this location is not an error. Opportunities were investigated to reduce the peak flow rate downstream of the release area P6-1-1 into GBF and RCT habitat within Garigal National Park as far as practicable to maintain existing flows from pre-development and post-development. To facilitate this objective, flows above existing are to be diverted north to P3-1-1. During detailed design the pavement design will aim for discharges to Wirreanda Creek to be as close to zero per cent as possible in the 2 year ARI event and a maximum five per cent increase in the 100 year ARI event, consistent with the approach being developed by DPE for the Ingleside release area.

Construction water quality management measures will be detailed in a CEMP to be prepared by the construction contractor and approved by Roads and Maritime prior to construction. Roads and Maritime will provide a copy of the draft CEMP to OEH.

5.4 Response to OEH concurrence conditions

Subsequent to the display of the REF, OEH has granted conditional concurrence to the Species Impact Statement.

OEH concurrence condition 1(a) requires

a description of the Early Activity Works, their location (including the Drawing GT-1091 Issue 1 Sheets 01 to 03 dated 19 May 2017) and their timing in relation to the implementation of the environmental safeguards and management measures to protect biodiversity specified in Table 6-1 of the Submissions Report, other mitigation measures required, and the measures to be undertaken to offset by retiring biodiversity credits or through other conservation measures.

Early works would comprise the construction of an earth platform to the north of the existing Mona Vale Road carriageway between Tumburra Street and the location of the proposed fauna land bridge. Construction of the earth platform would use about 85,000 m³ of material which would be sourced from the Mona Vale Road East Upgrade Project.

This would comprise the following activities (in general order of occurrence):

- Site clearance and installation of environmental controls (incorporating all relevant matters identified in Table 6-1)
- Relocation/adjustment of high voltage and communications utilities
- Placement of fill material in layers
- Placement of topsoil and seeding.

The location of the early works is shown in the design drawings provided in Appendix F.

Table 6-1 in this report and Section 8 identify the mitigation and management measures that would be implemented to address the identified biodiversity impacts associated with the proposal,

including the early works. These provide for regular review to monitor the ongoing efficacy of the mitigation and management measures, and for further engagement with relevant stakeholders including OEH. The OEH concurrence conditions would be integrated into the environmental management documentation for the proposal.

OEH concurrence condition 1(b) requires

for each of the affected threatened species or ecological community listed below:

- i) a revised tabulated statement listing*
 - (1) the area of actual and potential habitat within the Construction Boundary*
 - (2) the number biodiversity credits required to be acquired and retired if all actual and potential habitat was cleared the corresponding area of required suitable offset area*
- ii) a separate map for each of those species and ecological community showing the location of the areas of actual and potential habitat within the Construction Boundary.*

Threatened species or ecological communities for which these data are required are:

- Duffys Forest Ecological Community, also identified as Plant Community Type (PCT) 1786 Red Bloodwood - Silvertop Ash - Stringybark open forest on ironstone in the Sydney region – endangered ecological community*
- Grevillea caleyi (Caley’s Grevillea) – critically endangered species*
- Microtis angusii (Angus’s Onion Orchid) – endangered species*
- Pseudophryne australis (Red-crowned Toadlet) – vulnerable species*
- Cercartetus nanus (Eastern Pygmy-possum) – vulnerable species.*

The response to OEH concurrence condition 1(b)(i) is provided in Table 5-1 below.

The revised figures in response to OEH concurrence condition 1(b)(ii) are provided in Appendix F.

Table 5-1 Response to OEH concurrence condition 1(b)(i)

Ecological Community/Species	Actual area within construction boundary (ha)	Potential area within construction boundary (ha)	Credits required	Equivalent area of habitat (ha)
Duffys Forest EC (Plant Community Type PCT 1786 Red Bloodwood–Silvertop Ash–Stringybark open forest on ironstone in the Sydney region)	3.07	N/A	204	21.94
<i>Grevillea caleyi</i>	2.4	2.8	462	65.07
<i>Microtis angusii</i>	0.226	N/A	26	3.66
Red-crowned Toadlet	0.35 (breeding)	1.95 (non-breeding)	30	4.23
Eastern Pygmy-possum	18.9	N/A	378	53.24

To ensure consistency with all conditions of concurrence, Table 6-1 Summary of environmental safeguards has been amended.

6. Environmental management

The REF for the Mona Vale Road West Upgrade between McCarrs Creek Road, Terrey Hills and Powder Works Road, Ingleside identified the framework for environmental management, including safeguards and management measures that would be adopted to avoid or reduce environmental impacts (Chapter 7 of the REF).

After consideration of the issues raised in the public submissions and changes to the proposal, the safeguard and management measures have been revised. The REF had identified a small area adjacent to Harvey Road where access to private property to undertake field investigations was not possible prior to the public exhibition of the REF. These investigations have subsequently been carried out, and the corresponding mitigation measures have been removed and updated with the additional measures proposed, where required. Additional mitigation measures have also been proposed in response to Council and OEH submissions, particularly with regards to heritage and biodiversity protection.

Should the proposal proceed, environmental management will be guided by the framework and measures outlined below.

6.1 Environmental management plans (or system)

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

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

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by Roads and Maritime Biodiversity specialists, and environment staff Greater Sydney region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G40 – Clearing and Grubbing and QA Specification G10 - Traffic Management.

6.2 Summary of safeguards and management measures

The REF for the Mona Vale Road West Upgrade between McCarrs Creek Road, Terrey Hills and Powder Works Road, Ingleside identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

After consideration of the issues raised in the public submissions, the environmental management measures for the proposal (refer to Chapter 7 of the REF) have been revised. Should the proposal proceed, the environmental management measures in Table 6-1 will guide the subsequent phases of the Mona Vale Road West Upgrade McCarrs Creek Road, Terrey Hills to Powder Works Road, Ingleside development. Additional and/or modified environmental safeguards and management measures to those presented in the REF have been underlined and deleted measures, or parts of measures, are denoted by ~~strikethrough text~~.

Table 6-1 Summary of environmental safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
G-1	General	All environmental safeguards must be incorporated within the following: <ul style="list-style-type: none"> • project Environmental Management Plan • detailed design stage • contract specifications for the proposal • contractor’s Environmental Management Plan 	Roads and Maritime Project manager	Pre-construction
G-2	General	A risk assessment must be carried out on the Proposal in accordance with the Roads and Maritime Services Project Pack and PMS risk assessment procedures to determine an audit and inspection program for the works. The recommendations of the risk assessment are to be implemented.	Roads and Maritime Project manager and regional environmental staff	Pre-construction
		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 works 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.		After first audit
G-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 ten working days prior to the tender stage. A contractual hold point must be maintained until the CEMP is reviewed by the Roads and Maritime Services Senior Environmental Officer.	Roads and Maritime Project manager	Pre-construction
G-4	General	The Roads and Maritime Services Project Manager must notify the Roads and Maritime Services Environmental Officer (Sydney Region) at least five days prior to work commencing.	Roads and Maritime Project manager	Pre-construction
G-5	General	Environmental awareness training must be provided, by the contractor, to	Construction contractor	Pre-construction,

ID	Impact	Environmental safeguards	Responsibility	Timing
		all field personnel and subcontractors.		During construction as required.
Biodiversity				
B-1	General	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • requirements set out in the Landscape Guideline (RTA, 2008) • pre-clearing survey requirements • procedures for unexpected threatened species finds and fauna handling • procedures addressing relevant matters specified in the Policy and guidelines for fish habitat conservation and management (DPI Fisheries, 2013) • <u>procedures and measures to control spread of pathogens, including Cinnamon Fungus and Myrtle Rust</u> • <u>procedures and measures to minimise and mitigate harm and damage to threatened species, ecological communities and their habitats</u> • <u>monitoring and documentation of the implementation and effectiveness of those measures</u> • <u>corrective measures to be implemented in response to identified triggers and their timings</u> • <u>reporting to Roads and Maritime any damage or harm to threatened species, ecological communities and their habitats outside the Construction Boundary.</u> 	Construction contractor	Pre-construction
B-2		Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed	Construction contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		design and implemented where practicable and feasible.		
B-3	Threatened flora/EEC management (<i>Grevillea caleyi</i>)	Seedbank salvage. Refer SIS Section 7.1.2 Refer Safeguard B36	Roads and Maritime	Pre-construction Construction Post-construction
B-4		<p>Monitor the Tumbledown Dick Hill and Baha'i Temple <i>Grevillea caleyi</i> populations pre, during and post construction to establish baseline habitat conditions, ensure habitats are being maintained and exclusion zones are being adhered to during construction as well as to determine any changes to population size and extent.</p> <p>Following approval, an annual monitoring program of the two <i>G. caleyi</i> populations shall be prepared (in consultation with an appropriately qualified specialist) and implemented for a duration of at least three years post construction. Monitoring would be undertaken by a suitably qualified botanist. Data collected would include:</p> <ul style="list-style-type: none"> • number of plants (seedlings, saplings, adults); • number of flowers on each plant; • associate plant species (native and exotic), including plant heights and densities; • overall plant health and vigour; • disturbance. <p>The monitoring program shall include a reporting requirement and shall trigger management actions where appropriate (based on threshold criteria to be developed).</p>	Roads and Maritime	Pre-construction Construction Post-construction
B-5		Regular inspections of <i>G. caleyi</i> Tumbledown Dick Hill and Baha'i Temple populations during construction. Contractor's environment site officer shall undertake regular inspections of the retained <i>G. caleyi</i> populations (including Duffys Forest EEC) during construction to ensure its protection from plant and equipment, to ensure hydrology is being maintained and to confirm the integrity of the exclusion fencing.	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
B-6	Threatened flora management – <i>Microtis angusii</i> (subject to taxonomic revision and conservation status of the species)	Undertake a differential GPS survey (<1m accuracy) of the remaining <i>M. angusii</i> sub-populations within the study area during flowering season to confirm the approximate number of individuals located within the subject site. Results can then be used to inform the appropriate location for the installation of exclusion fencing in the vicinity of the four <i>M. angusii</i> subpopulations.	Roads and Maritime	Pre-construction
B-7		Maintain pre development hydrology to ensure pre development soil moisture levels are maintained within the remaining <i>M. angusii</i> sub-populations within the study area through design and implementation of adequate drainage structures during and post construction.	Design Contractor Construction Contractor Roads and Maritime	Pre-construction Construction Post-construction
B-8		Adopt a suitable roadside maintenance (ie. mowing) regime with the Northern Beaches Council to maintain pre development optimal <i>M. angusii</i> grassland habitat at all the remaining sub-population sites. The mowing regime should include a prohibition on mowing during autumn through to late spring during the <i>M. angusii</i> above ground life cycle (leaf, flower, fruit).	Construction Contractor Roads and Maritime	Pre-construction Construction Post-construction
B-9		<p><u>Subject to the results of the taxonomic revision/conservation status</u>, monitor remaining <i>M. angusi</i> sub-populations within the study area pre, during and post construction to establish baseline habitat conditions, ensure habitats are being maintained and exclusion zones are being adhered to during construction as well as to determine any changes to population size and extent.</p> <p>Following project approval, an annual monitoring program shall be adopted and for a duration of at least 3 years post construction.</p> <p>Monitoring would be undertaken by a suitably qualified botanist and would adopt the grid cell structure established by the RBG Sydney (2015). The monitoring program shall include a reporting requirement and shall trigger management actions where appropriate (based on threshold criteria to be developed)</p>	Roads and Maritime	Pre-construction Construction Post-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
B-10		<p>A salvage and reintroduction program shall be implemented for those <i>M. angusii</i> plants proposed for direct disturbance prior to construction with the objective of achieving a no net loss in biodiversity of the <i>Microtis</i> sub-populations.</p> <p>Following approval, a <i>M. angusii</i> salvage and reintroduction program shall be prepared by a suitably qualified ecological consultant in consultation with the Royal Botanic Gardens, Sydney. The program shall detail methods, monitoring and reporting requirements for:</p> <ul style="list-style-type: none"> • excavating plants proposed for disturbance and reintroducing them into the main (type) sub-population (to be retained); or • outplanting existing RBG ex situ tubestock (propagated from seed from the main population) at a 1:1 removal/replacement ratio into the main sub-population; or • collecting seed from the main sub-population and propagating additional tubestock for outplanting into the main population. <p>Translocation trials for <i>M. angusii</i> have been undertaken by the RBG in 2015 and have shown (at least from initial monitoring results) to be successful. RBG have also been successful in isolating the fungal symbiont necessary for successful <i>M. angusii</i> germination and growth.</p>	Roads and Maritime	Pre-construction
B-11		<p>If unexpected threatened flora species are discovered, stop works immediately and follow the Roads and Maritime Unexpected Threatened Species Finds Procedure in the Roads and Maritime <i>Biodiversity Guidelines – Guide 1 (Pre-clearing process)</i> (RTA, 2011).</p>	Construction Contractor	Construction
B-12	Impacts on retained native vegetation adjoining the construction footprint	<p>Ensure exclusion zones (at the subject site boundary) are established prior to vegetation clearing in accordance with Guide 2 of the Roads and Maritime <i>Biodiversity Guidelines</i> (RTA, 2011). Fencing and signage and should be delineated by a registered surveyor.</p>	Construction Contractor	Pre-construction
B-13	Rehabilitation	<p>Batters, embankments, verges and redundant areas should be planted out, where practicable and appropriate, with indigenous species in</p>	Construction Contractor	Construction Post-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		accordance with <u>an approved Landscaping and Revegetation Plan, to be prepared prior to construction</u> (excluding the type <i>Microtis</i> sub-population area).		
B-14	Establishment and spread of invasive species and pathogens	Implement a Site Erosion and Sediment Control Plan or Soil Water Management Plan in accordance with the Blue Book (Landcom 2004) during construction.	Construction Contractor	Construction
B-15		Undertake weed management and control in accordance with the Roads and Maritime <i>Biodiversity Guidelines</i> (RTA, 2011) during and post-construction in accordance with a weed management sub-plan.	Construction Contractor	Construction Post-construction
B-16		<u>Prepare a hygiene management plan as part of the Construction Environmental Management Plan in accordance with Roads and Maritime hygiene policy. All Roads and Maritime and Contractor vehicles entering the Subject Site must be cleaned in accordance with Roads and Maritime hygiene policy to reduce the potential for spread of noxious weeds, plant pathogens or animal diseases.</u> It is recommended that all Roads and Maritime and Contractor vehicles be subject to cleaning in accordance with Roads and Maritime hygiene policy to reduce the potential for spread of noxious weeds, plant pathogens or animal diseases into retained forested habitats (eg. vehicle washdown areas) in accordance with a hygiene management sub-plan.	Construction Contractor	Construction
B-17		Establish a protocol to prevent introduction or spread of <i>Phytophthora cinnamomi</i> and Myrtle Rust consistent with Roads and Maritime <i>Biodiversity Guidelines - Guide 7 (Pathogen Management)</i> (RTA, 2011) during construction.	Construction Contractor	Construction
B-18	Impact on native fauna and their habitat	Remove the minimum required amount of native vegetation to retain the maximum amount of habitat for native fauna	Construction Contractor	Pre-construction
B-19		Bush rock proposed for disturbance should be salvaged for relocation into	Construction Contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		suitable retained habitats in accordance with the Roads and Maritime <i>Biodiversity Guidelines</i> (RTA, 2011).		Construction
B-20		Identify hollow-bearing trees for retention	Construction Contractor	Pre-construction Construction
B-21		Undertake staged habitat removal of hollow-bearing trees in accordance with the Roads and Maritime <i>Biodiversity Guidelines</i> (RTA, 2011). A nest box strategy will be developed in accordance with the Roads and Maritime <i>Biodiversity Guidelines</i> (RTA, 2011).	Construction Contractor	Pre-construction Construction
B-22		A suitably qualified fauna ecologist/spotter catcher shall be present during clearing of native vegetation (ie. clearing supervision) to capture any injured fauna or fauna that does not naturally relocate. Injured fauna may be transferred to a local wildlife carer for rehabilitation prior to being released into suitable retained habitats.	Construction Contractor	Construction
B-23		Pre-clearing surveys shall be undertaken in accordance with the Roads and Maritime <i>Biodiversity Guidelines</i> (RTA, 2011).	Construction Contractor	Pre-construction
B-24		Red-crowned Toadlet seasonal pre-clearance searches and relocation will be undertaken during optimal conditions by a suitably qualified fauna ecologist.	Construction Contractor	Pre-construction Construction
B-25		<u>A threatened species monitoring program will be prepared in accordance with conditions 12, 13, 14,21 and 23 attached to OEH’s SIS concurrence dated 31 October 2017. This includes obtaining OEH approval of the persons used for advice in preparing the monitoring plan prior to their engagement, submission of a draft monitoring plan to OEH for approval prior to the commencement of Early Works activity (as defined in the OEH SIS concurrence) The monitoring program will be prepared in consultation with Roads and Maritime biodiversity specialists, Northern Beaches Council and OEH to ensure it aligns with conservation work and research in the area.</u>	<u>Roads and Maritime</u>	<u>Prior to construction</u>

ID	Impact	Environmental safeguards	Responsibility	Timing
B-26		<u>Pre-clearing surveys will include inspection for Heath Monitor eggs of all termite mounds proposed to be removed. Salvage of any eggs would be undertaken by appropriately experienced personnel.</u>	<u>Construction Contractor</u>	<u>Pre-construction Construction</u>
B-27		<u>Roads and Maritime will provide a copy of the draft CEMP to OEH.</u>	<u>Roads and Maritime, Construction Contractor</u>	<u>Prior to construction</u>
B-28		<u>The design of the fauna underpass at the Harvey Road extension will be re-examined during detailed design to maximise use by target fauna species in consultation with Roads and Maritime Biodiversity specialists, OEH and Northern Beaches Council.</u>	<u>Design Contractor</u>	<u>Detailed design</u>
B-29		<u>Fauna furniture in crossing structures will be designed to maximise use by target fauna species in consultation with OEH and Northern Beaches Council.</u>	<u>Design Contractor</u>	<u>Detailed design</u>
B-30		<u>Additional measures to minimise pollutant loads to discharge areas through the use of gross pollutant traps and options for incorporation of grass swales will be investigated as part of the detailed design phase in consultation with OEH and Northern Beaches Council.</u>	<u>Design Contractor</u>	<u>Detailed design</u>
B-31		<u>Further investigations into opportunities for fauna-exclusion fencing and fauna furniture along Harvey Road would be investigated in detailed design in consultation with OEH and Council.</u>	<u>Roads and Maritime, Design Contractor</u>	<u>Detailed design</u>
B-32		<u>Fauna-exclusion fencing targeted specifically for the Eastern Pygmy Possum would be installed for 100 metres either side of the crossing structures.</u>	<u>Roads and Maritime, Design Contractor</u>	<u>Detailed design</u>
B-33		<u>Where feasible, topsoil from the local area will be used on the fauna overpass that will contain a seedbank of local species so to maximise the effectivity of revegetation</u>	<u>Roads and Maritime, Design Contractor</u>	<u>Detailed design</u>

ID	Impact	Environmental safeguards	Responsibility	Timing
B-34		<u>Planting guides will be developed as part of the detailed design, using indigenous species. Detailed design will be undertaken in consultation with OEH and Northern Beaches Council.</u>	<u>Roads and Maritime, Design Contractor</u>	<u>Detailed design</u>
B-35		<u>During detailed design and as part of the pre-clearing surveys, targeted amphibian surveys will be completed in the Wirreanda Creek area of the proposal. If required, additional mitigation measures will be implemented in this location to minimise any impacts to threatened amphibians. Key performance indicators of the mitigation measures and remedial actions will be included in the Flora and Fauna Management Sub-plan.</u>	<u>Roads and Maritime, Construction Contractor</u>	<u>Detailed design</u>
B-36		<p><u>A Soil Seedbank and Threatened Plant Translocation Plan would be prepared setting out detailed measures for the salvage and translocation of <i>Grevillea caleyi</i> plants and Duffys Forest ecological community and soil seedbank, which will otherwise be destroyed.</u></p> <p><u>The plan would:</u></p> <ul style="list-style-type: none"> <u>• be prepared in accordance with the Australian Network for Plant Conservation <i>Guidelines for the Translocation of Threatened Plants in Australia</i> (2004) and OEH's <i>Guidelines for the management of Duffys Forest ecological community remnants</i> (October 2007) (for soil seedbank translocation, ecological restoration, fire management and buffers)</u> <u>• include estimates, and how the estimates were derived, of the costs for translocating <i>Grevillea caleyi</i> specifically</u> <u>• be prepared by a vegetation management specialist with at least four years' experience in the management of native bushland in the Sydney region and with at least a TAFE Certificate III in Bush Regeneration or Conservation and Land Management - Natural Area Restoration</u> <u>• be submitted to OEH for approval prior to the commencement of clearing or disturbance of any <i>Grevillea caleyi</i> plants or Duffys Forest ecological community.</u> 	<u>Roads and Maritime, Construction Contractor</u>	<u>Detailed design</u>

ID	Impact	Environmental safeguards	Responsibility	Timing
B-37		<u>Site preparation works at translocation recipient site(s) would be carried out prior to any impacts to Duffys Forest and <i>Grevillea caleyi</i> at the donor site(s), in accordance with the guidelines identified in B-36.</u>	<u>Roads and Maritime, Construction Contractor</u>	<u>Detailed design</u>
B 38	<u>Biodiversity offset strategy and implementation</u>	<u>A draft Biodiversity Offset Strategy will be prepared within 12 months of the commencement of clearing and submit for review by OEH. This strategy will be prepared in accordance with Conditions 24 and 30 attached to OEH's SIS concurrence dated 31 October 2017.</u>	<u>Roads and Maritime</u>	<u>Pre-construction/ construction</u>
		<u>A final Biodiversity Offset Strategy (BOS) will be prepared within six months of the completion of clearing.</u> <u>Purchase all required offsets within 24 months of the completion of vegetation clearing</u>	<u>Roads and Maritime</u>	<u>Construction</u>
B 39	<u>Management Plan for Duffy's Forest and <i>Grevillea caleyi</i></u>	<u>A conservation management plan (CMP) will be prepared for for Duffy's Forest and <i>Grevillea caleyi</i> not impacted by the proposal. This management Plan will be prepared in accordance with Conditions 25 and 26 attached to OEH's SIS concurrence dated 31 October 2017.</u> <u>The CMP will be prepared in consultation with multiple landholders, OEH and Northern Beaches Council and be submitted by 31 October 2019 for OEH approval and before any impacts Duffy's Forest and <i>Grevillea caleyi</i>.</u>	<u>Roads and Maritime</u>	<u>Pre-construction (prior to any impacts on Duffy's Forest and <i>Grevillea caleyi</i>)</u>
Landform, geology and soils				
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: <ul style="list-style-type: none"> • Roads and Maritime Code of Practice for Water Management. • The Blue Book – Managing Urban Stormwater: Soils and Construction, Volumes 1 and 2. • Roads and Maritime Technical Guidelines – Temporary Stormwater Drainage for Road Construction. 	Construction contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<p>The SWMP would include:</p> <ul style="list-style-type: none"> • stockpile management plan • identification and a diagram of catchment and subcatchment area high risk areas and sensitive areas • sizing of each of the above areas and catchment • the likely runoff from each road subcatchment • direction of flow of on-site and off-site water • separation of on-site and off-site water • direction of runoff and drainage points during each stage of construction • dewatering plan which includes process for monitoring flocculating and dewatering water from site (i.e. any sediment basins and sumps) • 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 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 works.	Construction contractor	Construction
SO-3	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-4	Erosion and sedimentation	Controls would be implemented at construction zone exit points to minimise the tracking of soil and particulates onto pavement surfaces.	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
SO-5	Disturbance of contaminated land	<p>A Contaminated Land Management Plan will be prepared for the proposal and will include:</p> <ul style="list-style-type: none"> • a procedure for identifying potentially contaminated land through monitoring: <ul style="list-style-type: none"> - 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 • unexpected finds procedure will be developed to address the management of potentially contaminated material if encountered during works • 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 study area • contamination management measures, including waste classification and reuse procedures and unexpected finds procedures • capture and 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. 	Construction contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
SO-6	Disturbance of ACM	An Asbestos Management Plan will be prepared and implemented.	Construction contractor	Pre-construction
SO-7	Potentially contaminated land	Stage 2 investigations, including a Dangerous Goods search to investigate the potential above ground storage tank located at 8 Tumburra Street, Ingleside would be conducted.	Roads and Maritime	Detailed design
SO-8	Contaminated land	Any construction activity in the vicinity of identified AECs would require inspection and verification of assumed conditions during the following activities: <ul style="list-style-type: none"> • pavement removal • underground service relocation • ancillary site preparation and operation • excavation • importing, handling, stockpiling and transporting material resources. 	Construction contractor	Construction
Hydrology, hydraulics & water quality				
WQ-1	Concrete and other materials from construction vehicles entering waterways	Vehicle wash down and concrete wash out would occur in a bunded location(s).	Construction contractor	Construction
WQ-2	Spills during construction	All fuels, chemicals and liquids would 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 would occur either off-site or on relatively level ground at least 50 metres from waterways, drainage lines and sensitive areas. The refuelling machinery would have spill management equipment and there would be a person in attendance during refuelling.	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
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 <i>Environmental Incident Classification and Management Procedure</i> (Roads and Maritime Services, 2014) would be followed and the Roads and Maritime Contract Manager notified immediately.	Construction contractor	Pre-construction, Construction
WQ-5	Pollution from the road during operation	Consideration would 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) would be investigated during detailed design.	Design contractor Roads and Maritime	Detailed design
WQ-7	Scouring of downstream channels	The drainage design would seek to mimic the existing pattern of drainage from the roadway. Drainage outlets would include appropriate scour protection.	Design contractor Roads and Maritime	Detailed design
WQ-8	Impacts on amphibian habitat	The pavement drainage design includes the provision of oil and grit separators at each outlet discharging upstream of the frog habitat.	Design contractor Roads and Maritime	Detailed design
Traffic and transport				
TT-1	Construction traffic impacts	A traffic management plan (TMP) will be prepared prior to construction and would be included in the Construction Environmental Management Plan. The TMP would: <ul style="list-style-type: none"> • 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 turn-around bays where appropriate 	Construction contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> include methods for implementing the traffic management plan and minimising road user delays provide temporary works and traffic signals determine the number and width of traffic lanes in operation identify traffic barrier requirements and placement 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. 		
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	Access to bus services	Further consultation will be undertaken with bus operators to identify new locations for re-located bus stops	Roads and Maritime	Pre-construction
Aboriginal heritage				
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 <i>National Parks and Wildlife Act 1974</i> .	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
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 safeguards would be prescribed. Monitoring would occur where necessary.	Construction contractor	Pre-construction, Construction
AH-4	Unexpected impacts on Aboriginal heritage	The <i>Standard Management Procedure: Unexpected Archaeological Finds Procedure</i> (Roads and Maritime Services, 2012) will be followed in the event of uncovering a potential Aboriginal heritage item.	Construction contractor Roads and Maritime	Construction
AH-5	Damage to unknown Aboriginal sites	Further survey is required, when access is available, for the section of the Harvey Road extension between Mona Vale Road and Addison Road to determine if any Aboriginal objects or sites are present within the area and the potential impact from the proposed works.	Roads and Maritime	Pre-construction
AH-6	Damage to unknown Aboriginal sites	Further survey, using oblique lighting, is required for potential rock engravings on the large rock platform and sandstone benching identified within the road easement between Bungendore Street and Addison Road to determine if any Aboriginal objects or sites are present within the area and the potential impact from the proposed works.	Roads and Maritime	Pre-construction
AH-7	<u>Change in impact on Aboriginal heritage</u>	<p><u>If any change in impact on Aboriginal heritage items is identified during detailed design, confirmation of the need for an Aboriginal Heritage Impact Permit (AHIP) should be sought from the Roads and Maritime Environment Manager.</u></p> <p><u>If an AHIP is required, a Management Plan would be developed prior to submission of the AHIP and/or commencement of works. The plan would identify all measures to avoid all direct and indirect impacts to Aboriginal heritage sites within and in proximity to the construction area and would include appropriate considerations to address subsurface archaeological potential of the proposal area.</u></p> <p><u>The AHIP would include documentary evidence of consultation with the Aboriginal community in accordance with clause 80C of the <i>National Parks and Wildlife Regulation 2009</i> and the <i>Aboriginal cultural heritage</i></u></p>	<u>Roads and Maritime</u>	<u>Detailed design</u>

ID	Impact	Environmental safeguards	Responsibility	Timing
		<u>consultation requirements for proponents (2010).</u>		
AH-8	<u>Protection of known Aboriginal heritage items</u>	<u>The rock engravings identified in the SoHI would be inspected and assessed by an archaeologist suitably qualified in Aboriginal heritage prior to the submission of an AHIP application and/or commencement of works.</u>	<u>Roads and Maritime</u>	<u>Detailed design, Pre-construction</u>
Historic heritage				
HH-1	Impacts on known heritage values	All team members should be made aware of their legislative obligations for heritage under the <i>National Parks and Wildlife Act 1974</i> and <i>Heritage Act 1977</i> , which may be implemented as a cultural heritage induction. The induction should be presented prior to the commencement of any activity within the study area and include information about local heritage (Baha'i Temple and Group of Monterey Pines)	Construction Contractor	Construction
HH-2	Unexpected finds	The Roads and Maritime Standard Management Procedure <i>Unexpected Heritage Items</i> (Roads and Maritime Services, 2012) is to be followed in the event of uncovering a potential historic heritage item not considered by the REF	Construction contractor	Construction
HH-3	Impact on known heritage items	An exclusion zone should be established and maintained during construction to prevent inadvertent impacts to the item and its surrounding curtilage. The original vegetation and landscaping should be retained within the curtilage where possible. If vegetation is to be removed it should be replaced with plantings of a similar type and maturity.	Construction contractor	Pre-construction
HH-4	<u>Loss of heritage item</u>	Roads and Maritime should consult with the Northern Beaches Council with respect to the impacts on the 'Group of Monterey Pines' listed under the Pittwater LEP.	Roads and Maritime	Detailed design
HH-5	<u>Loss of heritage item</u>	<u>Opportunities to investigate the feasibility of the relocation of the heritage listed Monterey Pines would be explored during detailed design.</u>	<u>Roads and Maritime</u>	<u>Detailed design</u>

ID	Impact	Environmental safeguards	Responsibility	Timing
<u>HH-6</u>	<u>Loss of heritage items</u>	<u>A photographic archival record of the Monterrey Pines to be removed would be made prior to the commencement of any works.</u>	<u>Construction Contractor</u>	<u>Pre-construction</u>
<u>HH-6</u>	<u>Changed impact to heritage items</u>	<u>If the proposal footprint in the vicinity of local heritage items changes during detailed design, confirmation of any change in potential heritage impacts would be undertaken.</u>	<u>Roads and Maritime</u>	<u>Detailed design</u>
Urban design and visual amenity				
VA-1	Landscape character and visual impacts	Detailed design of the proposal 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 works 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 construction related visual clutter.	Construction contractor	Construction
<u>VA-5</u>	<u>Impacts to wayfinding signage for Baha'i Temple</u>	<u>Opportunities to develop interpretive signage along the realigned access road to the Baha'i House of Worship would be investigated during detailed design.</u>	<u>Roads and Maritime</u>	<u>Detailed design</u>
<u>VA-6</u>	<u>Improved local features signage</u>	<u>Consideration of an elevation sign at Tumbledown Dick will be included as part of the detailed design.</u>	<u>Roads and Maritime</u>	<u>Detailed design</u>

ID	Impact	Environmental safeguards	Responsibility	Timing
VA-7	Visual amenity	<u>Appropriate landscaping, including planting of screening vegetation, would be carried out on the two embankments on the Harvey Road extension.</u>	Roads and Maritime	<u>Detailed design, Construction</u>
Noise and vibration				
N-1	Construction noise	<p>Construction noise would be managed by a detailed Construction Noise and Vibration Management Plan (CNVMP) prepared prior to commencement of works. The CNVMP would consider the following as a minimum:</p> <ul style="list-style-type: none"> • 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 • 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
N-2	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 <i>Environmental Noise Management Manual Practice Note 4</i> (RTA, 2001).	Roads and Maritime	Detailed design
N-3	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
N-4	Construction noise	Vehicle delivery times will be scheduled where feasible to the	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		recommended construction hours to minimise noise impacts from heavy vehicle movements and deliveries.		
N-5	Construction noise	Any out of hours works would comply with RMS Specification G36 community notification requirements and the mitigation measures specified within the RMS <i>Noise Management Manual – Practice Note VII</i>	Construction contractor	Construction
N-6	Construction noise	The environmental induction program will include specific noise and vibration issues awareness training including, but not limited to, the following: <ul style="list-style-type: none"> • 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
N-7	Construction noise	Building condition surveys will be undertaken for buildings identified in the NVMP. A copy of the report will be sent to the landholder	Construction contractor	Pre-construction
N-8	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
N-9	Operational noise	A post-construction noise monitoring program (including simultaneous traffic counts) will be undertaken in accordance with the RMS <i>Environmental Noise Management Manual (ENNM)</i> within 6 to 12 months of opening once traffic flows have stabilised in order to verify the noise assessment	Roads and Maritime	Post-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
Air quality				
AQ-1	Dust and emissions	<p>An Air Quality Management plan (AQMP) would be prepared as part of the CEMP. The plan would include but not be limited to:</p> <ul style="list-style-type: none"> • a map identifying locations of sensitive receivers • identification of potential risks/impacts due to the work/activities as dust generation activities • management measures to minimise risk including a progressive stabilisation plan • a process for monitoring dust on site and weather conditions • a process for altering management measures as required 	Construction contractor	Pre-construction
AQ-2	Dust and emissions	<p>The management measures within the AQMP would include but not limited to the following:</p> <ul style="list-style-type: none"> • vehicles transporting waste or other materials that have a potential to produce odours or dust are to be covered during transportation • dust will be suppressed on stockpiles and unsealed or exposed areas using methods such as water trucks, temporary stabilisation methods, soil binders or other appropriate practices • disturbed areas will be minimised in extent and rehabilitated progressively • speed limits will be imposed on unsealed surfaces • stockpiles will be located as far away from residences and other sensitive receivers • 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 	Construction contractor	Pre-Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<p>effectiveness of controls and enable early intervention</p> <ul style="list-style-type: none"> work activities will be reprogrammed if the management measures are not adequately restricting dust generation. 		
Climate change and greenhouse gas				
GG-1	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-2	Greenhouse gas emissions	Equipment will be properly maintained to ensure it is operating efficiently.	Construction contractor	Construction
GG-3	Climate change	Sensitivity analysis will be undertaken during detailed design to determine if there are any future impacts as a result of climate change.	Design contractor	Detailed design
Socio-economic				
SE-1	Property impacts	Site surveys would be undertaken to ascertain the actual property impacts expected as a consequence of the Harvey Road extension and appropriate management measures developed in consultation with the respective property owners	Roads and Maritime	Detailed design
SE-2	Property impact	Department of Planning and Environment would be consulted regarding the impact on property zoned for future educational use.	Roads and Maritime	Detailed design
SE-3	Property acquisition	Early and on-going communication and consultation will occur with property owners, business owners and residents about the property acquisition process.	Roads and Maritime	Detailed design
SE-4	Property acquisition	All property valuations and acquisitions will be carried out in accordance with the <i>Roads and Maritime Services Land Acquisition Information Guide</i> (Roads and Maritime Services, 2014b) and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Roads and Maritime	Detailed design

ID	Impact	Environmental safeguards	Responsibility	Timing
SE-5	Construction related disruption	A complaint handling procedure and register will be included in the Contractor's Environmental Management Plan.	Construction contractor	Pre-construction
SE-6	Construction related disruption	Affected people will be notified of all aspects of the proposal prior to commencement of construction. This will include notification of time and duration of the proposal provision of a contact name and number.	Construction contractor	Construction
SE-7	Construction related disruption	Potentially affected residents and businesses will be notified of the progress of the works and advised in advance (e.g. by letterbox drop, meetings with individuals, etc) of any anticipated changes in noise emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms.	Construction contractor	Construction
SE-8	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-9	Business impacts	Opportunities for the installation of new local business directional signage for the Wirreanda Valley would be investigated during detailed design.	Roads and Maritime	Detailed design
Hazards and risks				
HR-1	Construction hazards and risks	Emergency response plans will be incorporated into the construction environmental management plan. This will include a bushfire risk and response plan.	Construction contractor	Construction
HR-2	Debris build up on road shoulders 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	<i>Planning for Bush Fire Protection</i> (NSW Rural Fire Service, 2006) will be considered in finalising the landscape plan for the proposal.	Roads and Maritime	Detailed design

ID	Impact	Environmental safeguards	Responsibility	Timing
Waste management and resource use				
WR-1	Construction waste management	<p>The following resource management hierarchy principles will be followed: avoid unnecessary resource consumption as a priority.</p> <ul style="list-style-type: none"> • 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 <i>Waste Avoidance and Resource Recovery Act 2001</i>). 	Construction contractor	Construction
WR-2	Construction waste management	<p>A Resource and Waste Management Plan (RWMP) would be prepared, which will include the following (as a minimum):</p> <ul style="list-style-type: none"> • the type, classification and volume of all materials to be generated and used on site including identification of recyclable and non-recyclable waste in accordance with the EPA's <i>Waste Classification Guides 2014</i> • quantity and classification of excavated material generated as a result of the proposal (Refer RMS 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. 	Construction contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
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	Resource use	<p>Prepare and implement a design resource plan. As a minimum, the plan is to include the following information:</p> <ul style="list-style-type: none"> • outline the quantities and type of material that will be produced by the proposal. • 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	Resource use	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	Resource use	Excavated material will be reused onsite for fill where feasible to reduce demand on resources.	Construction contractor	Construction
Cumulative impacts				
CU-1	Cumulative construction impacts	The Contractor's Environmental Management Plan will be revised as required to consider potential cumulative impacts from surrounding development activities as they become known.	Construction contractor	Pre-construction and Construction

6.3 Licensing and approvals

Table 6.2 lists the licences and approvals needed to construct / operate the proposal.

Table 6-2 Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Threatened Species Conservation Act 1995</i>	Concurrence of the SIS by the Chief Executive of OEH.	OEH requires 30 days from date of receipt of concurrence application.
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) works being undertaken.	An applicable road occupancy licence would need to be in place prior to the commencement of construction.	Prior to start of the activity.
If groundwater extraction is required, an aquifer interference approval would be required for the work under Section 91F of the <i>Water Management Act 2000</i> .	Prior to construction commencement or during construction as required.	Prior to start of the activity.
The proposal would be a scheduled activity under the <i>Protection of the Environment Operations Act 1997</i> . 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.	Prior to start of the activity.

7. References

SMEC (2017a) Mona Vale Road West Upgrade McCarrs Creek Road, Terrey Hills to Powder Works Road, Ingleside Review of Environmental Factors, report prepared for Roads and Maritime, February 2017.

SMEC (2017b) Mona Vale Road West Upgrade McCarrs Creek Road, Terrey Hills to Powder Works Road, Ingleside Species Impact Statement, report prepared for Roads and Maritime, February 2017.

RTA (2009) *Use of fauna passage structures on RTA roads: summary report*. Roads and Traffic Authority, Sydney.

Appendix A

REF submissions

Respondent	Submission No.	Section No.
Northern Beaches Council	1	2.3, 2.4, 2.5.1, 2.5.2, 2.6, 2.9.3, 2.9.5, 2.10.1, 2.10.2, 2.10.3, 2.10.4, 2.10.5, 2.11, 2.12.1, 2.12.2, 2.13, 2.15, 2.16, 2.18, 2.20
Community member	2	2.9.5
Community member	3	2.5.1
Community member	4	2.7
Community member	5	2.7
Community member	6	2.4, 2.5.1, 2.5.2, 2.5.4, 2.9.3, 2.20
Community member	7	2.9.1, 2.10.2, 2.10.3
Community member	8	2.7
Community member	9	2.5.1, 2.5.2, 2.9.1, 2.9.5, 2.15
Community member	10	2.1
Community member	11	2.5.1, 0
Community member	12	2.9.1, 2.9.3, 2.10.3
Community member	13	2.7
Community member	14	2.5.1, 2.9.3, 2.20
Community member	15	2.5.1
Community member	16	2.7, 2.20
Community member	17	2.2, 2.9.5
Community member	18	2.6, 2.7
Community member	19	2.9.1
Community member	20	2.9.2
Community member	21	2.9.1
Community member	22	2.5.4
Community member	23	2.5.2, 2.9.1, 2.9.3, 2.11

Respondent	Submission No.	Section No.
Community member	24	2.1
Community member	25	2.8
Community member	26	2.5.3
Community member	27	2.3, 2.9.1
Community member	28	2.7
Community member	29	2.5.1
Community member	30	2.5.1, 2.5.2, 2.9.5
Community member	31	2.5.4, 2.6, 2.11
Community member	32	2.5.2, 2.9.4, 2.11
Community member	33	2.20
Community member	34	2.10.3
Community member	35	2.10.2, 2.10.3
Community member	36	2.10.2, 2.10.3, 2.10.4
Community member	37	2.10.2, 2.10.3, 2.10.4
Community member	38	2.10.3
Community member	39	2.10.1, 2.10.3
Community member	40	2.10.3
Community member	41	2.10.3
Community member	42	2.10.3
Community member	43	2.10.1, 2.10.5
Pittwater Natural Heritage Association	44	2.10.3
Community member	45	2.10.3
Community member	46	2.10.3
Community member	47	2.10.3

Respondent	Submission No.	Section No.
Community member	48	2.10.3
Community member	49	2.10.3, 2.11
Community member	50	2.10.3
Community member	51	2.5.1, 2.10.3
Community member	52	2.3, 2.9.1, 2.14, 2.15, 2.20
Community member	53	2.10.3
Community member	54	2.10.3
Community member	55	2.10.3
Community member	56	2.10.3
Friends of Narrabeen Lagoon Catchment	57	2.10.3
Community member	58	2.10.1, 2.10.3
Community member	59	2.10.1
Community member	60	2.3, 2.5.1, 2.10.5, 2.13, 2.19, 2.20
Community member	61	2.4, 2.9.1, 2.9.2, 2.9.5, 2.15
Community member	62	2.8, 2.9.1, 2.9.3, 2.14, 2.15, 2.20
Community member	63	2.5.1, 2.10.3
Community member	64	2.10.3
Community member	65	2.10.3
Community member	66	2.2, 2.10.3
Community member	67	2.5.1, 2.5.2, 2.9.4, 2.10.3
Community member	68	2.5.2, 2.5.4
Community member	69	2.10.3
Community member	70	2.9.1, 2.10.3, 2.15
Community member	71	2.10.3

Respondent	Submission No.	Section No.
Community member	72	2.10.3
Community member	73	2.4
Community member	74	2.10.3
Community member	75	2.10.3
Community member	76	2.5.4, 2.11
Community member	77	2.10.3
Community member	78	2.5.1
Australian Plant Society– Northern Beaches	79	2.10.1, 2.15
Community member	80	2.5.4
Community member	81	2.5.2
Community member	82	2.9.3
Community member	83	2.10.3
Community member	84	2.7
Community member	85	2.8, 2.9.5, 2.14, 2.15
Office of Environment and Heritage	86	2.17
Community member	87	2.4, 2.14

Appendix B

Additional biodiversity assessment

Appendix C

Example fauna furniture design

Appendix D

Indicative planting guide for fauna overpass

Recommended planting for bridge deck

Bridge deck_FA_ @ 1/m ² & 6/m ²)					
Species	Common Name	Size	Plant%	Density	
<i>Austrostipa spp</i>	Feather Speargrass	100mm	5%	0.06	m2
<i>Banksia ericifolia subsp. ericifolia</i>	Heath-leaved Banksia	tubestock	25%	1	m2
<i>Breynia oblongifolia</i>	Coffee Bush	tubestock	10%	1	/m ²
<i>Dodonaea triquetra</i>	Hop Bush	tubestock	25%	1	/m ²
<i>Entolasia stricta</i>	Wiry Panic	100mm	10%	6	/m ²
<i>Grevillea buxifolia subsp. buxifolia</i>	Grey Spider flower	tubestock	15%	1	m2
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	100mm	5%	6	/m ²
<i>Pultenaea tuberculata</i>	Wreath Bush Pea	tubestock	5%	1	/m ²

Recommended shrubs and native grasses beside bridge deck

S & NG_FA @ 1/m ² & 6/m ²)					
Species	Common Name	Size	Plant%	Density	
<i>Austrostipa spp</i>	Feather Speargrass	100mm	5%	0.06	m2
<i>Banksia ericifolia subsp. ericifolia</i>	Heath-leaved Banksia	tubestock	15%	1	m2
<i>Breynia oblongifolia</i>	Coffee Bush	tubestock	10%	1	/m ²
<i>Dianella caerulea</i>	Blue Flax Lily	100mm	10%	6	/m ²
<i>Dodonaea triquetra</i>	Hop Bush	tubestock	20%	1	/m ²
<i>Entolasia stricta</i>	Wiry Panic	100mm	5%	6	/m ²
<i>Grevillea buxifolia subsp. buxifolia</i>	Grey Spider flower	tubestock	15%	1	m2
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	100mm	15%	6	/m ²
<i>Pultenaea tuberculata</i>	Wreath Bush Pea	tubestock	5%	1	/m ²

Recommended shrubs for adjacent areas

S_AFA @1/m2				
Species	Common Name	Size	Plant%	Density
<i>Allocasuarina distyla</i>	Shrubby She-oak	tubestock	12%	1 /m ²
<i>Breynia oblongifolia</i>	Coffee Bush	tubestock	15%	1 /m ²
<i>Dodonaea triquetra</i>	Hop Bush	tubestock	25%	1 /m ²
<i>Dillwynia retorta</i>	Eggs and Bacon Pea	tubestock	5%	1 /m ²
<i>Hakea teretifolia</i>	Dagger Hakea	tubestock	12%	1 /m ²
<i>Lambertia formosa</i>	Mountain Devil	tubestock	8%	1 /m ²
<i>Leptospermum squarrosum</i>	Peach Blossom Tea-tree	tubestock	15%	1 /m ²
<i>Leptospermum trinervium</i>	Flaky-barked Tea-tree	tubestock	8%	1 /m ²

Appendix E

Addendum to Aboriginal Cultural Heritage Constraints

Appendix F

Design Drawings GT-1091 Sheets 01 to 03

Appendix G

Revised SIS figures



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