Executive summary

Roads and Maritime Services (Roads and Maritime) proposes to upgrade about 11.5 kilometres of the Princes Highway between Schofields Lane (south of Berry) and Cambewarra Road, Bomaderry. The proposal would provide a four lane divided highway (two lanes in each direction) with median separation.

In accordance with the requirements of the Environmental Planning and Assessment Act 1979, an environmental impact assessment was prepared to assess the potential impacts of the proposal.

The environmental impact assessment was documented in a review of environmental factors which was publicly displayed for 29 days from Friday 1 November 2013 to Friday 29 November 2013. During the display of the review of environmental factors, 49 submissions were made, comprising five from government agencies, three from Shoalhaven City Council (including Shoalhaven Water) and 41 from the community. Detailed issues and responses are presented in Chapter 2 – Response to issues.

Submissions generally raised issues relating to:

- Traffic and transport, including property and local road access arrangements, road, pedestrian and cyclist safety, impacts on the existing local road network and the heavy vehicle inspection bay.
- Noise and vibration, including construction activities and work hours, road traffic noise and noise mitigation measures.
- Biodiversity, including impacts on wildlife corridors, waterways and threatened species and flora and fauna mitigation measures.
- Surface water, groundwater and flooding, including flooding impacts from proposed bridge structures and the Pestells Lane / Merroo Road grade-separated half-interchange.
- Landscape character and visual amenity, including visual impact of the proposal on the rural landscape character of the area and mitigation measures including vegetation planting.
- Aboriginal and non-Aboriginal (historic) heritage impacts, including construction impacts on Aboriginal and non-Aboriginal cultural sites and heritage values.
- Land use and property impacts, including property acquisition, impacts on property boundaries, property values and property access.
- Socio-economic impacts, including amenity and lifestyle impacts, business impacts and property values.
- Air quality impacts, including increased dust and emissions.

As detailed in Chapter 3 – Changes to the proposal, a number of design changes have been made as a result of submissions received and consultation undertaken with land owners during and following the display of the review of environmental factors. These changes are generally related to wildlife crossings, local road access, pedestrian access, property boundaries and design refinements to minimise environmental impacts.
1 Introduction and background ........................................................................................................... 1
   1.1 Purpose ................................................................................................................................... 1
   1.2 The proposal ........................................................................................................................... 1
   1.3 Review of environmental factors display ................................................................................. 5
       1.3.1 Letter and emails to key stakeholders and community ................................................... 6
       1.3.2 Phone calls to property owners ....................................................................................... 7
       1.3.3 Meetings with property owners ....................................................................................... 7
       1.3.4 Meeting with local council ............................................................................................... 7
       1.3.5 Aboriginal Focus Group meeting..................................................................................... 7
2 Response to issues ............................................................................................................................... 8
   2.1 Government agencies and Shoalhaven City Council ........................................................... 10
   2.2 Community ............................................................................................................................ 11
   2.3 Need and options considered ............................................................................................... 12
       2.3.1 Need and justification .................................................................................................... 12
       2.3.2 Funding and cost ........................................................................................................... 14
   2.4 Description of the proposal ................................................................................................... 15
       2.4.1 Road design .................................................................................................................. 15
       2.4.2 Public utilities ................................................................................................................. 18
   2.5 Statutory and planning framework ........................................................................................ 20
       2.5.1 Assessment process including adequacy of the review of environmental factors ...... 20
   2.6 Consultation .......................................................................................................................... 22
       2.6.1 Level and quality of consultation ................................................................................... 22
       2.6.2 Future consultation ........................................................................................................ 26
       2.6.3 Accuracy and adequacy of information ......................................................................... 27
   2.7 Traffic and transport .............................................................................................................. 27
       2.7.1 Impacts of construction vehicles ................................................................................... 27
       2.7.2 Travel time changes for individuals ............................................................................... 28
       2.7.3 Road safety ................................................................................................................... 28
       2.7.4 Service roads ................................................................................................................ 30
       2.7.5 Heavy vehicle routes ..................................................................................................... 30
       2.7.6 Local road network ........................................................................................................ 31
       2.7.7 Pedestrian and bicycle use ........................................................................................... 33
       2.7.8 Heavy vehicle inspection bay ....................................................................................... 35
       2.7.9 Berry to Bomaderry access strategy ............................................................................. 36
       2.7.10 Roundabout between Abernethys Lane and Cambewarra Road ................................ 37
Appendices

Appendix A: Proposed Aboriginal heritage salvage methodology

List of tables

Table 1-1: Display locations 5
Table 2-1: Respondents 8
Table 2-2: Summary of terrestrial fauna mitigation structures to be established along the proposal 66
Table 3-1: Summary of proposal design changes 109
Table 3-2: Summary of proposed fauna friendly bridge design features along the proposal 111
Table 4-1: Summary of site specific environmental safeguards 120
Table 4-2: Summary of licensing and approval required 168

List of figures

Figure 1-1: Overview of the proposal 4
Figure 2-1: Revised Figure A1-20 of the Aboriginal cultural heritage assessment report for the proposal 86
Figure 3-1: Location of fauna crossings along the proposal 112
Figure 3-2: Flying Fox Creek vehicle underpass 113
Figure 3-3: O’Keeffes Lane right hand turn configuration 114
Figure 3-4: Turners Lane right hand turn configuration 115
Figure 3-5: Boxsells Lane u-turn facility 117
Figure 3-6: Indicative cross section of overpass along the proposal with pedestrian and cycling facilities 118
## Glossary of terms and abbreviations

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D</td>
<td>Three dimensional</td>
</tr>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Aboriginal cultural heritage</td>
<td>The tangible (objects) and intangible (dreaming stories, songlines, places) cultural practices and traditions associated with past and present day Aboriginal communities.</td>
</tr>
<tr>
<td>Aboriginal focus group</td>
<td>Aboriginal focus group meetings are held to consult with Aboriginal stakeholders who have registered their interest to be consulted regarding a Roads and Maritime project.</td>
</tr>
<tr>
<td>Aboriginal heritage information management system</td>
<td>A register of NSW Aboriginal heritage information maintained by the Office of Environment and Heritage.</td>
</tr>
<tr>
<td>Aboriginal object</td>
<td>Any deposit, object or material evidence (not being a handicraft made for sale), including Aboriginal remains, relating to the Aboriginal habitation of NSW.</td>
</tr>
<tr>
<td>Aboriginal place</td>
<td>Any place declared to be an Aboriginal place under Section 94 of the National Parks and Wildlife Act 1974.</td>
</tr>
<tr>
<td>Aboriginal stakeholders</td>
<td>Members of a local Aboriginal land council, Aboriginal groups or other Aboriginal people who have registered their interest with Roads and Maritime to be consulted about a proposed Roads and Maritime project or activity.</td>
</tr>
<tr>
<td>Acid sulfate soils</td>
<td>Naturally acid clays, mud and other sediments usually found in swamps and estuaries. They may become extremely acidic when drained and exposed to oxygen and may produce acidic leachate run-off that can pollute waters and liberate toxins.</td>
</tr>
<tr>
<td>Acquisition</td>
<td>The act of acquiring or gaining possession.</td>
</tr>
<tr>
<td>Arboreal</td>
<td>To live in, or be connected with, trees.</td>
</tr>
<tr>
<td>Alignment</td>
<td>The geometric layout (e.g. of a road) in plan (horizontal) and elevation (vertical).</td>
</tr>
<tr>
<td>Anabranach</td>
<td>A section of a river or stream that diverts from the main channel or stem of the watercourse and rejoins the main stem downstream.</td>
</tr>
<tr>
<td>Ancillary</td>
<td>A subordinate part or element.</td>
</tr>
<tr>
<td>Archaeology</td>
<td>The scientific study of human history, particularly the relics and cultural remains of the distant past.</td>
</tr>
<tr>
<td>ARI</td>
<td>Average recurrence interval - Used to describe the frequency or probability of floods occurring (e.g. a 100 year ARI flood is a flood that occurs or is exceeded on average once every 100 years).</td>
</tr>
<tr>
<td>Artefact</td>
<td>An object, normally portable, made or modified by human hand (see 'stone artefact')</td>
</tr>
<tr>
<td>At-grade</td>
<td>A road at ground level, not on an embankment or in a cutting. Opposite to grade-separated.</td>
</tr>
<tr>
<td>Aquatic ecology</td>
<td>Flora and fauna that live in or on water for all or a substantial part of the life span (generally restricted to fresh / inland waters).</td>
</tr>
<tr>
<td>Austroads</td>
<td>The association of Australian and New Zealand road transport and traffic authorities.</td>
</tr>
<tr>
<td>Term</td>
<td>Meaning</td>
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<tr>
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</tr>
<tr>
<td><strong>B</strong></td>
<td>Bridge deck</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Carriageway</td>
</tr>
<tr>
<td>CD</td>
<td>Compact disc.</td>
</tr>
<tr>
<td>Chainage</td>
<td>Any point on a control line selected to provide more detailed information about the cross-section or any other feature mentioned in the drawings. Also known as a station.</td>
</tr>
<tr>
<td>Clearing</td>
<td>The removal of vegetation or other obstacles at or above ground level.</td>
</tr>
<tr>
<td>Construction footprint</td>
<td>The construction footprint for the proposal extends from the junction of Schofields Lane and the Princes Highway, about 0.8 kilometres south of Berry (from the junction of Victoria Street and the Princes Highway), to the junction of Cambewarra Road and the Princes Highway, in Bomaderry. It includes the area that would be directly impacted by the proposal, including the upgraded highway, all junctions, grade-separated facilities and half-interchange, u-turn facilities, the heavy vehicle inspection bay, batters, cuttings, embankments, bridge access and construction pads, temporary construction ancillary facilities and construction and operational water quality basins.</td>
</tr>
<tr>
<td>Cultural heritage assessment report</td>
<td>A report combining an Aboriginal archaeological assessment and Aboriginal cultural assessment, required to be submitted to the Office of Environment and Heritage for any Part 6 <em>National Parks and Wildlife Act 1974</em> approval or prepared for projects under the provisions of the <em>Environmental Planning and Assessment Act 1979</em> where Aboriginal cultural heritage is identified as a key issue.</td>
</tr>
<tr>
<td>Culvert</td>
<td>A tunnel carrying a stream or open drain under a road.</td>
</tr>
<tr>
<td>Cumulative impacts</td>
<td>Impacts that, when considered together, have different and/or more substantial impacts than a single impact considered alone.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Dasyurids</td>
</tr>
<tr>
<td>dB(A)</td>
<td>Decibels using the A-weighted scale measured according to the frequency of the human ear.</td>
</tr>
<tr>
<td>Decibel</td>
<td>A scale unit used in the comparison of powers and levels of sound energy. Used for measuring noise.</td>
</tr>
<tr>
<td>Department of Environment and Conservation</td>
<td>NSW Department of Environment and Conservation (now NSW Office of Environment and Heritage).</td>
</tr>
<tr>
<td>Department of Environment and Climate Change</td>
<td>NSW Department of Environment and Climate Change (formerly NSW Department of Environment and Conservation and now NSW Office of Environment and Heritage).</td>
</tr>
<tr>
<td>Department of Environment and Climate Change and Water</td>
<td>NSW Department of Environment, Climate Change and Water (formerly NSW Department of Environment and Conservation and NSW Department of Environment, Climate Change and Water and now NSW Office of Environment and Heritage).</td>
</tr>
<tr>
<td>Department of Planning and Infrastructure</td>
<td>Now an executive agency of the Department of Premier and Cabinet known as Planning and Infrastructure.</td>
</tr>
<tr>
<td>Term</td>
<td>Meaning</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>Determination</td>
<td>The act of making or arriving at a decision about whether the proposal should proceed.</td>
</tr>
<tr>
<td>Determining authority</td>
<td>The authority responsible for determining the proposal, in this case, Roads and Maritime.</td>
</tr>
<tr>
<td>Drainage</td>
<td>Natural or artificial means for the interception and removal of surface or subsurface water.</td>
</tr>
<tr>
<td>Earthworks</td>
<td>All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.</td>
</tr>
<tr>
<td>Ecology</td>
<td>The relationship between living things and the environment.</td>
</tr>
<tr>
<td>Environment</td>
<td>All aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings (from Environmental Planning and Assessment Act 1979).</td>
</tr>
<tr>
<td>Environment protection licence</td>
<td>A licence issued by the Environment Protection Authority containing conditions relating to pollution prevention and monitoring, and cleaner production through recycling and reuse and the implementation of best practice.</td>
</tr>
<tr>
<td>Foxground and Berry bypass</td>
<td>The upgrade 11.6 kilometres of the Princes Highway between Toolijooa Road north of Foxground and Schofields Lane south of Berry, in New South Wales to achieve a four lane divided highway (two lanes in each direction) with median separation. This includes bypasses of Foxground and Berry.</td>
</tr>
<tr>
<td>Fisheries NSW</td>
<td>Department of Primary Industries (Fisheries NSW).</td>
</tr>
<tr>
<td>Footprint</td>
<td>The extent of impact that a development makes on the land.</td>
</tr>
<tr>
<td>G2B</td>
<td>Gerringong to Bomaderry.</td>
</tr>
<tr>
<td>Gerringong upgrade</td>
<td>The upgrade of the Princes Highway between Mount Pleasant and Toolijooa Road in New South Wales to achieve a four- lane divided highway (two lanes in each direction) with median separation.</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System.</td>
</tr>
<tr>
<td>Grade</td>
<td>1. The rate of longitudinal rise (or fall) with respect to the horizontal expressed as a percentage or ratio.</td>
</tr>
<tr>
<td></td>
<td>2. To trim or smooth an earth, gravel or other surface using a grader or similar implement.</td>
</tr>
<tr>
<td>Grade-separated facility</td>
<td>Unlike a standard grade-separated interchange which has full length on-ramps and off-ramps, a grade-separated facility has deceleration lanes to a connecting road that links to an overpass or underpass. Grade-separated facilities have been used along the Pacific Highway and are informally referred to as Type S interchanges.</td>
</tr>
<tr>
<td>Grade-separation</td>
<td>The separation of road, rail or other traffic so that crossing movements at intersections are at different levels. Opposite to at-grade.</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Water that is held in the rocks and soil beneath the earth’s surface.</td>
</tr>
<tr>
<td>Habitat</td>
<td>The place where a species, population or ecological community lives (whether permanently, periodically or occasionally). Habitats are measurable and can be described by their flora and physical components.</td>
</tr>
<tr>
<td>Term</td>
<td>Meaning</td>
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<tr>
<td>Headwall</td>
<td>A wall, usually of concrete or masonry, at the outlet site of a drain or culvert, serving as a retaining wall, as protection against the scouring or undermining of fill, or as a flow-diverting device.</td>
</tr>
<tr>
<td>Heavy vehicle</td>
<td>A heavy vehicle is classified as a Class 3 vehicle (a two axle truck) or larger, in accordance with the Austroads Vehicle Classification System.</td>
</tr>
<tr>
<td>Heavy vehicle rest area</td>
<td>Facilities that are used by heavy vehicle drivers to take long and short rest breaks, use amenities and check loads and vehicles.</td>
</tr>
<tr>
<td>Horizontal alignment</td>
<td>The geometric layout (eg of a road) in plan (horizontal).</td>
</tr>
<tr>
<td>Hydrology</td>
<td>The study of rainfall and surface water runoff processes.</td>
</tr>
<tr>
<td>Hz</td>
<td>Hertz.</td>
</tr>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>ID number</td>
<td>Identification number.</td>
</tr>
<tr>
<td>Impact</td>
<td>Influence or effect exerted by a project or other activity on the natural, built and community environment.</td>
</tr>
<tr>
<td>Intersection at-grade</td>
<td>An intersection where carriageways cross at a common level.</td>
</tr>
<tr>
<td>J</td>
<td></td>
</tr>
<tr>
<td>Junction</td>
<td>A place where two or more roads meet.</td>
</tr>
<tr>
<td>K</td>
<td></td>
</tr>
<tr>
<td>kV</td>
<td>Kilovolt.</td>
</tr>
<tr>
<td>L</td>
<td></td>
</tr>
</tbody>
</table>
| Landscape          | 1. A tract of land.  
<pre><code>                 | 2. A prospect or piece of scenery or land which may include villages, towns, cities and infrastructure.                                     |
</code></pre>
<p>| Landscape character | The aggregate of built, natural and cultural aspects that make up an area and provide a sense of place. Includes all aspects of a tract of land — built, planted and natural topographical and ecological features. |
| Lane               | A portion of the carriageway allotted for the use of a single line of vehicles.                                                             |
| Left-in / left-out | Restricted turning movements for vehicles entering and leaving the highway. Only left hand turns would be permitted due to the central median barrier to prevent conflicting traffic movements. |
| Levallois          | A technique of flake production involving preparation of a bifacial core that is convex on both faces, and then striking a large flake from the flatter of the two faces, from a prepared platform surface. The large flakes (Levallois flakes) and the cores from which they are struck (Levallois cores) have characteristic, identifiable shapes. |
| Lot                | A parcel of land defined by measurement as a lot in a deposited plan (DP) or as a Crown portion or allotment.                                |
| Luminaire          | A complete electric light unit.                                                                                                            |
| M                  |                                                                                                                                           |
| MFT                | Mature Fig Tree.                                                                                                                          |
| MP                 | Member of Parliament.                                                                                                                     |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
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<tr>
<td>N</td>
<td>Noxious weeds: A weed declared to be a noxious under Section 7 of the <em>Noxious Weed Act 1993</em>.</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales.</td>
</tr>
<tr>
<td>NSW Office of</td>
<td>Department of Primary Industries (NSW Office of Water).</td>
</tr>
<tr>
<td>Water</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>Off-ramp: A short section of road which allows vehicles to enter or exit a highway.</td>
</tr>
<tr>
<td>On-ramp</td>
<td>A ramp by which one enters a limited-access highway.</td>
</tr>
<tr>
<td>P</td>
<td>PASA: Potential archaeologically sensitive area.</td>
</tr>
<tr>
<td>Pavement</td>
<td>The portion of a carriageway placed above the subgrade for the support of, and to form a running surface for vehicular traffic.</td>
</tr>
<tr>
<td>Pits</td>
<td>Drainage infrastructure.</td>
</tr>
<tr>
<td>Pipes</td>
<td>Drainage infrastructure.</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>Particulate matter less than 10 microns in diameter.</td>
</tr>
<tr>
<td>Potential acid</td>
<td>Soils that contain iron sulfides or sulfidic material which have not been exposed to the air or oxidised.</td>
</tr>
<tr>
<td>sulphate soils</td>
<td></td>
</tr>
<tr>
<td>Proposal</td>
<td>The upgrade of about 11.5 kilometres of the Princes Highway between Schofields Lane (south of Berry) and Cambewarra Road, Bomaderry to provide a four-lane divided highway (two lanes in each direction) with median separation.</td>
</tr>
<tr>
<td>Proposal area</td>
<td>The proposal area extends from the junction of Schofields Lane and the Princes Highway, about 0.8 kilometres south of Berry (from the junction of Victoria Street and the Princes Highway), to the junction of Cambewarra Road and the Princes Highway, in Bomaderry. It includes the area that would be directly impacted by the proposal, including the upgraded highway, batters, cuttings, embankments, bridge access and construction pads, construction compound and stockpile sites, operational ancillary facility sites and construction and operational water quality basins.</td>
</tr>
<tr>
<td>Provenance seed</td>
<td>Seed sourced from local plants that are genetically adapted to local environmental conditions.</td>
</tr>
<tr>
<td>Q</td>
<td>QA: Quality Assurance.</td>
</tr>
<tr>
<td>R</td>
<td>Receptor / receiver: An environmental modelling term used to describe a map reference point where the impact is predicted. A sensitive receptor is a home, work place, school or other place where people spend some time. An elevated receptor is a point above ground level.</td>
</tr>
<tr>
<td>Review of</td>
<td>Princes Highway Upgrade – Berry to Bomaderry Review of Environmental Factors prepared for Roads and Maritime by AECOM in November 2013 to document the environmental impact assessment for the proposal.</td>
</tr>
<tr>
<td>environmental</td>
<td></td>
</tr>
<tr>
<td>factors</td>
<td></td>
</tr>
<tr>
<td>Riparian</td>
<td>Relating to the banks of a natural waterway.</td>
</tr>
<tr>
<td>Road reserve</td>
<td>A legally defined area of land within which facilities such as roads, footpaths and associated features may be constructed for public travel.</td>
</tr>
<tr>
<td>Roads and</td>
<td>Roads and Maritime Services of New South Wales.</td>
</tr>
<tr>
<td>Maritime</td>
<td></td>
</tr>
</tbody>
</table>

**Princes Highway upgrade – Berry to Bomaderry**

Roads and Maritime Services

Submissions report
<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTA</td>
<td>Roads and Traffic Authority of NSW (now Roads and Maritime Services of NSW).</td>
</tr>
<tr>
<td>S</td>
<td>The act of saving something that is in danger of being completely destroyed.</td>
</tr>
<tr>
<td>‘Sandtrack’</td>
<td>An alternative route to the winding, hilly section of Princes Highway between Gerringong and Bomaderry (via Fern Street, Crooked River Road, Gerroa Road and Bolong Road).</td>
</tr>
<tr>
<td>SEPP</td>
<td>State Environmental Planning Policy.</td>
</tr>
<tr>
<td>Scour</td>
<td>The erosion of material by the action of flowing water.</td>
</tr>
<tr>
<td>Severance of land</td>
<td>The creation of a physical barrier between a property and an existing road access to that property, or between two sections of the same property.</td>
</tr>
<tr>
<td>Shoulder</td>
<td>The portion of the carriageway beyond the traffic lanes adjacent to and flush with the surface of the pavement.</td>
</tr>
<tr>
<td>Sight distance</td>
<td>The distance measured along the carriageway over which objects of defined height are visible to a driver whose eyes are at a specified height above the pavement surface level.</td>
</tr>
<tr>
<td>Span</td>
<td>The distance between the centres of adjacent supports of a bridge.</td>
</tr>
<tr>
<td>Stock underpass</td>
<td>A structure to permit the passage of stock beneath a road.</td>
</tr>
<tr>
<td>Surface water</td>
<td>Water flowing or held in streams, rivers and other wetlands in the landscape.</td>
</tr>
<tr>
<td>Swale</td>
<td>A shallow, grass-lined drainage channel.</td>
</tr>
<tr>
<td>T</td>
<td>Groups or categories, at any level, in a system for classifying plants or animals.</td>
</tr>
<tr>
<td>Temporary construction ancillary facility</td>
<td>Facilities used to support the operation of a construction site including (but not limited to) site offices, workshops, delivery areas, storage areas, crib sheds, staff vehicle parking, materials, plant and equipment.</td>
</tr>
<tr>
<td>Terrestrial</td>
<td>Living or growing on land (ie a terrestrial plant or animal).</td>
</tr>
<tr>
<td>Terrestrial ecology</td>
<td>Flora and fauna whose habitat is on land as opposed to in water, or on the ground as opposed to on another plant.</td>
</tr>
<tr>
<td>Threatened</td>
<td>As defined under the Threatened Species Conservation Act 1995, a species, population or ecological community that is likely to become extinct or is in immediate danger of extinction.</td>
</tr>
<tr>
<td>Turbidity</td>
<td>A measure of light penetration through a water column containing particles of matter in suspension.</td>
</tr>
<tr>
<td>U</td>
<td>A grade separation where the subject carriageway passes under an intersecting carriageway (or railway). A tunnel constructed for the use of pedestrians, cyclists, fauna and / or stock under the carriageway.</td>
</tr>
<tr>
<td>V</td>
<td>That portion of the formation not covered by the carriageway, the median or the footpath.</td>
</tr>
<tr>
<td>Vertical alignment</td>
<td>The geometric layout (eg of a road) in elevation (vertical).</td>
</tr>
</tbody>
</table>
1 Introduction and background

1.1 Purpose

This submissions report relates to the *Princes Highway Upgrade - Berry to Bomaderry Review of Environmental Factors* (AECOM 2013d) prepared for Roads and Maritime Services (Roads and Maritime) by AECOM in November 2013 (herein referred to as the review of environmental factors) and should be read in conjunction with that document.

The review of environmental factors was placed on public display from Friday 1 November to Friday 29 November 2013. Roads and Maritime Services (Roads and Maritime) received submissions relating to the proposal and the review of environmental factors from government agencies, Shoalhaven City Council and the community. This submissions report summarises the issues raised and provides responses to each issue (Chapter 2), describes and assesses the environmental impact of changes to the proposal (Chapter 3), and identifies new or revised environmental management measures (Chapter 4).

1.2 The proposal

Roads and Maritime proposes to upgrade about 11.5 kilometres of the Princes Highway between Schofields Lane (south of Berry) and Cambewarra Road, Bomaderry. The proposal would provide a four-lane divided highway (two lanes in each direction) with median separation.

The proposal is one of a series of upgrades to sections of the Princes Highway which aims to provide at least a four-lane divided highway between Waterfall and Jervis Bay Road, Falls Creek. This would improve road safety and traffic efficiency, including for freight, on the NSW South Coast.

The proposal, as displayed in the review of environmental factors, comprises the following key features:

- Upgrade of the existing highway, including widening from two lanes to a four-lane divided highway (two lanes in each direction) with median separation (wire rope barriers generally, or concrete barriers where space is constrained, such as at bridge locations).
- Provision for widening of the highway (if required in the future) to six lanes within the road corridor between Schofields Lane and around Pestells Lane.
- Tie-in to the Berry bypass to the north of the proposal.
- Grade-separated facilities at:
  - Jaspers Brush Road and Strongs Road.
  - Morschels Lane and Devitts Lane.
- A grade-separated half-interchange at:
  - Pestells Lane and Meroo Road.

---

1 Unlike a standard grade-separated interchange which has full length on-ramps and off-ramps, a grade-separated facility has deceleration lanes to a connecting road that links to an overpass or underpass. Grade-separated facilities have been used along the Pacific Highway and are informally referred to as Type S interchanges.
• Protected right turn bays at:
  - Mullers Lane (northbound).
  - Croziers Road (southbound).
  - At the u-turn facility between Strongs Road and Turners Lane at about chainage 23200 (northbound).
  - Between Strongs Road and Turners Lane at about chainage 24050, adjacent to Silos Winery (southbound).
  - Lamonds Lane (northbound).
  - Boxsells Lane (southbound).
  - South of Abernethys Lane at about chainage 28590 (northbound).

• U-turn facilities at:
  - Croziers Road (to travel northbound).
  - Between Strongs Road and Turners Lane at about chainage 23200 (to travel southbound).
  - Between Strongs Road and Turners Lane at about chainage 24050, adjacent to Silos Winery (to travel northbound).
  - Lamonds Lane (to travel southbound).
  - South of Abernethys Lane at about chainage 28590 (to travel southbound).

• A large cutting at Strongs Road, Jaspers Brush of around 300 metres long and up to a maximum of ten metres deep in addition to various smaller cuttings along the proposal.

• Eight bridges over waterways:
  - Creek crossing No. 1 – Unnamed drainage line at chainage 19350, a three span concrete structure around 44 metres long and three metres high.
  - Creek crossing No. 2 – Unnamed drainage line at chainage 19800, a single span concrete structure around 33 metres long and four metres high.
  - Creek crossing No. 3 – Flying Fox Creek, a single span concrete structure around 18 metres long and seven metres high.
  - Creek crossing No. 4 – Jaspers Brush Creek, a three span concrete structure around 44 metres long and six metres high.
  - Creek crossing No. 5 – Wileys Creek, a five span concrete structure around 76 metres long and five metres high.
  - Creek crossing No. 6 – Tandingulla Creek, a three span concrete structure around 44 metres long and three metres high.
  - Creek crossing No. 7 – Tullian Creek, a three span concrete structure around 44 metres long and five metres high.
  - Creek crossing No. 8 – Abernethys Creek, a three span concrete structure around 76 metres long and two metres high.

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2 The u-turn facility within the proposal area at Mullers Lane (northbound) has been approved under Part 3A of the Environmental Planning and Assessment Act 1979 as part of the Foxground and Berry bypass project.

3 Existing waterway crossings at Flying Fox, Jaspers Brush and Abernethys creeks are all currently spanned by bridges. These three bridges would be replaced as part of the proposal. The remainder of the new bridges would be constructed at the locations of the existing culverts.
- Major drainage and flood mitigation structures:
  - O'Keeffes Lane culvert – ten cell box culvert, with each cell around 2.5 metres wide, 1.5 metres high and about 70 metres long at chainage 21130.
  - Flood mitigation bridge – located just south of O'Keeffes Lane at about chainage 21200, a three span concrete structure around 45 metres long and 3.5 metres high.
  - Pestells Lane culvert – eight cell box culvert, with each cell around 2.5 metres wide, 1.5 metres high and about 130 metres long (between chainages 28020 and 28150).
  - Morschels Lane culvert – five cell box culvert, with each cell around 2.5 metres wide, 2.1 metres high and about 60 metres long at chainage 25070.
  - Overflow channel – around 300 metre long channel located upstream of the alignment to allow flood waters to follow the existing drainage path (between chainages 22320 and 22650).
- A northbound heavy vehicle inspection bay at Jaspers Brush, staffed as needed and locked when not in use.
- Modifications to the connections between local roads and the highway, including Strongs Road, Jaspers Brush Road, Morschels Lane, Devitts Lane, Pestells Lane, Meroo Road and Abernethys Lane.
- Physical modifications to about 16 existing property accesses.
- Relocation and formalisation of existing southbound bus stops at Mullers Lane, Jaspers Brush Road, Morschels Lane and Lamonds Lane and existing northbound bus stops at Boxsells Lane, Croziers Road and Strongs Road. Bus stops would be relocated to sites where there is provision for safe vehicular access, set down and pick up.
- Removal of the current southbound bus stop adjacent to Croziers Road.
- Ancillary operational facilities, including permanent detention basins and stormwater treatment facilities.
- Tie-in with the existing highway at the Cambewarra Road / Moss Vale Road roundabout.

Temporary construction ancillary facilities, including construction compounds, stockpile sites, haulage roads and sediment basins would be established and operated for construction and located as shown on Figure 1-1, Figure 3-1, Figure 3-2 and Figure 3-3 of the review of environmental factors.

An overview of the proposal is shown in Figure 1-1. A more detailed description of the proposal is available in Chapter 3 of the review of environmental factors.

As a result of the community consultation undertaken during the display of the review of environmental factors, there have been some changes made to the proposal. These changes are described and assessed in Chapter 3 – Changes to the proposal.
Figure 1-1: Overview of the proposal
1.3 Review of environmental factors display

Roads and Maritime Services prepared a review of environmental factors to assess the environmental impacts of the proposal. The review of environmental factors was displayed for 29 days between 1 November 2013 and 29 November 2013 at eight locations, as detailed in Table 1-1.

Table 1-1: Display locations

<table>
<thead>
<tr>
<th>Location</th>
<th>Address</th>
<th>Dates and times</th>
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<tbody>
<tr>
<td>Shoalhaven City Council</td>
<td>44 Bridge Road, Nowra</td>
<td>Monday to Friday 9am to 5pm</td>
</tr>
<tr>
<td>Nowra Library</td>
<td>10 Berry Street, Nowra</td>
<td>Monday to Friday 9.30am to 7pm and Saturday 9.30am to 3pm</td>
</tr>
<tr>
<td>Office of Gareth Ward MP</td>
<td>125 Terralong Street, Kiama</td>
<td>Monday to Friday 9am to 5pm</td>
</tr>
<tr>
<td>Office of Shelley Hancock MP</td>
<td>1/57 Plunkett Street Kiama</td>
<td>Monday to Friday 9am to 5pm</td>
</tr>
<tr>
<td>Roads and Maritime Wollongong Office</td>
<td>90 Crown Street, Wollongong</td>
<td>Monday to Friday 8.30am to 5pm</td>
</tr>
<tr>
<td>Gerringong upgrade community display centre</td>
<td>446 Princes Highway, Gerringong</td>
<td>Monday to Friday 9am to 5pm</td>
</tr>
<tr>
<td>Roads and Maritime project office</td>
<td>(Broughton Court) Shop 3/113 Queen Street, Berry</td>
<td>Fridays 10am to 5pm, Saturday 9 November 10am to 2pm, Thursday 14 November 4pm to 7pm and Saturday 23 November 10am to 2pm</td>
</tr>
<tr>
<td>Nowra Showground Pavilion</td>
<td>West Street, Nowra</td>
<td>Tuesday 12 November 10am to 5pm and Thursday 28 November 4pm to 7pm</td>
</tr>
</tbody>
</table>

A community update was sent to over 14,000 households from Berry in the north, to Nowra in the south and Shoalhaven Heads in the east. The update provided information about the review of environmental factors display locations and timeframes for submissions.

The review of environmental factors was placed on the Roads and Maritime internet website and made available electronically for viewing and for download. Electronic copies (on flash drives and CD) were also made available to members of the public on request.

The display locations and website link were advertised on local radio stations and in local newspapers as follows:

- 94.9 Power FM Illawarra – 4 to 8 November, 11 to 15 November, 18 to 22 November and 25 to 29 November.
- Illawarra Mercury – 6 November and 18 November.
- South Coast Register – 6 November, 9 November, 11 November and 20 November.
- Shoalhaven and Nowra News – 7 November and 21 November.
- National Indigenous Times – 6 November.
- Kiama Independent – 6 November and 20 November.
- Town Crier – 25 November.
In addition to the above public display, a copy of the review of environmental factors was given to individuals as requested from either the project office, via the 1800 number and / or during interviews and site visits.

Over 100 visits were made by community members to the staffed displays held at the Roads and Maritime project office in Berry and the Nowra Showground Pavilion. These displays included:

- Copies of the review of environmental factors report, including technical papers.
- A set of eight information posters, displaying the concept design, key environmental issues (flora and fauna, Aboriginal and non-Aboriginal heritage and local road access arrangements) and outlining how to make a submission.
- A 3-dimensional animated model of the concept design which was used during one-on-one discussions with community members. The built in features of the model allowed affected stakeholders to measure distances and heights of particular project features.
- Three 3-dimensional video animations showing:
  - The proposed alignment from Mullers Lane, Berry to Cambewarra Road, Bomaderry (southbound).
  - The proposed alignment from Cambewarra Road, Bomaderry to Mullers Lane, Berry (northbound).
  - The proposed heavy vehicle inspection bay at Jaspers Brush.
- Technical concept design drawings.

The project website provided an overview of the proposal, a full copy of the review of environmental factors and accompanying technical papers, guidance on how to make a submission and information on consultation activities undertaken for the proposal to date. The website included links to the three video animations.

A free call project information line (1800 506 976) and email address were also available during the display period.

1.3.1 Letter and emails to key stakeholders and community

A letter advising of the commencement of the display period and a copy of the review of environmental factors report and the technical papers was sent to the following key stakeholders:

- Shoalhaven City Council.
- Environment Protection Authority.

A letter advising of the commencement of the display period was sent to the following key stakeholders:

- NSW Office of Environment and Heritage.
- NSW Department of Primary Industries – Fisheries NSW.
- NSW Department of Primary Industries – NSW Office of Water.

Over 500 registered stakeholders and community members were also sent an email notification to advise them of the commencement of the display period. The email provided direction to the project website for more information.
1.3.2 Phone calls to property owners

Over 50 phone calls were made to advise property owners about the display of the review of environmental factors. Phone calls were made at the start of the display to both potentially directly affected property owners and potentially indirectly affected property owners (within close proximity to the proposal, but not directly affected by property acquisition) along the highway.

1.3.3 Meetings with property owners

Potentially directly affected property owners were offered a one-on-one meeting with members of the project team. In total, 22 meetings were held with property owners throughout the display period to discuss the review of environmental factors, potential property impacts and other issues associated with the proposal.

1.3.4 Meeting with local council

A meeting was held with Shoalhaven City Council on Thursday 14 November 2013. Members of the project team presented a summary of information available in the review of environmental factors and potential issues associated with the proposal were discussed.

1.3.5 Aboriginal Focus Group meeting

An Aboriginal Focus Group meeting was held on Wednesday 20 November 2013 during the display of the review of environmental factors. The following matters were discussed at the meeting:

- The status of the review of environmental factors.
- A summary of key potential environmental impacts of the proposal.
- A summary of potential impacts of the proposal on Aboriginal heritage.
- The process of providing a submission for the proposal.

No issues were raised by members of the Aboriginal Focus Group regarding the proposal and its potential impacts. Several meeting attendees requested electronic and hard copies of the review of environmental factors which were provided by Roads and Maritime.
2 Response to issues

Roads and Maritime received a total of 49 submissions from 46 respondents. This included 39 submissions received during the display period and ten late submissions received through to 7 March 2014. All submissions received have been responded to in this report. Table 2-1 lists the respondents and each respondent’s allocated Stakeholder Identification (ID) number. The table also indicates the location in which the submissions are addressed in Chapter 2 of this report.

Table 2-1: Respondents

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Stakeholder ID number</th>
<th>Section number where issues are addressed</th>
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<td>2.7.11.</td>
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<td>Individual</td>
<td>4</td>
<td>2.20.3.</td>
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</table>
Of the 49 submissions received in response to the display of the review of environmental factors, five were from government agencies (including two from the Department of Primary Industries – Fisheries NSW), three were from Shoalhaven City Council (including two from Shoalhaven City Council and one from Shoalhaven Water) and 41 were from the community.

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, as well as Roads and Maritime responses to these issues, form the basis of this chapter.

Of the 49 submissions received, two per cent made a clear statement of objection to the proposal and 10 per cent made a clear statement of support for the proposal. A further 10 per cent of respondents stated an objection to the proposal with qualifications and two per cent provided conditional support on the basis that their issues of concern would be addressed. The remaining submissions did not include a clear statement of objection to or support for the proposal.

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Stakeholder ID number</th>
<th>Section number where issues are addressed</th>
</tr>
</thead>
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</tbody>
</table>
2.1 Government agencies and Shoalhaven City Council

Three government agencies and Shoalhaven City Council made submissions, raising a range of issues relevant to their areas of responsibility. A summary of issues raised by each government agency and Shoalhaven City Council is provided below.

**Department of Primary Industries**

*Fisheries NSW*

The Department of Primary Industries (Fisheries NSW) submission raised issues relating to impacts of the proposal on waterways including:

- The bridge crossings of eight tributaries should be designed and constructed in line with Department of Primary Industries policy and guidelines to minimise the impact on waterways.
- A vegetated riparian buffer should be created between any new internal property accesses under highway bridges and adjacent waterways.
- Copies of relevant construction management plans should be issued to Fisheries NSW prior to the commencement of works in waterways.
- Environmental safeguards should be adopted to minimise the impact of construction activities on waterways.

**NSW Office of Water**

The Department of Primary Industries (NSW Office of Water) submission raised issues relating to riparian corridors and flooding including:

- NSW Office of Water guidelines for riparian corridors should be considered during detailed design and construction.
- Consultation should be undertaken with NSW Office of Water during detailed design, in relation to potential impacts to hydrology and flooding from proposed bridge structures.

**Environment Protection Authority**

The Environment Protection Authority submission raised issues relating to the mitigation and management of waste, noise, air, surface water and groundwater impacts including:

- Environmental management measures for waste management should form part of any determination for the proposal.
- Noise mitigation treatments should be implemented for both construction and operational phases of the proposal, with any out of hours work requiring clear justification and approval.
- A detailed air quality management plan should be prepared for the proposal.
- Environmental management measures to prevent the discharge of pollutants to either surface water and / or groundwater should form part of any determination for the proposal.
Office of Environment and Heritage

The Office of Environment and Heritage submission raised issues relating to Aboriginal cultural heritage including:

- Preparation of an Aboriginal heritage management plan for the proposal.
- Impacts to Aboriginal heritage values as a result of the potential adjustment of public utilities.
- The use of native vegetation in rehabilitation works and consideration of the impacts to the recorded areas of Aboriginal cultural heritage values by vegetation plantings.
- Proposed location of a number of temporary construction ancillary facilities within areas containing Aboriginal objects.

Shoalhaven City Council

The Shoalhaven City Council’s submissions raised a number of issues including:

- Access arrangements to properties, businesses and the local road network during the operational phase of the proposal.
- Roads and Maritime funding of upgrades to local roads that would experience changes in traffic conditions as a result of the proposal.
- Use of the ‘Sandtrack’ by heavy vehicles during construction of the proposal.
- Roads and Maritime funding for remediation of the ‘Sandtrack’.
- Short term implications of the diversion of traffic onto Gerroa Road / Bolong Road (the ‘Sandtrack’).
- The need for a northbound heavy vehicle rest area at or further north of South Nowra.
- Entrance treatment to Bomaderry and approach to the Cambewarra Road roundabout.
- Impact from the proposal on identified heritage items.
- Potential impacts of the proposal on Shoalhaven Water assets.

Shoalhaven Water

The Shoalhaven Water submission raised issues relating to impacts of the proposal on Shoalhaven City Council assets such as water mains, gravity sewerage mains and sewer rising mains.

2.2 Community

Community submissions have predominantly reflected the issues and concerns of residents living along the Princes Highway alignment, local groups with social, economic and environmental interests and users of the Princes Highway including motorists and agricultural business owners. The main issues raised in community submissions include:

Traffic and transport

- Access arrangements to individual properties, businesses and the local road network.
- Provision of acceleration lanes at major intersections.
- Potential impact on residents from the relocation of the heavy vehicle inspection bay to Jaspers Brush.
- Pedestrian and cyclist safety along the Princes Highway.
Noise and vibration

- Construction noise and vibration impacts on residents, especially during high noise activities and out of hours work.
- Increased operational traffic noise from the upgraded highway.
- Noise mitigation treatments including road surface and noise barriers.

Biodiversity

- Fauna mitigation measures including wildlife crossings.
- Environmental impacts of the proposal on wildlife corridors, threatened species and waterways due to construction activities and vegetation removal.
- Impact of the proposal on the Currambene Batemans Lowland Forest at Devitts Lane.

Landscape character and visual amenity

- Visual impact of the proposal on individual properties.
- Vegetation planting along the proposal to reduce the visual impacts.
- Headlight glare and light spill from the proposal.

Land use and property

- Access arrangements to the highway and internal property accesses during construction and operation of the proposal.
- Impacts on property boundaries and ongoing agricultural use of affected land.

Socio-economic

- Loss of amenity as a result of increased noise, vibration, dust and visual impacts during both the construction and operation of the proposal.
- Disproportionate scale of infrastructure to the existing landscape and amenity of the area.
- Business impacts as a result of property acquisition and modified access arrangements.
- Property value impacts.

Air quality

- Increased dust and emissions during the construction and operation of the proposal.

2.3 Need and options considered

2.3.1 Need and justification

Stakeholder identification number(s)

37

Issue description

In the submission relating to justification of the proposal, the respondent requested justification as to whether the proposal is even necessary.
Response

The proposal is one of a series of upgrades to sections of the Princes Highway which aims to provide at least a four-lane divided highway between Waterfall and Jervis Bay Road, Falls Creek. It is one of the last remaining sections of the highway to be upgraded and would add to the road safety and traffic efficiency benefits provided by the other Princes Highway upgrades to the north and south.

The existing Princes Highway between Schofields Lane and Cambewarra Road is generally a two-lane undivided highway (one lane in each direction), with horizontal and vertical alignments that often result in traffic travelling at lower speeds than the signposted speed limits and as well as traffic inefficiencies. There are also limited overtaking opportunities and many at-grade junctions with rural roads along the proposal. Numerous private accesses onto the highway currently have poor sight lines due to the existing horizontal and vertical alignment of the highway. For further details about the need for the proposal, refer to Chapter 2 of the review of environmental factors.

Once the Gerringong upgrade and the Foxground and Berry bypass projects are opened to the north of the proposal, it is expected that there would be a shift of traffic away from the ‘Sandtrack’ onto the Princes Highway. This is forecast to increase the existing traffic volumes on the Princes Highway between Berry and Bomaderry by about 50 per cent, exacerbating existing traffic issues and increasing road safety risks.

The provision of additional capacity on the Princes Highway between Berry and Bomaderry is considered necessary to enable acceptable highway performance. Without the proposal, the traffic growth would continue on an unchanged road network which would result in decreased road efficiency. This would include increased travel times, adverse impacts on the local economy and a reduction in road safety which would likely result in an increase in the frequency of crashes on the Princes Highway and the ‘Sandtrack’.

The volume of traffic along the Princes Highway continues to increase, with an average growth rate of 3.2 per cent recorded per annum over the 1990 to 2012 period. Historical records indicate that crashes resulting in injury or fatality along the Princes Highway are high, with over 40 per cent more fatalities per kilometre than the NSW average for reported crashes on all roads open to the public. Without the proposal, the frequency of crashes on the Princes Highway and the ‘Sandtrack’ would be expected to increase with the continued growth in traffic on an unchanged road network. Assuming current crash rates and costs remain constant, the total number and cost of crashes would be expected to increase by 78 per cent by 2039 (refer to Section 2.5.1 of the review of environmental factors). Of particular concern on the Princes Highway are crashes resulting from insufficient capacity on the highway and vehicles turning at local roads and property accesses.

The current form of the proposal was determined through a lengthy process which included consideration of the following alternatives to the proposal:

- Do nothing.
- Upgrade of the Princes Highway.
- Upgrade of the ‘Sandtrack’.
- Upgrade of the South Coast railway.

A ‘do nothing’ alternative would not satisfy any of the proposal objectives. The highway would continue to have safety, efficiency and capacity problems. This would have flow on effects to the regional and local economy, as well as to the communities located along the existing highway. For these reasons, the ‘do nothing’ alternative was not considered further.
An upgrade to the ‘Sandtrack’ would not provide any distinct benefits to the environment, the economy or communities in the region when compared to an upgrade of the Princes Highway. It would generate adverse impacts on a number of communities located along the ‘Sandtrack’ that are not currently exposed to heavy vehicle traffic, as there are weight limitations restricting its use. Any upgrade to the ‘Sandtrack’ would require access for heavy vehicles. In addition the Princes Highway would continue to present road safety issues for traffic travelling to local destinations between Gerringong and Bomaderry, and regional destinations that cannot be accessed via the ‘Sandtrack’.

An upgrade to the South Coast railway would not meet the proposal objectives as traffic efficiency and safety issues would remain. Given the current limitations of the South Coast railway line and the low volume of freight movements, it is unlikely that an upgrade of the rail network would see a large change in the number of vehicles that utilise the Princes Highway.

An upgrade to the Princes Highway was selected as the preferred alternative as:

- It would improve the road safety and efficiency of the Princes Highway.
- It would support regional and local economic development.
- It would provide the opportunity to upgrade the existing alignment which would minimise impacts on the environment, communities and the local economy and provide value for money.
- It would improve the quality of surface water runoff that is discharged into local waterways and would improve the flood immunity of the highway.
- It would result in the least change to community connectivity.

For further details about the need for the proposal, refer to Chapter 2 of the review of environmental factors.

2.3.2 Funding and cost

Stakeholder identification number(s)

2, 29

Issue description

Submissions relating to funding and cost raised issues about whether the funding required for the proposal would be better used for alternative projects in the South Coast region, that additional costs to Shoalhaven City Council as a result of the proposal should be funded by Roads and Maritime, and whether alternative cheaper design options could be adopted for the proposal.

In summary, the respondents raised the following issues:

- The upgrade of the highway is necessary and long overdue. However, the location of the new bridge over the Shoalhaven River should have been determined prior to finalising the design of the proposal. It seems a waste of money to undertake the proposal and then have to alter the road alignment in the future should a new bridge be located further upstream (or downstream) from the existing bridges over the Shoalhaven River.
- It is unacceptable that Roads and Maritime is making Shoalhaven City Council responsible for funding the increased maintenance of Pestells Lane which would result from the current proposal.

Response

Roads and Maritime are currently investigating the options for a new crossing of the Shoalhaven River at Nowra. The location of the new Nowra Bridge, whether near the existing crossings or further upstream or downstream, would not influence the current proposal. The alignment of the Princes Highway between Berry and Bomaderry would not need to be altered to accommodate a new bridge across the Shoalhaven River.
The assessment of changes to traffic volumes along Pestells Lane as a result of the proposal indicates that changes in traffic volumes would not require the road to be sealed. Notwithstanding, Roads and Maritime modified the concept design prior to exhibition of the review of environmental factors to include a southbound right turn bay into Boxsells Lane. This change is anticipated to improve local access and reduce additional traffic that would otherwise have been expected along Pestells Lane. Roads and Maritime would continue to liaise with Shoalhaven Council about any potential impacts of the proposal on surrounding roads.

2.4 Description of the proposal
2.4.1 Road design

Stakeholder identification number(s)
9, 46

Issue description

The submissions relating to the design of the proposal raised issues about whether a roundabout is proposed on the approach to Bomaderry, the vertical and horizontal alignment of the proposal at Meroo Meadow and why the Pestells Lane / Meroo Road grade-separated half-interchange was not located at the current Meroo Road / Princes Highway intersection.

In summary, the respondents raised the following issues:

- Moving the vertical curve crest northwards appears to be the main reason for the increase in road height adjacent to a property in Meroo Meadow. The controlling feature fixing the design of the crest vertical curve is the Tandingulla Creek bridge deck clearance which must be above the calculated 100 year flood level. The current design indicates the clearance is currently about 1.2 metres at the lowest corner of the bridge and 2.4 metres at the highest. This could be reduced by about 0.8 metres and still conform. The vertical alignment should be lowered to the minimum bridge clearance, resulting in the crest being located closer to the intersection.

- The horizontal alignment of the proposal should be moved about seven to eight metres east of a property in Meroo Meadow to maintain the edge of the nearest lane in its current location. This could be achieved by coming tangent off the R1000 curve and offsetting three to four metres west then an approximate R800-850 curve to tie-in with the straight. Benefits would be:
  - Increased distance of the highway from a property at Meroo Meadow.
  - No houses or properties on the southern end of the re-alignment would be affected.
  - The only property marginally affected would be the historic Meroo Union Church which on the present concept design is about 53 metres from the nearest lane. The church only holds monthly services and has no resident or residential buildings.
  - Moving the centre line and increasing the curve radius at the Tandingullia Creek bridge would assist in staging during construction of the new roadway.
  - Moving the alignment and the vertical curve about 80 metres south at Boxsells Lane would maintain the existing road surface height for traffic entering the highway from Boxsells Lane and would assist the grade for traffic entering the highway at Lamonds Lane.
  - Moving the alignment would reduce the risk of damage to the historic school buildings constructed with only brick footings.
  - Moving the alignment would allow for future northbound lane widening and six metres clearance to the boundary without further acquisition or retaining wall treatment.
Roads and Maritime has recently acquired property in the vicinity of the existing Meroo Road / Princes Highway intersection and consequently the proposed Pestells Lane / Meroo Road grade-separated half-interchange should be relocated to the current Meroo Road / Princes Highway intersection to reduce impacts on properties at Meroo Meadow, improve safety and remove the need for a roundabout at Pestells Lane.

The highway should be straightened between Boxsells Lane and Abernethys Creek. This would shift the alignment further west of the current Meroo Road / Princes Highway intersection and make Meroo Road closer to perpendicular to the highway. This realignment would facilitate an interchange at this location instead of the proposed Pestells Lane / Meroo Road location.

Pestells Lane should be realigned to intersect with the highway at the current Meroo Road / Princes Highway intersection. This would reduce the impact on private properties.

Southbound on- and off-ramps could be incorporated into an interchange at the existing Meroo Road / Princes Highway intersection.

Has the specific environmental impact of an interchange at the Meroo Road / Princes Highway intersection been looked at?

The Pestells Lane / Meroo Road grade-separated half-interchange has not been located at the Meroo Road / Princes Highway intersection because Roads and Maritime need to keep Meroo Road open for use by construction traffic. This is short term reasoning only applicable to construction, and operational impacts, such as flooding, of the half-interchange at the proposed location would be long term. If Meroo Road was closed during construction, trucks could use other routes to get to Bomaderry.

Response

Following consideration of issues raised in relation to the vertical and horizontal alignment of the concept design at Meroo Meadow and in the vicinity of the Tandingulla Creek bridge, Roads and Maritime has modified the concept design in this location to lower the vertical alignment by about 0.9 metres and to shift the horizontal alignment about 1.5 metres to the east. This would reduce noise and visual impacts to an adjacent property at Meroo Meadow.

In the submission about the horizontal and vertical alignment at this location, the respondent requested that the horizontal alignment be shifted about seven or eight metres to the east. This was not possible due to consequent impacts including: increased land acquisition on the eastern side of the R750 curve and risk of damage to the pine trees adjacent to the Meroo Union church grounds (non-Aboriginal heritage item G2B H78). These pine trees were established along the existing highway in the first half of the twentieth century within or adjacent to settlements as part of a broader tree planting which often consisted of avenues with plantings on both sides of the road. The pine trees adjacent to the Meroo Union church are representative of these tree plantings and have been actively maintained.

For further details about the realignment of the highway at Meroo Meadow, and the potential impacts of the change, refer to Chapter 3 – Changes to the proposal.
During development of the concept design for the proposal, the most appropriate locations for the grade-separated facilities and half-interchange were determined by looking at the alignment of the proposal in its entirety and by assessing the environmental, engineering and functional constraints, such as topography. Location of the proposed Pestells Lane / Meroo Road grade-separated half-interchange at the current Meroo Road / Princes Highway intersection was considered as part of this process. Roads and Maritime has found that the half-interchange as proposed in the concept design is the preferred option primarily because it is subject to fewer environmental and engineering constraints and less cost, which is consistent with the stated proposal objectives. This is further supported by consideration of the following reasons in combination:

- Pestells Lane is perpendicular to the highway and is more suitable for the grade-separated half interchange than Meroo Road which is on an angle to the highway.
- There is an existing undeveloped road reserve located on the opposite (southern) side of the highway. The road reserve is between Meroo Road and the existing Pestells Lane / Princes Highway intersection. There is no such road reserve opposite Meroo Road. Utilising the existing road reserve would reduce the amount of impact on private properties, whereas locating the grade-separated half-interchange at the Meroo Road / Princes Highway intersection would require greater acquisition of private property.
- Southbound on-ramps and off-ramps could be provided if the grade-separated half-interchange was located at the existing Meroo Road / Princes Highway intersection. However in the proposal, Meroo Road forms part of the grade-separated half-interchange and is an important link in that it provides the southbound on-load and off-load movements to and from the highway.
- If the bridge over the highway was proposed on top of the Meroo Road alignment it would not be possible to keep Meroo Road open without building temporary side tracks which would have a greater impact on the adjoining properties than the current proposal. Relocating the proposed grade-separated half-interchange to the Meroo Road / Princes Highway intersection would not have a reduced impact on properties as suggested by the respondent.
- Locating the interchange at or near the Meroo Road / Princes Highway intersection would have much greater environmental impacts to the Tullian Creek waterway and existing riparian vegetation than the current proposal.
- Meroo Road is the only alternative route into the centre of Bomaderry from the north of the town and consequently experiences higher traffic volumes in comparison to other local access roads along the proposal. Around 1800 vehicles per day use Meroo Road, compared to up to about 325 vehicles per day at other local access roads, so it is beneficial to keep this link open to traffic as long as possible during construction.
- The proposed roundabout at the intersection of Meroo Road and Pestells Lane is an appropriate treatment in this situation. The roundabout is not a large factor in the selection of the proposed location of the interchange for this proposal.

The proposal generally follows the existing highway alignment and is contained within the existing road corridor as far as possible to minimise acquisition of properties where it is reasonable to do so. Straightening of the highway between Boxsells Lane and Abermethys Creek would greatly increase the amount of property acquisition required and therefore the cost of the proposal. Realigning Pestells Lane from its current alignment to a new one to meet the intersection of Princes Highway and Meroo Road would not reduce property impacts and would increase the environmental impacts on Tullian Creek. Tullian Creek would need to be realigned west of the highway, which would require additional vegetation clearance to avoid encroachment of the large fill embankments that would be required.

It is clear that an interchange at the Meroo Road / Princes Highway intersection would have substantial environmental impacts to Tullian Creek based upon proximity alone. A specific environmental impact assessment would identify the same issues as those listed in Section 2.4.1 – Road design.
Changes to flooding in the vicinity of the Pestells Lane / Meroo Road grade-separated half-interchange would be managed so that increased flooding would be negligible, as explained in Section 2.11 - Flooding. Meroo Road is an important existing link as explained in Section 2.4.1 – Road design. Maintaining access to Meroo Road during construction is one of a number of reasons why the proposed location for the interchange at Pestells Lane is the preferred option. It is a good value for money solution with the least environmental and engineering constraints, and best meets the proposal objectives.

For more information about safety and access at the Pestells Lane / Meroo Road grade-separated half-interchange, refer to Section 2.7.16 - Pestells Lane / Meroo Road grade-separated half-interchange – access and safety.

For information about the heritage significance of the Meroo Union church and the adjacent pine trees, refer to Section 6.8 of the review of environmental factors.

2.4.2 Public utilities

**Stakeholder identification number(s)**

32, 46, Shoalhaven City Council, Shoalhaven Water

**Issue description**

Submissions relating to public utilities raised issues about the proposed location of power poles on Jaspers Brush Road and the potential impact of the proposal on Shoalhaven Water assets and high pressure gas pipelines.

In summary, the respondents raised the following issues:

- Where would the power poles be situated following the completion of the Jaspers Brush Road / Strongs Road interchange and would there be any impact on a property on Jaspers Brush Road?
- The proposed works appear to impact on the following Shoalhaven Water assets and detailed investigation is required to determine the impact and any rectification measures:

  **Water mains**
  - 150mm uPVC water main, Cambewarra Road intersection (reticulation main).
  - 300mm mPVC trunk, Cambewarra Road intersection (TM55 critical / trunk).
  - 100mm AC water main, Cambewarra Road intersection (reticulation main).
  - 100mm PVC water main, Cambewarra Road intersection (reticulation main).
  - 200mm uPVC trunk main, Highway between Cambewarra Road and Abernethy Lane (TM55 critical/trunk).
  - 100mm AC water main, Highway between Cambewarra Road and Abernethy Lane (reticulation main).
  - 300mm AC trunk main, Highway between Meroo Road and Lamonds Lane (TM2 critical / trunk).
  - 100mm PVC water main, Lamonds Lane (road crossing).
  - 200mm AC trunk main, Highway between Lamonds Lane and Devitts Lane (TM2 critical / trunk).
  - 100mm PVC water main, unnamed lane between Lamonds Lane and Devitts Lane (road crossing).
  - 100mm PVC water main, Morschels Lane (reticulation main).
  - 50mm PVC service line, between Lamonds Lane and Devitts Lane (road crossing).
- 200mm AC trunk main, Highway between Devitts Lane and Strongs Road (TM2 critical /
 trunk).
- 100mm AC water main, Turners Lane (reticulation main).
- 100mm PVC water main, Strongs Road intersection (reticulation main).
- 100mm PVC water main, Highway / Jaspers Brush Road (road crossing).
- 80mm PVC water main, Croziers Road (critical rising main / road crossing).

**Gravity sewage mains and sewer rising mains**
- 150mm PVC rising main, Cambewarra Road intersection (No.23).
- 150mm PVC gravity main, Cambewarra Road intersection (3U/3 - 3U/2).

- Any works for the proposal associated with access, operation or services for the proposed work
  which impacts upon Shoalhaven Water assets eg unsatisfactory cover over water mains, below
  minimum offset or conflict with other services (existing or proposed) shall be rectified at the full
  expense of Roads and Maritime. All plans and specification of proposed works shall be submitted
  to Shoalhaven Water for determination.
- Any works which affect minimum cover, access for maintenance or repair, serviceability or
  effective life of the existing Shoalhaven Water assets shall be relocated, replaced or protected in
  accordance with WSAA water supply Code 2011 V3.1 and Shoalhaven Water supplement to the
  code.
- Shoalhaven Water does not approve concrete encasement of AC water mains. Any AC water
  main affected by the proposal would need to be removed and replaced in accordance with WSAA
  Water Supply Code 2011 V3.1 and Shoalhaven Water's Supplement to the Code and WorkCover
  Guidelines.
- Sewer and water assets are not approved to be located under road pavements, other than
  adequately constructed road crossings. Any assets located under proposed pavements (other
  than road crossings) would be located at the expense of Roads and Maritime.
- Have impacts to high pressure gas pipelines in the vicinity of the Pestells Lane / Meroo Road
  grade-separated half-interchange been investigated?

**Response**

Electricity transmission lines and water and sewer networks may be impacted as a result of the
proposal. Where any of these utilities are located within the construction footprint of the proposal,
these utilities would need to be reinforced or relocated. Final locations for relocated utilities would be
determined during the detailed design phase of the proposal.

A 33 kV electricity transmission line, which crosses the highway at Croziers Road, would require
relocation and / or adjustment of its’ height to provide clearance over the highway due to the change
in the vertical alignment of the highway at this location. The final location for the transmission line
would be determined during the detailed design phase of the proposal in consultation with Endeavour
Energy and impacted landowners. Any works would be undertaken in consultation with Endeavour
Energy and impacted landowners.

A water main is located between the South Coast Rail line and the eastern side of the proposal. The
water main traverses the construction footprint for the proposal in a number of locations between
Jaspers Brush Road and Meroo Road with various utility mains crossing the highway to service
properties on the western side of the highway. This water main would require protection or relocation
where impacted by the proposal. These activities would be undertaken in consultation with
Shoalhaven Water.
During the period leading up to and including the detailed design phase of the proposal, Roads and Maritime would consult with Endeavour Energy and Shoalhaven Water concerning assets that would require protection or relocation as a result of the proposal. This would be undertaken either as part of the pre-construction and / or construction works for the proposal.

During operation, the proposal would not be connected to sewer or water supply assets.

Roads and Maritime acknowledges the following Shoalhaven Water requirements and would consider these during consultation with Shoalhaven Water where relevant:

- Any works for the proposal associated with access, operation or services for the proposed work which impacts upon Shoalhaven Water assets eg unsatisfactory cover over water mains, below minimum offset or conflict with other services (existing or proposed) shall be rectified at the full expense of Roads and Maritime. All plans and specification of proposed works shall be prepared in consultation with Shoalhaven Water.

- Any works which affect minimum cover, access for maintenance or repair, serviceability or effective life of the existing Shoalhaven Water assets shall be relocated, replaced or protected in accordance with WSAA water supply Code 2011 V3.1 and Shoalhaven Water supplement to the code.

- Shoalhaven Water does not approve concrete encasement of AC water mains. Any AC water main affected by the proposal would need to be removed and replaced in accordance with WSAA Water Supply Code 2011 V3.1 and Shoalhaven Water's Supplement to the Code and WorkCover Guidelines.

- Sewer and water assets are not approved to be located under road pavements, other than adequately constructed road crossings. Any assets located under proposed pavements (other than road crossings) would be located at the expense of Roads and Maritime.

The Eastern Gas pipeline would not be impacted by the proposal. Roads and Maritime has consulted with the Manildra group about the proposed Shoalhaven Starches factory site gas pipeline as discussed in Section 6.16.2 of the review of environments factors. It is understood that the Manildra Group is no longer planning to undertake this project.

2.5 Statutory and planning framework

2.5.1 Assessment process including adequacy of the review of environmental factors

Stakeholder identification number(s)

17, Department of Primary Industries - Fisheries NSW, Department of Primary Industries - NSW Office of Water, Environment Protection Authority, Shoalhaven City Council

Issue description

Submissions relating to the approval process raised issues about the adequacy of the level of assessment presented in the review of environmental factors and the responsibilities of the determining authority in relation to both determination and implementation of proposed safeguards and management measures.
In summary, the respondents raised the following issues:

- **Community concerns have not been addressed in the review of environmental factors.** An objective of the *Environmental Planning and Assessment Act 1979* is to give consideration to social impacts as well as economic and environmental impacts. Impacts to the community should be given greater consideration in the review of environmental factors.

- **All works should conform to and be consistent with the review of environmental factors and other information placed on public exhibition.** In particular, all the proposed safeguards and measures to minimise environmental impacts in the review of environmental factors must be fully implemented.

- **The road alignment and the landscape for this section of the highway upgrade is quite straightforward (i.e., the road is simply being duplicated along the horizontal alignment of the existing highway).** As such, the review of environmental factors appears adequate in terms of the issues which are of interest to the NSW Office of Water.

- **There would be considerable benefits to the local community and motorists in NSW from upgrading this section of the Princes Highway.** It is the role of Roads and Maritime as the determining authority to weigh these benefits against the predicted adverse impacts, some of which are environmental impacts, when making its decision about whether to proceed with the proposal.

- **The review of environmental factors report identifies the need to prepare and implement management plans to minimise the environmental impact of the proposal, i.e., soil and water management plans etc.** It is appropriate for this assessment/planning to occur prior to construction and is unnecessary for the purpose of the review of environmental factors.

**Response**

Roads and Maritime has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal as documented in the review of environmental factors and has therefore complied with Section 111 of the *Environmental Planning and Assessment Act 1979*. Submissions stating the benefits of the proposal and the adequacy of the review of environmental factors have been noted.

Roads and Maritime considers meaningful and detailed community and stakeholder engagement to be an essential component of the proposal. A comprehensive consultation program has been undertaken for the proposal and community involvement has been an integral component of each stage of the proposal, commencing with the route options development process in 2006. At each stage, various consultation activities have been undertaken to inform the community and other stakeholders with the aim of both increasing public understanding of the proposal, and encouraging participation in the consultation activities and feedback process. The consultation program has aimed to inform and engage the whole community in a constructive, fair, and transparent process.

Community and stakeholder engagement throughout the route options development and environmental assessment phases of the proposal has included: the establishment of a project office in Berry; a 1800 (toll free) information line; a dedicated project website; public displays and information sessions at key milestones/stages of the proposal; meetings with interest groups, relevant stakeholders, and property owners; participation in value management workshops; a community review group; community working groups; distribution of community updates; letters to householders and regular registered stakeholder email notifications.

Community input has influenced the route selection process and the development of the concept design, and community concerns have been considered during the environmental impact assessment phase of the proposal as outlined in Chapter 5 of the review of environmental factors.
The primary purpose of the environmental impact assessment for the proposal is to assess the environmental, social and economic impacts of the proposal. In order to achieve this, a number of technical assessments were undertaken by appropriately qualified and experienced professionals to inform the review of environmental factors. This included a socio-economic assessment which was undertaken by AECOM in 2013. The socio-economic assessment was included in Section 6.10 and Appendix K of the review of environmental factors and is available on the Roads and Maritime project website (www.rms.nsw.gov.au/bbu).

In Chapter 7 of the review of environmental factors, a number of safeguards and management measures have been identified that would minimise adverse environmental impacts, including social impacts which could potentially arise as a result of the proposal. Following consideration of the submissions to the review of environmental factors, some additional safeguards and management measures have been identified and added to the suite of measures included in chapter 7. The complete set of safeguards and mitigation measures identified to avoid or reduce adverse impacts of the proposal is provided in Chapter 4 – Environmental management. Should the proposal proceed, these safeguards and management measures, including any additional measures arising via contract documentation from commitments in this report, would be incorporated into the detailed design and applied during the construction and operation of the proposal.

When determining the proposal Roads and Maritime will, in accordance with Section 111 of the Environmental Planning and Assessment Act 1979, examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity. This includes consideration of both the positive and adverse impacts of the proposal, as assessed in the review of environmental factors and this submissions report.

2.6 Consultation

2.6.1 Level and quality of consultation

**Stakeholder identification number(s)**

7, 9, 14, 17, 20, 26

**Issue description**

Submissions relating to the level and quality of consultation raised issues about a lack of consultation with impacted community members and inadequate consideration of community suggestions.

In summary, the respondents raised the following issues:

- A copy of the review of environmental factors documentation was provided in a CD format. This format was difficult to navigate around to find the specific data required.
- Roads and Maritime, during the concept design development, advised that the alignment of the proposal in front of a property in Meroo Meadow would not be considerably closer or higher than the existing road pavement. The latest concept design contradicts this advice.
- There has been a lack of consultation to advise the community about design changes and about the highway north of Boxsells Lane and Lamonds Lane being raised by 2.1 metres. The website and the video animations fail to indicate that the highway would be raised to this height. The highway would also be widened on the western side which was not indicated at any of the community meetings. In fact previous consultation indicated widening would occur on the eastern side.
• There has been very little consultation with Roads and Maritime. During the limited communication that has occurred there was little negotiation about the concept plans or alternative options to the overpass at Strongs Road. Several meetings have been held with Roads and Maritime to discuss residents' concerns over the overpass at Strongs Road, but most ideas suggested by residents have been immediately dismissed, have not been taken seriously and / or have not been addressed in the review of environmental factors. There is immense dissatisfaction among the other impacted residents that Roads and Maritime is not looking into the collective effects on the neighbouring residents.

• O'Keeffes Lane appears to have been neglected on the basis that the residents have not protested loudly enough. Requests for an overpass at Croziers Road have been ignored. The design shows limited consideration for residents affected by the upgrade. Residents have raised this issue but have been ignored, similar to the residents of Croziers Road. Residents should be listened to.

Response

Roads and Maritime is committed to meaningful and engaging community consultation and community involvement has been an integral component in the development of the proposal.

Roads and Maritime has proactively engaged the community and stakeholders to increase public understanding of, and participation in, the development of the proposal during the identification of route options, the selection of the preferred option, the development of the concept design and the environmental impact assessment for the proposal.

The proposal has benefited from the input of local knowledge provided through community engagement, which has helped identify issues, potential mitigation strategies and opportunities to improve proposal outcomes.

Based on the IAP2 Public Participation Spectrum (International Association for Public Participation Australasia. 2007), a community involvement plan has and would continue to be implemented to inform and consult with the community and stakeholders in a constructive and transparent manner.

Community and stakeholder engagement to date has included:

• The establishment of a project office in Berry (open on Fridays) staffed by members of the project team.
• A 1800 (toll free) project information line.
• A dedicated project website.
• Public displays and information sessions at key milestones / stages of the proposal including route options, preferred option, preliminary concept design, review of environmental factors and concept design display.
• Meetings with interest groups, relevant stakeholders and property owners.
• Distribution of community updates.
• 3D animation and videos to assist understanding of the proposal.
• A public issues register.
• Letters to householders.
• Advertisements in the local press and local radio announcements.
• Regular registered stakeholder email notifications.
• Publications accessible on the project website.
From the time of publication of the preliminary concept design for the proposal in April 2012 to display of the review of environmental factors in November 2013, Roads and Maritime has:

- Received 107 visits to the project office in Berry.
- Received 18 calls to the 1800 (toll free) project information line.
- Registered 21,250 unique page views and 4115 document downloads from the dedicated project website.
- Held five community information sessions.
- Held five meetings with resident groups.
- Held 43 stakeholder / property owner interviews.
- Held 10 meetings with government agencies, council and interest groups and two meetings with the Aboriginal Focus Group.
- Issued seven householder letters / community updates.
- Developed a 3D model and animations of the proposal.
- Developed and maintained an issues register, available on the project website.
- Advertised the public display of the review of environmental factors in four issues of the South Coast Register, two issues of the Shoalhaven and Nowra News, two issues of the Illawarra Mercury and one issue of the National Indigenous Times and via radio spots on Power 94.9 FM and Radio 2ST.
- Issued 18 email updates to registered stakeholders.
- Received 22 'Have your say' feedback forms.
- Received 106 emails / letters.
- Provided 31 documents on the project website.

Roads and Maritime provided regular updates to the community to inform them of refinements to the proposal. For example, in March 2013, a community update was sent to 3000 residents in the proposal area describing design changes resulting from community feedback and showing the refined concept design. In September 2013 a letter was sent to residents of Croziers Road and O’Keeffes Lane to update them about the investigations carried out by Roads and Maritime to address concerns raised, both in written correspondence and during site meetings, relating to Croziers Road access arrangements. Copies of these updates are available on the project website.

In addition to written updates, Roads and Maritime held group meetings with property owners, residents and community groups to try to better understand their concerns with the proposal and to discuss potential design modifications such as changes to intersection and access arrangements. Meetings were held with residents of Croziers Road, O’Keeffes Lane, Boxsells Lane and Strongs Road.

Details of the meetings and information sessions, including dates, activities and outcomes can be found in Table 5.1 of the review of environmental factors.

Roads and Maritime endeavours to provide the community with up to date and accurate information at all times. Roads and Maritime acknowledges that information provided to the community may at times have been superseded as a direct result of the ongoing design process, however information provided to the community at any point in time was accurate at that time.

During the public display of the review of environmental factors, Roads and Maritime provided copies of the report in CD format, hard copies were available to view in the project office in Berry and hard copies were provided on request to community members who were not able to access the information electronically.
The review of environmental factors and supporting documentation was also available at: Shoalhaven City Council; Nowra Library; the Office of Gareth Ward MP; the Office of Shelley Hancock MP; the Roads and Maritime Southern Region office; the Gerringong upgrade community display centre; and the Nowra Showground Pavilion.

This range of community engagement activities has provided community members with opportunities to gain information about the proposal and to have direct access to the project team.

Roads and Maritime has carefully considered all issues and suggestions during the development of the proposal.

Key changes made to the proposal during the preparation of the review of environmental factors as a direct result of community feedback include:

- Amendments and modifications to individual property accesses following discussions with property owners.
- Removal of the northbound heavy vehicle rest area near Meroo Meadow from the proposal and inclusion of the northbound heavy vehicle inspection bay near Jaspers Brush.
- Realignment of the highway to the north in the vicinity of Morschels Lane to avoid impacting on a row of trees with heritage significance on the southern side of the existing highway.
- Provision of a protected right turn lane into Boxsells Lane.
- Re-alignment of the Pestells Lane grade-separated half-interchange slightly to the north to reduce impacts on local property owners.
- Provision of between two and three metre wide shoulders along the alignment to improve safety for cyclists.

Further design changes were requested in submissions received during the display of the review of environmental factors. Each request has been considered by Roads and Maritime as documented in Section 2.3 to Section 2.20 and Chapter 3 – Changes to the proposal.

Specific issues raised above are addressed in the submissions report as follows:

- Modifications to the highway alignment near Meroo Meadow to minimise impacts to an adjacent property at Meroo Meadow. Refer to Section 2.4.1 – Road design and Chapter 3 – Changes to the proposal.
- Increase in highway height north of Boxsells Lane and Lamonds Lane and impacts of this on the vertical alignment and access to Lamonds Lane. Refer to Section 2.7.14 - Lamonds Lane – access and safety.
- Design of Croziers Road and O’Keeffes Lane, consideration of alternatives suggested in submissions and provision of a right hand turn into O’Keeffes Lane. Refer to Section 2.7.11 - Croziers Road and O’Keeffes Lane – access and safety and Chapter 3 – Changes to the proposal.
- Overpass at Strongs Road and consideration of alternatives suggested in submissions. Refer to Section 2.7.12 - Jaspers Brush Road and Strongs Road – access and safety.
2.6.2 Future consultation

Stakeholder identification number(s)
7, 34, Shoalhaven City Council, Department of Primary Industries – NSW Office of Water

Issue description
Submissions relating to future consultation raised issues about consultation on noise and vibration, provision for cyclists, local road access and waterways matters.

In summary, the respondents raised the following issues:

- Respondents have advised they are available to meet with Roads and Maritime noise and safety specialists to discuss the issues raised in their submission and ascertain the future habitability of a property in Jaspers Brush. Roads and Maritime should consult with Shoalhaven City Council to ensure cycle provision on the new highway is compatible with the newly adopted Shoalhaven Bike Plan.
- Roads and Maritime should hold separate individual community consultation with residents and businesses for each access road affected by the proposal to discuss the community's needs and concerns with the current design. These meetings would ensure affected residents and businesses fully appreciate the potential impacts of the current proposal and would give them the opportunity to have their concerns heard and addressed.
- NSW Office of Water recommends that consultation between Roads and Maritime and the NSW Office of Water continue during the detailed design phase of the proposal, particularly in relation to proposed bridges over waterways and impacts to hydrology and flooding.

Response
Roads and Maritime is committed to continued engagement with key stakeholders, local government, government agencies, interest groups and the community throughout the assessment and the detailed design, construction and operation phases of the proposal. Subject to determination of the proposal, identification and management of issues would continue through the detailed design and construction phases. This would include safety, noise and vibration, hydrology and flooding, local road access and accessibility for cyclists and pedestrians.

A community involvement plan would be further developed and implemented during the detailed design and construction phases of the proposal. It would describe the community consultation objectives, stakeholders, strategies, future consultation events, activities and evaluation for the proposal.

At a minimum, consultation during the detailed design and construction phases of the proposal would include:

- Ongoing consultation with the community and stakeholders including potentially directly impacted and adjacent property owners, interest groups (business, the Aboriginal community and specific interest groups), government and non-government agencies and the wider community.
- Regular updates to the community throughout the remainder of the planning and construction phases.
- Development and maintenance of a comprehensive complaints management system.
- Toll free community information line (1800 506 976).
- Email address (berrytobomaderryupgrade@rms.nsw.gov.au).
- Maintaining a presence at the project office in Berry.
For further information about access arrangements at a property at Jaspers Brush, refer to Section 2.15.3 - Property access.

2.6.3 Accuracy and adequacy of information

Stakeholder identification number(s)

25, Shoalhaven City Council

Issue description

Submissions relating to the accuracy and adequacy of information raised issues about a printing error on the community update and a query over the accuracy of the information provided in the review of environmental factors for Shoalhaven City Council owned land.

In summary, the respondents raised the following issues:

- There is an error on the community update aerial concept design. “Cambewarra Road” printed on the western side of the map, this is actually “Moss Vale Road”.
- The review of environmental factors identifies Lot 2 DP806783 and Lot 11 DP776413 as Roads and Maritime owned land. GIS records and title searches show these lots as Council owned. There appears to be an error in Roads and Maritimes’ records and Council requests ownership is investigated and Council advised.

Response

Roads and Maritime notes the mislabelling on the community update map and will correctly label Moss Vale Road and Cambewarra Road in all future publications.

Roads and Maritime confirms that Lot 2 DP806783 and Lot 11 DP776413 are owned by Shoalhaven City Council and land ownership records will be updated accordingly. Partial acquisition of these lots would be required for the proposal as outlined in Section 6.9.3 of the review of environmental factors. All property acquisition would be undertaken in accordance with the Land Acquisition (Just Terms Compensation) Act 1991 and the ‘Roads and Maritime land acquisition information guide’ (Roads and Maritime, 2014).

2.7 Traffic and transport

2.7.1 Impacts of construction vehicles

Stakeholder identification number(s)

37

Issue description

In the submission relating to the impact of construction vehicles, the respondent questioned how the impact from construction vehicles (cars, utes and trucks) parking in Croziers Road would be managed.

Response

Details of constructability and staging of the proposal are described in Section 7.1.1 of the Technical Paper: Traffic and Transport (AECOM, 2013) provided at Appendix C of the review of environmental factors. The construction sequencing and temporary works identified would be based on minimising impacts whilst providing sufficient flexibility for the contractor to efficiently plan and construct the proposal in a safe manner. However, specific construction staging and traffic control details are limited at this stage in the proposal due to the uncertainty associated with the ultimate contractor’s work methods.
The traffic management plan described in Section 6.1.4 of the review of environmental factors would be prepared by the nominated construction contractor as part of the construction environmental management plan. Construction activities that may influence the safety and amenity of residents living / travelling in the proposal area would be identified in the traffic management plan and corresponding mitigation measures would be detailed and implemented.

Specifically, the traffic management plan would provide details of temporary parking provisions for construction workers and other construction-related traffic in the vicinity of Croziers Road. It is expected that construction-related traffic would generally park at locations designated for this purpose within compound and site office areas; wherever practical.

2.7.2 Travel time changes for individuals

**Stakeholder identification number(s)**

Shoalhaven City Council

**Issue description**

In the submission relating to increased travel times for residents that would be impacted by revised access arrangements between properties and the upgraded highway; the respondent suggested that consultation with landowners affected may provide optimum results to minimise travel times and reduce the need for local road diversions.

**Response**

Roads and Maritime acknowledges that the proposed access arrangements would result in increased travel time for some local residents. However it is considered that this inconvenience would be offset by the overall road safety benefits that the proposed design would deliver to both local and through traffic. Moreover, the additional travel time for residents impacted by the proposed access arrangements would be offset by reduced travel times on the upgraded highway in comparison to existing conditions.

The proposed concept design has been refined since publication of the review of environmental factors, including the provision of an additional u-turn (Boxesells Lane) and two right hand turn (Turners Lane and O'Keeffes Lane) bays on the upgraded highway to further mitigate the impacts of local access constraints. These design changes are discussed in detail in Chapter 3 - Changes to the proposal.

Roads and Maritime has met with individual land and property owners to discuss their access arrangements and the overall functionality of the proposal, and community consultation would continue during the detailed design phase of the proposal.

2.7.3 Road safety

**Stakeholder identification number(s)**

1, 8, 46

**Issue description**

Submissions relating to road safety raised the need for acceleration lanes at major intersections and safety barriers on the northern side of the highway on the exit out of Bomaderry, and queried why right hand turns were provided at some locations instead of interchanges.
In summary, the respondents raised the following issues:

- The failure to provide acceleration lanes at major intersections is a considerable safety omission and acceleration lanes should be included at critical locations.

- A safety barrier or a safety fence should be erected on the western side (northbound side) of the highway on the exit out of Bomaderry to prevent vehicles crashing into properties due to the speed change from 70 kilometres per hour to 100 kilometres per hour.

- Safety of the proposal has been compromised by the provision of right hand turns across oncoming traffic at Boxsells Lane and Lamonds Lane. What criteria determine whether an interchange is required as opposed to right hand turn provisions?

Response

Findings from the traffic and transport assessment for the proposal indicated that acceleration lanes at major intersections are not required as there would be sufficient gaps in the traffic and for vehicles to safely enter the upgraded highway. Motorists would have the option to utilise the wide shoulder should they wish to accelerate before entering the highway.

In addition, the introduction of acceleration lanes would conflict with other local road access facilities. For example, an acceleration lane from Croziers Road would mean the right turn into Mullers Lane could not be provided, and vice versa; which is similar at other locations. On balance it is considered the best option is not to remove local road access facilities at the expense of acceleration lanes; which are not necessarily required as the proposal would provide safe local road and property access in accordance with current road design standards.

The design and Road Safety Audit processes so far have not identified a need for a safety barrier along the western side (northbound side) of the highway, just north of Cambewarra Road, in Bomaderry.

Around 1800 vehicles currently use Meroo Road each day with about 20 per cent of these being heavy vehicles. The use of other side roads along the Princes Highway ranges between 50-325 vehicles per day by contrast. This is primarily due to Meroo Road providing an important function directly linking the Princes Highway with the Bomaderry industrial area and the established local road network. Meroo Road is an important road link warranting full access at the highway. In addition, Shoalhaven City Council has indicated its support for a full interchange to be provided for Meroo Road.

Another factor that played a role in determining proposed locations of interchanges was the spacing of interchanges along the proposal length to limit additional travel time for the local community as a result of the new central median introduced by the proposal.

Providing facilities on the highway for right turns into Boxsells Lane and Lamonds Lane would benefit local residents by reducing the impact on accessibility with the highway as a result of the new median. It could be safer at side roads if right turns were not allowed. However, right turns into the side roads pose much less risk that right turns on to the highway from side roads. On balance, provisions on the highway for right turns into side roads are considered reasonable as they would limit the impact of the proposal on accessibility for local residents.
2.7.4 Service roads

**Stakeholder identification number(s)**
Shoalhaven City Council

**Issue description**
In the submission relating to the proposed service road to a property north of Meroo Road, the respondent understands that Roads and Maritime has purchased this property, which is on the western side of the highway and believes a better outcome would be achieved if that property was linked to Pestells Lane instead of constructing some additional 350 metres of service road, only to reinstate another access on the highway.

**Response**
The proposal includes modifications to the connections between local roads and the highway, including Strong Road, Jaspers Brush Road, Morschels Lane, Devitts Lane, Pestells Lane, Meroo Road and Abernethys Lane. An overview of the proposed access strategy for local roads and properties is provided in Section 6.1.3 (page 124) of the review of environmental factors.

This strategy has been developed with consideration to community feedback and is considered to most appropriately meet the proposal objectives, whilst satisfying the functional requirements of the upgraded highway. The strategy best meets the objective of road safety by providing safe and controlled access to all local roads and properties and is considered to deliver a value for money solution.

In the suggested alternative, a shorter but comparable service road would need to be constructed on the Roads and Maritime owned property on the western side of the highway to link the existing residential property to Pestells Lane. The service road would have to cross Tullian Creek which would require the construction of a new crossing structure and would also require the clearing of existing trees and vegetation within the creek corridor. The design features and impacts of this arrangement are not believed to provide an improved solution for the proposal.

2.7.5 Heavy vehicle routes

**Stakeholder identification number(s)**
23

**Issue description**
In the submission relating to heavy vehicle routes, the respondent stated that alternative routes for heavy vehicles from the highway to Bolong Road that do not pass through heavily populated residential areas would be preferred. For example Turners Lane, Morschels Lane and Lamonds Lane all leave the highway and travel through rural areas. One of these could be linked to an existing road such as Hanigans Lane or Jennings Lane to access Bolong Road.

**Response**
An overview of the proposed access strategy for local roads and properties is provided in Section 6.1.3 (page 124) of the review of environmental factors.

The preferred access strategy for the proposal includes a grade-separated half-interchange at Pestells Lane / Meroo Road. The strategy best meets the objective of road safety by providing safe and controlled access to all local roads and properties and is considered to deliver a value for money solution.
The proposal is expected to improve safety for heavy vehicle access between the Princes Highway and Meroo Road. It is not however expected to encourage a large increase in the use of Meroo Road by heavy vehicles. The speed and relative attractiveness of Meroo Road when compared to alternatives would remain broadly unchanged by the proposal.

The suggested alternatives would provide an alternative route to Meroo Road for traffic travelling between the Princes Highway north of Meroo Road and Bolong Road east of Railway Street. These options would however require both the upgrade of existing roads and infrastructure, and the construction of a substantial length of new road and associated infrastructure to appropriate design standards. The cost and impacts of this construction would be exacerbated by the alignment of these routes, crossing the South Coast Railway and an expansive flood plain.

In summary, multiple existing routes provide heavy vehicle access between the Princes Highway and Bolong Road, and the proposal is not expected to greatly influence the distribution of heavy vehicles on these routes. Consequently, the cost and impact of construction of an additional route would not fulfil the proposal objectives.

2.7.6 Local road network

**Stakeholder identification number(s)**

1, Shoalhaven City Council

**Issue description**

Submissions relating to the local road network raised issues about the importance of local road junctions as meeting places for carpooling, potential impacts on the 'Sandtrack' as a result of the proposal and the financial implications on the respondent from additional traffic using local roads.

In summary, the respondents raised the following issues:

- Junctions of side roads with the Princes Highway are important meeting places for carpooling or the transfer of passengers or goods from one vehicle to another. It is important that provision is retained for this important social function.

- The operational impacts of the Foxground and Berry bypass project and the proposal on Gerroa Road / Bolong Road should be considered. In particular, the 'Sandtrack' was constructed for light vehicle traffic only and a five tonne load limit must be maintained to protect the structural integrity of the road.

  Roads and Maritime documentation identifies that only three per cent additional traffic could be expected on the 'Sandtrack' as a consequence of traffic diverting to avoid delays on the highway during construction.

  The conditions of approval for the Foxground and Berry bypass project require Roads and Maritime to monitor and report on levels of traffic usage on the 'Sandtrack' during construction and to identify what corrective actions are required to address any adverse impacts. This monitoring has not commenced.

  Roads and Maritime need to fund remediation of the 'Sandtrack' during construction. Roads and Maritime has recently funded $820,000 for shoulder works, line marking and vegetation clearing on the 'Sandtrack' but this does not allow for considerable remediation works outside the block funding by Roads and Maritime for maintenance.

- Short term implications of the diversion of traffic onto Gerroa Road need to be considered and Council would need to negotiate an agreement with Roads and Maritime in relation to impacts of diversions from the Foxground and Berry bypass project and the proposal and the provision of funds for any remediation.
• There are financial implications to the respondent from the current proposal. The proposal would be largely built on the existing highway alignment, however costs to Council would result due to impacts from the local access treatment proposed. For example u-turn bays are proposed on many side roads, with ownership likely to be transferred to the respondent. Between the u-turn bays and the highway there would also be an increase in traffic on local roads.

Response

An overview of the proposed access strategy for local roads and properties and the resulting highway access constraints are provided in Section 6.1.3 (pages 124 - 125) of the review of environmental factors.

Where minor roads join the Princes Highway, drivers currently have the ability to turn either left or right to or from the highway. Once a central median and safety barriers are installed, movements at local roads and accesses in rural areas would generally be restricted to left-in and left-out movements only. The proposal includes changes to the connections between local roads and the highway, including Strongs Road, Jaspers Brush Road, Morschels Lane, Devitts Lane, Pestells Lane, Meroo Road and Abernethys Lane.

It is proposed that to improve road safety following the construction of the proposal, the practice of stopping at or near the intersections of the Princes Highway with local roads and property accesses, in close proximity to high-speed highway traffic, would be discouraged. As mitigation to this impact, the proposal would provide safe left-in and left-out access arrangements for all existing local roads and property accesses. In addition, the proposal would also provide grade-separated facilities, protected right-turn bays, and u-turn facilities at selected locations to provide direct access to properties or local access roads for the safe transfer of passengers or goods from one vehicle to another.

Following construction of the proposal, activities such as collecting or delivering passengers or goods would be undertaken after exiting the highway using the grade-separated facilities, protected right-turn bays, and u-turn facilities. Vehicles would safely exit the highway to stop on a local road or property access, meet with others to transfer passengers or goods, and then safely return to the highway. As a specific example at the Strongs Road / Jaspers Brush Road grade-separated facility, safe left-in and left-out and u-turn facilities would be provided, improving safety when compared to current practices, and minimising additional travel time.

An overview of the road network in the proposal area is provided in Section 6.1.1 of the review of environmental factors. It is acknowledged that the ‘Sandtrack’ is commonly used by regional light vehicle traffic to avoid delays behind slow moving heavy vehicles, which are prevented from using this route by a five tonne load limit. No changes to the existing load limit are proposed.

Roads and Maritime does not intend to divert additional traffic to the alternative ‘Sandtrack’ route, which currently accommodates around 45 per cent of total through traffic between Gerringong and Bomaderry. However, based on the relationship between relative travel times and traffic distribution in the area, it is estimated that on average around three per cent of traffic would transfer to the ‘Sandtrack’ from the Princes Highway during the three year construction period. This proportion has been estimated based on the effects of 80 kilometres per hour construction zone speed limits and limited overtaking opportunities along the existing highway.

In response to this and in consultation with Shoalhaven City Council, Roads and Maritime has agreed to periodically install traffic counters at strategic locations between Berry and Bomaderry during the three year construction period. These counters would be used to monitor changes to existing traffic volumes and patterns, and, in consultation with Council, develop a strategy to address road safety and road maintenance issues arising from:

• A greater transfer of traffic than the predicted three per cent.
• Major and / or other unexpected changes to existing traffic patterns and volumes.
These commitments would be carried forward to the design and construction contractor or retained by Roads and Maritime as appropriate for the Shoalhaven City Council area. This is consistent with monitoring that will be undertaken during the construction phase of the Foxground and Berry bypass project.

Roads and Maritime would conduct pre and post construction dilapidation surveys and prepare reports so that impacts of the proposal on council road infrastructure (assets) can be identified and repaired where required. This would be undertaken in consultation with Shoalhaven City Council.

It is acknowledged in Section 6.1.3 (page 125) of the review of environmental factors that the proposed access strategy would result in relatively low volumes of additional daily traffic on some local roads when compared to existing access arrangements. Any potential operational impacts of additional traffic on local roads in terms of performance are expected to be mitigated by the safe and efficient design of these facilities.

Moreover, any potential ongoing maintenance implications of these impacts would be considered during the handover of assets to Council via a working group set up in accordance with the Roads and Maritime Policy 192 ‘Transfer of Assets and Asset Management Functions Between the RTA and Other Roads Authorities’ (RTA, 2009). Generally, the transfer process would commence well before the asset is scheduled to become part of the receiving authority’s inventory.

2.7.7 Pedestrian and bicycle use

Stakeholder identification number(s)
1, 23, 27, 30, 34, 35, 46

Issue description
Submissions relating to pedestrian use raised the need for footpaths across overpasses to provide safe pedestrian access over the highway. Submissions relating to pedestrian and bicycle use raised issues about safety impacts to pedestrians and cyclists along Meroo Road due to increased heavy vehicle movements, the need for appropriate and safe cycle routes and compatibility of any new cycle route with the Shoalhaven Bike Plan.

In summary, the respondents raised the following issues:

- Footpaths providing pedestrian access across overbridges at locations such as Strong's Road should be included. Footpaths would provide safe access over the highway to bus stops and for those carpooling to work or social events.

- An upgrade to the highway access at Meroo Road would increase heavy vehicles on Meroo Road. Heavy vehicles would use Meroo Road to access the industrial area of Bomaderry instead of travelling along the highway to exit at Bolong Road. This would increase the danger to pedestrians and cyclists.

- The use of the Princes Highway by cyclists is understated in the review of environmental factors. The highway between Berry and Bomaderry is well used by cyclists and forms part of a number of popular cycle routes and circuits. All the routes rely on good cycling conditions on the highway between Berry and Bomaderry. Cycling would be more popular in this section if the lack of verge on some of the bridges was addressed and signage improved.

- The review of environmental factors indicates the ‘Sandtrack’ is an alternative cycling route. This is misleading as the ‘Sandtrack’ is unsuitable for cyclists in its current state and is one of the most dangerous roads to cycle on in the district due to the lack of a paved verge and the high speed of traffic.

- The new highway must cater for cyclist safety as cycling is a growing and important mode of transport. It is important that a cycling route does not have any dangerous pinch points (such as Jaspers Brush Creek and Flying Fox Creek) and provides lane separation similar to the freeway between Waterfall and Wollongong.
• Roads and Maritime should consult with Shoalhaven City Council to ensure cycle provision on the new highway is compatible with the newly adopted Shoalhaven Bike Plan.

Response
The preferred access strategy for the proposal includes:

• Two grade-separated facilities at Jaspers Brush Road / Strongs Road and Morschels Lane / Devitts Lane.
• A grade-separated half-interchange at Pestells Lane / Meroo Road.

An overview of the proposed access strategy for local roads and properties is provided in Section 6.1.3 (page 124) of the review of environmental factors.

In response to submissions, Roads and Maritime has agreed to introduce a footpath on the Strongs Road and Pestells Lane overbridges and the Morschels Lane underpass. The highway crossings provided at these locations would include a two metre shoulder for cyclists as well as a one metre footpath for pedestrians on each side. The footpaths and road shoulders would connect with the existing arrangements on the local road network; in most instances this is a grassed footway between the road edge and the nearest property boundary and the local roadway respectively. The concept design can accommodate these connections between the introduced footpaths and road shoulders and the existing arrangements on the local roads, the details of which would be developed during detailed design. Refer to Chapter 3 – Changes to the proposal for further details.

An overview of existing cycling routes and conditions in the proposal area is provided in Section 6.1.2 (page 119) of the review of environmental factors. It is noted that there are no formal cycle specific facilities in or between Berry and Bomaderry; however Shoalhaven City Council promotes various on-road cycle routes to and from both towns. Specifically Ride A2 is noted as a circuit between Berry and Bomaderry which includes cycling along both the Princes Highway and the ‘Sandtrack’. In addition, the NSW Coastline Cycleway is a proposed 1400 kilometre coastal cycleway stretching from the Queensland border, through NSW to the Victorian border and includes a section within the proposal area that follows the route of the ‘Sandtrack’.

The ‘Shoalhaven Bike Plan 2013’ (Shoalhaven City Council, 2013) is consistent with this overview of existing routes, indicating that:

• The Princes Highway is a ‘proposed on-road connector route’ between Berry and Bomaderry.
• The ‘Sandtrack’ is a ‘proposed on-road popular route’ in the proposal area.
• Meroo Road – Railway Street is a proposed on-road route between the Princes Highway and the ‘Sandtrack’.

Section 6.1.3 of the review of environmental factors provides an overview of impacts on public and active transport as a result of the proposal. Section 6.1.4 of the review of environmental factors provides an overview of management measures to mitigate proposal impacts.

The proposal is expected to improve cycling safety and amenity on the Princes Highway between Berry and Bomaderry. In rural areas of the proposal, cyclists would utilise the 2.5 metre shoulder provided on the upgraded highway, allowing greater separation between bicycles and high speed traffic than existing conditions. Existing pinch points including those currently encountered at Jaspers Brush Creek and Flying Fox Creek would be removed as a result of construction of a 2.5 metre shoulder on the proposed bridge structures. These features were included in the concept design assessed in the review of environmental factors and consequently no change to the design is required to accommodate this highway shoulder. All provisions for cyclists including all grade-separated facilities, half-interchanges, and intersections constructed as part of the proposal would comply with the Roads and Maritime ‘NSW Bicycle Guidelines’ (RTA, 2005a).
The preferred access strategy for the proposal includes a grade-separated half-interchange at Pestells Lane / Meroo Road. As a result the proposal is expected to improve safety and connectivity for heavy vehicles that currently travel between the Princes Highway and Meroo Road. It is not however expected to encourage a large increase in the use of Meroo Road by heavy vehicles. The speed and relative attractiveness of this route when compared to alternatives would remain broadly unchanged by the proposal. Consequently the proposal is not expected to decrease pedestrian and cyclist safety on Meroo Road.

The proposal would not result in any changes to lane configurations or lane widths on the ‘Sandtrack’. However, as traffic is expected to transfer to the Princes Highway from the ‘Sandtrack’ following construction of the proposal, the reduction in traffic on the ‘Sandtrack’ would be expected to improve the amenity of this route for cyclists. The 2.5 metre shoulder provided on the upgraded highway would also provide a safe alternative for cyclists using the ‘Sandtrack’ to travel between Berry and Bomaderry.

Provision for pedestrians and cyclists on the upgraded highway would support and complement the Shoalhaven Bike Plan and would be developed further during the detailed design phase of the proposal in consultation with Shoalhaven City Council.

2.7.8 Heavy vehicle inspection bay

**Stakeholder identification number(s)**

17

**Issue description**

In the submission relating to the heavy vehicle inspection bay, the respondent raised concerns about the relocation of the heavy vehicle inspection bay from Meroo Meadow to Jaspers Brush. The respondent believes that Jaspers Brush has less space available for the facility and more houses that would be affected. The respondent feels that Jaspers Brush has less space available for the facility and more houses that would be affected. The respondent feels that there are sections of the highway where there are no houses and that it would be more sensible planning for the heavy vehicle inspection bay to be located in an area where there are no residents living directly on the highway. The respondent asked whether a cumulative impact study has been completed for the works planned at Jaspers Brush?

**Response**

An overview of the proposed heavy vehicle inspection bay, located at Jaspers Brush adjacent to the northbound carriageway, is provided in Section 3.3.10 of the review of environmental factors. The facility would be staffed as needed and locked when not in use. The heavy vehicle inspection bay would consist of a paved area of around 3250 square metres (excluding the on-ramps and off-ramps) and would provide four inspection bays 100 metres long and 15 metres wide. There would be no permanent structures such as buildings, toilets or shade structures constructed at the site.

A combined heavy vehicle rest area and Roads and Maritime inspection bay located at Meroo Meadow was considered for inclusion in the proposal. However, the community was strongly opposed to the location of this facility and in response Roads and Maritime investigated alternate options along, as well as outside, the proposal alignment. The investigations considered community feedback and social and environmental impacts associated with locating a heavy vehicle facility at each alternative location. Roads and Maritime also considered alternatives for the form and function of the facility including a split facility, with the rest area component in one location and the inspection bay component in another location.

Overall, the proposed location is believed to be the most appropriate when considering and balancing proposal objectives, engineering constraints, environmental impacts, and community impacts and feedback.

Refer to Section 2.20.1 – Heavy vehicle rest area / inspection bay for further information.
2.7.9 Berry to Bomaderry access strategy

Stakeholder identification number(s)
Shoalhaven City Council

Issue description
The submission relating to the Berry to Bomaderry access strategy raised issues regarding the need for right hand turn access to Abernethys Lane, Turners Lane, O’Keeffes Lane and Andersons Lane.

In summary, the respondent raised the following issues:

- There is an inequitable provision of right turn access off the highway. For example, direct right turn access would be provided into Silo’s winery and selected other local roads (Lamonds Lane, Croziers Road, Mullers Lane and Boxsells Lane). However there is still no provision for direct right turn access into Abernethys Lane, Turners Lane, O’Keeffes Lane or Andersons Lane.
- By not providing direct right turn access into Abernethys Lane, Turners Lane, O’Keeffes Lane or Andersons Lane, local traffic is required to traverse up the highway to the next right turn bay, turn right, use a local u-turn facility, turn left onto the highway, traverse back down the highway and then turn left into their respective lane.
- Apart from the additional travel burden and potential conflicts, local traffic would still be making a direct right turn just into a side street rather than into their own lanes.

Response
An overview of the proposed access strategy for local roads and properties and the resulting highway access constraints are provided in Section 6.1.3 (pages 124 - 125) of the review of environmental factors.

The access strategy focussed on the engineering and functional constraints of the proposal to provide balanced access along the alignment. It addressed the requirement to provide access to all local roads and properties along the length of the proposal and minimise additional travel time for road users who may be affected by modified access arrangements, while enabling the corridor to operate in a safe and efficient manner. For example the locations of right turn and u-turn facilities were considered carefully between intersections in order to provide safe access while minimising inconvenience for road users.

Key design considerations when selecting grade-separation, right-turn and u-turn facilities included:

- Minimising the number of entry and exit points to and from the upgraded highway to reduce potential conflict points.
- Providing an even spread of turning facilities along the length of the proposal.
- Providing turning facilities that satisfy engineering design criteria – such as sight distances – to provide safe access to and from the upgraded highway.

Following consideration of the issues raised in submissions, it is agreed that right-turn access to Turners Lane and O’Keeffes Lane would result in a cost-effective proposal benefit without compromising safety or efficiency. Consequently right-turn access to Turners Lane and O’Keeffes Lane would be included as part of a refined concept design. This refinement would improve local accessibility and consistency across the whole proposal. Although the additional protected lanes would increase the highway footprint width, this is considered acceptable in order to improve accessibility to these roads which are only connected to the road network via the Princes Highway. Refer to Chapter 3 – Changes to the proposal for further details.
Right-turn access to Abernethys Lane and Andersons Lane has not been requested in submissions from residents of Abernethys Lane or Andersons Lane. Residents have indicated that they are satisfied with the left in / left out access arrangement. Moreover, residents have indicated that they would prefer the turning restrictions as they perceive that greater accessibility could increase the likelihood of increased future development in the area. Therefore, no change is proposed to the concept design at these locations.

2.7.10 Roundabout between Abernethys Lane and Cambewarra Road

**Stakeholder identification number(s)**

8, Shoalhaven City Council

**Issue description**

Submissions relating to a roundabout near the Caltex service station raised issues about whether a roundabout is proposed and the local accessibility impacts if it is not provided.

In summary, the respondents raised the following issues:

- Construction of a roundabout around the location of the existing 70/100 speed limit change on the fringe of the existing urban area (immediately to the north of the existing Caltex Service Station in Bomaderry) should be considered. This would mitigate the local accessibility impacts of constructing the median along the highway and minimise the impact at the Princes Highway / Cambewarra Road intersection. Without the roundabout, the current proposal would result in unacceptable impacts to the local accessibility for the many businesses and dwellings affected by the median and would introduce additional travel on the network.

- Is a roundabout proposed outside the Caltex service station on the approach to Bomaderry? If a roundabout is proposed, the respondent has requested further consultation.

**Response**

An overview of the proposed access strategy for local roads and properties and the resulting highway access constraints are provided in Section 6.1.3 (pages 124 - 125) of the review of environmental factors.

The access strategy focused on the engineering and functional constraints of the proposal to provide balanced access along the alignment. It addressed the requirement to provide access to all local roads and properties along the length of the proposal and minimise additional travel time for road users who may be affected by modified access arrangements, while enabling the corridor to operate in a safe and efficient manner.

Roads and Maritime proposes to transition down the operating speed of the highway on approach to Bomaderry. This would be achieved by the use of raised medians on approach to Cambewarra Road and the implementation of the Bomaderry arrival strategy which uses road design, signposting, landscaping, lighting and road furnishings to transition the environment from a highway feel to a local road feel. The presence of increasing levels of development in this area would also identify arrival at an urban area.

A new roundabout at the location suggested by the respondent would have the same function as the existing Cambewarra Road roundabout and hence, would not provide additional safety benefits. In addition, a key objective of the proposal is to improve travel times and efficiency on the upgraded highway. Therefore, additional at-grade intersections would be inconsistent with this objective.

Following consideration of the issues raised, Roads and Maritime believes that construction of the suggested roundabout would not result in a cost-effective proposal benefit and the resulting impacts would not be justified. Due to the road safety and design implications, Roads and Maritime does not propose to include a roundabout between Abernethys Lane and Cambewarra Road as part of the proposal.
2.7.11 Croziers Road and O'Keeffes Lane - access and safety

Stakeholder identification number(s)
3, 7, 19, 20, 21, 24, 31, 43, Shoalhaven City Council

Issue description
Submissions relating to access arrangements for Croziers Road and O'Keeffes Lane raised issues about generally inadequate access arrangements at Croziers Road and O'Keeffes Lane and possible alternative designs that would resolve access and safety issues.

In summary, the respondents raised the following issues:

- An underpass should be considered at the intersection of the Princes Highway and Croziers Road. The underpass could involve a tapering of the existing road at a point about 100 metres back from the highway where Croziers Road is at or near its lowest point of elevation. The road could veer off to the north and join an underpass at an area between the existing Croziers Road intersection and the creek located on the Croziers Road side of Andersons Lane.

- There is a possible route for an underpass about 200 metres north of Croziers Road. This would involve turning Croziers Road to the left (north) at its lowest point and cutting across through the property on the corner (which it is understood by the respondent would be demolished as part of the proposal).

- An underpass at the intersection of the Princes Highway and Croziers Road would alleviate the safety and convenience concerns of the majority of Croziers Road residents.

- If an underpass is not considered appropriate at the intersection of the Princes Highway and Croziers Road, a butterfly lane allowing Croziers Road residents to turn right should be reconsidered as a safer alternative to the existing proposal.

- A seagull configuration is not a safe option for access to the Princes Highway at Croziers Road, especially in peak periods of traffic. Considering the number of crashes (some fatal) on this stretch of highway, safety should be paramount.

- An overpass at Croziers Road with ramps similar to the intersection of Sally's Corner Road on the Hume Highway would reduce the impact on the landscape. The current proposal is to cut the highway down by 5.5 metres from the present road level. Given that the present highway level is already 2.5 metres below the level of the hill and an overhead bridge requires a total of seven metres clearance the overpass would be no higher than the existing bus shelter.

- An overpass would be more appropriate than an underpass at Croziers Road for the movement of farming equipment across the upgraded highway.

- A grade-separated facility at Croziers Road with a service road linking Mullers Lane and the Penwood Miniature Railway to Croziers Road should be considered.

- A grade-separated facility at Croziers Road, or at least a right turn access into O'Keeffes Lane should be considered. This would provide an improvement to safety and accessibility to O'Keeffes Lane and remove unnecessary travel. Not having direct access via a right turn direct into O'Keeffes Lane would create unacceptable impacts to local accessibility, particularly in the absence of a grade-separated interchange at Croziers Road.

- Given the proximity of Andersons Lane to Mullers Lane there may be an opportunity to investigate a better location for an overpass and service road arrangement to incorporate O'Keeffes Lane, Croziers Road, Mullers Lane, Andersons Lane and the Penwood Miniature Railway. This must be considered to improve local accessibility and safety in this section of the highway.

- Alternative options for Croziers Road preferred and prepared by interested community members are not required and are an unnecessary cost to tax payers. If approval is given to an alternative proposal, specifically for the Croziers Road intersection, all residents from all cross roads affected by this proposal would have a similar claim to such special treatment. It has been seen that the current proposal for the other similar intersections is accepted by the majority of residents and the proposal should be concerned with ensuring that money is not wasted.
• The argument that the necessary driving skills required for the southbound turn via Mullers Lane from Croziers Road would be difficult for local residents to perform is not credible. Drivers regularly perform similar driving activities. Numerous examples currently exist in NSW that require traffic flow merging in safe and acceptable manners through various speed and road conditions.

• If traffic merging is deemed to be a danger then perhaps a speed limit reduction to 80 kilometres per hour could be introduced at the Croziers Road junction.

• The u-turn facility proposed at Croziers Road should be transferred to the opposite side of the road, given the understanding that Roads and Maritime would purchase the opposite property and the u-turn facility could be located on either side of the road. This would prevent encroachment into a property on Croziers Road.

• Shoalhaven City Council staff have had limited discussions with concerned residents and it is understood that Roads and Maritime are corresponding directly with individual land and business owners. Council staff have had discussions with concerned residents in the O’Keeffes Lane and Croziers Road catchments who have requested the provision of a full grade-separated treatment (overpass) at the intersection of the Princes Highway and Croziers Road. Council agrees with this. Roads and Maritime has advised it has investigated various grade-separated options at Croziers Road but does not believe them to be feasible and has proposed no changes to the design in that area.

• Roads and Maritime provided a letter to the householder to address residents’ concerns at Croziers Road. The letter included a question and answer factsheet which was also published on the Roads and Maritime website. It is considered that the Roads and Maritime reasoning for not pursuing an overpass at Croziers Road is not well founded when considering recent Roads and Maritime works.

• Traffic volumes indicate that a combined maximum of about 420 vehicles per day would use the intersection at Croziers Road when considering existing Croziers Road traffic and also O’Keeffes Lane, Mullers Lane, Andersons Lane and Penwood Miniature Railway traffic which would indirectly use the interchange due to proposed right turn restrictions. This figure is a 93 per cent higher in volume (almost double) than the proposed combined Morschels Lane / Devitts Lane interchange. There is potential for considerably higher volumes on busier days at Penwood. Croziers Road traffic alone is some 28 per cent higher volume than the proposed combined Morschels Lane / Devitts Lane interchange.

• There would be traffic growth and an increase in traffic movements resulting from the left-out only restriction at Croziers Road. There are numerous properties along Croziers Road requiring cattle movements, property maintenance using farm vehicles such as tractors, hay baling equipment etc.

• O’Keeffes Lane residents, business owners and visitors wanting to access O’Keeffes Lane from the south would have to travel more than a kilometre further north to use the Mullers Lane u-turn bay. Travelling north from O’Keeffes Lane would require residents, business owners and visitors to travel south to use the Strongs Road overpass. O’Keeffes Lane users would be adversely affected by loss of time, increased vehicle running costs and inconvenience.

• The proposed access arrangement for O’Keeffes Lane is unacceptable as it does not provide the highest degree of safety for O’Keeffes Lane users. An over / underpass at Croziers Road would avoid the need to cross oncoming traffic to perform a u-turn at Mullers Lane and would provide the highest degree of safety for users of O’Keeffes Lane.

• The proposed access arrangements for O’Keeffes Lane gives little regard to safety (particularly during public holidays) with vehicles having to turn across two lanes of busy traffic to perform u-turns at Mullers Lane and Strongs Road.

• A dairy farm and nursery located on O’Keeffes Lane receive regular pick-ups / deliveries and require access arrangements which can accommodate milk tankers and large trucks.
Response

An overview of the proposed access strategy for local roads and properties and the resulting highway access constraints are provided in Section 6.1.3 (pages 124 - 125) of the review of environmental factors. Specifically, the following proposed local road access arrangements for Croziers Road and O’Keeffes Lane were included in the concept design for the proposal and assessed in the review of environmental factors:

- **Croziers Road**
  - Northbound highway traffic would turn left into Croziers Road.
  - Southbound highway traffic would turn right into Croziers Road via a protected right turn bay.
  - Traffic exiting Croziers Road to travel north would turn left onto the highway.
  - Traffic exiting Croziers Road to travel south would turn left onto the highway, turn right at Mullers Lane via a protected right turn bay, make a u-turn at the Mullers Lane u-turn facility and turn left onto the highway.

- **O’Keeffes Lane**
  - Northbound highway traffic would turn right at Mullers Lane via a protected right turn bay, make a u-turn at the Mullers Lane u-turn facility, turn left onto the highway and turn left into O’Keeffes Lane.
  - Southbound highway traffic would turn left into O’Keeffes Lane.
  - Traffic exiting O’Keeffes Lane to travel north would turn left onto the highway and turn around at the Strongs Road / Jaspers Brush grade-separated facility to travel north.
  - Traffic exiting O’Keeffes Lane to travel south would turn left onto the highway.

Local road and property access arrangements for the proposal were determined through the development of an access strategy for the proposal which considered feedback from property owners. The access strategy focussed on the engineering and functional constraints of the proposal to provide balanced access along the alignment.

Roads and Maritime recognises that the proposed arrangement would result in increased travel time for some local residents. However, it is considered that this inconvenience would be offset by the overall safety benefits that the proposed design would deliver to both through and local traffic. The additional travel time for residents impacted by the proposed design would be offset by reduced travel times on the upgraded highway in comparison to existing conditions.

The proposal would provide for safe property and local road access in accordance with current road design standards. As a consequence no specialist or unusual driving skills or proficiencies would be required to safely access local roads using the facilities provided.

The access strategy addressed the requirement to provide access to all local roads and properties along the length of the proposal and minimise additional travel time for road users who may be affected by modified access arrangements, while enabling the corridor to operate in a safe and efficient manner. For example the locations of right turn and u-turn facilities were considered carefully between intersections in order to provide safe access while minimising inconvenience for road users.

Key design considerations when selecting grade-separation, right-turn and u-turn facilities included:

- Minimising the number of entry and exit points to and from the upgraded highway to reduce potential conflict points.
- Providing an even spread of turning facilities across the proposal area.
- The ability of proposed turning facilities to satisfy engineering design criteria – such as sight distances – to provide safe access to and from the upgraded highway.
Table 7.7 of the Technical Paper: Traffic and Transport (AECOM, 2013) provided at Appendix C of the review of environmental factors indicates the following forecast patronage for proposed grade-separated facilities and u-turn facilities in 2039:

- 420 vehicles per day would use a highway overpass at Jaspers Brush Road | Strongs Road.
- 490 vehicles per day would use a highway overpass at Devitts Lane | Morschels Lane.
- 315 vehicles per day would travel to and from the highway via Croziers Road.

Assuming around 50 per cent of Croziers Road traffic would require access to and from the northbound carriageway of the Princes Highway, less than 160 vehicles per day would use an overpass or underpass at this location. To cater for traffic in a similar way to the proposed grade-separated facilities, an overpass or underpass at Croziers Road would need to be constructed in conjunction with a comprehensive service road network linking O'Keeffes Lane, Croziers Road, Mullers Lane, Andersons Lane and the Penwood Miniature Railway. Following consideration of the issues raised, it is not believed that a grade-separated facility (either an overpass or an underpass) and accompanying service road network in this area would provide a cost-effective design solution.

In addition, the benefits of providing right-turn access out of Croziers Road in a seagull or butterfly (sic) arrangement would create a conflict point which would result in an unacceptable impact to road safety and efficiency. Hence no change is proposed to the concept design at the intersection of the Princes Highway and Croziers Road. This arrangement is designed to appropriate standards for a 100 kilometre per hour speed limit and is consistent with the adjoining Foxground and Berry Bypass and Gerringong upgrade projects to the north. The design of this arrangement would allow traffic to safely and efficiently join the highway from Croziers Road. A speed limit reduction from 100 to 80 kilometres per hour would not be required to maintain safe operation.

After considering alternative design options, modifying the design of the proposed u-turn facility from the south of Croziers Road to the north would have an adverse effect, as it would result in further impacts to additional property owners in the area. Consequently, the existing design is considered to provide an optimum balance between property impacts and access requirements and hence further modifications would not be included as part of a refined concept design.

Following consideration of the issues raised, it is agreed that right-turn access to O'Keeffes Lane would result in a cost-effective proposal benefit without compromising safety or efficiency. Consequently right-turn access to O'Keeffes Lane has been included as part of a refined concept design. Refer to Section 2.7.9 – Berry to Bomaderry access strategy and Chapter 3 – Changes to the proposal for further information.

Section 3.2.1 of the review of environmental factors provides an overview of the design criteria adopted. The minimum design vehicle standard adopted for the concept design for all local roads and property accesses is a 12.5 metre single unit or 19 metre semi-trailer, with greater design standards agreed and adopted on a case-by-case basis. Specifically, the final design for O'Keeffes Lane would be agreed and adopted to provide safe and efficient access for the size of vehicles servicing the dairy farm and nursery.

In summary, the strategy has been developed using community feedback and is considered to most appropriately meet the proposal objectives whilst satisfying the functional requirements of the upgraded highway. The strategy best meets the objective of road safety by providing safe and controlled access to all local roads and properties and is considered to deliver a value for money solution.
2.7.12 Jaspers Brush Road and Strongs Road - access and safety

Stakeholder identification number(s)
1, 17

Issue description
Submissions relating to Jaspers Brush Road and Strongs Road raised issues about safety (sight distances, acceleration lanes, and speed limits) and access, including suggested alternatives to the proposed overpass at Strongs Road.

In summary, the respondents raised the following issues:

- Southbound traffic would be travelling at a posted speed of 100 kilometres per hour as it passes through the flat straight section near Jaspers Brush Creek on the approach to the proposed Strongs Road / Jaspers Brush Road grade-separated facility. Would sight distances be improved from the present situation (which is very dangerous) for vehicles turning left out of Jaspers Brush Road?
- An acceleration lane for vehicles turning left out of Strongs Road onto the highway should be provided for safety reasons. The gradient in this location means vehicles exiting Strongs Road have trouble accelerating up the hill.
- The speed limits proposed for the exit lane and overpass at Strongs Road are not safe.
- An overpass is proposed at Strongs Road rather than a u-turn bay which would be provided at other locations along the proposal. Can a u-turn bay be provided at Strongs Road instead of an overpass?
- An overpass is proposed at Strongs Road where residents are opposed to the proposal. The overpass should be located at Croziers Road instead where there is support for an overpass.

Response
An overview of the proposed access strategy for local roads and properties and the resulting highway access constraints are provided in Section 6.1.3 (pages 124 - 125) of the review of environmental factors.

The preferred access strategy for the proposal includes:

- Two grade-separated facilities at Jaspers Brush Road / Strongs Road and Morschels Lane / Devitts Lane.
- A grade-separated half-interchange at Pestells Lane / Meroo Road.

Local road and property access arrangements for the proposal were determined through the development of an access strategy for the proposal which considered feedback from property owners. The access strategy focussed on the engineering and functional constraints of the proposal to provide balanced access along the alignment.

The access strategy addressed the requirement to provide access to all local roads and properties along the length of the proposal and minimise additional travel time for road users who may be affected by modified access arrangements, while enabling the corridor to operate in a safe and efficient manner.

As detailed in Section 2.7.11 – Croziers Road and O’Keeffe’s Lane – access and safety, it is not believed that a grade-separated interchange in the vicinity of Croziers Road would provide an overall proposal benefit when compared to the current proposal. Consequently this modification would not be included as part of a refined concept design.
The introduction of a central median and safety barrier would provide substantial improvements in road safety. This would result in the separation of opposing traffic flows, and elimination of uncontrolled right turn movements between the Princes Highway and property accesses across fast-moving two-way traffic. This would inconvenience a small proportion of local traffic as it would require additional travel when compared to existing arrangements. However it is considered to provide for a safer and more efficient overall proposal.

The grade-separated facility proposed at Jaspers Brush Road / Strongs Road would eliminate the current need for vehicles to make uncontrolled right-turn movements, but maintain accessibility. An equivalent level of access using at-grade right-turn and u-turn facilities in combination could not be achieved, as right-turn out facilities would not be provided. In addition the provision of right-turn in facilities into both Strongs Road and Jaspers Brush Road would create two additional conflict points on the highway, which would reduce the safety and efficiency of the current design. Consequently the provision of an at-grade rather than grade-separated facility at Jaspers Brush Road / Strongs Road would not result in an improved solution and has not been included as part of a refined concept design.

The proposal is expected to improve road safety in the proposal area. The proposal is being designed to current safety standards. This includes the development of alignments and access arrangements suitable for the posted speed limits proposed, including the grade-separated arrangement and overpass proposed at Strongs Road.

A road safety audit has been undertaken by a qualified audit team as part of the development of the concept design to examine the design from a road safety perspective and identify potential safety issues created by the design. This process was undertaken in accordance with the Roads and Maritime 'Guidelines for Road Safety Audit Practices, Part 1 – Road Safety Audits' (July 2011). As part of this process, road safety audits would be conducted at key stages in the pre-construction, construction and post-construction phases of its life cycle.

The proposal would provide for safe property and local road access in accordance with current road design standards. Property and local road access arrangements have been designed to include a wider shoulder, which would allow safer deceleration and minimise the potential for rear-end crashes.

The vertical alignment of the existing highway near Strongs Road results in northbound vehicles travelling up an incline, which reduces travel speeds for heavy vehicles in particular. The proposed concept design includes the creation of fill embankments and cuttings to reduce gradients. This would mitigate the effects on vehicle travel times and improving sight distances, including existing sight distances for vehicles turning onto the upgraded highway.

All access arrangements have been designed to appropriate standards and are consistent with the adjoining Foxground and Berry Bypass and Gerringong upgrade projects to the north.

2.7.13 Morschels Lane and Devitts Lane - access and safety

**Stakeholder identification number(s)**

18, Shoalhaven City Council

**Issue description**

Submissions relating to the Morschels Lane / Devitts Lane grade-separated facility raised issues about the design of the facility and possible opportunities for Roads and Maritime to work with the respondent to further improve local road connections in the vicinity of this intersection.
In summary, the respondents raised the following issues:

- The Morschels Lane / Devitts Lane underpass should be designed as an overpass as this would reduce the height and visual impact of the upgrade near a property in Meroo Meadow.

- Roads and Maritime should consider making a contribution towards the connection of Lamonds Lane to Morschels Lane to add value to the Morschels Lane / Devitts Lane grade-separated facility. This connection would substantially improve the accessibility for residents of Lamonds Lane, remove at-grade turning movements at the intersection of the Princes Highway / Lamonds Lane and remove unnecessary additional travel on the network.

- Roads and Maritime should consider building a service road to link Turners Lane to Morschels Lane. The service road would remove unacceptable impacts to local accessibility and would allow another intersection to be removed from the highway resulting in marked benefits to the highway and safety of local access.

Response

An overview of the design standards adopted for the proposal is provided in Section 3.2.1 of the review of environmental factors. Features proposed, including the design of underpasses and overpasses, have been developed in accordance with design standards adopted for the proposal, while also providing a value for money solution which minimises adverse impacts. Through this process, an underpass at Morschels Lane / Devitts Lane has been determined to provide an optimum solution as the proposed highway design alignment would be above the current intersection and an overpass would require substantial earthworks to lower the highway and raise the local road. Therefore no change is proposed to the current concept design.

An overview of the proposed access strategy for local roads and properties and the resulting highway access constraints are provided in Section 6.1.3 (pages 124 - 125) of the review of environmental factors.

Local road and property access arrangements were determined through the development of an access strategy for the proposal which considered feedback from property owners. The access strategy focussed on the engineering and functional constraints of the proposal to provide balanced access along the alignment.

The access strategy addressed the requirement to provide access to all local roads and properties along the length of the proposal and minimise additional travel time for road users who may be affected by modified access arrangements, while enabling the corridor to operate in a safe and efficient manner.

The construction of additional service roads, for example the connection of Lamonds Lane and Turners Lane to Morschels Lane, would result in increased costs of construction, and subsequently increase the cost of ongoing maintenance. Given the relatively low volumes of traffic demand that such service roads would accommodate, the cost of this infrastructure is not believed to be justified by the benefits that it would provide. Moreover, a service road at this location would still require additional travel to the underpass for northbound traffic and hence only residents returning from the south would experience travel time savings. Consequently an additional service road is not included as part of a refined concept design.

In summary, the strategy has been developed using community feedback and is considered to most appropriately meet the proposal objectives whilst satisfying the functional requirements of the upgraded highway. The strategy best meets the objective of road safety by providing safe and controlled access to all local roads and properties and is considered to deliver a value for money solution.
2.7.14 Lamonds Lane - access and safety

Stakeholder identification number(s)
5, 9, 14

Issue description

Submissions relating to the access and safety at Lamonds Lane raised issues about safety implications of the highway design at Lamonds Lane.

In summary, the respondents raised the following issues:

- Extension of the maintenance / stopping bay south of Lamonds Lane would allow trucks entering the highway from Lamonds Lane room to accelerate. This would need to be discussed with the trucking companies.

- A southbound right turning lane has been added at Boxsells Lane to accommodate residents in that area. It appears that the crest of the vertical curve outside a property in Meroo Meadow has been moved north to improve the sight distance for this movement to the detriment of traffic travelling north making a similar right turn into Lamonds Lane.

- Increasing the highway height by 2.1 metres north of Boxsells Lane and Lamonds Lane would impinge on traffic trying to turn right at Lamonds Lane.

Response

Extending the proposed maintenance and stopping bay back to Lamonds Lane would not comply with design standards for an acceleration lane. Moreover, it is desirable to stop at a near right angle to the traffic stream and enter the highway when there is an appropriate gap in the traffic. The current and future traffic density would allow an appropriate sized gap for trucks to accelerate from the bay.

Further details of the access arrangements proposed at both the Boxsells Lane and Pestells Lane intersections are provided in Section 2.7.15 – Boxsells Lane and Pestells Lane – access and safety. Specifically, the addition of a southbound protected right-turn bay into Boxsells Lane would not compromise the safety of the northbound right-turn bay into Lamonds Lane. Moreover, the vertical alignment of the proposed highway would not impact the safety of the protected right hand turn into Lamonds Lane, as the concept design complies with sight distance standards to allow for safe movements across the traffic.

The proposal is being designed to current safety standards and a road safety audit was completed early on in the process by a qualified audit team as part of the concept design. The objective was to examine the concept design from a road safety perspective and identify and mitigate potential safety issues that were subsequently modified in the design. This process was undertaken in accordance with the Roads and Maritime ‘Guidelines for Road Safety Audit Practices, Part 1 – Road Safety Audits’ (July, 2011). As part of this process, road safety audits would be conducted at key stages in the pre-construction, construction and post-construction phases of its life cycle.

For more information about the justification for providing right hand turns at Lamonds Lane and Boxsells Lane, refer to Section 2.7.3 – Road safety.
2.7.15 Boxsells Lane and Pestells Lane - access and safety

Stakeholder identification number(s)

12, 29, Shoalhaven City Council

Issue description

Submissions relating to access and safety at Boxsells Lane and Pestells Lane raised issues about additional travel time, increased traffic on Pestells Lane, the need to upgrade Pestells Lane and calm traffic and the left-out only access from Boxsells Lane.

In summary, the respondents raised the following issues:

- With the major regional centre in Nowra and postal services in Bomaderry, the residents and businesses of Boxsells Lane, Elliotts Lane, Graham Road and Red Cedar Lane would be forced to turn left onto the Princes Highway and travel to the Morschels Lane / Devitts Lane overpass (which is in the opposite direction) to turn around. This is a major disadvantage, adding five kilometres to every trip to Nowra and Bomaderry.

- To avoid driving the extra five kilometres from Boxsells Lane to the Morschels Lane / Devitts Lane overpass, residents and business clients would use Pestells Lane to access the Princes Highway. Pestells Lane is a narrow, pot hole ridden, unsealed road which tends to flood after heavy rain. By not providing a right turn facility onto the highway at Boxsells Lane, Roads and Maritime is forcing residents onto a potentially dangerous and unsuitable road.

- Roads and Maritime should consider alternatives to the left-out only access from Boxsells Lane for southbound traffic, including:
  - Build an under / overpass at the Boxsells Lane / Lamonds Lane intersection.
  - Construct service roads parallel to the Princes Highway.
  - Fund the upgrade and sealing of Pestells Lane.

- An inevitable upgrade of Pestells Lane as a result of left-out only access at Boxsells Lane would result in increased traffic flow along Pestells Lane from residents of Boxsells Lane, Graham's Lane and Cedar Lane who need to gain access to the highway heading south.

- An upgrade of Pestells Lane would create a tar 'dragstrip' from the western end of Boxsells Lane, south to the existing sharp left corner, with the potential for mishaps as traffic fails to slow down to negotiate the turn.

- Pestells Lane should be modified so that where the existing road easement narrows (at the northern boundary of 100 Pestells Lane, Meroo Meadow), the road easement is widened to the western side of Pestells Lane, creating a dogleg in the road which would calm traffic and retain the country road feel.

- Roads and Maritime should fund the upgrade of Pestells Lane to the minimum extent required under AUSTROADS guidelines based on the forecast increased traffic demand. There is a clear nexus between the proposal and the need to upgrade Pestells Lane. It is acknowledged that allowing the right turn from the highway directly into Boxsells Lane would address some local access concerns and reduce the extent of traffic increase on Pestells Lane but it is unlikely to be to the extent that would eliminate the need for an upgrade to Pestells Lane. This is because Boxsells Lane southbound traffic would still be diverted to Pestells Lane.

- Pestells Lane is likely to result in a considerable financial impact in the long term to Shoalhaven City Council as a consequence of the proposed access treatment by Roads and Maritime. A large proportion of the existing traffic using both Pestells Lane and Boxsells Lane would be re-routed to the narrow unsealed Pestells Lane to access the new Pestells Lane / Meroo Road grade-separated half-interchange. As a consequence Pestells Lane would need to be widened and the pavement upgraded and sealed. This is still the case despite the current design incorporating a right turn into Boxsells Lane. This needs to be at Roads and Maritime cost.
What does the proposed maintenance facility on Pestells Lane, west of the proposed highway / Meroo Road consist of and how would this affect traffic flow on Pestells Lane?

Response

An overview of the proposed access strategy for local roads and properties and the resulting highway access constraints are provided in Section 6.1.3 (pages 124 - 125) of the review of environmental factors.

The access strategy focuses on the engineering and functional constraints of the proposal to provide balanced access along the alignment. It addresses the requirement to provide access to all local roads and properties along the length of the proposal and minimise additional travel time for road users who may be affected by modified access arrangements, while enabling the corridor to operate in a safe and efficient manner. For example the locations of right turn and u-turn facilities were considered carefully between intersections in order to provide safe access while minimising inconvenience for road users.

Key design considerations when selecting grade-separation, right-turn and u-turn facilities included:

- Minimising the number of entry and exit points to and from the upgraded highway to reduce potential conflict points.
- Providing an even spread of turning facilities across the proposal area.
- The ability of proposed turning facilities to satisfy engineering design standards – such as sight distances – to provide safe access to and from the upgraded highway.

It is believed that right-turn access into Boxsells Lane would result in a cost-effective proposal benefit. Right-turn access into Boxsells Lane was included as part of the proposed concept design assessed in the review of environmental factors, as it maintains local accessibility and consistency across the whole proposal without compromising safety or efficiency.

Conversely, the benefits of providing right-turn access out of Boxsells Lane to the Princes Highway would introduce unacceptable safety and efficiency implications. Therefore, no change is proposed to the concept design at this location.

The construction of additional service roads or a grade-separated facility, would result in increased costs of construction, and subsequently increase the cost of ongoing maintenance. Given the relatively low volumes of traffic demand that such service roads would accommodate, the cost of this infrastructure is not believed to be justified by the benefits that it would provide. Consequently this additional infrastructure would not be included as part of a refined concept design.

Roads and Maritime recognises that the proposed arrangement would result in increased travel time for some local residents, however it is considered that this inconvenience would be offset by the overall safety benefits that the proposed design would deliver to both through and local traffic. In addition, the additional travel time for residents impacted by the proposed design, would be offset by reduced travel times on the upgraded highway in comparison to existing conditions.

Overall, the strategy is considered to most appropriately meet the proposal objectives whilst satisfying the functional requirements of the upgraded highway. The strategy best meets the objective of road safety by providing safe and controlled access to all local roads and properties and is considered to deliver a value for money solution.

With right-turn access into Boxsells Lane included, the concept design maintains as closely as possible existing accessibility while achieving a safe and efficient overall design proposal. The only major change to existing accessibility would be the prevention of the existing right-turn from Boxsells Lane onto the Princes Highway.
Right-turning traffic from Boxsells Lane would be re-routed to the Meroo Road / Pestells Lane grade-separated half-interchange. Here traffic would be able to perform a safe left turn movement to join the Princes Highway southbound. All grade-separated facilities, the grade-separated half-interchange and intersections to and from the highway would be designed and constructed to appropriate (and generally improved from existing) standards.

The resulting increase in traffic on Pestells Lane is not expected to appreciably change traffic conditions and the new right turn bay would further reduce the potential for additional traffic volumes. In 2011, annual average daily traffic on Boxsells Lane was around 230 vehicles, or around 115 vehicles per direction. Assuming a relatively high estimate of 75 per cent of vehicles turning right out of Boxsells Lane onto the Princes Highway, the proposed access constraint would result in around 85 vehicles per day, less than four per hour on average, using Pestells Lane as an alternative. Assuming a growth rate of two per cent per annum, the proposed access would result in around an additional 130 vehicles per day in 2039, using Pestells Lane as a result of construction of the proposal.

The temporary construction ancillary facility site (Site number 17) on Pestells Lane located to the north of Pestells Lane would be used for the interim storage of materials and equipment required for construction of the proposal. The design of the facility would be developed further during the detailed design phase of the proposal. This facility would be expected to generate low traffic volumes of around 10 traffic movements per day increasing up to around 40 traffic movements per day during peak use. Access to and from the facility would be provided by a safe intersection designed to appropriate standards. Any activities using this facility would be undertaken within the boundaries of the site, and would not interfere with traffic using Pestells Lane.

Following the completion of construction, Roads and Maritime is considering the possibility of using the area known as temporary construction ancillary facility site 17 as a road maintenance facility for longer-term use to service maintenance of this section of the highway during operation. The long-term road maintenance facility is not part of the proposal and was not assessed in the review of environmental factors because Roads and Maritime would need to obtain separate approval for such a facility (under part 4 of the Environmental Planning and Assessment Act 1979) from Shoalhaven City Council. Any future application to Shoalhaven City Council for such a facility would be accompanied by an environmental impact assessment that would include a traffic assessment. The traffic assessment would provide information on the impact on traffic flow on Pestells Lane. Any future application for approval would also involve consultation, in particular with adjoining landowners.

As the proposal is not expected to result in a major change in traffic conditions on Pestells Lane, Roads and Maritime do not propose to undertake or fund any road upgrades or implementation of traffic calming measures on this local road. The maintenance and any upgrade of Pestells Lane would remain the responsibility of Shoalhaven City Council.

2.7.16 Pestells Lane and Meroo Road - access and safety

Stakeholder identification number(s)
13, 22, 23, 46, Shoalhaven City Council

Issue description
Submissions relating to access and safety at the Pestells Lane / Meroo Road grade-separated half-interchange raised issues about safety implications of the proposed design for residents and livestock and from increases in heavy vehicle traffic. Alternate design suggestions were provided.
In summary, the respondents raised the following issues:

- The construction of the Pestells Lane / Meroo Road grade-separated half interchange and the extension of Pestells Lane would result in a greater volume of traffic passing a property on Meroo Road. This would make entry to and exit from the property hazardous.

- The proposed roundabout at the intersection of Meroo Road and the Pestells Lane extension is a safety issue, with the potential for accidents from speeding vehicles failing to negotiate the roundabout when joining the Pestells Lane on-ramp. This could cause damage to nearby properties and could kill or injure livestock. If fences are compromised as a result of a crash, livestock could escape onto the road resulting in collisions with oncoming vehicles.

- An acceleration lane from the Pestells Lane interchange for southbound traffic should be provided based on the likely redistribution of traffic from Boxsells Lane and Pestells Lane. While a diamond interchange and cul-de-sac of Meroo Road is preferred (consistent with the Nowra-Bomaderry Structure Plan), a southbound on-ramp must be provided to maintain acceptable levels of safety (to remove considerable at grade turning movements from entering the highway from a standstill out of Meroo Road with no acceleration lane).

- The proposed upgrade to the access at Meroo Road from the highway would encourage heavy vehicles that travel to Bolong Road industrial area to use Meroo Road, instead of remaining on the highway and turning off at Bolong Road.

- The Pestells Lane / Meroo Road half-interchange (including the roundabouts at Pestells Lane / Meroo Road) would be costly due to the fill required to raise the highway above flood levels. The existing location of the Meroo Road / Princes Highway intersection connects directly (at-grade) to the highway and therefore fill would also be required to raise the highway above flood levels; particularly as a grade-separated interchange at this location would be more appropriate for an overpass and would have a lesser impact on a property on Meroo Road.

Response

An overview of the proposed access strategy for local roads and properties and the resulting highway access constraints are provided in Section 6.1.3 (pages 124 - 125) of the review of environmental factors.

Local road and property access arrangements for the proposal were determined through the development of an access strategy for the proposal which considered feedback from property owners. The access strategy focussed on the engineering and functional constraints of the proposal to provide balanced local road connections along the alignment. The access strategy addressed the requirement to provide access to all local roads and properties along the length of the proposal and minimise additional travel time for road users who may be affected by modified access arrangements, while enabling the corridor to operate in a safe and efficient manner.

The preferred access strategy for the proposal includes a grade-separated half-interchange at Pestells Lane / Meroo Road, which allows for the future provision of southbound ramps to create a full interchange if and when they are required. In addition, the existing Meroo Road / Princes Highway intersection connects directly (at-grade) to the highway and therefore fill would also be required to raise the highway above flood levels; particularly as a grade-separated interchange at this location would be directly over Tullian Creek.

The grade-separated half-interchange at Pestells Lane / Meroo Road is expected to improve safety for heavy vehicle access between the Princes Highway and Meroo Road. It is not however expected to encourage use of Meroo Road by heavy vehicles. The speed and relative attractiveness of this route when compared to alternatives would remain broadly unchanged by the proposal. Consequently the proposal is not expected to increase heavy vehicle volumes on Meroo Road.

All road network and access modifications – including the roundabouts proposed on Meroo Road and Pestells Lane – have been designed to appropriate standards to enable safe and efficient operation.
The grade-separated arrangement proposed would result in traffic travelling from Meroo Road to the Princes Highway northbound being re-routed to the highway overpass, and then joining the northbound carriageway via the northbound onramp. This arrangement would reduce northbound and total traffic on Meroo Road to the north of the Pestells Lane extension when compared to conditions without the proposal. Consequently, the proposal is not expected to increase traffic passing local property accesses on this route. Any modifications to existing property or local road access points would be designed to appropriate standards to enable safe and efficient vehicle movements.

At the left turn out from Meroo Road onto the Princes Highway southbound, it is not desirable to use the shoulder as an acceleration lane because of the observation angle required to merge when exiting a property or local access road. It is desirable to stop at a near right angle to the traffic stream and enter the highway when there is an appropriate gap in the traffic. Travel demand for this movement is expected to be relatively low, and the future traffic density would allow an appropriate sized gap to safely join the highway.

Overall, the proposal is expected to improve road safety in the proposal area. The proposal is being designed to current safety standards and a road safety audit has been undertaken by a qualified audit team as part of the concept design. The road safety audit examined the design from a road safety perspective and identified potential safety issues created by the design. This process was undertaken in accordance with the Roads and Maritime ‘Guidelines for Road Safety Audit Practices, Part 1 – Road Safety Audits’ (July, 2011). As part of this process, further road safety audits would be conducted at key stages in the pre-construction, construction and post-construction phases of its life cycle.

For more information about the proposed location of the Pestells Lane / Meroo Road grade-separated half-interchange, refer to Section 2.4.1 – Road design.

2.8 Noise and vibration

2.8.1 Construction noise and vibration

**Stakeholder identification number(s)**

13, Environment Protection Authority

**Issue description**

Submissions relating to construction noise and vibration raised issues about increased noise impacts at individual properties, exceedance of noise and vibration goals during construction and recommended noise management measures.

In summary, the respondents raised the following issues:

- Construction of the Pestells Lane ramp would only be about 33 metres from a property in Meroo Meadow increasing noise and making it impossible to sleep.
- Trees and shrubs have been planted at a property in Meroo Meadow to act as a noise buffer and to deflect vehicle lights shining on the house and property. The review of environmental factors indicates that these trees would be removed, thus increasing construction traffic noise impacts at the property. This would have a severe impact on lifestyle and sleeping patterns.
• Construction noise management levels adopted in the review of environmental factors and the noise and vibration technical paper are appropriate. Any exceedances of the noise management levels indicates the potential for construction noise impacts which should be addressed in the construction noise and vibration management plan for the proposal. Table 6-35 of the review of environmental factors proposes a range of noise and vibration mitigation and management measures to address the expected impacts, including the implementation of a construction noise and vibration management plan. The implementation of the construction noise and vibration management plan referred to in Table 6-35 would not, in many cases, be able to reduce the impacts from the works to a level that even approaches the relevant construction noise and vibration goals. Consequently, the Environment Protection Authority considers that the paramount construction noise management measures would be:

- Effective communication with, and management responses to, the concerns of the affected community.
- The need for clear justification, clear community support and prior approval to carry out any construction works outside the recommended standard hours defined in Section 2.2 of the Environment Protection Authority ‘Interim Construction Noise Guideline’ (Department of Environment and Climate Change, 2009).
- The early erection of temporary and, where possible, permanent operational noise barriers and / or other mitigation measures proposed in the review of environmental factors.
- The need to minimise any construction traffic movements outside standard hours and particularly at night time (10pm to 7am), to reduce the potential for sleep disturbance as much as possible.

Response

Potential construction noise and vibration impacts of the proposal have been assessed in Section 6.3 of the review of environmental factors and the Technical Paper: Noise and Vibration (AECOM 2013a) provided at Appendix D of the review of environmental factors. A number of safeguards and management measures are outlined in these documents and would be implemented to minimise the noise impacts of the proposal.

Roads and Maritime acknowledges that even with the implementation of nominated safeguards and management measures, construction noise levels at some receivers would at times exceed relevant noise and vibrations goals.

Night time noise and consequent impacts to sleep patterns was raised as a concern in submissions particularly in relation to the construction of the Pestells Lane ramp, which is located in noise catchment area six.

During out of hours works periods (evening and night-time), noise at some receivers in noise catchment area six is expected to exceed the applicable noise management level and sleep disturbance criteria. However during these periods, no receiver in noise catchment area six is predicted to be highly affected.

To minimise impacts of construction noise, construction works would generally not be undertaken during the night time. Where night-time works are required, all feasible and reasonable noise mitigation would be undertaken to reduce the potential impact as much as possible.

Noise emissions during construction of the proposal would be assessed in more detail prior to the commencement of construction when more information is available about construction methods, activities that would be undertaken in the evening and night time periods and the timing of works.

Trees and shrubs planted need to be very dense and deep to have a noticeable impact on noise levels. The trees and shrubs currently planted on Meroo Road would not have the ability to reduce noise levels from the Princes Highway. The removal of this vegetation would not increase noise levels.
The construction of permanent noise barriers was considered in the design process and a noise barrier assessment was undertaken in accordance with Practice note IV of the Roads and Maritime ‘Environmental Noise Management Manual’ (RTA, 2001) as part of the noise and vibration impact assessment for the proposal. Due to isolation of receivers and the impact property accesses would have on noise barrier design (ie require gaps in the noise barriers for access), permanent noise barriers were not considered to be reasonable and feasible. As a result, a total of 42 residential receivers and one child care centre would be considered for architectural treatment. Refer to Section 6.2.4 (page 160) of the review of environmental factors and Section 6.2 of the Technical Paper: Noise and Vibration (AECOM 2013a) provided at Appendix D of the review of environmental factors for further information.

All feasible and reasonable noise management and mitigation measures would be implemented to minimise the impact of the proposal on nearby sensitive receivers. These include the safeguards and management measures outlined in Section 6.2.5 of the review of environmental factors. During the detailed design phase of the proposal, more specific management and mitigation measures would be developed to minimise impacts on nearby receivers. These measures would be included in the construction noise and vibration management plan and implemented during construction. The following construction noise management measures nominated by the Environment Protection Authority in its submission would also be included in the construction noise and vibration management plan and implemented where feasible and reasonable:

- Effective communication with, and management responses to, the concerns of the affected community.
- The need for clear justification, clear community support and prior approval to carry out any construction works outside the recommended standard hours defined in Section 2.2 of the Environment Protection Authority ‘Interim Construction Noise Guideline’ (Department of Environment and Climate Change, 2009).
- The early erection of temporary and, where possible, permanent operational noise barriers and / or other mitigation measures proposed in the review of environmental factors.
- The need to minimise any construction traffic movements outside standard hours and particularly at night time (10pm to 7am), to reduce the potential for sleep disturbance as much as possible.

For further information about measures that would be undertaken to minimise out of hours works and sleep disturbance, refer to Section 2.8.2 – Construction noise – outside of standard construction hours.

2.8.2 Construction noise – outside of standard construction hours

Stakeholder identification number(s)

13, Environment Protection Authority

Issue description

Submissions relating to out of hours construction noise raised issues about the disturbance of sleep patterns as a result of construction works at night time.

In summary, the respondents raised the following issues:

- Increased noise levels from construction night work, including intermittent loud noise from trucks and heavy plant equipment, would wake residents and disturb sleeping patterns which are essential to health and wellbeing.
• The review of environmental factors for the proposal predicts, at times, considerable impacts (up to 32 dB(A) over the noise management level) to the surrounding community due to noise from construction works, specifically those associated with earthworks and paving. Considerable exceedances of the identified noise goals are predicted, even with noise mitigation measures in place, and the proposal is expected to require considerable ‘out of hours’ work. Prior approval and clear justification should be required for any construction works on the proposal outside the standard hours in accordance with the Environment Protection Authority’s ‘Interim Construction Noise Guideline’ (Department of Environment and Climate Change, 2009).

Response

Roads and Maritime recognises that work undertaken outside normal construction hours, particularly during the night-time period, can have a greater impact on residents and should only be undertaken when absolutely necessary. Section 6.2.4 of the review of environmental factors and Section 4 of the Technical Paper: Noise and Vibration (AECOM 2013) provided at Appendix D of the review of environmental factors states that construction works during the night-time period would only be undertaken in instances where there are technical considerations (some work such as pavement curing can only be undertaken during the night-time period), to limit impacts of construction work on traffic movements along the highway and/or undertaking the works during the night time allows the works to be undertaken safely.

During out of hours work periods, all feasible and reasonable noise and vibration safeguards and management measures would be implemented in order to minimise noise and vibration impacts in sensitive receivers. These would include, but would not be limited to, the following which are also detailed in Section 6.2.5 of the review of environmental factors:

• Prepare and implement a construction noise and vibration management plan in accordance with Practice Note VI of the Roads and Maritime ‘Environmental Noise Management Manual’ (RTA, 2001) prior to the commencement of construction that:
  - Includes a sleep disturbance assessment.
  - Identifies details of the out of hours works.
  - Includes specific noise management measures such as:
    ▪ Carry out noise intensive construction works during standard construction hours where feasible and reasonable.
    ▪ Schedule noisy activities that cannot be undertaken during standard construction hours as early as possible during the evening and/or night-time periods.
    ▪ Plan noise intensive works in the following order of priority to minimise the potential impacts on sensitive receivers: standard working hours; evening working hours; night-time working hours.

• Inform the community about any out of hours works in accordance with Practice Note VII of the Roads and Maritime ‘Environmental Noise Management Manual’ (RTA, 2001).

Prior to the commencement of out of hours work, the contractor would:

• Apply for approval of out of hours construction works in accordance with the Environment Protection Authority ‘Interim Construction Noise Guideline’ (Department of Environment and Climate Change, 2009).

• Discuss the work and potential impacts with potentially affected receivers to keep them informed and consult with those receivers on an ongoing basis.
2.8.3 Noise at temporary construction ancillary facilities

**Stakeholder identification number(s)**

13

**Issue description**

In the submission relating to noise at temporary construction ancillary facilities, the respondent raised the potential for increased noise and sleep deprivation resulting from the unloading and loading of materials at temporary construction ancillary facility sites 15, 16 and 17 located only a short distance from a property in Meroo Meadow.

**Response**

Noise impacts from temporary construction ancillary facilities have been assessed in Section 6.2.4 (page 151) of the review of environmental factors. The investigation found that noise levels from the operation of temporary construction ancillary facility sites 15, 16 and 17 would exceed the noise management levels at eight receivers in each of the evening and night time periods, with a maximum predicted noise level of 65 dB(A). No receiver would be ‘highly impacted’ by noise as a result of the operation of these three facilities. ‘Highly impacted’ is defined in the Environment Protection Authority Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009) as a noise level measured at 75 dB(A) or greater at a receiver.

Noise emissions from temporary construction ancillary facilities would be assessed in more detail prior to construction when more information is available about construction methods, activities that would be undertaken at each of the temporary construction ancillary facilities and timing of works. Prior to the commencement of construction, details about proposed consultation with the community on noise and vibration would be included in the community involvement plan for the proposal. During construction, the community would be informed about any out of hours works in accordance with Practice Note VII of the Roads and Maritime ‘Environmental Noise Management Manual’ (RTA, 2001) and the community would also have access to a 24 hour hotline for noise complaints. Roads and Maritime has committed to this consultation in Section 6.2.5 of the review of environmental factors.

All feasible and reasonable noise management and mitigation measures would be implemented to minimise the impact of noise on nearby sensitive receivers, including the safeguards and management measures outlined in Section 6.2.5 of the review of environmental factors. During the detailed design phase of the proposal, more specific management and mitigation measures would be developed. These would be included in the construction noise and vibration management plan and would be implemented during construction to minimise impacts on nearby receivers.

For further information about measures that would be undertaken to minimise out of hours works and sleep disturbance, refer to Section 2.8.2 – Construction noise – outside of standard construction hours.

2.8.4 Operational noise and vibration

**Stakeholder identification number(s)**

7, 9, 13, 14, 17, 18, 22, 23, 28, 29, 44

**Issue description**

Submissions relating to operational noise and vibration raised issues about increased traffic noise impacts of the proposal as a result of: increased use of the highway and some local roads; changes to local road configuration including connections, traffic route selection and elevation and slope of the highway; increased vibration from traffic on the Strongs Road overpass; and increased use of Meroo Road by heavy vehicles.
In summary, the respondents raised the following issues:

- There has been a dramatic increase in both daytime and night time noise levels on the Princes Highway as a result of the introduction of B-double trucks, more powerful truck engines and general non-compliance with exhausts from many vehicles especially motor bikes. The proposal would bring even more traffic and increased noise to the area.

- All noise sources, when combined, would generate noise level increases at properties along the Princes Highway that would result in unacceptable impacts to quality of life, especially when noise is not ‘averaged out’ but instead small time frames are assessed.

- Noise from heavy vehicles comprises a considerable proportion of traffic noise and there does not appear to be any restrictions or monitoring of the amount of noise they produce. Heavy vehicles typically travel in the early hours of the morning and use exhaust braking. Roads and Maritime should consider the impact of this noise and include measures to abate it for residents, especially where proposed road surfaces are to be raised higher than current levels. All noise associated with heavy vehicles needs to be considered. The proposal would raise the road pavement by about 2.1 metres in front of a property in Meroo Meadow reducing the existing cutting from four metres to two metres which would considerably add to traffic noise.

- The proposed roundabout joining Meroo Road to the Pestells Lane extension would have a dramatic impact on noise at a property in Meroo Meadow. In particular, trucks and buses using their exhaust brakes as they slow on approach to the roundabout and as they exit at Meroo Road, and accelerate to climb the hill, to travel into Bomaderry. Trucks and buses that use the Pestells Lane extension to access the highway would also use their exhaust brakes as they slow on approach to the roundabout and proceed along the Pestells Lane extension. This is on an incline so additional noise and emissions would result from trucks and buses accelerating up the ramp.

- The filled embankment raising the highway above its current level directly in front of a property in Meroo Meadow would result in intolerable road noise impacts.

- Local residents would experience increased noise and vibration as a result of an upgrade to the access to Meroo Road from the highway, as a result of more heavy vehicles using Meroo Road to access the industrial area of Bomaderry, instead of travelling along the highway to exit at Bolong Road.

- An overpass at Pestells Lane would increase traffic noise for residents on Emerald Drive. An overpass at the current Meroo Road / Princes Highway intersection would be a preferred option.

- There is a strong possibility that the proposal would result in increased use of Pestells Lane exposing residents to increased noise. This needs to be considered.

- Noise pollution would increase as a result of the highway being raised by 2.1 metres north of Boxsells Lane and Lamonds Lane.

- Properties on Strongs Road would be subject to increased traffic noise and vibration from traffic on the lead up to, and travelling across, the Strongs Road overpass.

- Increased noise would be generated from the proposed bridge over Jaspers Brush Creek due to increased traffic levels.

**Response**

Operational noise from the proposal has been assessed in accordance with the Environment Protection Authority ‘NSW Road Noise Policy’ (Department of Environment, Climate Change and Water, 2011) and the Roads and Maritime ‘Environmental Noise Management Manual’ (RTA, 2001). The ‘NSW Road Noise Policy’ (Department of Environment, Climate Change and Water, 2011) has been developed through the review of both international and national studies to increase protection for residents in quiet areas experiencing increases in noise from road projects. The ‘Environmental Noise Management Manual’ (RTA, 2001) provides additional guidance on how the policy should be implemented and appropriate noise mitigation in response to exceedances.
An increase in road traffic is expected as a direct result of the proposal. During development of the concept design, measures have been included to minimise the potential for noise impacts. The proposal would reduce the undulations in the existing alignment and straighten curves. This would allow vehicles to maintain more consistent speeds, reducing engine noise and the need for heavy vehicle engine braking. These design elements are not evident in noise modelling as they affect drivers’ habits rather than attributes that directly influence noise (speed, gradient and vehicle type amongst others). The concept design for the proposal also incorporates low noise pavement which would appreciably reduce road / tyre noise from both light and heavy vehicles. Bridges (such as the proposed bridge at Jaspers Brush Creek) would be constructed using low noise joints to minimise noise impacts as much as reasonably practicable.

In the noise and vibration impact assessment undertaken for the proposal, sensitive receivers within 600 metres of the proposal were identified. Each façade of each receiver has been assessed against the ‘NSW Road Noise Policy’ (Department of Environment, Climate Change and Water, 2011), and in accordance with the ‘Environmental Noise Management Manual’ (RTA, 2001). Where exceedances have been predicted, mitigation has been recommended in accordance with the ‘Environmental Noise Management Manual’ (RTA, 2001).

When predicting noise levels from the proposal, the future alignment, road gradient, surrounding terrain, vehicle speeds, and traffic composition (volumes and heavy vehicle percentage) were taken into account. Noise levels have been accurately predicted (as demonstrated in the model calibration detailed in Section 5.1.6 of the Technical Paper: Noise and Vibration (AECOM, 2013a) provided at Appendix D of the review of environmental factors) and assessed against the applicable criteria. The noise model included the main alignment, ramps, side roads and existing roads (including Meroo Road, Pestells Lane ramp and the bridge over Jaspers Brush Creek), and used predicted traffic figures for 2019 and 2029 for each road (including Pestells Lane ramp) which enabled the accurate calculation of predicted noise levels at each receiver. Where applicable noise criteria are predicted to be exceeded at receivers, appropriate mitigation has been recommended and would be implemented during the operation of the proposal.

A maximum noise level event is defined in the ‘Environmental Noise Management Manual’ (RTA 2001) as a pass by event for which the Lmax noise level is equal to or greater than 15 dB(A) above the L_Aeq (1 hr). Maximum noise levels are generally dependent on truck engine braking events. Maximum noise events have been discussed in Section 6.2.4 (page 158) of the review of environmental factors and Section 5.1.9 of the Technical Paper: Noise and Vibration (AECOM 2013a) provided at Appendix D of the review of environmental factors.

Whilst the ‘NSW Road Noise Policy’ (Department of Environment, Climate Change and Water, 2011) requires an assessment of maximum noise levels during the night-time period, the ‘Environmental Noise Management Manual’ (RTA, 2001) states that results of such an assessment can be used to help rank and prioritise noise mitigation strategies, but should not be applied as a decisive criterion.

Noise emitted from heavy vehicle exhausts are subject to Australian Design Rules. The Australian Design Rules restrict the amount of noise heavy vehicle exhausts may produce. Roads and Maritime has methods to manage and mitigate heavy vehicle noise, including reducing gradients and straightening curves, which are key components of the design of this proposal. Reducing gradients and straightening curves are two of the main methods implemented by Roads and Maritime to reduce engine braking and engine noise in general. The assessment found that the likelihood of heavy vehicles using engine brakes on the upgraded highway should be less than on the existing highway.

The proposal presented in the review of environmental factors would raise the road pavement by about 2.1 metres in front of a property in Meroo Meadow. Noise levels at the property were predicted to increase by 1 dB(A) during the night-time and 1.6 dB(A) during the daytime as a result of the proposal. This is a minimal increase, but the receiver is currently affected by acute levels of noise from the existing highway and would remain acutely impacted during operation of the proposal. Noise mitigation in the form of architectural treatment has been proposed to manage the noise impacts at this receiver. It should be noted that as a result of issues raised in submissions, the alignment of the highway has been moved away from the property in Meroo Meadow to reduce impacts of the proposal on amenity at this location. Architectural treatment of this property would still be considered.
Refer to Section 2.4 – Description of the proposal and Chapter 3 – Changes to the proposal for more information.

The noise impact of heavy vehicles on the approach to the proposed roundabout joining Meroo Road to Pestells Lane extension have been included in the noise modelling. Noise levels at a property in Meroo Meadow are predicted to decrease by 4.4 dB(A) during the daytime and 4.9 dB(A) during the night-time. The prediction of noise levels at this receiver included noise emissions from the main alignment, Meroo Road and the Pestells Lane ramp. Noise treatment is not required at this receiver as the predicted noise levels comply with the applicable noise criteria.

The filled embankment raising the highway above its current level in front of a property at Meroo Meadow has been included in the noise modelling. Noise levels at the property are predicted to decrease by 4.9 dB(A) during the daytime and 4.6 dB(A) during the night-time during operation of the proposal which would be constructed using low noise pavement. The predicted noise levels comply with the appropriate noise criteria, hence noise mitigation would not be required at this property.

Heavy vehicle movements are predicted to slightly increase from the proposal while the light vehicle movements are predicted to slightly decrease. However from a noise perspective, the change in traffic movements is not considerable. Noise levels experienced at receivers on Meroo Road are predicted to increase by less than 1 dB(A) during the daytime and night-time periods as a result of the change in traffic associated with the proposal. These receivers are located more than 500 metres away from the proposal.

Some receivers along Meroo Road are currently acutely affected by noise generated by traffic movements on Meroo Road. This would continue in the future with or without the proposal. The proposal would increase noise at these sensitive receivers by less than 1 dB(A), which complies with applicable noise criteria and noise triggers contained within the ‘Environmental Noise Management Manual’ (RTA, 2001).

On the basis that noise levels experienced at residences on Meroo Road are dominated by road traffic noise from Meroo Road and not from the proposal, these receivers are not eligible for the consideration of noise mitigation. This is consistent with the requirements of the ‘Environmental Noise Management Manual’ (RTA, 2001).

Meroo Road is not moving closer to sensitive receivers. Consequently, vibration levels generated from vehicles operating on Meroo Road throughout operation of the proposal would be consistent with existing vibration levels.

The impact of the proposal on traffic movements along Pestells Lane have been included in the noise model which includes the overpass at Pestells Lane. Receivers located on Emerald Drive have been considered in the noise assessment and noise mitigation has been recommended where appropriate.

The raising of the alignment by 2.1 metres to the north of Boxsells Lane and Lamonds Lane has been included in the noise modelling. Noise levels at some receivers are predicted to increase as a result. Mitigation measures to minimise the impact of noise generated by the operation of the proposal at this location have been recommended for receivers that exceed the applicable noise criteria.

Noise levels at properties on Strongs Road have been predicted to marginally increase by 0.1 dB(A) to 0.2 dB(A)) as a result of the proposal. Low noise pavement has been included in the design of the proposal to minimise noise increases as a result of the proposal. The provision of architectural treatment would be considered for any receivers at which the applicable noise criteria are still exceeded.
Further design changes were requested and/or concerns raised in submissions received during the display of the review of environmental factors. Each request/concern has been considered by Roads and Maritime as documented in Section 2.3 to Section 2.20 and Chapter 3 – Changes to the proposal. Further information on specific design features relating to operational road noise concerns is provided as follows:

- Modifications to the highway alignment near Meroo Meadow, refer to Section 2.4.1 – Road design and Chapter 3 – Changes to the proposal.
- Increase in highway height north of Boxsells Lane and Lamonds Lane, refer to Section 2.7.14 - Lamonds Lane – access and safety.
- Relocation of the overpass at Pestells Lane to the Meroo Road / Princes Highway intersection, increased use of Meroo Road by heavy vehicles and increased traffic on Pestells Lane, refer to Section 2.7.16 – Pestells Lane and Meroo Road – access and safety.
- Overpass at Strongs Road, refer to Section 2.7.12 - Jaspers Brush Road and Strongs Road – access and safety.

2.8.5 Assessment methodology

**Stakeholder identification number(s)**
7, 8, 13, 46

**Issue description**
Submissions relating to the methodology used for the noise and vibration impact assessment for the proposal raised issues about use of average noise levels, predicting noise from structures that do not yet exist, impact of exhaust brakes, tyres and diesel engines and how these have been considered in the noise modelling and lack of noise monitoring at individual properties.

In summary, the respondents raised the following issues:

- Noise level (dB) figures are presented as 'average noise levels'. Averaging noise over long periods is an inadequate approach for assessing liveable noise levels.
- Averaging noise levels over a one hour period does not provide a peak noise level of a truck with exhaust brakes activated for five to 10 seconds. This example is further exacerbated when two or more northbound heavy vehicles coincide with southbound trucks accelerating up a hill. This scenario is not an isolated incident and it is common, especially at night and during the early mornings, when heavy vehicles operate to miss peak hour traffic conditions.
- Climatic conditions would contribute to noise propagation. Measurements should be undertaken in dBs (without noise measurement averaging) under different climatic conditions, over the specific frequency spectrums incorporating exhaust brakes, tyres and powerful diesel engines. Results should be provided.
- Noise frequency (Hz) plays a considerable role in noise propagation. However, the noise frequency (Hz) of exhaust brakes, tyres and powerful diesel engines is different. It is unclear if noise level measurements specific to different frequencies have been measured. This information should be provided as it is imperative to establish liveability conditions.
- Wet road surfaces, from experience, cause a considerable increase in tyre noise levels. Does the noise modelling 'average out' the wet weather scenario? Noise modelling should include specific measurements over short time frames to substantiate acceptable liveability noise criteria.
- Precise information should be provided on the effect and extent of vibration (both ground vibration and noise vibration) resulting from the highway moving closer to a property in Jaspers Brush and the impact this would have on the liveability standards at the property.
• Previous consultation indicated that noise level increases at a property in Bomaderry would be minimal. The latest concept design plans show the alignment of the highway moving closer to the property to accommodate the road widening and the accuracy of the noise data provided is questionable. Noise levels from the highway have already increased at the property following the removal of bush in the area.

• The review of environmental factors indicates that traffic volumes on all sides of a property in Meroo Meadow would increase five-fold. Readings taken for noise levels at the property do not reflect the true noise generated by future traffic as recordings were only taken at the Princes Highway and Meroo Road, failing to consider traffic using the proposed Pestells Lane ramp. Also, the noise loggers were placed about 70 metres from Pestells Lane and 280 metres from the Princes Highway. Traffic would actually pass about 33 metres from the property and living areas of the residence on the property.

• A “noise receiver” was not located directly adjacent to a Jaspers Brush property entrance meaning no specific measurements for the property are available. Unless specific noise levels are recorded adjacent to the gate and 50 metres to the north of the property (the direction from which noise, specifically exhaust noise, is directed into the bedroom of this property), it is not possible to predict noise levels.

• Measuring noise from a structure that does not exist is confusing. How do you tell what noise each vehicle type (motor cycles through to B-double trucks) would make when ascending and descending the Pestells Lane grade-separated half-interchange (including the Pestells Lane overpass) or braking to approach and / or accelerating to exit the roundabout on Pestells Lane?

Response

The road traffic noise modelling undertaken for the proposal was completed in strict accordance with the Environment Protection Authority ‘NSW Road Noise Policy (Department of Environment, Climate Change and Water, 2011) and the Roads and Maritime ‘Environmental Noise Management Manual’ (RTA, 2001). The road traffic noise modelling considered the tyre / road interface, engine noise and exhaust noise by modelling these as separate sources. The frequency and character of noise was carefully considered throughout the development of the road traffic noise algorithm used for the proposal. This has been taken into account in the noise level that is predicted at each sensitive receiver location.

Using $L_{Aeq, period}$ noise levels (the energy averaged a-weighted noise level) is accepted nationally and internationally as the most appropriate approach to the assessment of road traffic noise. This method has been found to correlate well with annoyance and health effects of noise and is the method adopted by ‘NSW Road Noise Policy’ ((Department of Environment, Climate Change and Water, 2011).

Rather than measuring noise from structures that would be built in the future, noise impacts of the proposal are predicted using internationally accepted algorithms. The algorithms have been developed and validated over years of research and measurements incorporating the full spectrum of vehicles operating on varying road surfaces. The percentage of heavy vehicles, speed, road gradient and surface are all considered in the prediction of noise. Predicted noise emissions from vehicles ascending and descending the Pestells Lane ramp takes into specific consideration the number of light and heavy vehicles and the road gradient. Research has found that generally there is a marginal decrease in noise levels around intersections as a result of vehicles travelling at lower speeds when entering and exiting intersections such as roundabouts. As a conservative approach, the noise model for the proposal modelled traffic travelling at the posted speed limit through intersections which results in slightly higher noise levels being predicted than would be experienced in reality.

The ‘NSW Road Noise Policy’ (Department of Environment, Climate Change and Water, 2011) does not require consideration of weather effects for road traffic noise. This is standard practice nationally and internationally. Consequently, secondary weather effects such as wet roads were not considered in the noise and vibration assessment for the proposal.
International studies have shown that roads free from joints and cracks do not create ground-borne noise and vibration that is perceptible in residential dwellings. The design of the proposal would not cause vibration that would exceed the criteria set in the Environment Protection Authority ‘Assessing Vibration: A Technical Guideline’ (Department of Environment and Conservation, 2006). The proposal is unlikely to increase vibration levels perceptibly above existing vibration levels along the proposal, including at a property in Jaspers Brush due to the change in road pavement from the existing dense graded asphalt to the proposed low noise pavement and also the distances of receivers from the carriageway.

Noise levels have been accurately predicted at all sensitive receiver locations, and where noise levels at these receivers exceed the applicable criteria, feasible and reasonable noise mitigation would be provided.

As provided in Appendix I of the Technical Paper: Noise and Vibration (AECOM 2013a) at Appendix D of the review of environmental factors, noise levels at a property in Elvin Drive, Bombaderry are not expected to increase as a result of the proposal which has been designed with low noise pavement. Despite this, the property in Elvin Drive would still exceed the applicable noise criteria by 1 dB(A) and has therefore been recommended for further noise mitigation which would be considered in further detail at the detailed design stage of the proposal.

Noise logging was undertaken at various locations to provide calibration data for the noise model of the existing scenario and to check it was accurately predicting noise from the existing alignment. It was confirmed that the noise model correctly calculated the noise levels at all sensitive receiver locations including at a property on Meroo Road, Meroo Meadow and a property on the Princes Highway, Jaspers Brush about which this issue has been raised. The design models were then developed using the same assumptions as the existing scenario model to enable road traffic noise to be accurately predicted for the design.

The noise modelling has included all existing and proposed major roads related to the proposal, including the Pestells Lane ramp, Meroo Road.

2.8.6 Noise mitigation

Stakeholder identification number(s)
8, 9, 17, 32, 46, Environment Protection Authority

Issue description

Submissions relating to noise mitigation raised issues about whether noise barriers, noise reducing road pavement or noise absorbing vegetation should be used for the proposal and whether best practice for traffic noise mitigation is being adopted.

In summary, the respondents raised the following issues:

- With the implementation of the proposed low noise pavement and architectural treatment for 42 properties and one childcare centre, the upgraded road is predicted to meet the noise goals in the NSW Road Noise Policy.
- Would the road surface of the Princes Highway be designed to reduce noise as much as possible for residents living alongside the highway?
- Would noise barriers be installed at the Jaspers Brush Road and Strongs Road intersection?
- Given a noise barrier is not proposed along the entrance to Bomaderry, could architectural treatment be provided to an individual property to address potential noise impacts.
The Environmental Noise Management Manual recommends traffic noise mitigation is most effective and achieved for the lowest cost if it is considered right from the earliest planning stages. By using best practice, the vertical alignment of new roads can be designed to minimise propagation of noise from vehicles by taking advantage of existing topography. The current concept design does not do this in the vicinity of a property in Meroo Meadow.

What design features would be used to mitigate road noise? Would vegetation selected for the median strip or verge be high enough and thick enough to absorb noise?

Response

A low noise road surface (stone mastic asphalt) has been included in the concept design for the proposal. This would provide a reduced noise impact on all sensitive receivers along the alignment, when compared to a standard road pavement such as dense graded asphalt which forms the pavement of the current highway. Noise barriers were investigated where applicable for this proposal but were not found to be feasible and reasonable in accordance with the Roads and Maritime ‘Environmental Noise Management Manual’ (RTA, 2001). This conclusion is reinforced by the Environment Protection Authority in its submission which stated “With the implementation of the proposed low noise pavement and architectural treatment for 42 properties and one childcare centre, the upgraded road is predicted to meet the noise goals in the ‘NSW Road Noise Policy’” The noise barrier assessment is discussed further in Section 6.2.4 (page 160) of the review of environmental factors and Section 6.2 of the Technical Paper: Noise and Vibration (AECOM 2013a) provided at Appendix D of the review of environmental factors.

All receivers at which the applicable noise criteria would be exceeded, and that were found eligible for additional noise mitigation, would be considered for architectural treatment. These receivers are discussed in Section 6.2.4 of the review of environmental factors and the Technical Paper: Noise and Vibration (AECOM 2013a) provided at Appendix D of the review of environmental factors.

The section of highway that would be upgraded by the proposal would be both straightened and flattened as much as possible taking other engineering and environmental constraints into consideration. Road traffic noise amongst other factors was considered at the earliest planning stages to minimise the impact on sensitive receivers adjacent to the proposal. As a result of issues raised in submissions the vertical and horizontal alignment of the highway has been modified over 900 metres in Meroo Meadow. Refer to Section 2.4.1 – Road design for further information.

Vegetation needs to be very dense and deep to have a noticeable impact on noise levels. Vegetation planted on the median strip or verge, regardless of density, would not have the required depth (which would need to be about 20 times the proposed median width or greater) to mitigate noise and as a result would not have the ability to reduce noise levels from the Princes Highway.

The safeguards and management measures proposed in Section 6.2.5 of the review of environmental factors meet the requirements of the ‘Environmental Noise Management Manual’ (RTA, 2001) which are applicable to all major road upgrade projects.

2.9 Biodiversity

2.9.1 Terrestrial ecology

**Stakeholder identification number(s)**

27

**Issue description**

The submission relating to terrestrial ecology raised issues about the use of locally sourced flora for replanting and the need to conduct further searches for the endangered plant *Zieria baeuerlenii*. 
In summary, the respondent raised the following issues:

- It is understood from the review of environmental factors report that a biodiversity offset is not required as a result of the proposal. However, locally sourced flora should be used for replanting, especially in relation to the Currambene Batemans Lowland Forest at Devitts Lane. This requirement should be included in the tender documents for the proposal to allow sufficient time for seed collection and propagation.

- A detailed search for the endangered plant *Zieria baeuerlenii* should be conducted at the Moss Vale roundabout.

**Response**

Safeguards and management measures that would be implemented to minimise and manage potential impacts on biodiversity that may occur as a result of the proposal are detailed in Section 6.3.4 of the review of environmental factors. One such measure requires the preparation of a vegetation management plan for the proposal. The vegetation management plan would be prepared according to several guides from the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011) including ‘Guide 3: Re-establishment of Native Vegetation’ (Guide 3). Guide 3 provides a process and key steps for re-establishing native vegetation. Step 2 of Guide 3 provides an outline of best practice native seed collection, such as allocating sufficient lead time for the collection of seed and conducting collection in accordance with existing guidelines (eg those published by FloraBank 2000). Step 3 of Guide 3 discusses the procurement of native plants including that where possible, the use of local provenance seed is optimal for revegetation works. Further emphasis is made in Step 3 that sufficient lead time in the collection or other procurement of local provenance seed is necessary, to allow for adequate growth of the plant stock to facilitate the success of the planting program.

Replanting using native plant species that are representative of retained adjoining or nearby native plant communities is a key recommendation of Step 6 of Guide 3, when developing landscaping or other plans such as a vegetation management plan. This would apply to the Currambene Batemans Lowland Forest at Devitts Lane and other native plant communities that would be retained and managed according to the vegetation management plan for the proposal. These measures, the measures cited above and other best practice management would form part of a reference to the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011) in tender documents issued in the tender specifications. For example the Roads and Maritime ‘QA Specification G36 Environmental Protection’ (Roads and Maritime 2013a) includes reference to the use of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011) when preparing flora and fauna management plans. The Roads and Maritime ‘QA Specification G36 Environmental Protection’ template (Roads and Maritime, 2013a) provides a direction to detail any specific flora and fauna management requirements that have been recommended in impact assessment documents such as a review of environmental factors, submissions reports or determination documents.

*Zieria baeuerlenii* is a plant species listed as endangered under the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999*. A recovery plan has been prepared for this species (Department of Environment, Climate Change and Water, 2010a). Further discussion regarding the proposed critical habitat listing for the species by the NSW National Parks and Wildlife Service (National Parks and Wildlife Service, 2002) is provided in Section 3.7 (page 75) of the *Technical Paper: Terrestrial Flora and Fauna* (Biosis 2013) at Appendix E of the review of environmental factors. Recovery actions for *Zieria baeuerlenii* have included a range of surveys and studies. A detailed survey by members of the species recovery team, local community members and other volunteers during 1998 was carried out to determine the full extent of the species within the Bomaderry bushland. In summary these surveys and subsequent monitoring have determined that the population occurs as a total of 43 colonies in six discrete clusters. These clusters are confined within a 0.5 kilometre by one kilometre area spanning both sides of Bomaderry Creek within the Bomaderry Creek Regional Park, adjoining bushland and several other locations (Department of Environment, Climate Change and Water, 2010a).
Flora surveys were carried out on 22 of March 2013 in bushland adjoining the Bomaderry Creek Regional Park in the vicinity of the Moss Vale roundabout as shown in Figure 2.1 of the Technical Paper: Terrestrial Flora and Fauna (Biosis 2013) provided at Appendix E to the review of environmental factors. These surveys specifically targeted Zieria baeuerlenii by random meander. There are no specific survey guidelines for this species and although it is conspicuous, the species was not located during the current surveys. Following the field surveys and associated habitat assessments, the species was further considered. Appendix B of the Technical Paper: Terrestrial Flora and Fauna (Biosis 2013) provided at Appendix E of the review of environmental factors provides an assessment of likelihood of threatened species and populations previously recorded in the locality occurring in the study area. On the basis of a number of factors, including the species' highly restricted geographic range, particular habitat requirements and specific reproductive and dispersal biology, it was concluded that Zieria baeuerlenii has a low likelihood of occurrence in the study area (page B-17). On the basis of previous field surveys by others (Department of Environment, Climate Change and Water, 2010a), the field surveys by Biosis (2013) and that the remnant bushland near the corner of Moss Vale Road and Princes Highway would not be directly impacted (Figure 3.1 on page 31), further searches are not considered necessary for the species either in the construction footprint or other areas that may be indirectly impacted.

2.9.2 Riparian corridors and wildlife crossings

Stakeholder identification number(s)

27, 42, 46, Department of Primary Industries - Fisheries NSW, Department of Primary Industries - NSW Office of Water

Issue description

Submissions relating to riparian corridors and wildlife crossings raised issues about the condition and function of riparian corridors and buffer zones, increased fauna movement in the area, fauna mortality, the inclusion of specific fauna friendly features in bridge design and the need for a wildlife crossing in the vicinity of Abernethys Creek.

In summary, the respondents raised the following issues:

- The proposal includes eight bridges over waterways including the replacement of existing bridges. These bridges would improve the situation at existing creek locations in terms of riparian corridors and function.
- A vegetated riparian buffer should be created between any new property access tracks and the adjacent waterway where they pass under the new highway bridges.
- Rehabilitation of the riparian zone (including replanting of native riparian vegetation) where it is degraded or disturbed by the works should be carried out at the completion of the proposal.
- The review of environmental factors indicates that NSW Office of Water guidelines for controlled activities (available at http://www.water.nsw.gov.au/Water-Licensing/Approvals/Controlled-activities/default.aspx) have been considered in the assessment and would be further considered during the detailed design and construction phases of the proposal. The NSW Office of Water ‘Riparian Corridor Guidelines’ should also be applied, where possible, as minimum criteria in the bridge designs.
- During the 1970s, most of the countryside in the area was open pasture land supporting a viable dairy industry. Due to changes in this industry and the increase in rural dwellings, especially within the last 10 years, there has been a large increase in vegetated areas capable of sheltering native fauna. The proposal would be in place for at least the next 100 years and therefore an allowance should be made for an increase in native fauna moving about the area.
• Section 6.1.4 of the terrestrial flora and fauna technical paper states: "Wildlife corridors and connectivity are not prominent features of the study area." The paper then goes on to mention three watercourse crossings: Wileys Creek, Jaspers Brush Creek and Flying Fox Creek, where "proposed bridges would accommodate fauna friendly bridge design where appropriate, feasible and reasonable." Further, the paper provides "Where fauna friendly design features are included in the bridge design, consideration would be given to the use of appropriate fencing to funnel wildlife beneath the road." This wording provides too much flexibility and the developer is likely to take the lowest cost approach. Standards for "fauna friendly features" exist, and these should be stipulated as indispensable design features which would constrain the developer.

• Riparian fauna corridors require fauna friendly features to be incorporated into bridge design, including fauna underpasses, fauna furniture and fauna-proof fencing to funnel fauna into the underpasses and away from road verges. Fauna-proof fencing should be made a mandatory requirement in the tender documents for the contractor.

• Figure 7.2 (Wildlife corridors and SEPP 14 wetlands - South Coast Regional Conservation Plan (Department of Environment, Climate Change and Water, 2010b)) of the Terrestrial Flora and Fauna Technical Paper shows several more watercourses than the three (Wileys Creek, Jaspers Brush Creek and Flying Fox Creek) mentioned in Section 6.1.4 [the respondent cited Section 6.4.1 which has been assumed to be a typographic error as it is not relevant to this issue] of the report. Each watercourse would require culvert underpasses which are quite capable of being "fauna friendly features." While these crossings may at present not support much native flora it is highly probable that within the life of the highway they would. The presence of the alternate potential crossing points would increase the possibility of plantings by active Landcare groups in the community.

• A wildlife crossing should be provided in the vicinity of Abernethys Creek in light of the nearby 'Environment' zone and sightings of wombats in the area. The importance of this area for wildlife movement may have been overlooked during the surveys.

• The proposal should aim to decrease mortality rates of individual fauna species rather than just accept that there is potential for fauna mortality during operation of the proposal (as reported in the review of environmental factors). Currently there is fauna mortality at the Jaspers Brush Creek highway crossing and at the Flying Fox Creek highway crossing.

• Flying Fox Creek should not be overlooked as a key fauna crossing even though it is not shown in the South Coast Regional Conservation Plan, as it is currently subject to more fauna fatalities than Wileys Creek and Jaspers Brush Creek.

Response

The NSW Office of Water has prepared a range of guidelines for controlled activities on waterfront land including ‘Guidelines for Riparian Corridors on Waterfront Land’ (Department of Primary Industries, 2012). A public authority such as Roads and Maritime does not need to obtain approval to undertake any works carried out in, on or under waterfront land which would be defined as a controlled activity in accordance with the Water Management Act 2000. Further, Roads and Maritime are not required to adhere to the NSW Office of Water guidelines for controlled activities. The terrestrial flora and fauna assessment for the proposal draws on the recommendations of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011). These guidelines are intended to be used or referred to whenever Roads and Maritime projects or maintenance works have the potential to impact on biodiversity. This may include activities involving clearing of native vegetation, removal of hollow-bearing trees and working in aquatic habitats and riparian zones (RTA, 2011). The overall objectives of the guidelines and specific objective and suite of management measures of ‘Guide 10: Aquatic Habitats and Riparian Zones’ (Guide 10) of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011) are consistent with the objectives for riparian corridor management identified in the NSW Office of Water ‘Guidelines for Riparian Corridors on Waterfront Land’ (Department of Primary Industries, 2012). Furthermore, Guide 10 was developed in close consultation with the Department of Primary Industries (Fisheries NSW).
Three waterways that intersect the proposal, Flying Fox Creek, Jaspers Brush Creek and Wileys Creek, are considered to provide potential dispersal corridors for local terrestrial fauna, as outlined in Section 6.3 of the review of environmental factors and Section 6.1.4 (page E-107) of the Technical Paper: Terrestrial Flora and Fauna (Biosis 2013) provided at Appendix E of the review of environmental factors. Each of these three waterways have been deemed appropriate for the implementation of terrestrial fauna underpasses that provide continuity between habitats on either side of the road based on current literature and observations made during field investigations. The creation of these terrestrial fauna underpasses is considered to improve the existing environment and facilitate a potential increase in the successful dispersal of native fauna through the area into the future. The design of the underpasses would support the facilitation of fish passage and promote habitat continuity by providing stable creek banks to support shade tolerant low growing riparian vegetation and minimising erosion in peak flow conditions (See Section 2.9.3 – Aquatic ecology for more information).

In the current state, wildlife corridors in the study area are limited. The majority of the study area is covered by cleared land and grazed paddocks that contain little native vegetation and have not been mapped or described as a native plant community (Biosis 2013). The South Coast Regional Conservation Plan (Map 15 of Department of Environment, Climate Change and Water, 2010b) identifies important wildlife corridors which provide a focus for future protection and landscape restoration, but may not necessarily currently operate as viable fauna movement corridors. Riparian corridors falling into the environmental corridors class traverse the study area at Wileys Creek and Jaspers Brush Creek and are shown in Figure 6.7 of the review of environmental factors. Although not identified in the South Coast Regional Conservation Plan, Flying Fox Creek also has sufficient connective vegetation to have potential to be a functional wildlife corridor. Tandingulla Creek, Tullian Creek, Aberneithys Creek and several unnamed drainage lines that traverse the study area are excluded from the corridor mapping by the Department of Environment, Climate Change and Water, (2010b) and are not considered to be important fauna movement corridors in view of the absence of native vegetation and limited range of other fauna habitat features (Biosis 2013).

This information is supported by current literature, with riparian zones often considered to act as corridors facilitating the movement of wildlife (ie hotspots) (Harris and Bamford 2011). For this reason, fauna road deaths commonly occur at or near creeks lines, gullies and wetlands (Goosem et al. 2004). The inclusion of fauna passages and associated funnel guides were considered at a total of eight watercourse crossings along the alignment. Veage and Jones (2007) recommend that fauna crossing structures are located in areas where regular crossing and / or migration pathways are identified. This approach is reinforced by research by Ramp and Roger (2008) which supports the use of habitat variables in the prediction of animal – vehicle collisions, and thus the mitigation of such impacts. Therefore, given the lack of connective vegetation along the other five watercourses and that Wileys Creek, Jaspers Brush Creek and Flying Fox Creek are considered to be, or have the potential to be, functional wildlife corridors, mitigation measures have focused in these locations with the greatest potential efficacy.

Based on detailed investigations of the alignment (fauna survey effort is provided in Table 2-2 of the Technical Paper: Terrestrial Flora and Fauna (Biosis 2013) provided at Appendix E of the review of environmental factors), the following species are considered most at risk of fragmentation and injury as a result of the proposal and form the target of the proposed mitigation measures:

- Large sized mammals including Eastern Grey Kangaroos (Macropus giganteus).
- Medium sized mammals including Swamp Wallaby (Wallabia bicolor), Common Wombat (Vombatus ursinus) and Long-nosed Bandicoot (Perameles nasuta).
- Small sized mammals including rodents, dasyurids and microchiropteran bats.
- Arboreal mammals in areas containing tall vegetation including Common Brushtail Possum (Trichosurus vulpecula) and Common Ringtail Possum (Pseudocheirus peregrinus) (specifically at Jaspers Brush Creek).
- Reptiles.
- Amphibians.
- Birds including Fairy Martins (Petrochelidon ariel) and Welcome Swallow (Hirundo neoxena).
Following the development of a concept design, Roads and Maritime confirmed that it would be feasible and reasonable to construct fauna underpasses (including fauna friendly bridge design and associated fauna fencing) at Wileys Creek, Jaspers Brush Creek and Flying Fox Creek.

The optimal underpass design would target multiple species over a long period of time and would not be species specific because of the potential effects on other taxa (ie exclusion of or unsuitability for species etc). Therefore the fauna underpass designs would aim to accommodate a wide range of species and enable the movement of fauna with little restriction.

A summary of the mitigation structures that would be established is provided in Table 2-2 below and further information about these structures is provided following Table 2-2 and in Chapter 3 – Changes to the proposal.

Table 2-2: Summary of terrestrial fauna mitigation structures to be established along the proposal

<table>
<thead>
<tr>
<th>Location</th>
<th>Mitigation structures</th>
<th>Target species</th>
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| Highway crossing of Wileys Creek | • Minimum three metre wide fauna underpass  
                                 | • Fauna furniture within the underpass                                                | • Mammals (small, medium and large)                      |
|                               | • One pole railing or ledges                                                          | • Reptiles                                               |
|                               | • Retention or revegetation of riparian vegetation on approaches to underpass         | • Amphibians                                             |
|                               | • Fauna exclusion fencing                                                             | • Birds                                                  |
|                               |                                                                                      |                                                          |
| Highway crossing of Jaspers Brush Creek | • Minimum three metre wide fauna underpass  
                                              | • Fauna furniture within the underpass such as logs with and without hollows, rocks and refuge pipes   |
|                               | • One pole railing or ledges                                                          | • Mammals (small, medium and large)                      |
|                               | • Around four to six refuge poles                                                    | • Arboreal mammals in areas containing tall vegetation |
|                               | • About three microchiropteran bat (microbat) roost recesses in the roof or walls of the bridge structure | • Reptiles                                               |
|                               | • Retention or revegetation of riparian vegetation on approaches to underpass         | • Amphibians                                             |
|                               | • Fauna exclusion fencing                                                             | • Birds                                                  |
|                               |                                                                                      |                                                          |
| Highway crossing of Flying Fox Creek | • Minimum two metre wide fauna underpass  
                                              | • Fauna furniture within underpass such as logs with and without hollows, rocks and refuge pipes   |
|                               | • About three microbat roost recesses in the roof or walls of the bridge structure    | • Mammals (small, medium and large mammals)              |
|                               | • Retention or revegetation of riparian vegetation on approaches to underpass         | • Reptiles                                               |
|                               | • Fauna exclusion fencing                                                             | • Amphibians                                             |
|                               |                                                                                      | • Birds                                                  |
A single two to three metre (or greater) fauna underpass would be located on one side of Wileys Creek, Jaspers Brush Creek and Flying Fox Creek away from direct human interference. The underpass would provide terrestrial fauna a dry passage from one side of the carriage way to the other and would be positioned above the one-in-two-year flood zone. This design is in accordance with the Roads and Maritime ‘Draft Connectivity Guidelines’ (Roads and Maritime 2013).

Fauna furniture such as logs with and without hollows, rocks and refuge pipes would be scattered throughout each of the proposed fauna underpasses. These would be fastened to the substrate to maintain microhabitats in flood events. The addition of fauna furniture would be undertaken in accordance with Section 6.1.2 (page E-106) of the Technical Paper: Terrestrial Flora and Fauna (Biosis 2013) provided at Appendix E of the review of environmental factors and ‘Guide 5: Re-use of Woody Debris and Bushrock’ (Guide 5) of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011). Installing this fauna furniture at the three bridge underpasses would improve the existing habitat available for ground-dwelling fauna. Several recesses would also be included in the internal roof of the bridge structure to provide supplementary roosting habitat for microbats at each underpass.

A raised walkway in the form of pole railing or ledges would be erected at Jaspers Brush Creek and Wileys Creek to facilitate the movement of small ground-dwelling mammals including rodents and dasyurids (Bond and Jones 2008). In addition, refuge poles, to facilitate the dispersal of arboreal mammals including Common Brushtail Possum and Common Ringtail Possum, would be established on either side and in the fauna underpass established at Jaspers Brush Creek. These poles would be up to three metres in height, providing arboreal fauna elevated access and a means for avoiding predators. The final height of the poles would be dictated by the height of the underpass which would be determined during the detailed design phase of the proposal.

Natural vegetation cover would be retained in areas immediately adjacent to the proposed bridge structures to provide cover for fauna using the underpass (particularly from introduced predators). Where no natural vegetation occurs, low-lying dense shade tolerant vegetation cover that does not obstruct the view of the habitat or horizon on the far side of the underpass would be planted using locally indigenous vegetation. This would include vegetated riparian buffers between any new property access tracks and the adjacent waterway where they pass under the new highway bridges such as that being considered for Flying Fox Creek. The final vegetated buffer width would depend on the final detailed design for the proposal.

In addition to farm boundary fencing, fauna fencing would be provided to maximise the potential use of the underpass and to help prevent fauna from moving onto the highway. Fencing would extend either side of the underpass and encompass habitat considered as part of a fauna hotspot (ie riparian vegetation and / or vegetation forming the forested / cleared grassland interface) with the last 10 to 15 metres angled in towards the entrance to create a funnel effect. Despite the absence of vegetated habitat present to the north of Flying Fox Creek, medium to large mammals including macropods and wombats may also use the habitats associated with farm dams located on properties Lot 1 DP 1082572 and Lot 2 DP 711868 and may disperse across the road to access these habitats. Fauna fencing to encompass this habitat in addition to the riparian vegetation of Flying Fox Creek to prevent unnecessary fauna mortality in this area would be considered during the detailed design phase of the proposal.

Fauna fencing would be at least 1.8 metres in height and the arrangement would be constructed on both sides of the highway to maximise entry of fauna on both sides of the underpass and prevent animals being trapped on one side of the road. This is in accordance with ‘Guide 2: Exclusion Zones’ (Guide 2) of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011). Exclusion fencing would include specifically designed breaks in the fence to allow animals to escape in the event they become trapped within the road reserve. This would be designed in conjunction with stock access routes.

Exclusion fencing would be designed in accordance with the provisions of Guide 2. Barbed wire would not be utilised in the vicinity of specific exclusion fencing due to the potential for native wildlife to become caught and killed in barbed wire fences. The use of fauna-friendly fencing design when fencing farm boundaries along the road corridor would be considered. The specific fencing type used along the farm boundaries would be subject to agreements with landholders.
Following the rehabilitation of the riparian zone and the preparation of a vegetation management plan in accordance with Section 6.3.4 of the review of environmental factors, the five other watercourse crossings where no specific terrestrial fauna mitigation measures are proposed (inclusive of the Tandingulla Creek, Tullian Creek and Abernethys Creek crossings), are considered to provide incidental terrestrial fauna passages. The details of the vegetation management plan would be guided by a focus on vegetation that provides habitat and fauna connectivity in accordance with ‘Guide 3: Re-establishment of Native Vegetation’ of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011). Although no specific mitigation measures would be established, improvements to the riparian zone, as a result of the proposal and commitments made by Roads and Maritime in Section 6.3.4 of the review of environmental factors, would naturally enhance the current environment and would provide additional options for dispersal in the locality.

In summary, the proposed mitigation measures relating to riparian corridors and wildlife crossings are considered to improve habitat connectivity within the locality resulting in a decrease in terrestrial wildlife road mortality along the Princes Highway between Berry and Bomaderry. These measures would be included in the contractual requirements for the contractor.

Bank formations on both sides of the waterway are provided beneath the proposed new highway bridge at Tullian Creek. There is plenty of room on these banks for any fauna or animals to pass through.

2.9.3 Aquatic ecology

**Stakeholder identification number(s)**

Department of Primary Industries – Fisheries NSW

**Issue description**

The submission relating to aquatic ecology raised issues about design requirements for new bridge crossings and temporary road crossings over the tributaries of Broughton Creek and the notification process in the event of fish kills.

In summary, the respondent raised the following issues:

- The proposed bridge designs would avoid or minimise the placement of piers in the waterways. The final design plans for the new bridge crossings of the eight tributaries of Broughton Creek (including Flying Fox Creek, Jaspers Brush Creek, Wileys Creek, Tandingulla Creek, Tullian Creek and Abernethys Creek) should be submitted to Fisheries NSW for review and concurrence.

- All temporary waterway road crossings must be designed and constructed in accordance with the Fisheries NSW ‘Policy and Guidelines for Fish Friendly Waterway Crossings’ (DPI, 2012) and ‘Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings’ (Fairfull and Witheridge, 2003).

- The final design plans and construction environmental management plan for any temporary road crossings of the eight tributaries of Broughton Creek (including Flying Fox Creek, Jaspers Brush Creek, Wileys Creek, Tandingulla Creek, Tullian Creek and Abernethys Creek) should be submitted to Fisheries NSW for review and concurrence.

- Fisheries NSW is to be immediately notified of any fish kills in the vicinity of the works. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and written approval to proceed is provided by Fisheries NSW.

- A copy of the vegetation management plan should be submitted to Fisheries NSW prior to the commencement of works in waterways.
Response

All bridge piers would be located outside of waterways as outlined in Section 6.3.3 (page 185) of the review of environmental factors. Bridge piers would be located above the main waterway channel, w defined by the top of the stream banks under normal flow conditions. Bridge piers would be designed with consideration to local hydrological factors to minimise the potential for erosion during period of elevated flows.

Temporary waterway crossings would not be constructed as part of the proposal.

Fisheries NSW would be immediately notified of any fish kills in the vicinity of the works and all construction works would cease until the issue is rectified and written approval is provided by Fisheries NSW.

Roads and Maritime would continue to consult with Fisheries NSW throughout the detailed design and construction phases of the proposal and would develop relevant documents, such as the vegetation management plan, in consultation with Fisheries NSW.

2.9.4 Weed and pest management

Stakeholder identification number(s)

27, 28

Issue description

Submissions relating to weed management raised issues about the control of the transport of Madeira Vine (*Anredera cordifolia*) during construction and the development of a weed management plan.

In summary, the respondent raised the following issues:

- The review of environmental factors refers to the development of a vegetation management plan, incorporating a weed management plan to prevent the spread of noxious weeds. It is important to avoid the transport of Madeira Vine (*Anredera cordifolia*) during construction (likely to be spread by corms in the tyres of heavy vehicles). The weed is not listed in Table 6-36 of the review of environmental factors but is a weed of national significance.
- Tree planting along the upgraded highway would require ongoing maintenance to control weeds and vermin.

Response

An outline of the main content that would be included in a vegetation management plan for the proposal is provided in Section 6.3.4 of the review of environmental factors. Roads and Maritime also commits to managing vegetation within the road reserve and adjacent to areas of vegetation clearing in accordance with ‘Guide 6: Weed Management’ (Guide 6) and ‘Guide 10: Aquatic Habitats and Riparian Zones’ (Guide 10) of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011).

Under the *Noxious Weeds Act 1993*, Roads and Maritime is required to control and manage noxious weeds during pre-construction, construction and operation phases with management of other weeds as part of the overall mitigation measures for vegetation. This is consistent with the objectives of Guide 6. In addition Guide 6 provides a strategic pathway for managing the main categories of weeds including noxious species, weeds of national significance, environmental weeds and agricultural weeds. Important measures for the management of all categories of weeds that would be included in the weed management plan element of the vegetation management plan to be prepared are recommended in Guide 6.
A vegetation management plan would be prepared prior to, and as close as possible to, the commencement of construction of the proposal to address specific weed issues and site conditions as committed to by Roads and Maritime in Section 6.3.4 of the review of environmental factors. This is consistent with Guide 6 which recommends pre-construction surveys are completed by a person trained in weed identification including mapping weed infestations. This survey would provide baseline information for the preparation of a weed management plan. Guide 6 includes recommendations for content of a weed management plan including consultation with surrounding landholders, managing specific noxious weeds and weeds of national significance, weed hygiene protocols, other general control measures and integration with other project documents such as a landscape management plan, construction environmental management plan or work method statements.

The preparation of a weed management plan as part of a vegetation management plan for the proposal would address the management of the eight noxious weeds and seven weeds of national significance, including Madeira Vine (*Anredera cordifolia*), identified in Appendix A Table A1-1 of the *Technical Paper: Terrestrial Flora and Fauna* (Biosis, 2013) provided at Appendix E of the review of environmental factors. About 73 other environmental weeds also identified in Table A1-1 would be addressed in the weed management plan as relevant. Additional noxious weed species and weeds of national significance may be identified in a pre-construction survey, with the management of these also included.

Measures to reduce the potential for establishment of weed infestations in areas of revegetation are suggested in ‘Guide 3: Re-establishment of Native Vegetation’ and Guide 6 of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011). These measures include only reusing topsoil recovered from areas of low weed infestation, mulching, monitoring and maintenance. In addition, measures to reduce damage to plantings from pest fauna would be recommended in the vegetation management plan and are provided for in contract specifications, such as for landscape planting (Roads and Maritime 2013b). This includes installing and maintaining tree guards around plantings, assessing their effectiveness during the monitoring program and taking further action to protect plantings from damage by pest fauna where necessary.

No programs to control pest fauna are recommended for the proposal to reduce the possibility of damage or losses to plantings stock. Control of pest fauna such as rabbits, hares and deer, which would be widely distributed and common to abundant in the study area or locality would be most effective when developed and implemented as part of a group control program. Such a program would need to be consistent with a specific Local Strategic Plan managed and coordinated by the NSW Department of Primary Industries regional Local Land Services office. The proposal does not include initiation or incorporation in a group control program managed by Local Land Services.

### 2.10 Surface water and groundwater

#### 2.10.1 Water quality

**Stakeholder identification number(s)**

Department of Primary Industries - Fisheries NSW, Environment Protection Authority

**Issue description**

Submissions relating to water quality treatment and waterways raised issues about the preparation of a soil and water management plan and a vegetation management plan for the proposal and recommended environmental safeguards and mitigation measures for implementation.
In summary, the respondents raised the following issues:

- A copy of the soil and water management plan should be submitted to Fisheries NSW prior to the commencement of works in waterways.
- Environmental safeguards (e.g., silt curtains, sediment fences, booms, etc.) should be installed consistent with 'Managing Urban Stormwater: Soils and Construction' (4th Edition Landcom, 2004) to ensure that there is no escape of turbid plumes into the adjacent aquatic environment.
- Material removed from waterways that is to be temporarily deposited or stockpiled on land should be located well away from the waterway and should be contained by appropriate sediment control devices as outlined in 'Managing Urban Stormwater: Soils and Construction' (4th Edition Landcom, 2004).
- Split rock used in reclamation works in or adjacent to the waterways must be clean and free of fine sediment.
- Spill kits suitable for the containment of fuel and oil spills should be kept on site.
- The proposal is to be undertaken in a manner so as not to discharge pollutants to surface waters. To ensure that this is achieved, it is recommended that the following environmental management measures be included as part of any determination for the proposal:
  - Except as may be expressly provided by an environment protection licence, the proponent must comply with Section 120 of the Protection of the Environment Operations Act 1997. Based on the Environment Protection Authority’s assessment of the proposal, should an environment protection licence be applied for, conditions would not be placed on such a licence which allow for the discharge of any pollutants from the premises to surface waters.
  - A detailed surface water and groundwater monitoring plan should be prepared by an appropriately qualified and experienced person(s) in consultation with the Environment Protection Authority. The Environment Protection Authority would be guided by such a document in determining and placing surface water monitoring requirements as conditions of any environment protection licence for the proposal.

**Response**

Environmental management measures to reduce the generation of pollutants and minimise the impacts of the proposal on receiving waters are described in detail in Section 6.4.5 of the review of environmental factors.


Roads and Maritime note the requirements of Section 120 of the Protection of the Environment Operations Act 1997. The discharge of any stormwater from the construction of the proposal would be managed in accordance with the ‘Managing Urban Stormwater Guidelines’ (Landcom 2004), with specific reference to ‘Volume 2D, Main Road Construction’ (Department of Environment and Climate Change 2008). The latter publication produced by the Department of Environment and Climate Change (now the Environment Protection Authority) provides guidelines, principles and recommended design standards for managing erosion and sediment control during the construction of main roads including the discharge of treated waters from sediment basins. It is anticipated that any application for an environment protection licence for the proposal would include reference to licensed discharge and monitoring points to permit the discharge to surface waters of water treated to meet water quality limits prescribed in the Environment Protection Authority’s model licence for road construction and ‘Volume 2D, Main Road Construction’ (Department of Environment and Climate Change 2008).

A soil and water management plan (including an erosion and sediment control plan and a monitoring plan), as detailed in Section 6.4.5 of the review of environmental factors would be prepared prior to the commencement of construction in consultation with relevant stakeholders such as the Environment Protection Authority and Fisheries NSW. This would form part of the construction environmental management plan for the proposal.
These plans would take into account the detailed design of the proposal, the proposed construction staging and work methodology, the content of the review of environmental factors and any safeguards and management measures that would form part of the determination for the proposal. During the preparation and ongoing monitoring of these plans, Roads and Maritime and the selected contractor would consult with stakeholders to address issues that may require temporary local mitigation of a minor nature.

Spill kits would be provided at all temporary construction ancillary facilities as outlined in Section 6.4.5 of the review of environmental factors.

Where there is a risk of polluting receiving waters, split rock used in reclamation works or adjacent to the waterways would be clean and free of fine sediment.

2.10.2 Groundwater

**Stakeholder identification number(s)**
Department of Primary Industries – NSW Office of Water, Environment Protection Authority

**Issue description**
Submissions relating to groundwater raised issues about the adequate degree of consideration given to groundwater in the review of environmental factors and recommends measures to be included as part of any determination for the proposal.

In summary, the respondents raised the following issues:

- The review of environmental factors provides due consideration of groundwater impacts which have been described as low risk.
- The proposal is to be undertaken in a manner so as not to discharge pollutants to groundwater. To ensure that this is achieved, it is recommended that the following measures be included as part of any determination for the proposal:
  - Except as may be expressly provided by an environment protection licence, the proponent must comply with Section 120 of the *Protection of the Environment Operations Act 1997*. Based on the Environment Protection Authority's assessment of the proposal, should an environment protection licence be applied for, conditions would not be placed on such a licence which allow for the discharge of any pollutants from the premises to groundwater.
  - A detailed surface water and groundwater monitoring plan should be prepared by an appropriately qualified and experienced person(s) in consultation with the Environment Protection Authority. The Environment Protection Authority would be guided by such a document in determining and placing groundwater monitoring requirements as conditions of any environment protection licence for the proposal.

**Response**
Environmental management measures to reduce the generation of pollutants and minimise the impacts of the proposal on receiving waters are described in detail in Section 6.4.5 of the review of environmental factors.

Roads and Maritime does not consider that the preparation of a detailed groundwater monitoring plan is appropriate. The risk of impact to groundwater as a result of the proposal has been determined as low. Consequently a detailed groundwater monitoring plan is not proposed for this proposal. The risk of groundwater contamination would be managed through the use of a soil and water management plan, as detailed in Section 6.4.5 of the review of environmental factors. Roads and Maritime would continue to consult with the Environment Protection Authority on this issue prior to the commencement of construction.
2.11 Flooding

Stakeholder identification number(s)

13, 46

Issue description

The submissions relating to changes in flood levels have raised issues about the accuracy of 100 year ARI flood data and future flood predictions used in the review of environmental factors, the additional runoff from the upgraded highway, the Pestells Lane extension and drainage structures which result in increased flooding for properties and Meroo Road.

In summary, the respondents raised the following issues:

- The information provided in the review of environmental factors is based on a 100 year ARI flood scenario, with flood predictions appearing to be a general summarisation of rainfall in the Shoalhaven. While not disputing rainfall records, the respondent has been keeping detailed rainfall records for a property in Meroo Meadow since 1998. These records show a higher incidence of rainfall and thus a higher potential for flooding on the property than is stated in the review of environmental factors. These records are available to Roads and Maritime on request.

- The existing flooding situation for a property in Meroo Meadow, which occurs as a result of runoff from the existing Princes Highway and Meroo Road, would be further exacerbated by additional runoff from the building of the Pestells Lane extension, including embankments. The installation of proper drainage is crucial to prevent any additional flooding from occurring. Additional drainage is also essential at the site of the roundabout on Meroo Road to allow water to escape and prevent a damming effect which would increase flooding at the property and along Meroo Road. The creek at this location is tidal and flood levels are influenced by the tide.

- Roads and Maritime states that raising the existing highway by 2.4 metres and providing a drainage channel on a property near the proposed Pestells Lane / Meroo Road grade-separated half-interchange to control and guide the flow of flood water to Abernethys Creek would improve the flood immunity of the highway and the property at Meroo Meadow (to withstand a 100 year ARI flood). The respondent is concerned that as the drainage easement would run uphill for 50 metres before it enters Abernethys Creek, there would be increased flooding of the property (including the highest part and the property access) and Meroo Road in less severe floods. The drainage design needs to take into consideration increased water runoff from Pestells Lane and surrounds on both Meroo Road and the property in less severe floods.

- Increased flooding on Meroo Road as a result of the proposed drainage structures would have an economic impact which should be considered.

- Has flooding of Meroo Road as a result of the proposed drainage changes been discussed with Shoalhaven City Council?

- The drainage channel should be constructed on the western side of the highway instead of through a property near the proposed Pestells Lane / Meroo Road grade-separated half-interchange to channel excess water runoff from the northern side of Pestells Lane and surrounds into Tullian Creek. This would reduce flooding on the western side of the highway instead of increasing flooding on Meroo Road and the property at Meroo Meadow.
Response

Flood flow rates for the design and impact assessment of the proposal were estimated in accordance with the guideline ‘Australian Rainfall and Runoff’ (Institution of Engineers Australia, 1987). The procedures outlined in this guideline are accepted as the best available for Australian hydrology applications. The Australian design rainfalls referred to in this guideline are based on a Bureau of Meteorology assessment of long record periods (greater than 100 years) for numerous quality controlled rainfall stations in the region. Therefore, the design rainfall data set provides a better statistical sample than individual gauges of relatively short term records. It is considered that the hydrologic analysis used in the design and assessment is appropriate for informing flood risk management decisions.

While the concept design and review of environmental factors for the proposal considered historic rainfall data that was available at the time of analysis, the respondent refers to specific detail on historic rainfall events that was not available at the time of the assessment. This information would be reviewed where appropriate during the detailed design phase of the proposal.

The concept drainage design for the Meroo Meadow area is shown in drawing number 60021933-DRG-10-03-DR1018 and DR1018a. The exact configuration and sizing of drainage works would be confirmed during the detailed design phase of the proposal. Where construction of the proposal would result in changes to local catchment areas or flow characteristics, management measures such as stormwater collection pits, pipes, headwalls, swales, culverts and scour protection would be provided to mitigate the potential impacts.

The respondents raise a number of issues relating to changes in flood behaviour around the culvert proposed from north to south under the Pestells Lane grade-separated half-interchange, and the easements proposed at the inlet and outlet of this culvert (referred to by the respondent as the ‘drainage channel’).

As described in Section 6.5.2 of the review of environmental factors, under existing conditions in the 100 year ARI flood, the highway is overtopped over a length of some 600 metres. This is predominantly caused by flood flows overtopping the banks of Tullian Creek and flowing over the highway and through to the Abernethys Creek system. This mechanism produces broad, shallow flooding on a property near the proposed Pestells Lane / Meroo Road grade-separated half-interchange.

Construction of the new highway above the 100 year ARI flood levels, would result in the proposal being about 1.6 metres higher than the existing highway at the Pestells Lane / Meroo Road grade-separated half-interchange. Without the Pestells Lane grade-separated half-interchange culverts, considerable additional flow would be redirected under both the Abernethys Creek bridge and the Tullian Creek bridge. Construction of the drainage channel on the western side of the highway (as suggested by the respondent) would redirect considerable additional flow through the Tullian Creek bridge. Without any other mitigation, this increased peak flow through these bridges would increase flood impacts for a number of properties both upstream and downstream of the highway at this location. These impacts would be experienced at locations that are currently not subject to flooding, and / or locations where residential structures currently exist (notably structures 13 and 14 on Figure 6-17 of the review of environmental factors).

The proposed culverts have been designed to mitigate the overall impacts, to reasonably replicate the existing flood behaviour whilst facilitating flood immunity to the proposed highway in the 100 year ARI flood event. Under the proposal the flood flows would be discharged through the culverts into a formed channel that then disseminates into the existing natural depression or drainage line that is an anabranch (section of the creek that diverges from the main channel of the creek and rejoins the main channel downstream) of Abernethys Creek. As such, the distribution of flood flows and impacts of the proposal to flooding behaviour are generally contained within the natural drainage lines and depressions. It should be noted that the culverts would only convey flows during larger flood events when flow in Tullian Creek would overtop its southern banks. During these flows it is likely the subject anabranch of Abernethys Creek would already be accumulating and / or conveying flow, as is shown in Figure 6-18 of the review of environmental factors.
The proposed channel within the easement would reduce flooding across a sizeable proportion of a property near the proposed Pestells Lane / Meroo Road grade-separated half-interchange, including at the residential structures marked 15 and 16, as shown on Figure 6-17 of the review of environmental factors. It should also be noted that under existing conditions in a 100 year ARI flood the residential structure marked as 15 would be surrounded by floodwaters with no easy or readily available flood evacuation access. With the proposal, the property would have direct flood free access to the highway.

A residual impact of this configuration is that Meroo Road would experience an increase in flood depth of between 0.03 metres and 0.05 metres during the 100 year ARI flood event, as shown in Figure 6-17 of the review of environmental factors. No major change in the duration or frequency of flooding for the smaller events is expected at this location. This impact is considered minor and is offset by the regional improvements to flood evacuation and mobility of emergency services that would be provided by the proposal.

Shoalhaven City Council reviewed the review of environmental factors and provided comments on the proposal. The residual impact at Meroo Road was not raised as an issue.

2.12 Landscape character and visual amenity

2.12.1 Visual impact to individual properties

**Stakeholder identification number(s)**

13, 18, 22, 28, 37

**Issue description**

Submissions relating to visual impacts to individual properties raised issues about the impact of the proposal on the current views from individual properties.

In summary, the respondents raised the following issues:

- The proposal would have adverse visual impacts from the front and side verandas of a federation house in Bomaderry. The views from the house following the proposal would be of drains and an elevated highway with vehicles.
- The Pestells Lane / Meroo Road half-interchange would have a negative visual impact for residents of Emerald Drive. An overpass at the current Meroo Road / Princes Highway intersection would be a better option.
- The Pestells Lane / Meroo Road half-interchange would totally obstruct the views from a property in Meroo Meadow due to the proximity and height of the ramp passing by the southern facing end of the house. The property was purchased specifically for the tranquillity of the landscape, including surrounding views of the rural landscape and mountains. Noise barriers would further impede the views. The overpass bridge would have a further visual impact as it can be viewed from all locations on the property.
- The proposed filled embankment raising the highway above its current level directly in front of a property in Meroo Meadow would have intolerable visual intrusion impacts.
- The magnificent views from the indoor and outdoor living areas of a property on Croziers Road would be greatly and permanently lost as a result of the visual impact of the proposal. The house which has been designed to make the most of the view would look onto a dual lane highway with two turning bays in two different directions.
Response

A key design criterion of the proposal was to provide a highway that would not flood in a 1 in 100 year average recurrence interval (ARI) flood event. The highway corridor skirts the lower north-western edge of the lower Broughton Creek floodplain. To achieve the flood immunity requirements and safe horizontal alignment, the roadway level is required to be elevated above its existing levels in some areas. In elevating the highway there is also the requirement to have no adverse impact on flooding. To achieve this, the proposal includes the upgrade and / or construction of eight new bridges over existing waterways and three major drainage and flood mitigation structures. To produce an attractive and integrated outcome the minimum design requirements for these bridge and drainage and flood mitigation structures are outlined in Table 8.2 of the Technical Paper: Urban Design, Landscape Character and Visual Amenity (AECOM, 2013c) provided at Appendix H to the review of environmental factors.

The urban and landscape design strategy for the Pestells Lane / Meroo Road grade-separated half-interchange is described in Section 7.7.8 and Table 8.1 of the Technical Paper: Urban Design, Landscape Character and Visual Amenity (AECOM, 2013c) provided at Appendix H of the review of environmental factors. The concept design illustrating these strategies is shown in Section 3 and Figures 3.12 and 3.13 of Appendix H. The proposed concept design seek to minimise the potential visual impacts of the proposal to residents adjacent to the corridor and to be sympathetic to the immediate landscape context.

The half-interchange and grade-separated facilities have been designed to best fit with the existing terrain and to minimise the overall footprint and earthworks impacts of the proposal. In the case of the underpass at Morschels Lane and Devitts Lane, the existing alignment and topography means that considerably less area would be impacted by taking the carriageways underneath the highway rather than over it. Additionally, it is proposed that where possible, fill embankments be graded out to be less than 2:1, to better integrated with the adjacent landscape and provide a more natural fit for the road corridor.

Through an integrated design process, considerable effort has been made to minimise visual impacts of the proposal, especially the larger grade-separated facilities, grade-separated half-interchange and drainage and flood mitigation structures that are in close proximity to a number of properties along the corridor. These structures would have some impacts of varying scale on foreground and middle ground views. Roads and Maritime acknowledges this impact and would consult with impacted land owners during the detailed design phase of the proposal with the aim of developing site specific and integrated solutions to minimise visual impacts.

In regard to specific mitigation for individual properties, in Section 6.6.4 of the review of environmental factors, Roads and Maritime commits to ongoing engagement with potentially impacted adjacent land owners to assess whether early works mitigation (eg landscape planting) can help reduce the visual impacts of the proposal. This engagement would allow a site specific response that would be developed during the detailed design phase of the proposal, where further integrated mitigation opportunities can be defined and resolved.

For further information regarding the location of overpasses, refer to:

- Section 2.7.16 - Pestells Lane and Meroo Road - access and safety, for more details about the decision not to provide an overpass at the intersection of Meroo Road and the Princes Highway.
- Section 2.7.13 - Morschels Lane and Devitts Lane - access and safety, for more details about the decision not to provide an overpass at Morschels Lane / Devitts Lane grade-separated facility.
2.12.2 Urban design and landscape

Stakeholder identification number(s)
5, 32, 37, 45

Issue description
Submissions relating to urban design and landscape raised issues about the replanting and replacement of trees along the highway following construction of the proposal.

In summary, the respondents raised the following issues:

- Would the upgraded highway and u-turn bays be screened with established trees to reduce the visual impact?
- Further consultation is requested with Roads and Maritime to discuss vegetation planting to reduce the visual impact of the proposal on a property in Croziers Road.
- Trees at the front of a property in Jaspers Brush provide shelter for livestock and should be replaced after completion of the proposal.
- The trees between the front of a property in Meroo Meadow and the highway provide a privacy screen and help reduce noise. These trees should be replaced with something similar after completion of the proposal.
- Various contrasting blossoming trees (including Hakea Sericea) should be planted at precise locations along the sides of and parallel to the highway. Seniors, who have specific visual ability, should be able to view a tree every nine seconds. Using the Fibonacci sequence of numbers, developed by the mathematical genius Fibonacci, the highway speed limit would need to be 83 kilometres per hour to enable the best viewing of the blossoming trees by seniors. A family recreational rest area should be provided. A positive response to this request would show good government leadership.

Response
The recommended replanting and / or replacement of trees and other plantings along the corridor is based on the urban and landscape design principles outlined in Section 3.3 of the Technical Paper: Urban Design, Landscape Character and Visual Amenity (AECOM, 2013c) provided at Appendix H of the review of environmental factors. At the core of the principles is recognition of the unique open pastoral / rural landscape context of the proposal area. This unique character is described in Section 6.6.2 of the review of environmental factors. In summary, the cultural landscape of the proposal area is, at the broad scale, a collection of escarpment hills, gently rolling valleys, small drainage lines, open pasture and rural plots, contained to the east by lower Broughton Creek. The arrangement of this landscape forms an attractive and harmonious composition where any intervention would require careful integration with the southern extents of the broader Berry Bolong Valley cultural landscape. The existing highway experience generally offers expansive views of the largely open landscape and the distant ridges and escarpment.

The travelling experience for all road users including seniors is a balance of open rolling broad landscape views contrasted with occasional sections that are tree lined, framing the roadway and containing the view. The main section of this enclosed view is between Turners Lane and Morschels Lane. The concept design objectives are to reinforce this open and landscape character and still provide some areas of view containment which is consistent with what is presently experienced. No mathematical model or sequence has been assumed in the above referenced technical paper. The recommended plant species include a mix of indigenous and culturally relevant specimens that can fit sensitively within the existing landscape context.

No rest areas are proposed as part of the proposal due to the proximity of both Berry to the north and Bomaderry / Nowra to the south.
Principles relevant to tree planting are:

- Establish culturally relevant plantings such as Native Fig Trees, Pine Trees and Cabbage Tree palms to create identifiable landmarks.
- Reinforce the cultural landscape by planting trees perpendicular to the carriageway at the interface of creeks, fence lines and areas of existing vegetation. This could include the establishment of plantings, hedge rows and screens perpendicular to the road corridor.
- Extend the pastoral landscape to the edges of the road to engage motorists with the contextual landscape.

All of these strategies seek to reinforce the unique local landscape character and would be implemented as far as practicable for the proposal.

In response to requests for planting, as outlined in Section 6.6.4 of the review of environmental factors, Roads and Maritime commits to ongoing engagement with adjacent land owners to assess whether early works mitigation (e.g., landscape planting and or mounding) can help reduce or soften the visual impacts of the proposal to address privacy screening issues or assist with loss of functional value such as stock shelter and wind buffers. This would include considerations at u-turn bays and the heavy vehicle inspection bay. The concept plans and sections in Section 6.6 of the review of environmental factors illustrate tree planting within the corridor. Planting and landscaping would be undertaken in accordance with the Roads and Maritime ‘Landscape Guideline – Landscape Design And Maintenance To Improve The Quality, Safety And Costs Effectiveness Of Road Corridor Planting And Seeding’ (RTA, 2008).

2.12.3 Light spill and headlight glare

**Stakeholder identification number(s)**

13, 21, 26, 32

**Issue description**

Submissions relating to light spill and headlight glare raised issues about the impact of headlight glare and light spill from street lighting at intersections on individual properties and requested the use of LED lights at intersections.

In summary, the respondents raised the following issues:

- A property in Meroo Meadow is located in a rural area where vehicles frequently use high beam. All sides of the property would be subject to high beams at all hours of the night from vehicles using the Pestells Lane / Meroo Road half-interchange. Also, if street lights are placed at the half-interchange, these would destroy any sense of living in a rural environment.
- Headlight glare from vehicles travelling west up Strongs Road from the overpass would shine directly into the main bedrooms on the northern and southern sides of a property on Strongs Road. Traffic volumes passing the property on Strongs Road would increase as a result of the overpass.
- Would the street lights proposed at the Jaspers Brush Road / Strongs Road intersection impact on a property on Jaspers Brush Road?
- LED lighting should be installed at the Croziers Road intersection.
Response

All lighting of the proposal would be consistent with the requirements of Australian Standard (AS) 1158 Road Lighting. Application of this Australian Standard requires lighting of acceleration and deceleration lanes at the proposed grade-separated facilities and grade-separated half-interchange in the proposal area. This standard also determines the light levels or brightness that are required. Lighting would also be provided at the proposed u-turn and bus stop facilities to maximise safety and minimise anti-social behaviour.

During the detailed design phase of the proposal, the light fixtures (poles) and luminaires (light unit) would be selected and located with a focus on minimising light spill and screening light sources as far as practicable, while still meeting the requirements of the relevant Australian Standard. The considered arrangement of poles and luminaires in areas where there is the potential for impact to adjacent residences and careful selection of fixtures with cut off cowlings (where light is shielded and directed to the desired location), would be undertaken to restrict light to the proposal carriageway (road surface) at the proposed grade-separated facilities and grade-separated half-interchange in the proposal area.

The type of luminaire would be selected to meet the required lighting levels and to simplify ongoing maintenance. As part of this process the selection of either LED, halogen, metal halide, high pressure sodium or fluorescent tube would be determined.

Where vegetation can be utilised to assist with an integrated screening, consistent with the commitments identified in Section 6.6.4 of the review of environmental factors, Roads and Maritime commits to ongoing engagement with potentially impacted adjacent land owners, to assess whether early works mitigation (eg landscape planting) can help reduce or soften the visual impacts of the proposal, including headlight glare.

To date no detailed headlight glare assessment has been conducted for specific dwellings along the corridor. As part of the detailed design stage of the proposal, a detailed lighting strategy and design would be developed that would be informed by a thorough headlight glare assessment which would be undertaken at that time.

2.12.4 Bomaderry arrival strategy

Stakeholder identification number(s)
Shoalhaven City Council

Issue description

In the submission relating to the Bomaderry arrival strategy, the respondent raised issues regarding the entrance to the Nowra / Bomaderry urban area which needs treatment to reintroduce drivers to an urban environment. The respondent believes that drivers would need to adjust to the changed conditions and a treatment to remind drivers, in both daylight and dark, is required on the approach to the Cambewarra Road roundabout. The respondent believes that continuing discussions should be held between Roads and Maritime urban designers and Shoalhaven City Council in relation to suitable entrance treatments.

Response

The need for integrated highway and urban design that safely transitions drivers into the local urban road environment in Bomaderry is specifically addressed in Section 6.6.3 (page 243) of the review of environmental factors.
The Bomaderry arrival / departure strategy presents particular challenges related to speed management and road safety. The strategy recognises this area will form the southern extent of close to 45 kilometres of upgraded dual carriageway highway with design speeds of generally 100 kilometres per hour. The strategy also recognises the landscape context and the distinct transition from the pastoral open landscape of the Berry Bolong Conservation Area, to the urban area of Bomaderry and the heavily treed Shoalhaven River and Bomaderry Creek canyon landscape.

The strategy, as described in Section 4.1.1 through Section 4.1.5 of Appendix H to the review of environmental factors, recommends a range of integrated urban, landscape and road design treatments. These are summarised in Table 4.1 of Appendix H to the review of environmental factors. The concept plans illustrate integrated proposals in which the road design, signposting, landscaping, lighting and road furnishings are used to transition the environment from a highway feel to a local road feel. The cross sections illustrate this transition where, as a driver approaches Bomaderry, new elements including street lighting, kerb and gutter, street tree planting, median landscape, accompanied by speed signage requiring a reduction in speed, are introduced to make the driving environment begin to match that on the south side of the roundabout / intersection of Cambewarra Road.

Further development of the Bomaderry arrival / departure strategy would be undertaken during the detailed design phase of the proposal to maximise integration with the varying characteristics of the existing rural and town landscape context, providing a safe and intuitive transition from highway conditions to urban roads. Further development of the strategy would occur in consultation with Shoalhaven City Council.

2.13 Aboriginal heritage

2.13.1 Impacts to items of Aboriginal cultural heritage significance

**Stakeholder identification number(s)**
Office of Environment and Heritage

**Issue description**

The submission relating to impacts to items of Aboriginal cultural heritage significance raised issues about the preparation of an Aboriginal heritage management plan, impacts of landscaping and planting to heritage values, the location of temporary construction ancillary facilities and the need to update the search of the Aboriginal heritage information management system database.

In summary, the respondent raised the following issues:

- To ensure the proposed safeguards and management measures outlined within the review of environmental factors under Section 7.2, Table 7-1 are adhered to, a standalone Aboriginal heritage management plan should be prepared as part of the construction environmental management plan. The Aboriginal heritage management plan should include, but not necessarily be limited to:
  - An outline of the protection measures that would be undertaken to avoid impacts to Aboriginal cultural heritage values along the project corridor.
  - Specific measures to be applied to works undertaken in close proximity to identified Aboriginal objects and areas of Aboriginal cultural value to minimise and avoid impacts on these areas. This should include a component within the site induction program for construction workers on Aboriginal heritage along the proposal corridor.
  - An outline of the test excavation and / or salvage collection / excavation (by either surface collection or archaeological excavation) activities, that would be required to be undertaken prior to the commencement of construction works.
- An outline of the procedure required if any development or any ancillary works are proposed for areas outside of those areas already surveyed as part of the current concept design and identified within the review of environmental factors and Aboriginal cultural heritage assessment report for the proposal.

- An outline of the process that would be followed for continuing consultation with registered Aboriginal stakeholders and Office of Environment and Heritage, where required.

- An outline of the process for how the Aboriginal heritage management plan procedures would be managed and adhered to during the operational life of the proposal, to ensure that there is no impact on heritage objects / areas additional to that already permitted.

- Procedures that would be followed should an auditing program detect an impact on any known and / or any previously unidentified heritage object / area discovered during construction of the proposal.

- In relation to works proposed under both the non-Aboriginal heritage and the landscape character and visual amenity sections of the safeguards and management measures as detailed in Table 7-1 of the review of environmental factors, any proposed landscaping plans should ensure they have considered impacts to the recorded areas of Aboriginal cultural heritage values. If any impacts may occur to Aboriginal cultural heritage values as a result of proposed rehabilitation or vegetation planting activities, these impacts should be considered and covered within any application for an Aboriginal heritage impact permit.

- A number of temporary construction ancillary facilities are proposed to be placed within areas containing Aboriginal objects. Given the Princes Highway upgrade encompasses two other sections of highway upgrade to the north-east, the cumulative impacts to Aboriginal heritage values are considerable and therefore any temporary facilities should avoid impacts to any Aboriginal sites as much as possible. All efforts should be made to locate these temporary construction ancillary facilities elsewhere.

- The Aboriginal heritage information management system database search referred to in the Aboriginal cultural heritage assessment report was undertaken on 17 May 2012. An updated Aboriginal heritage information management system database search should be undertaken to ensure that no additional Aboriginal objects or sites have been recorded along, or within the vicinity of, the proposal corridor as part of any other recent assessments or surveys.

Response

All Aboriginal heritage mitigation measures would be consolidated into a construction environmental management plan as either a stand-alone Aboriginal heritage management plan or as a distinct chapter within the construction environmental management plan.

The Aboriginal heritage management plan, whether stand alone or incorporated into the construction environmental management plan would include, but not necessarily be limited to:

- An outline of the protection measures that would be implemented to avoid impacts to Aboriginal cultural heritage values along the proposal corridor.

- Specific measures to be applied to works undertaken in close proximity to identified Aboriginal objects and areas of Aboriginal cultural value to minimise and avoid impacts on these areas. This should include a component within the site induction program for construction workers on Aboriginal heritage along the proposal corridor.

- An outline of the test excavation and / or salvage collection / excavation (by either surface collection or archaeological excavation) activities that would be required to be undertaken prior to the commencement of construction works.

- An outline of the procedure required if any development or any ancillary works are proposed for areas outside of those areas already surveyed as part of the current concept design and identified within the review of environmental factors and the Aboriginal cultural heritage assessment report for the proposal.
An outline of the process that would be followed for ongoing consultation with registered Aboriginal stakeholders and Office of Environment and Heritage, where required.

An outline of the process for how the Aboriginal heritage management plan procedures would be managed and adhered to during the operational life of the proposal, so that there would be no impact on heritage objects / areas additional to that already permitted.

Procedures that would be followed should an auditing program detect an impact on any known and / or any previously unidentified heritage object / area discovered during construction of the proposal.

The proposal does not currently include any planned planting or landscaping actions to be conducted outside of the corridor boundaries. All potential cultural heritage impacts from such planned activities have therefore been covered in the assessments presented in the review of environmental factors.

Roads and Maritime committed to ongoing engagement with adjacent land owners to assess whether early works mitigation (eg landscape planting) can help reduce or soften the visual impacts of the proposal in Section 6.6.4 of the review of environmental factors. In the event that this commitment results in a future decision to conduct landscaping or planting actions outside of the proposal corridor, then, prior to the conduct of any earthworks, a supplementary cultural heritage assessment would be prepared with the aims of:

- Identifying cultural heritage values which may be impacted by the works.
- Identifying the extent and nature of the impact, including cumulative impact.
- Identifying all statutory constraints and requirements.
- Proposing strategies to either avoid or effectively manage and minimise impacts to cultural heritage values are.

The undertaking of any proposed landscaping work would be subject to the results of the cultural heritage assessment (as approved by Roads and Maritime) and any necessary statutory requirements, such as receipt of an Aboriginal heritage impact permit.

The selection process for the locations of temporary construction ancillary facilities outside of the proposal area incorporated both reference to mapped areas of Aboriginal archaeological sensitivity, and a staged set of selection criteria which favoured areas of negligible or low archaeological potential and disallowed areas of moderate or higher potential. This enabled impact to Aboriginal cultural heritage values to be kept to a minimum when selecting potential sites for temporary construction ancillary facilities.

The locations of temporary construction ancillary facilities are identified and assessed in Section 6.7 of the review of environmental factors and Section 6.2.2 of the Aboriginal Cultural Heritage Assessment Report provided at Appendix I of the review of environmental factors. The selection methodology and staged selection criteria are detailed in Section 10 and Appendix 2 of the Technical Paper: Aboriginal Cultural Heritage (Navin Officer Heritage Consultants, 2013a) , which forms Appendix D of the Aboriginal Cultural Heritage Assessment Report (Navin Officer Heritage Consultants, 2013).

Of the seventeen ancillary areas assessed, two (Area 1 and Area 12), would impact areas of Aboriginal archaeological sensitivity and one (Area 8) would be in the vicinity of mature fig trees (MFT) MFT 25 and MFT 26. In each case where an area of archaeological potential would be impacted, that area is situated within the corridor, and thus already subject to the high impacts associated with the construction footprint and its margins. In all other ancillary locations, and particularly where situated outside of the proposal corridor, areas of moderate or greater archaeological potential have been avoided.
Considered selection of the temporary construction ancillary facility areas has limited the cumulative impact of the proposal to the impact of construction activity within the corridor. These impacts can be characterised as extensions of disturbance to sites which have already been impacted by the existing highway. The continued use of the existing highway corridor means that no previously unimpacted zones of artefact occurrence would be disturbed. When viewed in context with the associated Princes Highway construction programs of the Foxground and Berry bypass, and the Gerringong upgrade, the cumulative impact of the proposal can be classed as the least of the three programs. This is because of the use of the previously disturbed corridor, and the similar range and continuous nature of the topographic forms encountered. Cumulative impacts would be greatest within the Foxground and Berry bypass project due to the creation of a new corridor and the varied nature of the landforms traversed.

An updated Aboriginal heritage information management system database search of the study area was undertaken on 22 January 2014. The search revealed that, apart from those already identified in the review of environmental factors, no additional Aboriginal objects or sites have been entered onto the database within the proposal study area since the Aboriginal heritage assessment was undertaken for the proposal.

2.13.2 Impacts from adjustments to public utilities and services

Stakeholder identification number(s)
Office of Environment and Heritage

Issue description

In the submission relating to impacts to Aboriginal heritage values from adjustments to public utilities and other service easements, the respondent queried whether such impacts have been included in the cumulative impacts for the entire proposal and whether each service provider would be required to undertake their own Aboriginal heritage assessment. The respondent believes public utility and service adjustments should be considered as part of the review of environmental factors to ensure an adequate understanding of the Aboriginal heritage values, the potential impacts and the proposed mitigation measures prior to determination.

Response

The assessment of impacts from utility and service adjustments situated within the proposal corridor area have been included as part of the assessment of overall and cumulative impacts of the proposal.

There may be minor utility and service adjustments required outside of the corridor however the nature and scope of any potential adjustment remains unknown at this time. An example may be the relocation of overhead power line poles. In the event that any service adjustments are required outside of the proposal corridor assessed in the review of environmental factors, a supplementary cultural heritage assessment would be prepared prior to the commencement of construction with the aims of:

- Identifying any cultural heritage values which may be impacted by the works.
- Identifying the extent and nature of the impact, including cumulative impact.
- Identifying all statutory constraints and requirements.
- Proposing strategies to either avoid or effectively manage and minimise impacts to cultural heritage values.

The conduct of any proposed work would be subject to compliance with the results of the cultural heritage assessment (as approved by Roads and Maritime) and any necessary statutory requirements, such as the receipt of an Aboriginal heritage impact permit.
2.13.3 Subsurface testing and salvage

Stakeholder identification number(s)
Office of Environment and Heritage

Issue description
The submission relating to impacts to items of Aboriginal cultural heritage significance raised issues about the timing for subsurface testing and the methodology for salvage.

In summary, the respondent raised the following issues:

- There is a recommendation in the Aboriginal cultural heritage assessment report for further subsurface test excavation to be undertaken at site G2B A49 / PASA47 after the review of environmental factors has been determined. All test excavations should be undertaken as part of the environmental assessment stage to ensure an adequate understanding of Aboriginal heritage values prior to determination. This would allow for appropriate management measures to be considered before the design for the proposal is completed. An Aboriginal heritage impact permit could not be issued for the site G2B A49 / PASA47 until the results of the subsurface test excavation have been obtained and considered.

- Aboriginal site impact recording forms must be submitted to the Office of Environment and Heritage in accordance with requirement 16a(13) of the ‘Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW’ (Department of Environment, Climate Change and Water 2010b), for all areas and sites that would be subject to test excavation.

- The proposed salvage methodology provided in Appendix C of the Aboriginal cultural heritage assessment report should be modified so that the information relating to subsurface testing for site G2B A49 / PASA47 is discussed at the beginning of the Appendix, under a test excavation heading, so as not to be confused with the proposed salvage methodology.

Response
During preparation of the review of environmental factors, archaeological subsurface test excavation could not be undertaken within a part of site G2B A49 / PASA47 due to land access restrictions.

These restrictions remain in force and are unlikely to be relaxed until the subject property is acquired by Roads and Maritime. Acquisition is thus a prerequisite for the conduct of the recommended further subsurface investigation at G2B A49 / PASA47.

The lack of site access and its ramifications was discussed with the Aboriginal Focus Group meeting on 25 July 2013, and with the Office of Environment and Heritage on 4 February 2014. Agreement was reached with both the Aboriginal Focus Group and the Office of Environment and Heritage regarding the approach taken in the review of environmental factors. It was agreed that the testing be delayed in this area until access is available. As soon as access is available, and when practicable, the program of archaeological test excavation would be completed within this area in accordance with the subsurface testing methodology outlined in the review of environmental factors which is consistent with the methodology used for the proposal to date.

The proposal would be the subject of ongoing and post-determination environmental assessment, which would allow for management measures identified from the test excavation of the remaining G2B A49 / PASA47 area to be considered and incorporated prior to the completion of the proposal design.

All site impact recording forms relevant to the proposal study area have been submitted to the Office of Environment and Heritage.
The proposed salvage methodology provided in Appendix C of Appendix I - Aboriginal Cultural Heritage Assessment Report (Navin Officer Heritage Consultants, 2013) to the review of environmental factors has been revised so that the information relating to subsurface testing for site G2B A49 / PASA47 is discussed at the beginning of the Appendix, under a test excavation heading, so as not to be confused with the proposed salvage methodology. The revised salvage methodology includes both test pit and salvage excavation methodologies and is presented at Appendix A of this report.

2.13.4 Editorial and cartographic errors

Stakeholder identification number(s)
Office of Environment and Heritage

Issue description

The submission relating to impacts to items of Aboriginal cultural heritage significance raised issues about the need to rectify minor editorial and cartographic errors.

In summary, the respondent raised the following issues:

- Figure A1.20 of the Aboriginal cultural heritage assessment report has no labels and the legend is not consistent with the style formatting of other maps/figures within this appendix.
- The term ‘Levallois’ and its meaning should be included in the Glossary in Appendix 6 of the Aboriginal cultural heritage assessment report as it is referred to within the text of that report (page 32).

Response

The revised Figure A1.20 is set out below. This figure legend is consistent with all other figures; however the PASA (predicted archaeologically sensitive area) number had been omitted and this has been corrected on the figure below.

This figure indicates the number of artefacts recovered per pit during the test excavation. The pit locations are white indicating that no artefacts were recovered. The area was also found not to be a site and as a consequence was not allocated a G2B number.

The following is a definition of the term ‘Levallois’, which should be read in conjunction with the glossary of this report.

**Levallois**: A technique of flake production involving preparation of a bifacial core that is convex on both faces, and then striking a large flake from the flatter of the two faces, from a prepared platform surface. The large flakes (Levallois flakes) and the cores from which they are struck (Levallois cores) have characteristic, identifiable shapes.
Figure 2-1: Revised Figure A1-20 of the Aboriginal cultural heritage assessment report for the proposal
2.14 Non-Aboriginal heritage

2.14.1 Impacts to heritage items

**Stakeholder identification number(s)**

5, 12, Shoalhaven City Council

**Issue description**

Submissions relating to non-Aboriginal (historic) heritage raised issues about the preservation of heritage items which would be impacted by the proposal.

In summary, the respondents raised the following issues:

- The proposed boundary line for the Pomona property runs directly through the trees located at the corner of Lamonds Lane and the Princes Highway. These trees are of considerable value as they have been there since 1893 and are seen as an icon of the Meroo locality. The impact on these trees by the proposal should be minimised.

- On Pestells Lane is a row of Osage Orange trees believed to be one of the few remaining plantings in the Shoalhaven. The trees are over 80 years old and should be preserved.

- The proposal would have considerable impact on a number of identified heritage items including the complete loss of two heritage items and partial impact to eight sites. The review of environmental factors assessment of the impacts identified a range of safeguards and management measures, however it did not consider alternative options / routes to minimise the impact on heritage items.

**Response**

The group of Eucalyptus trees on the north side of the intersection of Lamonds Lane and the Princes Highway is an apparent remnant of the 'blue and spotted gum forest' which, together with 'dense brush', was present on the ‘Pomona’ property at the time of its sale to John Muller in 1893. A description of the property in 1907, noted that small clumps of trees had been retained as shade for a dairy herd (The Town and Country Journal 4 Sept 1907, p.23; refer pages C-55 – C-61 of Appendix J: Technical Paper: Non-Aboriginal Heritage (Navin Officer Heritage Consultants 2013b) to the review of environmental factors).

It is acknowledged that this tree group forms a prominent part of the local landscape and was a location for past Pomona and local community social events such as annual Sunday school picnics (p.C-57 of the Technical Paper: Non-Aboriginal Heritage provided at Appendix J of the review of environmental factors). A portion of the trees was subsequently included in an expanded highway easement following widening of the highway in the 1970s and 1980s.

The alignment and associated footprint of the proposal has been carefully defined so that impact to non-Aboriginal heritage items in the Meroo Meadow area is either avoided or minimised, according to the relative values of each item. The heritage items involved are the Meroo Union Church and tree plantings (G2B H3), the former Meroo Meadow Public School and residence (G2B H4), the ‘Pomona’ homestead complex (G2B H46), the site of the former Meroo Meadow public hall (G2B H67), an avenue of planted road-side trees (G2B H78) and a former ‘Meroo Station’ hut site (G2B H88). The former Meroo Meadow Public School and residence (G2B H4), a former ‘Meroo Station’ hut site (G2B H88), and the Meroo Union Church and tree plantings (G2B H3), present constraints to the west of the alignment. The ‘Pomona’ homestead and grounds (G2B H46) forms a heritage constraint to the east. Any substantial realignment of the proposal to the west with the aim of avoiding impact to the Eucalyptus trees would necessitate direct impact to the Meroo Union Church grounds and trees (G2B H3) on the opposite side. In addition, considerable land acquisition would then be required on the western side of the highway south of Boxsells Lane.
The alignment of the proposal through Meroo Meadow balances multiple heritage considerations, including the recognition, based on assessed significance values, that the conservation of the Meroo Union Church grounds and boundary trees (G2B H3) has a higher priority than the conservation of the landscape values of the Eucalyptus tree group on the opposite side. An unavoidable consequence of this is that a substantial number of the trees in the Eucalypt group would be directly impacted by construction of the proposal.

Roads and Maritime recognises the need, as far as is feasible and reasonable, to minimise the impact to the Eucalyptus tree group, and the adjacent surrounds of the ‘Pomona’ homestead complex (G2B H46). To this end, Roads and Maritime would review the proposal boundary adjacent to the ‘Pomona’ property with a view to minimising land acquisition, and the net impact to the Eucalypt tree group. This undertaking compliments safeguards and management measures detailed in Section 6.8.4 of the review of environmental factors and existing recommendation number 18 of the Technical Paper: Non-Aboriginal Heritage (Navin Officer Heritage Consultants, 2013) provided at Appendix J of the review of environmental factors, which states that the proposal corridor boundary should be revised, if reasonable and feasible, so that the existing enclosed front garden and yard around the ‘Pomona’ homestead (G2B H46) is excluded from the highway corridor. This action would also involve movement of the proposal boundary to the west. Refer to Section 2.1.5 – Property and land use for further information regarding requested boundary adjustments.

The Osage Orange trees (Maclura pomifera) mentioned by a respondent consist of an alignment of around 11 trees on the eastern side of Pestells Lane, and extend for approximately 95 metres, between map grid co-ordinates 280244.6144542 and 280257.6144634.

The trees occur well outside of the study area for the proposal (defined as the proposal corridor and an area inclusive of 200 metres from the corridor boundary), and as such fall outside of the scope of the proposal assessment. The trees would not be impacted by the proposal.

One respondent suggested that the review of environmental factors heritage assessment did not consider alternative options or routes to avoid or minimise the impact on heritage items. However it is noted that during the development of the proposal, consideration has been given to alternative routes and/or alignment revisions. An integral part of the development of the concept design, on which the review of environmental factors was based, was an assessment of multiple route options (refer to Section 2.5.2 and Section 2.5.3 of the review of environmental factors). This was conducted as a preliminary assessment and employed a matrix of relatively weighted, assessment criteria, including the avoidance and minimisation of cultural heritage impacts. This process achieved, where possible, and in relative consideration of other criteria, the best possible heritage outcomes.

At a finer scale of analysis, the consideration of alternative alignments was incorporated into the assessment of impact for each heritage item. These assessments are outlined as part of a Statement of Heritage Impact for each item and compiled in the Technical Paper: Non-Aboriginal Heritage (Navin Officer Heritage Consultants, 2013) provided at Appendix J of the review of environmental factors.

2.15 Property and land use

2.15.1 Land use and development

Stakeholder identification number(s)

12, 43

Issue description

Submissions relating to land use and development raised issues about the impact from the proposal on future development plans for properties.
In summary, the respondents raised the following issues:

- There is a subdivision approval for a property on Pestells Lane for three blocks of land fronting Pestells Lane which would be adversely impacted by an upgrade of Pestells Lane and any widening to the east.
- A property on Mullers Lane currently has a strategic relationship with the Department of Primary Industries focussed on property improvement initiatives to enhance pasture, livestock management, cropping, fencing, landscaping etc to facilitate a business on this property. The business is reliant on land size as a condition of development consent and therefore the business and associated improvements may be impacted by an incursion onto the property by the proposal.

Response

Changes to the preliminary concept design as a result of community feedback received in 2012 included realigning the Pestells Lane / Meroo Road grade-separated half-interchange to the north to reduce impacts on local property owners. Despite this design adjustment, the proposal would still result in the acquisition of about 0.57 hectares (three per cent) of the property on Pestells Lane for the construction of the Pestells Lane / Meroo Road grade-separated half-interchange. The proposal does not however include upgrading or widening Pestells Lane, and would therefore not impact on the proposed subdivision of the property fronting Pestells Lane.

The proposal would result in the acquisition of about 0.17 hectares (four per cent) of the property on Mullers Lane.

The proportion of land to be acquired at these two properties to accommodate the footprint of the proposal is only a small percentage of the overall lot. Further, the required acquisition at these properties is adjacent to the existing highway and would not inhibit the use of residual land for its existing and potential future purposes. Impacts of the proposal on existing and future land use and development are not expected. Roads and Maritime would continue to consult with landowners of the Pestells Lane and Mullers Lane properties throughout the detailed design phase of the proposal.

All property acquisition for the proposal would be undertaken in accordance with the Land Acquisition (Just Terms Compensation) Act 1991 and the ‘Roads and Maritime land acquisition information guide’ (Roads and Maritime, 2014).

Business impacts as a result of the proposal are discussed in Section 6.10.2 of the review of environmental factors and Section 2.16.2 – Business impacts of this report.

2.15.2 Property boundaries and acquisition

Stakeholder identification number(s)

5, 6, 11, 12, 15, 28, 32, 37

Issue description

Submissions were received relating to various requests to amend proposed property boundaries to reduce the impact on individual properties. Submissions were also received about the property acquisition process.
In summary, the respondents raised the following issues:

• There is a current road zoned through a property in Meroo Meadow. The respondent requests that this land be acquired now as part of the proposal.

• The respondent requests that no further property acquisition occurs for a property at Meroo Meadow, or the neighbouring property, to enable the existing access to the property from the highway to be retained.

• The proposed boundary line along the front of a property in Meroo Meadow is about 10 metres from the front of the house which is too close. There would be a large area between the boundary and the road which would become overgrown if not maintained, providing a risk to the house from vermin (snakes, rats etc) and fire. The respondent requests that the proposed boundary be moved back towards the highway. Temporary access over this property could be provided during construction, if required, with the boundary moved back towards the highway following completion.

• The respondent requests that the boundary line that runs along the northern side of a property in Meroo Meadow be moved further back towards the highway. This would reduce the loss of valuable grazing land and reduce the impact on an important stand of trees.

• The respondent requests that the location of the proposed boundary line for a property in Meroo Meadow is reviewed to reduce the impact on the property.

• The respondent requests that the proposed new boundary fence between a property on Pestells Lane and the upgraded highway is a straight line as this would be easier to build and maintain.

• The respondent requests that the existing trees along the proposed new boundary fence between a property on Pestells Lane and the Princes Highway be cleared to allow tractor access along the respondent's side of the fence. This would enable fence checking, maintenance and would minimise trees falling on the fence in high winds.

• Land on the eastern side of a property on Pestells Lane would be acquired to accommodate the proposal. The respondent is concerned that further acquisition of land on the western side of the property would be required to upgrade Pestells Lane. The respondent requests that the impact on the property from any further acquisition should be considered when planning the upgrade of Pestells Lane.

• The proposal would impact on the future rental and saleable viability of a property in Jaspers Brush as a result of the boundary fence being located within a few metres of the residence. This is contrary to advice the respondent has previously received whereby the new boundary would encroach on the residence and the house would be demolished and compensation provided. The respondent requests further discussion with Roads and Maritime in relation to this issue and would seek compensation for any loss of value of the house should the proposed boundary location remain unchanged.

• The respondent requests that the location of the proposed property boundary for a property in Jaspers Brush be reviewed and relocated so it is as close as possible to the proposed road boundary as the proposed property boundary in its current location would impact the viability of the business operated on this property. If, during construction, extra land is required, a short term lease back from the property owners to Roads and Maritime could be considered.

• The respondent requests that consideration be given to the relocation of the proposed property boundary between a property in Jaspers Brush and the highway to reduce the proposed land acquisition which seems excessive, inconsistent with the rest of the boundary relocations and would impact the viability of the business operated on this property.

• The respondent requests details regarding the area of land that would be acquired from a property in Jaspers Brush, when the acquisition would take place and how the compensation for land acquisition is calculated.

• The respondent requests information on whether a property on Croziers Road would be acquired as part of the proposal. Although the land would not be directly affected, the respondent's views, peace and lifestyle would be greatly affected during both construction and operation. Information is also sought about the options available if the owner decides to move from the property.
Response

The area of land required for the proposal has been refined throughout the development of the preliminary concept design, based on discussions and feedback from affected landholders. This is detailed in Table 5-3 of the review of environmental factors. Details regarding the land proposed to be acquired to accommodate the footprint of the proposal are provided in Section 6.9 of the review of environmental factors.

Mitigation measures to minimise the impacts to surrounding residences throughout the construction and operation of the proposal have been identified as part of the environmental impact assessment of the proposal and are summarised in Section 7.2 of the review of environmental factors.

The unmade road zoned through a property in Meroo Meadow has been reserved by Shoalhaven City Council for a future regional services corridor. Roads and Maritime is not the acquiring authority for this land.

The boundary of a property in Jaspers Brush has been realigned to make it consistent with the alignment of adjacent property boundaries. This would necessitate the demolition of a residence and compensation would be provided in accordance with the Land Acquisition (Just Terms Compensation) Act 1991 and the ‘Roads and Maritime land acquisition information guide’ (Roads and Maritime 2014). This is detailed further in Chapter 3 – Changes to the proposal.

Rods and Maritime acknowledges that there have been numerous requests received for additional or reduced property acquisition at individual properties, as well as for adjustments to property boundary lines that abut the proposal. Acquisition and boundary adjustments requested in submissions to the review of environmental factors would be considered on a case by case basis during the acquisition phase of the proposal in consultation with the relevant landowners.

Further investigation into the setting of new property boundaries has identified that irregularly shaped boundary lines are impractical to survey in the field and make fencing and maintenance more difficult. Property boundaries will be reviewed by Roads and Maritime property and survey officers with the project team to simplify the new property boundaries to address this. This essentially involves reducing the number of kinks, angles and short straights in the new boundary lines of each property. Owners of properties where the new boundary lines would be adjusted will be advised initially and then consulted during the acquisition phase of the proposal.

All property acquisition for the proposal would be undertaken in accordance with the Land Acquisition (Just Terms Compensation) Act 1991 and the ‘Roads and Maritime land acquisition information guide’ (Roads and Maritime, 2014)\(^4\).

2.15.3 Property access

Stakeholder identification number(s)

5, 7, 11, 15, 18, 28, 32, Department of Primary Industries - Fisheries NSW

Issue description

Submissions relating to both external and internal property access raised issues about location, safety, functionality and capacity of external and internal property accesses.

\(^4\) The ‘Roads and Maritime land acquisition information guide’ (Roads and Maritime 2014) only applies to properties that would be directly affected by the proposal. A property is said to be directly affected when Roads and Maritime would need to acquire part or all of the property in order to construct the proposal.
In summary, the respondents raised the following issues:

- The proposed access to a property in Meroo Meadow is too steep. The existing access levels out to the house but following the proposal this access would not be able to be maintained without impacting the house or land. The property requires access for semi-trailers and B-double milk tankers.

- An existing access via double gates from the Princes Highway to an old dairy on a property in Meroo Meadow has not been shown in the concept design.

- Access for all machinery to a property in Meroo Meadow is via an access gate located off the Princes Highway. The gate is used for farming purposes and for Endeavour Energy to access the property. Access from the existing highway would be removed as part of the northbound off ramp at the Pestells Lane / Meroo Road half-interchange. Request for the access to this part of the property to be maintained at all times, preferably from the upgraded highway.

- In the event that the access to a property in Meroo Meadow from the Princes Highway cannot be maintained, the respondent requests that an alternate property access be provided from Abernethys Lane and that a formalised creek crossing be constructed over Abernethys Creek to maintain internal access.

- The access to a property in Meroo Meadow would be removed as a result of the proposal and consequently the alternate access from Lamonds Lane would need to be upgraded to accommodate B-doubles and semi-trailers. Preferably, the access from Lamonds Lane should remain in its current position as trees on the eastern side of the access way provide shade for cattle. If additional land is required to accommodate B-doubles and semi-trailers, it should be taken from the northern side of Lamonds Lane (between the highway and the existing access).

- The access to a property in Meroo Meadow would need to cater for semi-trailers and B-doubles.

- The access proposed for a property at Meroo Meadow would:
  - Cut through an earth mound constructed to mitigate road noise.
  - Require demolition of long established plantings including trees, garden beds, part of a (probably 19th Century) hedge of *Dovyalis caffra* and a pet graveyard.
  - Alter the character and layout of the well-developed garden.

  It would be preferable for the property access to be located between the southern side of the hedge and sheds, leading directly into the top of the existing driveway. A single lane gravel road across the adjacent paddock with a cattle grid at each end seems to be all that would be required.

- The community update indicates that the current access for a property in Meroo Meadow would be retained, but the 3D animation does not depict this. The respondent requests clarification regarding whether the existing property access would be retained.

- The respondent requests that the existing bridge underpass under Flying Fox Creek at a property in Jaspers Brush be retained and increased in size to a minimum height of 4.8 metres and a minimum width of five metres. Increasing the size of the underpass would allow machinery to pass underneath the highway to access the property, keeping slow moving farm machinery off the highway. Access changes for the property and O'Keeffes Lane would only allow left-in, left-out access which would greatly increase travel distances. These distances would be reduced if the underpass was modified.

- There is a well-used access track for vehicles and possibly stock which runs under the existing Princes Highway bridge over Flying Fox Creek. It has a concrete base in the bed of the creek and gates. If this access track is to be maintained then Fisheries NSW would need to review and approve the proposed bridge and track design. The current design appears to allow the access to continue in the creek bed. Fisheries NSW does not support this. If the underbridge access is to occur the bridge design needs to be revised to include an underpass track located up on the bank close to the abutment and well away from the edge of the creek.
The access arrangements for a property at Jaspers Brush would need to accommodate the following scenarios safely:

- Towing a 6.1 metre boat, box trailer or dog trailer. Provision is required to enable parking on the northbound verge of the highway while the entrance gate is secured.
- Truck access to the property for occasional cattle movements.
- Trucks (including garbage collection trucks) exiting the property would need enough joining road for vehicles to safely accelerate to join the highway and cross into the right hand lane to access the u-turn facility at Mullers Lane.

Operational safety of the entrance gate to a property in Jaspers Brush would need to be maintained. Previous consultation has advised there would be sufficient shoulder space as a continuance of the joining lane from Croziers Road. The respondent requests clarification about what distance would be available to enable acceleration to highway speed and merging into northbound traffic.

The respondent requests information regarding the proposed location and gradient of the driveway to a property in Jaspers Brush, and where the access laneway would join Jaspers Brush Road.

Response

Some external property accesses would be affected by the proposal. In a number of cases, property accesses would be permanently modified. Changes to property accesses have been discussed with affected landowners throughout the development of the concept design for the proposal and during the display of the review of environmental factors.

Although it has not been shown on the concept design, the existing access via double gates from the Princes Highway to an old dairy on a property in Meroo Meadow would be retained. The final levels for this access would be determined during the detailed design phase of the proposal.

The access to the property that abuts the Princes Highway south-east of the Morschels Lane / Devitts Lane grade-separated facility would be retained rather than relocated. By retaining the existing access, there would be no impacts to the existing plantings, garden and pet graveyard and no earth mound would need to be constructed. Retention of this access would require adjustments to the level of this access, which would be finalised in consultation with the landowner during the detailed design phase of the proposal. It is acknowledged that the existing access to this property is not shown on the 3D animation, however, it would be shown on the refined design drawings.

Roads and Maritime acknowledges that there have been numerous requests received for modifications to proposed property accesses. Access changes requested in submissions to the review of environmental factors would be considered on a case by case basis during the detailed design phase of the proposal in consultation with the relevant landowners. Consultation would include discussion of issues raised in submissions with the aim to agreeing upon and finalising changes to property access arrangements at affected properties, including final access locations, property access specifications (such as gradients) and the method of entry and exit from properties directly onto the highway. Where practicable throughout the proposal, property access arrangements, including vehicle and stock underpasses would be modified to accommodate movements for heavy vehicles, including B-doubles and semi-trailers, as well as vehicles towing trailers, boats and horse floats.

The design of the underpass at Flying Fox Creek would be modified as described in Chapter 3 – Changes to the proposal. The vehicle and stock underpass would be retained, but would be modified to remove it from the creek bed. The revised design would provide improved access for machinery.
2.16 Socio-economic

2.16.1 Amenity

**Stakeholder identification number(s)**

5, 9, 11, 13, 15, 17, 26, 28, 37, 43, 46

**Issue description**

Submissions relating to amenity raised issues about the impact on the existing lifestyle of residents as a result of both construction and operation of the proposal.

In summary, the respondents raised the following issues:

- Properties in Meroo Meadow would be affected by construction noise, fumes, dust, mud and clutter.

- Additional property acquisition at a property in Meroo Meadow to resolve property access issues would have an adverse impact on the respondent’s current lifestyle.

- The proposal would move the edge of the nearest highway lane from 29 metres to 22 metres from the boundary of a property in Meroo Meadow, 30 metres to 23 metres from the historic Meroo Public School building and 39 metres to 32 metres from the historic teacher’s residence. Future widening would reduce this by another 3.5 metres. The road pavement would also be raised by about 2.1 metres in front of the property reducing the existing cutting from four metres to two metres. This would considerably add to a loss of privacy and the respondent requests that the design be reviewed with the aim to achieving a better result in terms of horizontal and vertical alignment in this location.

- The hedge located just to the north of the house on a property in Meroo Meadow is important in so far as it provides screening and a windbreak for the house.

- The Pestells Lane / Meroo Road half-interchange would result in an increase in traffic volume, noise and emissions at a property in Meroo Meadow. This would impact on the peace and privacy of the property. The property (layout of building and tree planting) has been designed to lessen the impact of vehicles from the Princes Highway and Meroo Road. The construction of the Pestells Lane ramp would negate the efforts made regarding noise and privacy, with the property becoming a traffic island surrounded by roads on all sides. Vehicles travelling north from the western side of Pestells Lane would have to circumnavigate the property to access the northbound access. Additional local traffic from Bomaderry would also use the Pestells Lane ramp to travel north.

- Relocation of the Pestells Lane / Meroo Road grade-separated half-interchange to the current Meroo Road / Princes Highway intersection would reduce noise impacts to the neighbourhood south of a property at Meroo Meadow.

- The review of environmental factors indicates that traffic volumes on all sides of a property in Meroo Meadow would increase five-fold and would pass about 33 metres from the property and living areas. This would have a severe impact on lifestyle and sleeping patterns.

- A property in Meroo Meadow would be affected by noise, vibration, reduced air quality and road grime as a result of the proposal. The bedrooms and verandah are at the front of the house which faces the highway. The upgraded highway would be within two metres of the house and the equivalent height of the house roof. The proposal would affect the respondent’s future plans to upgrade the property.

- Construction and operation of an overpass at Strongs Road would have a considerable impact on families living on Strongs Road and Jaspers Brush Road. Properties on Strongs Road would be affected through a loss of privacy and amenity as a result of the Strongs Road overpass and connecting roads.

- A property in Jaspers Brush would be stuck "in the middle of a roundabout" as a result of the overpass connecting Strongs Road to Jaspers Brush Road with the height of Strongs Road rising by up to half a metre.
• The highway outside a property in Jaspers Brush would be raised by about five metres with the proposed boundary located almost at the front door of the residence. The respondent requests that consideration to be given to relocation of the residence, as the proposed location of the highway would make it virtually uninhabitable, to maintain the respondent's quiet enjoyment of the residence. Also the residence, in its current location, has a sight distance of only 350 metres to the heavy vehicle inspection bay (Roads and Maritime has stated a desirable sight distance of 500 metres). Moving the residence would allow for the 500 metre sight distance to the heavy vehicle inspection bay.

• A property in Jaspers Brush would look directly at two u-turn bays. The turning bays could be used by cars to perform donuts and burnouts.

• A business in Berry is being marketed and promoted as an 'executive luxury pet accommodation and farm stay for pets'. The proposal would seriously impact on the amenity and delivery of this concept which is subject to minimum size requirements as a condition of development consent.

Response

It is acknowledged that the construction of the proposal would result in noise, vibration and air quality impacts. The potential amenity impacts of the proposal have been assessed within Section 6.2 and Section 6.12 of the review of environmental factors, with mitigation and management measures identified to minimise potential impacts. A construction noise and vibration management plan and an air quality management plan would be developed and implemented prior to the commencement of construction. These plans would identify feasible and reasonable approaches to reducing noise and vibration and air quality impacts during construction. Where possible, noise intensive works would be undertaken during standard working hours to limit disturbance to sleeping patterns and temporary noise barriers would be utilised during the construction period.

Potential amenity impacts associated with noise, surface and groundwater (including mud and debris (clutter)) and visual amenity have been assessed within Section 6.2, Section 6.4 and Section 6.6 of the review of environmental factors respectively. A noise and vibration management plan would be developed during detailed design that will identify all feasible and reasonable measures to manage and mitigate noise impacts from the construction of the proposal. Roads and Maritime would also identify and implement all feasible and reasonable safeguards and management measures to mitigate noise during operation of the proposal in consultation with sensitive receivers. A soil and water management plan would be developed and implemented prior to commencement of construction in order to identify feasible and reasonable approaches to mitigating increased sediment and changes in surface water flows and conditions. An urban design and landscape concept plan would be implemented to mitigate potential loss of visual amenity or landscape character. Where possible, excessive removal of vegetation would be avoided and adjacent land owners would be engaged to assess whether early works mitigation can be implemented to help reduce or soften the visual impacts of the proposal.

Relocation of the Pestells Lane / Meroo Road grade-separated half-interchange to the current Meroo Road / Princes Highway intersection would reduce noise impacts on nearby residences to the south (refer to Section 2.8.4 – Operational noise and vibration – Emerald Drive), but would increase noise impacts on nearby residences to the north.

Where possible, the orientation of property boundaries has been considered during the design of the proposal so that the impact on properties would be minimised. Roads and Maritime would consider all requests made in submissions for boundary adjustments, including consideration of functional hedges used as windbreaks or privacy, proximity of the highway to residences, proximity of residences to the heavy vehicle inspection bay and property access refinements, during the acquisition or detailed design phases of the proposal in consultation with the relevant land owner.
An upgrade of the Princes Highway has been under consideration since the early 1990s, along with the allocation of some adjacent land for the potential widening of the highway corridor. Property impacts are expected to be largely limited to minimal strip acquisition. Roads and Maritime would acquire land in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* where the property is directly impacted. Property that is not directly impacted would not be purchased. On occasion, and in accordance with Roads and Maritime policy, Roads and Maritime may purchase the total property even if only part of it is required for the proposal. This typically occurs when the effect of the proposal on the remaining land is considered so major that it warrants total purchase. This would be considered on a case-by-case basis during the acquisition and detailed design phases of the proposal. Where partial acquisition is undertaken, the valuation of the property for compensation purposes would consider the impact on the value of the remaining portion of land. This consideration would include the earning capacity of the land.

It is anticipated that local law enforcement and highway patrol would monitor the highway, as currently occurs, to discourage anti-social activities (such as cars performing donuts and burnouts). It is anticipated that the proposal would increase road safety for both vehicles and pedestrians.

It is acknowledged that some dwellings would become visible from the highway as a result of the proposal. As passing drivers would be travelling at highway speeds, it is not anticipated that privacy would be considerably disrupted except in the case of an increased number of passing pedestrians or cyclists. Where possible, privacy screening may be considered for adversely affected properties in the detailed design phase of the proposal.

Further design changes were requested and/or concerns raised in submissions received during the display of the review of environmental factors. Each request/concern has been considered by Roads and Maritime as documented in Section 2.3 to Section 2.20 and Chapter 3 – Changes to the proposal. Further information on specific design features relating to operational road noise concerns regarding amenity is provided as follows:

- Modifications to the highway alignment near Merroo Meadow, refer to Section 2.4.1 – Road design and Chapter 3 – Changes to the proposal.
- Overpass at Strongs Road, refer to Section 2.7.12 - Jaspers Brush Road and Strong Road – access and safety.

2.16.2 Business impacts

**Stakeholder identification number(s)**

5, 11, 12, 13, 15, 28, 29, 43

**Issue description**

Submissions relating to business impacts raised issues about the impact on existing and future business opportunities and viability as a result of the proposal.

In summary, the respondents raised the following issues:

- The Pestells Lane / Merroo Road half-interchange would reduce the size of a property in Merroo Meadow which would impact silage production and income. The interchange would also impact on the carrying capacity of the property which until recently ran cattle and horses. It is the respondent's intention to restock the property in the near future. The business is dependent on bank loans secured against the property and any reduction in the value of the property would impact the business ability to borrow against the equity of the property and limit the opportunities to grow the business.
- The hedge located just to the north of the house on a property in Merroo Meadow is important in so far as it provides screening and a windbreak for the orchard which is used by the business for running young calves.
The hedge which runs south from the driveway at a property in Meroo Meadow provides valuable protection for stock from severe westerly winds experienced in winter. Any upgrade of Pestells Lane should not impact this hedge.

Land currently used for grazing and working paddocks at a property in Meroo Meadow would be affected by property acquisition for the proposal. Property acquisition would result in less paddock space, unviable areas of land, reduced grazing land for cattle and would require additional internal fencing. This would affect agricultural income. A buffer zone enforced by Council further impacts on the availability of pasture land at the property.

A property in Meroo Meadow would be affected by the close proximity of the proposal. It would be difficult for the owner to replace the property which is a residence and a business, close to town, close to the business operator's homes, close to businesses that service the machinery and has easy access to farms serviced by the business. The proposal would affect the respondent's future plans to upgrade the property.

An existing property access to a property in Meroo Meadow from the Princes Highway would be unviable as a result of the proposal. The proposal would remove the only access which accommodates farm machinery on the property and any additional property acquisition in order to resolve this property access issue would have adverse impacts on the farming business.

A business in Jaspers Brush is one of the largest employers in the Berry area and the largest agricultural industry employer in the region. Relocation of the business in the current environment is not possible due to both financial and alternative land suitability reasons. The following would reduce the impact of the proposal on the company's operations:

- Land currently operated by the business includes land leased from Roads and Maritime. The respondent has been asked to vacate the entire premises although it is not all required for construction of the proposal. The respondent requests that the lease be renegotiated and limited to the area of land not required for the development of the proposal.

- Relocation of the boundaries for a property in Jasper Brush to reduce the proposed land acquisition, reduce the impact of the proposal on the property and assist the property to remain viable as a turf farm.

- Relocation of the boundaries for a property in Jasper Brush to a position as close as possible to the highway to reduce the proposed land acquisition, reduce the impact of the proposal on the property and assist the property to remain viable as a turf farm. The amount of land proposed for acquisition equates to about 50 per cent of the paddock length which would impact on the turf farm operations as the remaining paddock would no longer be economically viable for turf farming. If extra land is required during construction, a short term lease back from the property owners to Roads and Maritime could be considered.

A property in Berry was specifically purchased for lifestyle and business prospects. Considerable investment has been made to enable future development and any incursion onto the property would pose a considerable impediment to the respondent's lawful right to conduct a business of this type. The proposal would seriously impact on the amenity and delivery of this concept. The development consent for the business has a strict relationship and reliance on land size for approval purposes and diminution of the available land would considerably impact on the business scope.

There are some delivery services in Bomaderry which currently restrict deliveries to the hinterland of Boxsells Lane due to the condition of some local roads. If these delivery services are required to travel additional distances as a result of the proposal to reach properties within this restricted delivery area, the service may be stopped altogether. This would require business owners to travel to Bomaderry to collect deliveries increasing business costs. Also, if the service does continue delivery charges may increase due to additional travel distance.
Response

Where possible, the orientation of property boundaries has been considered during the design of the proposal so that the impact on properties and businesses would be minimised. Roads and Maritime would consider all requests made in submissions for boundary or property access adjustments, including functional hedge locations, during the acquisition or detailed design phases of the proposal in consultation with the land owner. Submissions for boundary or access adjustments for businesses would also be considered during the acquisition or detailed design phases of the proposal. Where possible, Roads and Maritime would aim to maintain the viability of businesses impacted by the proposal by minimising land acquisition where possible and maintaining access during construction and operation of the proposal. The desire for farmers and property owners to remain on properties to manage operations during the construction period is noted and Roads and Maritime would implement all reasonable measures to achieve this if possible.

The proposed highway upgrade has been under consideration since the early 1990s, along with the allocation of some adjacent land for the potential widening of the highway corridor. Property impacts are expected to be largely limited to minimal strip acquisition. Roads and Maritime would acquire land in accordance with the Land Acquisition (Just Terms Compensation) Act 1991 where the property would be directly impacted. Property that would not be directly impacted would not be purchased. On occasion, and in accordance with Roads and Maritime policy, Roads and Maritime may purchase the total property even if only part of it would be required for the proposal. This typically occurs when the effect of the proposal on the remaining land is considered so major that it warrants total purchase. This would be considered on a case-by-case basis. Where partial acquisition is undertaken, the valuation of the property would be determined in consideration of the impact on the value of the remaining portion of land. This consideration would include the earning capacity of the land.

This proposal does not include the upgrade of any local roads. The proposal is however expected to decrease travel times between Berry and Bomaderry (from 12.9 to 11.8 minutes) and increase safety for traffic travelling to and from Bomaderry. Should a right hand turn not be available for the delivery of goods, the additional distance to a u-turn bay is expected to be minimal and would not have a major impact on travel times (the maximum additional travel time between 2.1 and 4.4 minutes), particularly considering the higher travel speeds that would be achievable on the upgraded highway.

There are a number of factors that influence property values and it is currently not clear that there would be any impact on property values due to the proposal. Local factors that contribute to property values include physical characteristics of the property, location, connectivity to employment and commercial centres, social and economic characteristics of the community and amenity. The proposal would increase connectivity and reduce travel times to regional hubs which are generally beneficial to businesses and property values.

2.16.3 Community cohesion / severance

Stakeholder identification number(s)

13, 46

Issue description

Submissions relating to community cohesion and severance raised issues about properties becoming cut off and isolated from the surrounding community as a result of the proposal and the need for increased pedestrian access across the highway.
In summary, the respondents raised the following issues:

- A property in Meroo Meadow would become a traffic island surrounded on all sides by major arterial roads. The existing views to the neighbouring farms would be cut causing a feeling of isolation from the community. Noise barriers would further heighten the sense of isolation.

- Future development in the vicinity of the proposal would increase the need for pedestrian access across the highway. Currently, the only east / west access across the highway between Cambewarra Road and Pestells Lane would be at Cambewarra Road and Pestells Lane. Underground pedestrian / cycle tunnels should be provided in between these two crossing locations to reduce the impact of the physical barrier created by the proposal.

Response

The proposed highway upgrade has been under consideration since the early 1990s, along with the allocation of some adjacent land owned by Roads and Maritime for the potential widening of the highway corridor and the road reservation set aside for the extension of Pestells Lane between the Princes Highway and Meroo Road. Apart from the alterations to accommodate the new roundabout at the corner of Meroo Road and Pestells Lane, Meroo Road is not anticipated to be altered and is not expected to obstruct views of neighbouring farms. Meroo Road and Pestells Lane are expected to be used by local traffic only. The proposal provides opportunities for increased connectivity for property owners through reduced travel times to local and regional centres which connect them with their local and regional communities.

Potential amenity impacts associated with visual amenity have been assessed within Section 6.6 of the review of environmental factors. An urban design and landscape concept plan would be implemented to mitigate potential loss of visual amenity or landscape character. Where possible, excessive removal of vegetation would be avoided and adjacent land owners would be engaged to assess whether early works mitigation can be implemented to help reduce or soften the visual impacts of the proposal.

A noise barrier assessment conducted for the proposal determined that no permanent noise barriers would be constructed under the proposal. The noise barrier assessment is discussed in Section 2.8 – Noise and vibration, Section 6.2.4 (page 160) of the review of environmental factors and Section 6.2 of the Technical Paper: Noise and Vibration (AECOM, 2013a) provided at Appendix D of the review of environmental factors.

The potential noise impacts of the proposal have been assessed in Section 6.2.4 of the review of environmental factors and mitigation and management measures have been identified in Section 6.2.5 of the review of environmental factors to minimise potential impacts. A construction noise and vibration management plan would be developed and implemented prior to the commencement of construction.

On-going consultation with the property owner would be undertaken to minimise the impacts of the proposal.

In response to submissions, Roads and Maritime has agreed to introduce a footpath on the Strong Street and Pestells Lane overbridges and the Morschels Lane underpass. The highway crossings provided at these locations would include a two metre shoulder for cyclists as well as a one metre footpath for pedestrians on each side. Details are provided in Chapter 3 – Changes to the proposal. These additional access points are considered to provide sufficient pedestrian access across the highway to address the impacts of the proposal. Shoalhaven City Council made a submission to the November 2013 display of the proposed concept design and review of environmental factors. Council made no mention of any pedestrian underpasses nor any future rezoning of land for urban residential use. If additional access across the highway is required in the future as a result of other projects, this would be considered as part of those projects at that time.
2.16.4 Property values

**Stakeholder identification number(s)**
6, 13, 17, 26, 28, 37

**Issue description**
Submissions relating to property values raised issues about the impact on property values as a result of the proposal and whether compensation would be provided by Roads and Maritime.

In summary, the respondents raised the following issues:

- The Pestells Lane / Meroo Road half-interchange would substantially impact on the value of properties in Meroo Meadow and make any future sale difficult.
- The boundary fence for a property in Jaspers Brush would be moved to within a few metres of the residence. The house would remain rather than being demolished (this is contrary to previous consultation whereby the owner was advised the house would be demolished and compensation provided). The proposal would make the house worthless due to the close proximity of the upgraded highway and also the impact on the property during the construction phase. The property is currently rented and the owner's ability to attract a tenant during the construction phase would be impacted due to potential traffic hazards, congestion, excessive noise, debris and dust and probable power and water disruptions. The impact of the proposal would decrease the value of the property considerably, if not completely, making it worthless as either a rental or a saleable property. Compensation would be sought in this situation.
- All properties impacted by the Strongs Road overpass would be devalued, without compensation.
- The value of a property in Jaspers Brush would decrease dramatically as a result of the Strongs Road overpass. Compensation should be provided by Roads and Maritime for the loss in value to the property.
- Would compensation be received for the decrease in property values as a result of the proposal?

**Response**
There are a number of factors that influence property values and therefore it is currently not clear that there would be any impact on property values due to the proposal. Local factors that contribute to property values include physical characteristics of the property, location, connectivity to employment and commercial centres, social and economic characteristics of the community and amenity. The proposal would increase connectivity and reduce travel times to regional hubs which are generally beneficial to businesses and property values.

Where possible, the orientation of property boundaries has been considered during the design of the proposal so that the impact on properties would be minimised. Roads and Maritime would continue to consider all requests made in submissions for boundary adjustments or property access during the acquisition or detailed design phases of the proposal in consultation with the land owner.

The proposed highway upgrade has been under consideration since the early 1990s, along with the allocation of Roads and Maritime owned land adjacent to the highway for the potential widening of the highway corridor. Property impacts are expected to be largely limited to minimal strip acquisition. Roads and Maritime would acquire land in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* where the property would be directly impacted. Property that would not be directly impacted would not be purchased. On occasion, and in accordance with Roads and Maritime policy, Roads and Maritime may purchase the total property even if only part of it would be required for the proposal. This typically occurs when the effect of the proposal on the remaining land is considered so major that it warrants total purchase. This would be considered on a case-by-case basis. Where partial acquisition is undertaken, the valuation of the property would be determined in consideration of the impact on the value of the remaining portion of land. This consideration would include the earning capacity of the land.
2.17 Air quality

2.17.1 Construction dust

**Stakeholder identification number(s)**

13, Environment Protection Authority

**Issue description**

Submissions relating to construction dust raised issues about the impact that dust (or particle) emissions due to construction activities would have on the health of individuals and compliance with the Environment Protection Authority air quality assessment criteria.

In summary, the respondents raised the following issues:

- The construction of the Pestells Lane / Meroo Road grade-separated half-interchange and the use of heavy plant machinery would increase dust and emissions. This would impact on the health of residents especially those who suffer from asthma, bronchiectasis or dust and pollen allergies.

- The review of environmental factors indicates that for all sensitive receivers, PM$_{10}$ and dust deposition predicted for the proposed development would comply with Environment Protection Authority air quality assessment criteria.

**Response**

An air quality impact assessment for the proposal is presented in Section 6.12 of the review of environmental factors. This assessed the potential impacts of windblown dust and vehicle emissions generated during construction of the proposal. While heavy machinery exhaust emissions were not modelled specifically, they are captured to a large extent in the various emission factors used to calculate construction emissions.

The assessment showed that there are likely to be short-term increases in ground level PM$_{10}$ concentrations while construction is occurring. Increases in levels of deposited dust at nearby sensitive receivers were also predicted. However, the modelling showed that these increases are predicted to be low and to remain well within the air quality assessment criteria which are set by the Environment Protection Authority to protect public health.

Additionally, the modelling undertaken for the assessment did not include any specific mitigation or dust management measures which would be adopted as part of the ongoing management of the ancillary / stockpile sites. The modelling is therefore conservative in this respect. Roads and Maritime has also committed (in Section 6.12.4 of the review of environmental factors) to undertake dust deposition monitoring at those residential properties closest to each temporary construction ancillary facility, to determine compliance with relevant Environment Protection Authority criteria.

Management and mitigation measures and monitoring requirements would be included in an air quality management plan which would be prepared by suitably qualified and experienced person(s) in consultation with the Environment Protection Authority. This plan would be included as part of the overall construction environmental management plan that would be developed post determination and prior to the commencement of construction of the proposal.
Health impacts due to dust emissions are largely related to the inhalation of fine particulate matter (PM$_{10}$ or less) rather than the coarser particles. Dust due to construction activities is generally coarse and causes nuisance impacts (deposited dust) rather than impacting on human health. In addition to this, it is also long-term exposure to elevated levels of these fine particles that potentially gives rise to health impacts. The construction of the entire alignment from Berry to Bomaderry is anticipated to take approximately two years and construction work would progress along the alignment. As such, construction activity would not remain adjacent to any particular property along the route for an extended period of time. The proposal would comply with the Environment Protection Authority air quality criteria which have been set to protect human health, including the most vulnerable in society (eg those with pre-existing conditions, or small children, or the elderly).

The construction of the proposal is therefore unlikely to result in adverse health impacts due to both the nature of the emissions and the short time period over which they would occur.

2.17.2 Air quality

**Stakeholder identification number(s)**

13, 28, 29, Environment Protection Authority

**Issue description**

Submissions relating to air quality raised issues about the reduction in air quality that would result from additional vehicles using the Princes Highway during the operational phase of the proposal, the impact this would have on the personal wellbeing of residents, and the need for an air quality management plan to mitigate the impact.

In summary, the respondents raised the following issues:

- The review of environmental factors predicts a population increase in and around Bomaderry and the NSW south coast resulting in additional heavy vehicle traffic using the upgraded highway. This would result in additional dust and emissions being produced which would have long term effects on the health of residents. The increase in traffic using the upgraded highway would impact on air quality.

- An increase in emissions, dust and pollens as a result of traffic using the Pestells Lane / Meroo Road grade-separated half-interchange would have a direct and detrimental impact on the personal wellbeing of residents, especially those who suffer from asthma, bronchiectasis or dust and pollen allergies.

- To manage potential air emissions from the proposal, a detailed air quality management plan should, as part of the determination of the proposal, be prepared by a suitably qualified and experienced person(s) for the proposal in consultation with the Environment Protection Authority. The Environment Protection Authority would be guided by such a document in determining and placing any air emissions monitoring requirements as conditions of any environment protection licence for the proposal.

**Response**

Traffic volumes that were used in the modelling for the air quality assessment include vehicle numbers for both the first and the tenth years of operation, and therefore take into account the predicted increases in population and vehicle numbers over that time. The vehicle fleet mix, which varies throughout the day and in future years, has also been considered and takes into account the expected increase in heavy vehicle traffic.
The increases in traffic volumes projected ten years into the future may not necessarily result in a proportionate increase in vehicle emissions for two main reasons. Firstly, the traffic estimated to use the upgrade does not represent an increase in total traffic of the same magnitude. In other words, much of the traffic using the upgrade is already using the road as it exists currently and so would not be included as additional traffic. Secondly, the modelling does not take into account improvements in emission reduction technologies that are likely to occur in the future. In other words, while there may be more vehicles on the road, the individual emissions from those vehicles are likely to be lower.

Regardless of these issues, ground level concentrations were not predicted to exceed any of the Environment Protection Authority's air quality assessment criteria, which are set at levels to protect public health, including receivers with respiratory problems and allergies.

An air quality management plan would be prepared by suitably qualified and experienced person(s) in consultation with the Environment Protection Authority to manage potential air emissions from the proposal.

2.18 Waste management

**Stakeholder identification number(s)**

28 and Environment Protection Authority

**Issue description**

Submissions relating to waste management raised issues about rubbish discarded from vehicles and waste management conditions to be incorporated into any approval for the proposal.

In summary, the respondents raised the following issues:

- The following conditions should be incorporated into any approval for the proposal:
  - All waste materials removed from the site shall only be directed to a waste management facility or premises lawfully permitted to accept the materials.
  - Waste generated outside the site shall not be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by a licence under the *Protection of the Environment Operations Act 1997*, if such a licence is required in relation to that waste.
  - All liquid and/or non-liquid waste generated on the site shall be assessed, classified and managed in accordance with 'Waste Classification Guidelines' (Department of Environment, Climate Change and Water, 2009a), or any superseding document, and the *Protection of the Environment Operations Act 1997*.

- Rubbish thrown from vehicles using the upgraded highway would accumulate and become an issue for residents.

**Response**

Waste would be generated during both the construction and operation phases of the proposal. Safeguards and management measures for mitigating the impacts of waste are provided in Section 6.14.3 of the review of environmental factors.
In addition to the safeguards and management measures already proposed for the construction of the proposal, Roads and Maritime agrees to include the following environmental management measures in any determination for the proposal:

- All waste materials removed from the site shall only be directed to a waste management facility or premises lawfully permitted to accept the materials.
- Waste generated outside the site shall not be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997, if such a licence is required in relation to that waste.
- All liquid and/or non-liquid waste generated on the site shall be assessed, classified and managed in accordance with 'Waste Classification Guidelines' (Department of Environment, Climate Change and Water, 2009a), or any superseding document, and the Protection of the Environment Operations Act 1997.

During the operational phase of the proposal, roadside litter would be expected to occur along the length of the proposal.

Management of roadside litter would be undertaken in accordance with the existing Roads and Maritime road maintenance and litter collection program for the Princes Highway as stated in Section 6.14.3 of the review of environmental factors. This would involve periodic inspections (by Roads and Maritime or its contractors) and removal of roadside litter.

All safeguards and management measures that would be implemented for the proposal are compiled in Chapter 4 – Environmental management.

2.19 Cumulative impacts
2.19.1 Princes Highway upgrade program

Stakeholder identification number(s)
37

Issue description

In the submission relating to cumulative impacts, the respondent raised issues about construction activity in Mullers Lane during construction of both the Foxground and Berry bypass and the proposal. The respondent’s property overlooks Mullers Lane and the respondent believes they would therefore be impacted twice and for an extended period.

Response

The Foxground and Berry Bypass project includes the construction of a u-turn facility along Mullers Lane. The proposal includes the construction of a protected right hand turn bay and the relocation of the existing bus stop in Mullers Lane. There is the potential for cumulative impacts to occur at residences along Mullers Lane as a result of either concurrent or consecutive construction of the Foxground and Berry Bypass project and the proposal.

The Foxground and Berry Bypass project is scheduled to be constructed between late 2014 and 2018, and the proposal would be constructed at a time when funding is made available. The worst case scenario for construction along Mullers Lane would therefore be construction works for the two projects with no respite period between construction periods. Roads and Maritime would continue to consult with affected residents along Mullers Lane and the wider community regarding the management of the impacts of construction in Mullers Lane, as construction timeframes are developed and potential impacts can be better identified. Mitigation would also be developed as appropriate once more information is available.
Potential cumulative construction impacts to sensitive receivers along Mullers Lane would be consistent with those outlined in Section 6.16 of the review of environmental factors, particularly with regards to traffic and transport, noise and vibration, air quality and landscape character and visual amenity.

Potential cumulative impacts to residents along Mullers Lane would be mitigated and managed by the safeguards and management measures outlined throughout Chapter 6 of the review of environmental factors.

2.20 Other

2.20.1 Heavy vehicle rest area / inspection bay

**Stakeholder identification number(s)**

38, Shoalhaven City Council

**Issue description**

Submissions relating to the heavy vehicle rest area raised issues in support of the relocation of the facility to an alternative site at South Nowra, but emphasised the need for a facility north of Bomaderry.

In summary, the respondents raised the following issues:

- Shoalhaven City Council does not challenge the decision to remove the provision of a northbound heavy vehicle rest area from the proposal, but would like to emphasise the need for such a facility to be provided at South Nowra or further to the north.
- The heavy vehicle rest area which was previously proposed to be located in Meroo Meadow is to be relocated to an alternative site at South Nowra. The South Nowra heavy vehicle rest area development and improved connections for Flinders Road should be expedited.
- Even though it is proposed to have a heavy vehicle rest area at Flinders Road, South Nowra, there still needs to be provision for a truck stop and inspection area on the north side of Bomaderry. A preferred option would be to purchase land on both sides of the highway at Bomaderry to have fuel stations, food, showers etc.

**Response**

Submissions stating the need and desire for a heavy vehicle rest area to be constructed have been noted.

A combined heavy vehicle rest area and inspection bay at Meroo Meadow was considered for inclusion in the proposal. However, following consideration of community feedback regarding the suitability of this location for the facility in conjunction with environmental and construction issues, Roads and Maritime investigated alternative locations both along and outside the proposal alignment. Three options were considered and assessed with respect to the social and environmental impacts associated with locating a heavy vehicle facility at each of the alternative locations including:

- A combined heavy vehicle rest area and inspection bay located at Meroo Meadow, that would be staffed as needed and closed with locked gates when not operational.
- A split facility, with the rest area component located outside of the proposal and the inspection bay component (staffed as needed and locked when not in use) at Meroo Meadow.
- A split facility, with the rest area component located outside of the proposal and the inspection bay component (staffed as needed and locked when not in use) at an alternate location within the study area.
A heavy vehicle inspection bay (staffed when needed and locked when not in use) at Jaspers Brush was determined to be the preferred heavy vehicle facility option. In regard to a heavy vehicle rest area, it was determined that an alternative location for this facility, outside of the proposal, would better meet the proposal objectives.

The provision of a heavy vehicle rest area at South Nowra is currently being considered as a separate project in consultation with Shoalhaven City Council and other stakeholders.

Heavy vehicle rest areas are facilities that are used by heavy vehicle drivers to take long and short rest breaks, use amenities and check loads and vehicles. The provision of heavy vehicle rest areas in NSW is guided by the Road and Maritime ‘Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in NSW’ (RTA, 2010). The suggested alternative to purchase land on both sides of the highway at Bomaderry to provide fuel stations, food and showers exceed normal provisions for a heavy vehicle rest area and would better be provided at privately owned service stations.

For further information regarding the heavy vehicle inspection bay for the proposal, refer to Section 2.7.8 – Heavy vehicle inspection bay.

2.20.2 New crossing of the Shoalhaven River

Stakeholder identification number(s)

2

Issue description

In the submission relating to a new crossing of the Shoalhaven River, the respondent raised issues about the need to finalise the location of the new bridge over the Shoalhaven River before the design of the proposal, in order to prevent the need to shift the road alignment in the future once the final bridge location has been determined.

Response

Options for the location of a new crossing of the Shoalhaven River are currently being investigated by Roads and Maritime. The location of the new crossing (whether upstream, downstream, on a bypass corridor or the existing Princes Highway) would not impact on the current proposal.

2.20.3 Nowra bypass

Stakeholder identification number(s)

4

Issue description

The submission relating to the Nowra bypass raised the issue that a bypass of Nowra should be included as part of the proposal. The respondent believes that the future bypass should swing south from around Strongs Road, cross the Shoalhaven River east of Pig Island and run to the east of the Nowra / Worrigee residential areas. This would require a low level bridge across the Shoalhaven River at one of its narrowest points. A bypass to the west of North Nowra would require an expensive high level bridge over the river. The bulk of traffic through Nowra travels to the coastal villages to the east and therefore a bypass should be located to the east.

Response

The location and construction of a future bypass of Nowra, whether located to the east or west of the proposal, would require consideration as part of a separate study. At this stage, any future bypass of Nowra is considered to be a long term proposal subject to further consideration of through traffic volumes which would dictate the need for a bypass.
The proposal is aimed at improving safety and efficiency on the Princes Highway between Berry and Bomaderry and would provide substantial benefits to the operation of the road network, whether or not a future bypass of Nowra is constructed in the long-term.

The proposal would not prevent or impact the development of a future bypass of Nowra.
3 Changes to the proposal

This chapter describes the changes to the proposal that have been adopted in response to the issues raised throughout the assessment of the proposal. Proposed changes are summarised in Table 3-1 and are discussed in more detail in Section 3.1 to Section 3.8.
<table>
<thead>
<tr>
<th>#</th>
<th>Location</th>
<th>Chainage</th>
<th>Description of refinement</th>
<th>Chapter 3 section reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Fauna crossings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Flying Fox Creek</td>
<td></td>
<td>Incorporation of fauna friendly features into the concept bridge design at Flying Fox Creek to facilitate fauna passage.</td>
<td>Section 3.1 and Figure 3-1</td>
</tr>
<tr>
<td>2</td>
<td>Jaspers Brush Creek</td>
<td></td>
<td>Incorporation of fauna friendly features into the Jaspers Brush Creek concept bridge design to facilitate fauna passage.</td>
<td>Section 3.1 and Figure 3-1</td>
</tr>
<tr>
<td>3</td>
<td>Wileys Creek</td>
<td></td>
<td>Incorporation of fauna friendly features into the Wileys Creek concept bridge design to facilitate fauna passage.</td>
<td>Section 3.1 and Figure 3-1</td>
</tr>
<tr>
<td></td>
<td><strong>Flying Fox Creek Bridge vehicle and stock underpass</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Flying Fox Creek</td>
<td></td>
<td>Modification to the proposed vehicle and stock underpass at Flying Fox Creek. The design change would relocate the proposed track closer to the abutment and away from the creek bed and the edge of the creek.</td>
<td>Section 3.2 and Figure 3-2</td>
</tr>
<tr>
<td></td>
<td><strong>Right hand turns</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>O’Keeffes Lane</td>
<td></td>
<td>Provision of a right hand turn into O’Keeffes Lane.</td>
<td>Section 3.3 and Figure 3-3</td>
</tr>
<tr>
<td>6</td>
<td>Turners Lane</td>
<td></td>
<td>Provision of a right hand turn into Turners Lane.</td>
<td>Section 3.3 and Figure 3-4</td>
</tr>
<tr>
<td></td>
<td><strong>Highway alignment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Near Meroo Meadow at Chainage 25800 to Chainage 27500</td>
<td></td>
<td>Localised refinements to the vertical and horizontal alignment of the proposal to minimise potential amenity impacts at the adjacent residential property.</td>
<td>Section 3.4</td>
</tr>
<tr>
<td></td>
<td><strong>Boxsells Lane u-turn facility</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Boxsells Lane</td>
<td></td>
<td>Provision of a u-turn facility at Boxsells Lane.</td>
<td>Section 3.5 and Figure 3-5</td>
</tr>
<tr>
<td>#</td>
<td>Location</td>
<td>Chainage</td>
<td>Description of refinement</td>
<td>Chapter 3 section reference</td>
</tr>
<tr>
<td>----</td>
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<td>----------------------------</td>
<td>-----------------------------</td>
</tr>
</tbody>
</table>
| 9  | Grade-separated facilities and half-interchange | Provision of pedestrian footpaths and road shoulders for cyclists at:  
• Jaspers Brush and Strongs Road grade-separated facility.  
• Morschels Lane and Devitts Lane grade-separated facility.  
• Pestells Lane and Meroo Road grade-separated half-interchange. | Section 3.6 and Figure 3-6 |
| 10 | Between Strongs Road and Turners Lane at Chainage 22700 to Chainage 22950 | Realignment of a property boundary in Jaspers Brush to make it consistent with the alignment of adjacent new property boundaries. | Section 3.7 |
3.1 Change 1-3: Fauna crossings

3.1.1 Description

Roads and Maritime has incorporated fauna friendly features into the bridge concept designs at Flying Fox Creek, Jaspers Brush Creek and Wileys Creek (refer to Figure 3-1 for locations of fauna friendly bridge structures along the proposal). A summary of these features is provided in Table 3-2. These changes have been made in response to issues raised in community submissions on the review of environmental factors as discussed in Section 2.9.2 – Wildlife crossings.

Table 3-2: Summary of proposed fauna friendly bridge design features along the proposal

<table>
<thead>
<tr>
<th>Location</th>
<th>Flying Fox Creek</th>
<th>Jaspers Brush Creek</th>
<th>Wileys Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fauna friendly bridge design specifications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum width of fauna underpass</td>
<td>✓ (2m)</td>
<td>✓ (3m)</td>
<td>✓ (3m)</td>
</tr>
<tr>
<td>Fauna furniture within underpass such as logs (both with and without hollows) rocks and refuge pipes.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Retention or reinstatement of riparian vegetation on approach to underpass</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Pole railing or ledge</td>
<td>✓ (one)</td>
<td>✓ (one)</td>
<td>✓</td>
</tr>
<tr>
<td>Fauna guide fencing</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Fauna refuge poles</td>
<td>✓ (four to six)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Microchiropteran bat (microbat) roost recesses in the roof or walls of the bridge structure</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Target species</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large sized mammals*</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Medium sized mammals**</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Small sized mammals***</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Reptiles</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Amphibians</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Arboreal mammals in areas containing tall vegetation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Fauna-friendly bridge design features are indicative only and would be finalised during detailed design.

*Large sized mammals include kangaroos, wombats and wallabies

** Medium sized mammals include arboreal mammals such as possums

*** Small sized mammals include small ground dwelling mammals such as rodents, dasyurids and microchiropteran bats
Figure 3-1: Location of fauna crossings along the proposal
3.1.2 Environmental assessment

The incorporation of fauna friendly features into the bridge design at Flying Fox Creek, Jaspers Brush Creek and Wileys Creek were identified in Section 6.3.4 of the review of environmental factors as a management measure to mitigate the potential impact of the proposal on habitat fragmentation, loss of connectivity and injury and mortality of individuals. The proposed fauna friendly bridge design features summarised in Table 3-1 would not alter the footprint of the proposal, and would remain consistent with the proposal as defined and assessed in the review of environmental factors. The provision of fauna friendly bridge design features is considered to have a beneficial environmental outcome and no adverse additional environmental impacts are expected.

3.2 Change 4: Flying Fox Creek vehicle and stock underpass

3.2.1 Description

Roads and Maritime has modified the design of the Flying Fox Creek bridge to remove the existing vehicular and stock underpass from the creek bed. This change has been made in response to issues raised during the display of the review of environmental factors as discussed in Section 2.15.3 – Property access.

Under the original design, existing vehicle and stock access would be maintained via an existing track, which runs under the Princes Highway and consists of a concrete base and gates within the channel of the creek.

In the modified underpass design, the bridge span has been increased to allow the existing vehicle and stock access to be relocated from the creek bed to the bank close to the abutment and away from the creek edge (refer to Figure 3-2). The vehicle and stock access would be located on the opposite side of the creek to the fauna crossing proposed as part of the fauna-friendly bridge design features at Flying Fox Creek (refer to Section 3.1 – Change 1-3 Fauna crossings for fauna friendly bridge design details).

Subject to feasibility during detailed design, the underpass would be a minimum height of 4.8 metres and a minimum width of five metres to enable farm machinery to use the underpass.

![Figure 3-2: Flying Fox Creek vehicle underpass](Refined design (February, 2014))
3.2.2 Environmental assessment

The revised design is considered to have a beneficial environmental outcome as it would move the existing vehicle and stock access out of the creek bed and away from the creek bank. The surface of the access is likely to be road base or gravel, but this would be determined during the detailed design phase of the proposal, with consideration of the need to prevent impacts to water quality. The design refinement is consistent with the proposal as defined and assessed in the review of environmental factors and would not require additional land acquisition or result in adverse additional environmental impacts.

3.3 Change 5 and 6: Right hand turns

3.3.1 Description

Roads and Maritime has modified the design to allow northbound right hand turn movements into O’Keefes Lane and Turners Lane. These changes have been made in response to issues raised during the display of the review of environmental factors as discussed in Section 2.7.9 – Berry to Bomaderry access strategy.

The original design presented in the review of environmental factors for the proposal consisted of a left-in / left-out only junction at both O’Keefes Lane (Chainage 21200) and Turners Lane (Chainage 24450).

In the original design, northbound road users wanting to access O’Keefes Lane would be required to travel north to Mullers Lane and perform a u-turn. Similarly, northbound users wanting to access Turners Lane would be required to travel north to the proposed u-turn facility at Chainage 23200 and perform a u-turn.

In the revised design, access to O’Keefes Lane and Turners Lane from the northbound side of the proposal would be via dedicated right hand turning lanes. The proposed design of the O’Keefes Lane and Turners Lane right hand turning provisions are shown in Figure 3-3 and Figure 3-4 respectively.

![Figure 3-3: O’Keefes Lane right hand turn configuration](image-url)

Refined design (February, 2014)
3.3.2 Environmental assessment

The provision for right hand turn movements into O’Keeffes Lane and Turners Lane would improve access provisions for residents, landowners and visitors to O’Keeffes Lane and Turners Lane and provide more consistent access provisions along the length of the proposal.

The modified design would require some localised increase in the width of the proposal on the western side of the highway at both O’Keeffes Lane and Turners Lane to accommodate the protected right hand turning lanes. The increased footprint would be located within the existing road reserve if possible, however some additional land acquisition may be necessary.

Roads and Maritime would continue to consult with potentially affected landowners regarding property impacts and any acquisition would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.

Overall, the provision of right hand turning lanes at O’Keeffes Lane and Turners Lane are considered to have positive community outcomes by improving accessibility. The right hand turning lanes at these locations would not result in adverse additional environmental impacts.

3.4 Change 7: Highway alignment

3.4.1 Description

Roads and Maritime has undertaken further engineering consideration and design review to address issues raised in submissions about the horizontal and vertical alignment of the proposal near Meroo Meadow between Chainage 25800 and Chainage 27500. Issues raised during the display of the review of environmental factors are discussed in Section 2.4.1 – Road design.

The vertical alignment of the proposal at this location has been lowered by about 0.9 metres and the horizontal alignment has been shifted about 1.5 metres further away from the adjacent residential property.
3.4.2 Environmental assessment

The adjustments to the alignment of the proposal at this location are expected to have positive environmental outcomes at the adjacent residential property by reducing potential noise impacts and improving amenity.

The proposed refinements to the highway alignment would not result in major changes to land acquisition and are considered to be consistent with the proposal as defined and assessed in the review of environmental factors. Resulting minor changes to land acquisition at the property on the opposite side of the highway have been discussed with the affected landowner. Roads and Maritime would continue to consult with the affected landowner about property impacts and any acquisition would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.

Changes to the highway alignment at this location would result in a negligible to slight increase in noise and amenity impacts to three properties on the opposite side of the highway to the residential property in question compared to the displayed concept design. However, these slight increases would be more than offset by the reduction of severe impacts to the residential property and lesser impacts to an additional five properties.

The alignment shift may also result in changes to noise levels at other receivers, however any change in noise levels as a result of the design change would be minimal.

3.5 Change 8: U-turn facility at Boxsells Lane

3.5.1 Description

Roads and Maritime has changed the design to include a u-turn facility at Boxsells Lane. This change has been made in response to accessibility issues raised during the display of the review of environmental factors as discussed in Section 2.7.2 – Travel time changes for individuals and is consistent with the u-turn facilities being provided in conjunction with right turn bays at:

- Mullers Lane (northbound).
- Croziers Road (southbound).
- Between Strongs Road and Turners Lane at about chainage 23200 (northbound).
- Between Strongs Road and Turners Lane at about chainage 24050, adjacent to Silos Winery (southbound).
- Lamonds Lane (northbound).
- South of Abernethys Lane at about chainage 28590 (northbound).

Under the original design, road users would turn right into Boxsells Lane and then make a three point turn along the road or utilise an existing driveway to complete a u-turn. Alternatively, road users wanting to make a u-turn would travel south to the Pestells Lane / Meroo Road grade-separated half-interchange and make a u-turn.

The refined proposal design includes the provision of a u-turn facility about 230 metres west of the highway along Boxsells Lane. The u-turn facility would provide a safer method of performing a u-turn in Boxsells Lane and provides more consistent access along the length of the proposal. The proposed design of the Boxsells Lane u-turn facility is shown on Figure 3-5.
3.5.2 Environmental assessment

The refined design would require additional land acquisition along Boxsells Lane to accommodate the u-turn facility. Roads and Maritime would continue to consult with the affected landowner regarding property impacts and any acquisition would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.

The provision of a u-turn facility at this location is considered to have a positive community outcome by improving accessibility and safety. The u-turn facility is not expected to result in additional adverse environmental impacts.

3.6 Change 9: Pedestrian and cyclist access

3.6.1 Description

Roads and Maritime has revised the proposed design to include provisions for pedestrian and cycling access at the Jaspers Brush / Strongs Road grade-separated facility, the Morschels Lane / Devitts Lane grade-separated facility and the Pestells Lane / Meroo Road grade-separated half-interchange. This change has been made in response to issues raised during the display of the review of environmental factors as discussed in Section 2.7.7 – Pedestrian and bicycle use.

The original design of the proposal included a three metre wide outer shoulder at the two grade-separated facilities and the grade-separated half-interchange to be utilised by cyclists wishing to cross the highway.

The revised design includes modifications to the outer shoulder of the two grade-separated facilities and the grade-separated half-interchange to accommodate an elevated one metre wide pedestrian walkway and a two metre wide cycling shoulder. The overall width of the two grade-separated facilities and the grade-separated half-interchange would not change. An indicative cross section of the proposed pedestrian and cycling access refinements is provided in Figure 3-6.
3.6.2 Environmental assessment

The revised design would maintain cyclist access and provide pedestrian access across the highway, improving safety and accessibility. The proposed changes would not result in any land acquisition and are considered to have a positive community outcome by improving pedestrian accessibility and safety as well as connectivity between the areas on either side of the proposal. The changes to pedestrian and cycling access are not expected to result in additional adverse environmental impacts.

3.7 Boundary adjustments

3.7.1 Description

Roads and Maritime has adjusted the property boundary between the proposal and an adjacent property at Chainage 22700 to 22950. This boundary adjustment makes the boundary consistent with the alignment of adjacent property boundaries. This change has been made in response to issues raised during the display of the review of environmental factors as discussed in Section 2.15.2 – Property boundaries and acquisition.

3.7.2 Environmental assessment

The refined design would require additional land acquisition and would necessitate the demolition of an existing residence. The landowners have, in their submission, stated that they accept the decision for the house to be demolished and compensation provided. Roads and Maritime would continue to consult with the affected landowner about property impacts and any acquisition would be undertaken in accordance with the Land Acquisition (Just Terms Compensation) Act 1991.

The adjustment of the property boundary at this location is considered to have a positive impact by aligning the boundary with adjacent boundaries and introducing consistency to the streetscape. The boundary adjustment is not expected to result in additional adverse environmental impacts.
4 Environmental management

The review of environmental factors for the Berry to Bomaderry upgrade proposal identified the framework for environmental management, including management and mitigation measures that would be adopted to avoid or reduce environmental impacts (Chapter 7 of the review of environmental factors).

After consideration of the issues raised in the public submissions and changes to the proposal, the management and mitigation measures have been revised to respond to submissions received so as to improve clarity and allow for better ongoing management, auditability and compliance tracking. Should the proposal proceed, the revised management and mitigation measures would guide the subsequent phases of the proposal.

The revised management and mitigation measures for the proposal are provided in Table 4-1.

4.1 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 project environmental management plan and a construction environmental management plan will be prepared to describe safeguards and management measures identified. These plans will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The plans will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Southern Region, prior to the commencement of any on-site works. The construction environmental management plan will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The construction environmental management plan and project environmental management plan would be developed in accordance with the specifications set out in the Roads and Maritime:

- QA Specification G38 – Soil and Water Management (Soil and Water Plan).
- QA Specification G40 – Clearing and Grubbing.

4.2 Summary of safeguards and management measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards would minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 4-1. Text that has been added to or deleted from the safeguards and management measures presented in Chapter 7 of the review of environmental factors can be identified as follows:

- New text is shown in italics.
- Deleted text has been struck out.
<table>
<thead>
<tr>
<th>No</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-1</td>
<td>General</td>
<td>All environmental safeguards must be incorporated <em>where relevant</em> within the following documents:</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Project environmental management plan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Detailed design stage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contract specifications for the proposal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction environmental management plan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G-2</td>
<td>General</td>
<td>A risk assessment must be carried out on the proposal in accordance with the Roads and Maritime Audit Pack and OSD risk assessment procedures to determine an audit and inspection program for the works. The recommendations of the risk assessment are to be implemented.</td>
<td>Roads and Maritime project manager and regional environmental staff</td>
<td>Pre-construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A review of the risk assessment must be undertaken after the initial audit or inspection to evaluate if the level of risk chosen for the proposal is appropriate.</td>
<td>Roads and Maritime project manager and regional environmental staff</td>
<td>After first audit</td>
</tr>
<tr>
<td></td>
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<td>Any works resulting from the proposal and as covered by the review of environmental factors may be subject to environmental audit(s) and / or inspection(s) at any time during their duration.</td>
<td>Roads and Maritime project manager and regional environmental staff</td>
<td>Construction and operation</td>
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<td>G-3</td>
<td>General</td>
<td>The environmental contract specification must be forwarded to the Roads and Maritime Services Senior Environmental Officer for review at least 10 working days prior to the tender stage.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td>A contractual hold point must be maintained until the construction environmental management plan is reviewed by the Roads and Maritime Services Senior Environmental Officer.</td>
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<td>G-4</td>
<td>General</td>
<td>The Roads and Maritime Project Manager must notify the Roads and Maritime Services Environment Officer Southern Region at least five days prior to work commencing.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>G-5</td>
<td>General</td>
<td>All businesses and residences likely to be affected by the proposed works must be notified prior to the commencement of the proposed activities in accordance with the community involvement plan for the proposal.</td>
<td>Roads and Maritime project Manager</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>G-6</td>
<td>General</td>
<td>Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.</td>
<td>Contractor</td>
<td>Pre-construction and during construction as required</td>
</tr>
<tr>
<td>G-7</td>
<td>General</td>
<td><em>Provide the community with ongoing, up to date and accurate information.</em></td>
<td>Roads and Maritime project manager and regional environmental staff.</td>
<td>Pre-construction, construction and operation.</td>
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| TR-1| Delays and disruptions due to construction traffic and works           | Prepare and implement a traffic management plan in accordance with the Roads and Maritime ‘Specification D&C G10 Traffic Management’ (Roads and Maritime, 2011) and the Roads and Maritime ‘Traffic Control at Worksites Manual Version 4’ (Roads and Maritime, 2011c) as part of the construction environmental management plan. The traffic management plan is to be submitted in stages to reflect the progress of work and at a minimum will include:  
  - Signage requirements.  
  - Lane possession approval process during periods of online construction.  
  - Traffic control devices such as temporary traffic signals.  
  - A local and regional communication strategy.  
  - Strategies to respond to any changes in road safety (including on the ‘Sandtrack’).  
  - **Strategies to minimise impacts of parked construction vehicles including:**  
    - Selecting suitable locations for worksites and identifying the specific controls required at these locations.  
    - Identifying construction activities that may influence the safety and amenity of residents living / travelling in the proposal area and identifying management measures to mitigate any impacts.  
    - Identifying parking provisions for construction workers and other construction-related traffic. This will be within the compound and site offices or at locations designated for this purpose where practicable.  
  Where feasible and reasonable, schedule construction work that will substantially reduce the performance of the road network during periods of typically lower traffic volumes. | Roads and Maritime project manager and construction contractor | Pre-construction and construction |

Roads and Maritime Services
Submissions report
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<tr>
<td>1</td>
<td>Clearly communicate and signpost traffic controls in use, such as road</td>
<td>Clearly communicate and signpost traffic controls in use, such as road closures, detours, temporary speed limits and passing constraints.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>closures, detours, temporary speed limits and passing constraints.</td>
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<td>2</td>
<td>Choose suitable locations for access and egress to and from worksites</td>
<td>Choose suitable locations for access and egress to and from worksites and provide adequate traffic control at these locations.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>and provide adequate traffic control at these locations.</td>
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<td>3</td>
<td>Consult with local emergency services during the development of the</td>
<td>Consult with local emergency services during the development of the traffic management plan to provide procedures to maintain an unrestricted and safe environment for emergency service vehicles to pass through construction zones. Provide updates to the local emergency services on the staging and progress of construction.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td></td>
<td>traffic management plan to provide procedures to maintain an unrestricted and safe environment for emergency service vehicles to pass through construction zones. Provide updates to the local emergency services on the staging and progress of construction.</td>
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<td>4</td>
<td>Consult with local bus companies operating the school and other bus</td>
<td>Consult with local bus companies operating the school and other bus services regarding appropriate location and access to bus stops during construction of the proposal.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>services regarding appropriate location and access to bus stops during</td>
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<td>construction of the proposal.</td>
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<td>5</td>
<td>Overall the traffic management plan will aim to:</td>
<td>Overall the traffic management plan will aim to:</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td></td>
<td>• Adopt construction methods and staging that are designed to minimise</td>
<td>• Adopt construction methods and staging that are designed to minimise road closures and disruptions to existing traffic; subject to other proposal constraints.</td>
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<td>road closures and disruptions to existing traffic; subject to other</td>
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<td>proposal constraints.</td>
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<td>• Implement an 80 kilometre per hour construction speed zone for</td>
<td>• Implement an 80 kilometre per hour construction speed zone for highway traffic where feasible and reasonable.</td>
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<td>highway traffic where feasible and reasonable.</td>
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<td>• Maintain continuous access to local roads and properties.</td>
<td>• Maintain continuous access to local roads and properties.</td>
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<td>• Ensure <strong>obtain</strong> road occupancy licences <strong>are obtained</strong> for all</td>
<td>• Ensure <strong>obtain</strong> road occupancy licences <strong>are obtained</strong> for all work that impacts traffic on the existing highway.</td>
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<td>work that impacts traffic on the existing highway.</td>
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<td>• Maintain suitable road network safety and performance during</td>
<td>• Maintain suitable road network safety and performance during construction of the proposal.</td>
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<td>construction of the proposal.</td>
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| TR-2| Impacts of the proposal on the local road network.                     | Periodically install traffic counters at strategic locations between Berry and Bomaderry during the three year construction period to monitor changes to existing traffic volumes and, in consultation with Shoalhaven City Council, patterns and develop a strategy to address road safety and road maintenance issues arising from:  
  - More than three per cent of traffic transferring to the ‘Sandtrack’.  
  - Considerable and/or other unexpected changes to existing traffic patterns and volumes.  
  Undertake pre and post construction dilapidation surveys and prepare reports so that the impacts of the proposal on Council road infrastructure (assets) can be identified and repaired where required. This will be undertaken in consultation with Shoalhaven City Council.  
  Consider ongoing impacts of additional traffic using local roads as a result of the proposal during the handover of assets to Council via a working group set up in accordance with the Roads and Maritime ‘Policy 192 Transfer of Assets and Asset Management Functions Between the RTA and Other Roads Authorities’ (RTA, 2009). | Roads and Maritime project manager and construction contractor | Construction and operation                         |
<p>| TR-43| Operational performance                                                 | Monitor traffic levels and operational performance of the Princes Highway between Berry and Bomaderry and at selected local roads once the proposal is operational, particularly during peak periods. Compare the actual versus modelled performance of the road network to identify differences at an early stage.                                                                 | Roads and Maritime project manager                 | Six months and 12 months after completion of construction |
| TR-54| Safety of cyclists                                                      | Provide cyclist access at all grade-separated facilities and half-interchanges in compliance with the Roads and Maritime ‘NSW Bicycle Guidelines’ (RTA, 2005a).                                                                                                                                                                                                 | Roads and Maritime project manager                 | Detailed design                            |</p>
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<tr>
<td>NV-1</td>
<td>Construction noise impacts on sensitive receivers</td>
<td>Revise the noise and vibration assessment based on the final detailed design.</td>
<td>Roads and Maritime project manager and Qualified noise specialist</td>
<td>Detailed design</td>
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<tr>
<td></td>
<td>Prepare and implement a construction noise and vibration management plan in accordance with Practice Note VI of the Roads and Maritime 'Environmental Noise Management Manual' (RTA, 2001) prior to the commencement of construction that:</td>
<td></td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Identifies feasible and reasonable approaches to reduce noise and vibration impacts during construction of the proposal, including ancillary facilities.</td>
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<td>• Identifies the extent that noise sensitive receivers are affected.</td>
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<td>• Provides an assessment of the construction noise impact of the proposal on the community.</td>
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<td>• Considers potential cumulative impacts associated with the concurrent construction of the proposal with other major construction projects following the receipt of a detailed construction schedule when available.</td>
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<td>• Includes a sleep disturbance assessment.</td>
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<td>• Considers appropriate height and location of temporary noise barriers and mounds for noise attenuation within ancillary facilities.</td>
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<td>• Identifies details of the out of hours works.</td>
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<td>• Complies with the requirements of the project environment protection licence (once obtained).</td>
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<td>Provide detail regarding proposed consultation with the community on noise and vibration in the community involvement plan for the proposal.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td></td>
<td>Inform the community about out of hours works in accordance with Practice Note VII of the Roads and Maritime 'Environmental Noise Management Manual' (RTA, 2001).</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Implement a 24-hour hotline and complaints management procedure for noise and other construction related complaints.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Include specific noise management measures within the construction noise and vibration management plan such as:</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Carry out noise intensive construction works during standard construction hours where feasible and reasonable.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Schedule noisy activities that cannot be undertaken during standard construction hours as early as possible during the evening and/or night-time periods.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Select appropriate plant for each task, to minimise the noise impact.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Plan the delivery of material to, and removal of spoil and waste from the proposal so there is a consistent and minimal number of trucks arriving at the site at any one time. Carry out these activities during standard construction hours where reasonable, practical and safe to do so.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Minimise reversing.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Fit non-tonal reversing alarms on construction equipment where possible, reasonable and where acceptable from a work health safety perspective.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Maximise the distance between noisy plant items and nearby residential receivers.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Orientate noisy equipment away from residential receivers where feasible and reasonable.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Locate site access points and roads as far as reasonably practicable away from residential receivers.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Use structures or enclosures to shield residential receivers from noise sources where reasonable and practical.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Require trucks to travel via internal haul routes and major roads and routes where reasonable and practical.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Minimise truck queuing or idling near residential dwellings.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Provide respite periods during times of noise intensive works where sensitive receivers will be adversely impacted for extended periods. These could include late</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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</table>
### Environmental safeguards

- Plan noise intensive works in the following order of priority to minimise the potential impacts on sensitive receivers:
  - Standard working hours.
  - Evening working hours.
  - Night-time working hours.
- Use bored piling in place of impact piling wherever possible. Additionally, only undertake impact piling during standard construction hours and only where ground conditions require it.
- Stage traffic movements to restrict movements which pass by noise sensitive receivers.
- Minimise noise from plant and equipment using treatments which could include mufflers, enclosed working areas and screening.
- Maintain effective communication with the community and provide management responses to the concerns of the affected community.
- Provide clear justification and obtain community support and prior approval (in accordance with the Environment Protection Authority 'Interim Construction Noise Guideline' (Department of Environment and Climate Change, 2009)) from the Environment Protection Authority for construction works outside of the recommended standard working hours.
- Erect temporary and where possible, permanent operational noise barriers, if applicable, and/or implement other noise mitigation measures recommended in the review of environmental factors as early as possible.
- Minimise construction traffic movements outside of standard working hours and particularly at night time (10 pm to 7 am) to reduce the potential for sleep disturbance as much as possible.

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<td>NV-2</td>
<td>Construction noise from</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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Where necessary to minimise noise impacts, and where feasible and reasonable, use noise barriers and mounds at the temporary construction ancillary facility sites.
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<td>ancillary facilities</td>
<td>Include and additional mitigation measures in the construction noise and vibration management plan in relation to the operation of ancillary facilities. Develop safeguards and management measures to minimise impacts from the operation of the temporary construction ancillary facilities and include these in the construction noise and vibration management plan.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<tr>
<td>NV-3</td>
<td>Construction vibration impacts on sensitive receivers</td>
<td>Minimise the size of vibration intensive equipment, taking into account the safe working distances and the distance between the area of construction and the nearest sensitive receiver. If vibration intensive works are required outside of the within safe working distances, use alternative equipment to ensure distances are not exceeded prevent relevant vibration criteria being exceeded at receivers. Undertake construction works in accordance with the following procedures when the use of vibration intensive equipment within safe working distances for cosmetic damage cannot be avoided:  - Notify the affected residents and community of the proposed works.  - Undertake attended vibration measurements prior to the commencement of vibration intensive works.  - Install a permanent vibration monitoring system if ongoing vibration intensive works are required. The system will warn operators when vibration levels are approaching cosmetic damage levels.  - Carry out dilapidation surveys on potentially affected properties.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<td>NV-4</td>
<td>Noise levels from road traffic exceed criteria at sensitive receivers</td>
<td>Develop and implement all feasible and reasonable safeguards and management measures to meet the applicable noise criteria provided in the ‘NSW Road Noise Policy’ (Department of Environment, Climate Change and Water, 2011), the ‘Environmental Noise Management Manual’ (RTA, 2001) and/or the ‘Interim Construction Noise Guidelines’ (Department of Environment and Climate Change, 2009a) in consultation with affected sensitive receivers.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design and construction</td>
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<td>Specific noise mitigation for this proposal includes building architectural treatments. Consideration of architectural treatment has been recommended for 42 residential properties and one child care centre to achieve the applicable noise criteria where feasible and reasonable. Treatments for properties with exceedences of up to 8 dB(A) could include modifications to buildings such as the provision of fresh air ventilation, sealing of wall vents and upgrading window and door seals. The type of architectural mitigation to be implemented at receivers specified for consideration of architectural treatment will be confirmed during detailed design.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design and construction</td>
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<td>Undertake post construction noise monitoring in accordance with the Roads and Maritime ‘Environmental Noise Management Manual’ (RTA, 2001) to determine whether the noise mitigation measures are adequate. Take appropriate action if further mitigation is required and is feasible and reasonable.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design and construction</td>
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| NV-5 | Operational noise impacts on sensitive land uses | Undertake a site inspection of the child care centre at 281 Princes Highway (receiver 778) during the detailed design phase. Consult with the owner of the centre on feasible and reasonable noise safeguards and management measures available and implement the agreed measures. Examples may include:  
  - Upgraded fencing.  
  - Upgraded seals, doors, glazing.  
  - Upgrade to mechanical ventilation system. | Roads and Maritime project manager and construction contractor | Pre-construction |
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| B1 | General construction impacts | Prepare a construction vegetation management plan to be integrated with the urban and landscape character plan for the proposal and included in the construction environmental management plan. The vegetation management plan will:  
  - Identify measures to manage vegetation within the road reserve.  
  - Detail restoration, regeneration and rehabilitation of areas of native vegetation that will be removed to accommodate the proposal. This will be in accordance with Guide 3: Re-establishment of Native Vegetation of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011).  
  - Detail appropriate management for the potential habitat of threatened flora and fauna species that will be indirectly impacted by the proposal. This may include fencing and signage.  
  - Identify weed management strategies.  
  As part of the site induction process, provide all site personnel with information on the biodiversity values of the study area, including threatened species, no-go areas and responsibilities under relevant environmental legislation, including but not limited to the Environmental Planning and Assessment Act 1979, the Threatened Species Conservation Act 1995 and the Environment Protection and Biodiversity Conservation Act 1999 and associated management plans for individual species.  
  Should unexpected threatened fauna be located at any time during construction, cease work immediately in the area to prevent further harm to the individual. Contact the Senior Environment Officer Southern Region and a suitably qualified ecologist to determine if further assessment or management plans are required.  
  *Develop the vegetation management plan in consultation with Fisheries NSW.* | Construction contractor | Pre-construction and construction |
|    |                         |                                                                                                                                                                                                                           | Construction contractor | Construction                |
|    |                         |                                                                                                                                                                                                                           | Roads and Maritime project manager | Pre-construction |

Princes Highway upgrade – Berry to Bomaderry  
Roads and Maritime Services  
Submissions report
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<td>BI-2</td>
<td>Vegetation clearance</td>
<td>Restrict vegetation clearing to those areas where it is necessary. Undertake vegetation clearing in accordance with Guide 1: Pre-clearing Process of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011). Pre-clearing surveys should include:</td>
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<td>• Targeted surveys for the Green and Golden Bell Frog, microchiropteran bats and forest owls. • Hollow-bearing tree / stag watching survey of habitat trees to be removed. • Installation of nest boxes. Where clearing is required, establish exclusion zones in accordance with Guide 2: Exclusion zones of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011) to manage clearing so it does not extend beyond the area necessary.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<td>BI-3</td>
<td>Habitat fragmentation and loss of connectivity and injury and mortality of individuals</td>
<td>Where reasonably practicable, minimise disturbance to stream banks through avoidance of the use of in-stream structures. Where feasible and reasonable, incorporate ‘fauna friendly’ features into bridge design at Wileys Creek, Jaspers Brush Creek and Flying Fox Creek to maintain or improve fauna passage under the Princes Highway, fauna movement corridors and vegetation connectivity. Where ‘fauna friendly’ features are incorporated into bridge design, consider the use of appropriate fencing will be used to funnel wildlife under the ‘fauna friendly’ bridge and prevent wildlife from accessing the highway.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td>Immediately notify Fisheries NSW of any fish kills in the vicinity of construction works. Should this occur, construction works will cease until written approval to proceed is provided by Fisheries NSW.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td>BI-4</td>
<td>Loss of threatened species and their habitats</td>
<td>Minimise the removal of native vegetation and fauna habitat Implement exclusion zones to protect threatened ecological communities and threatened species habitat.</td>
<td>Construction contractor</td>
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<td>Undertake targeted surveys for microchiropteran bats at bridges and culverts scheduled for removal in accordance with detailed survey guidelines (refer to Section 3.5 of the <em>Technical Paper: Terrestrial Flora and Fauna</em> (Biosis 2013) provided at Appendix E of the review of environmental factors). If microchiropteran bats are recorded roosting within bridges or culverts prior to or during construction, develop and implement a microbat management plan. As a minimum, the plan will:</td>
<td>Qualified ecologist</td>
<td>Pre-construction</td>
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<td>• Determine the types of roost habitat and locations to install replacement roost habitat.</td>
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<td>• Provide information regarding staged habitat removal including removal of secondary or less preferential roosting habitat prior to removal of primary habitat.</td>
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<td>• Methodology for a pre-demolition inspection of roost habitat and the implementation of exclusion measures to prevent the continuing use of existing roosts.</td>
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<td>• Outline monitoring requirements for the replacement habitat, such as outlining the predetermined number of occasions for which monitoring is required, and for the appropriate length of time that considers seasonal movements and habits of the subject species.</td>
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<td>Undertake targeted surveys for the Green and Golden Bell Frog in areas identified as providing potential breeding habitat in accordance with detailed survey guidelines (refer to Section 3.5 of the <em>Technical Paper: Terrestrial Flora and Fauna</em> (Biosis 2013) provided at Appendix E of the review of environmental factors). If the Green and Golden Bell Frog is recorded within the study area, develop and implement a Green and Golden Bell Frog management plan. At a minimum, the plan will address:</td>
<td>Qualified ecologist</td>
<td>Pre-construction</td>
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<td>• The type of and locations for temporary and permanent replacement habitat including consideration of staged habitat removal.</td>
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<td></td>
<td>• The most optimal alignments for frog exclusion fencing.</td>
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<td>• Diurnal and nocturnal pre-clearing surveys.</td>
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<td>• Environmental induction training for construction contractors.</td>
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<td>• Site hygiene management including prevention of chytrid fungus.</td>
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<td>• Green and Golden Bell Frog relocation procedures.</td>
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<td>• Construction works procedures (including timing of works).</td>
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<td>• Reporting procedures.</td>
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<p>|    |        | Undertake targeted surveys for forest owls within suitable breeding, roosting and foraging habitat of the study area in accordance with detailed survey guidelines (refer to Section 3.5 of the <em>Technical Paper: Terrestrial Flora and Fauna</em> (Biosis, 2013) provided at Appendix E of the review of environmental factors). The type and extent of habitat to be removed will inform the installation of nest boxes (ie for prey and / or owls) and subsequent pre-clearance survey methodology. | Qualified ecologist | Pre-construction |
|    |        | Provide nest boxes to mitigate impacts of removing hollow-bearing trees. | Construction contractor | Construction |
|    |        | Where reasonable and feasible, retain mature and hollow bearing habitat trees, including the dead stag (habitat tree 29) located within the temporary construction ancillary facility area shown in Figure 3.12 of the <em>Technical Paper: Terrestrial Flora and Fauna</em> at Appendix E 8. | Construction contractor | Construction |</p>
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<td>Remove trees in accordance with Guide 4: Clearing of Vegetation and Removal of Bushrock of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011) and in the presence of a qualified ecologist or wildlife expert experienced in the rescue of fauna.</td>
<td>Construction contractor and qualified ecologist / experienced wildlife expert</td>
<td>Construction</td>
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<td>Carry out a hollow bearing tree survey and stag-watching exercise, (targeting threatened parrots, cockatoos, forest owls, arboreal mammals and microbats) in order to identify the number and type of nest boxes required and the appropriate locations to install them.</td>
<td>Roads and Maritime project manager and qualified ecologist</td>
<td>Pre-construction</td>
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<td>Install roost and nest boxes in accordance with Table 8.1 of Guide 8: Nest Boxes of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011) at least one month prior to the commencement of construction.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Include locally indigenous species in post-construction revegetation works. These species will promote fauna habitat, for example, the planting of Allocasuarina species for the Glossy Black Cockatoo.</td>
<td>Construction contractor and qualified ecologist</td>
<td>Construction</td>
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<td>Salvage and relocate tree hollows and woody debris to appropriate locations for reuse in accordance with Guide 5: Re-use of Woody Debris and Bushrock of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011).</td>
<td>Construction contractor and qualified ecologist</td>
<td>Pre-construction and construction</td>
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<td>Include native in-stream vegetation (macrophytes) and snags where appropriate where establishment or rehabilitation of a riparian zone is required.</td>
<td>Construction contractor</td>
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<td>Manage riparian areas in accordance with Guide 10: Aquatic Habitats and Riparian Zones of the Roads and Maritime ‘Biodiversity Guidelines’ (RTA, 2011).</td>
<td>Construction contractor</td>
<td>Construction and operation</td>
</tr>
<tr>
<td>BI-5</td>
<td>Impacts to water quality</td>
<td>Measures to mitigate potential water quality impacts, for example from spills during construction are outlined in Section 6.4.5, Section 6.11.4 and Section 6.13.2. Safeguards and management measures to address potential impacts of spills are provided at SW3 above and HR1 to HR4 below.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
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<td>Fence off areas within ancillary sites seven and nine that are located less than 50 metres from a waterway as environmentally sensitive areas.</td>
<td>Construction contractor</td>
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<tr>
<td>BI-6</td>
<td>Invasion of exotic species</td>
<td>Manage vegetation within the road reserve and adjacent to areas of vegetation clearing in accordance with Guide 6: Weed Management and Guide 10: Aquatic Habitats and Riparian Zones of the Roads and Maritime 'Biodiversity Guidelines' (RTA, 2011) to reduce invasion of noxious weed species.</td>
<td>Construction contractor and Roads and Maritime project manager</td>
<td>Construction and operation</td>
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<td>Use weed-free topsoil in landscaping and revegetate disturbed sites with locally indigenous species in accordance with the urban and landscape character plan outlined in Section 6.6.3 of the review of environmental factors.</td>
<td>Construction contractor</td>
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<td>Undertake pre-construction weed management around all creek crossings to remove noxious vegetation from the work areas.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Train relevant construction staff in the identification and appropriate disposal of noxious species. This should include Eastern Gambusia.</td>
<td>Construction contractor and qualified ecologist</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td>BI-7</td>
<td>Fish passage</td>
<td>Should alteration of fish passage occur during construction consult with the NSW Department of Primary Industries – Fisheries NSW, to determine if a permit under Section 219 of the Fisheries Management Act 1994 is required.</td>
<td>Roads and Maritime project Manager</td>
<td>Construction</td>
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**Surface water and groundwater**

<p>| SW-1 | General construction impacts      | Prepare and implement a surface water management plan and site specific erosion and sediment control plans as part of the construction environmental management plan. Based on the high risk rating of this proposal and in accordance with the Roads and Maritime erosion and sedimentation management procedure, the surface water management plan and erosion and sediment control plans would will be prepared in consultation with a soil conservation consultant to be engaged from the Roads and Maritime panel of registered soil conservation consultants. The soil conservation consultant would will assist the construction contractor in identifying the most appropriate approach to erosion and sediment control. | Construction contractor | Pre-construction and construction |
|      |                                    | Prepare and implement a surface water management plan and erosion and sediment control plans in accordance with ‘Managing Urban Stormwater-Soils and Construction, Volume 2D’ (Landcom 2004), and the conditions of the environment protection licence for the proposal. | Construction contractor | Pre-construction and construction |</p>
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<td>Manage and use treated effluent in accordance with the Roads and Maritime ‘Environmental Direction No. 19 – Use of Reclaimed Water’ (RTA, 2006) and the Roads and Maritime ‘Tip Sheet – Use of Reclaimed Water’ (RTA, 2006a).</td>
<td>Construction contractor</td>
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<td>Minimise scour and creek instability through installation of structures such as rock revetments, where necessary. These <em>would will</em> be designed to minimise impacts to aquatic ecology, surrounding land uses and the visual amenity of the area.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Detailed design and construction</td>
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<td><em>Where there is a risk of polluting receiving waters, split rock used in reclamation works or adjacent to the waterways is to be clean and free of fine sediment.</em></td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>SW-3</td>
<td>Impacts to water pollution (surface water and groundwater)</td>
<td>Store fuels, chemical and hazardous materials in secure, bunded areas within temporary construction ancillary facilities.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<td>Capture and dispose of spill and contaminated materials from temporary construction ancillary facilities at a licensed facility.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<td>Undertake refuelling, washdown and the preparation of construction materials within bunded areas to mitigate risks in relation to spills or leaks of fuels / oils or other hazardous onsite construction material.</td>
<td>Construction contractor</td>
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<td>Apply good practice measures with regards to the storage and handling of dangerous and hazardous goods to minimise the risk of a spill occurring.</td>
<td>Construction contractor</td>
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<td>Provide spill kits <em>around at all</em> temporary construction ancillary facilities.</td>
<td>Construction contractor</td>
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<td>Manage and minimise the generation and discharge of tannins from vegetation mulch within temporary construction ancillary facility areas in accordance with the Roads and Maritime ‘Environmental Direction Number 25 – Management of Tannins from Vegetation Mulch’ (Roads and Maritime, 2012).</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>SW-4</td>
<td>Impacts to groundwater flow conditions</td>
<td>Minimise the depth of excavations in areas of alluvium.</td>
<td>Construction contractor</td>
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<td>Manage dewatering using a work method statement prepared in accordance with the Roads and Maritime ‘Environmental Management of Construction Site Dewatering’ (RTA, 2011a).</td>
<td>Construction contractor</td>
<td>Construction</td>
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<td>Should dewatering of the alluvial aquifer be required during the construction of the bridge footings, limit groundwater drawdown to the base of the footings.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td>SW-5</td>
<td>Potential impacts of acid sulfate soils</td>
<td>Refer to safeguards and management measures in Section 6.11. Safeguards and management measures to address potential impacts of acid sulfate spoils are provided at GS4 below.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>SW-6</td>
<td>Impacts to surface water quality</td>
<td>Prepare and implement an operational water quality strategy that includes a combination of water quality basins and swales. Where feasible and reasonable, the strategy should aim to achieve the suggested water quality treatment targets for the proposal of an 80 per cent reduction in total suspended sediment load and a 60 per cent reduction in total phosphorous load.</td>
<td>Construction contractor</td>
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<td><strong>Review the six indicative operational water quality basins have been planned for the proposal as part of the concept design. The number and location of basins would be refined and finalised during detailed design.</strong></td>
<td>Roads and Maritime project manager</td>
<td>Detailed design</td>
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<td></td>
<td>Direct runoff from bridges over watercourses and floodplains to water quality basins and swales</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td>SW-7</td>
<td>Monitoring and maintenance of surface water quality, swales and water quality basins</td>
<td>Inspect swales and basins every three months or following storm events until the system has become established. Inspections of swales would will include:</td>
<td>Roads and Maritime project manager</td>
<td>Operation</td>
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<td>• Checking vegetation is at a suitable height to allow design flow capacity.</td>
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<td>• Clearing of any obstructions or debris.</td>
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<td>• Checking for erosion, weeds, plant conditions, oil spill and the build-up of litter and sediment.</td>
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<td>• Mowing, as required.</td>
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<td>Inspections of sediment basins would will include:</td>
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<td>• Checking pits, pipes, weirs and other structures are clear of obstructions and debris.</td>
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<td>• Checking for erosion, weeds, plant condition, oil spills and the build-up of litter and sediment.</td>
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<td>To minimise maintenance requirements:</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Detailed design and construction</td>
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|    |                                            | • Use native species for the water treatment features of the landscape (as part of the design of swales and basins).  
• Plant using high and diverse planting densities to make aquatic features resistant to weed establishment.                                                                                                                                  |                               |                           |
| SW-8 | Impacts to groundwater quality              | If the Strongs Road cutting intercepts groundwater, direct the groundwater to the road drainage network via a drainage system.                                                                                                                                                                                                                     | Roads and Maritime project manager | Construction and operation |
| SW-9 | Impacts to farm dams                        | Undertake consultation with affected landowners where there *would* *will* be permanent losses or gains in dam catchments. Determine and implement appropriate mitigation measures in consultation with landowners.                                                                                                             | Roads and Maritime project manager | Detailed design           |
|    |                                            |                                                                                                                                                                                                                                                                                                                                               |                               |                           |
| Flooding |                                            | The construction methodology will minimise flooding impacts to and from the proposal. Refine the assessment of construction phase flooding impacts when the construction methodology is progressed.                                                                                                 | Roads and Maritime project manager | Pre-construction           |
| FL-1 | Flooding and construction                   |                                                                                                                                                                                                                                                                                                                                               | Construction contractor     | Construction              |
|    |                                            | Construct the proposal in stages where practicable to:                                                                                                                                                                                                                                                                                               |                               |                           |
|    |                                            | • Allow flood waters to flow naturally and not be retarded or altered by construction activities.  
• Reduce the risk of flood levels increasing upstream by a substantial amount.  
• Limit the potential for the construction site to be flooded.                                                                                                                                  |                               |                           |
<p>|    |                                            | Prepare a construction flood risk response plan for the proposal as part of the construction environmental management plan. This <em>would</em> <em>will</em> formalise the planned flood risk management response and incorporate safeguards and management measures.                                                                 | Construction contractor     | Pre-construction           |
|    |                                            | Use an automatic weather station to gather accurate and timely weather data such as rainfall volumes and communicate weather warnings to Roads and Maritime staff and construction contractors.                                                                                                                                                  | Construction contractor     | Pre-construction           |</p>
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<td>Store chemicals and fuels above the one in 100 year ARI flood level where possible.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<tr>
<td>FL-2</td>
<td>Impacts to residential buildings and structures</td>
<td>In consultation with the landowner, design and construct a driveway and waterway opening at 4 O’Keeffes Lane which is flood immune during a 100 year ARI flood event.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design</td>
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<td>Undertake floor level surveys at potentially flood affected properties to quantify flooding impacts of the proposal at each building / structure. If the surveys determine the change in flood level would will impact habitable areas, consult with the affected landowners to agree on and implement appropriate local mitigation works.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design</td>
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<td>Carry out modifications to the farm dam downstream of catchment four in consultation with the landowner.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design and construction</td>
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<td>During detailed design, review detailed rainfall data for a property at Meroo Meadow. Consider this when determining the exact configuration and sizing of drainage works in Meroo Meadow, including at the Meroo Meadow roundabout, to prevent increased flooding at the property and along Meroo Road. Where construction of the proposal would result in changes to local catchment areas or flow characteristics, management measures such as stormwater collection pits, pipes, headwalls, swales, culverts and scour protection will be provided as appropriate.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Detailed design and construction</td>
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<tr>
<td>FL-3</td>
<td>Impacts to pastureland</td>
<td>Following modification of the farm dam downstream of catchment four and in consultation with the landowner, design and implement measures to mitigate shallow ponding of water on pastureland between the dam and the South Coast Railway line. This may include constructing a higher embankment and spillway downstream of the dam.</td>
<td>Construction contractor</td>
<td>Construction</td>
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</table>
| FL-4 | Impacts of climate change | Undertake sensitivity testing for:  
- Blockage impacts of culverts and bridges.  
- A 10 per cent, 20 per cent and 30 per cent increase in rainfall due to climate change.  
- Tailwater levels for the northern and central catchments. | Roads and Maritime project manager | Detailed design |
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<td></td>
<td>Landscape character and visual amenity</td>
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<tr>
<td>LV-1</td>
<td>Loss of visual amenity</td>
<td>Avoid excessive vegetation clearance by demarcating areas requiring removal.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
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<td>Progressively stabilise cut batters and exposed areas with appropriate seed mixes for</td>
<td>Construction contractor</td>
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<td>cover crop and install landscape plantings as soon as reasonably practicable.</td>
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<td>Engage with adjacent land owners to assess whether early works mitigation (eg</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Construction</td>
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<td>landscape planting) can be implemented to help reduce or soften the visual impacts of the</td>
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<td>proposal, address privacy screening issues, provide stock shelter and wind buffers.</td>
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<td>This will include considerations at u-turn bays and the heavy vehicle inspection bay.</td>
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<td>Implement these measures where appropriate.</td>
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<td>LV-2</td>
<td>General loss of landscape character and</td>
<td>In addition to the area-specific measures outlined below, implement the urban design</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Construction</td>
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<td>visual amenity along the length of the</td>
<td>and landscape concept plan outlined in Section 3.0 of the *Technical Paper: Urban Design,</td>
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<td></td>
<td>proposal</td>
<td>Landscape Character and Visual Amenity* (AECOM, 2013c) provided at Appendix H of the</td>
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<td>review of environmental factors*.</td>
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<td>Minimise lighting impacts of the proposal by designing lighting in accordance with</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Detailed design</td>
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<td>‘Australian Standard 1158 Road Lighting’. Where lighting is proposed it will be designed</td>
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<td>at a non-intrusive angle to minimise light spill impacts on adjoining residential</td>
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<td>properties.</td>
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<td>Develop a detailed lighting strategy and design for the proposal informed by the</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design</td>
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<td>outcomes of a thorough headlight glare assessment which will be undertaken for the</td>
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<td>proposal.</td>
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<td>Select light fixtures (poles) and luminaires which minimise light spill and screen light</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Detailed design</td>
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<td>sources as far as practicable while still meeting the requirements of Australian Standard</td>
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<td></td>
<td>(AS) 1158 Road Lighting. Place light fixtures and luminaires at locations which restrict</td>
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<td>light to the areas on the proposal carriageway at the proposed grade-separated facilities</td>
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<td>and grade-separated half-interchange.</td>
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<tr>
<td>LV-3</td>
<td>Visual impacts at specific locations and precincts – Jaspers Brush and Meroo Meadow</td>
<td>Roll back the top of the cutting at Strongs Road to minimise the overall appearance of the cutting. Reinstate the vegetation as close to the top of cuttings as possible (whilst allowing for the provision of required drainage structures and maintenance access) in the spaces between the access ramps for Strongs Road and Jaspers Brush Road, and along the tops of the embankments on the ridge line south of Jaspers Brush Creek. Use cultural plantings to highlight property boundaries and waterways and along the top of embankments where appropriate.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Detailed design and construction</td>
</tr>
<tr>
<td>LV-4</td>
<td>Visual impacts at specific locations and precincts – Bomaderry gateway</td>
<td>Reinforce existing vegetation with additional plantings where appropriate at Abernethys Creek. Soften the grade of fill embankments so that the new slopes can be reinstated with turf grass.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Construction</td>
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<tr>
<td>LV-5</td>
<td>Inappropriate design of the southern tie in of the proposal.</td>
<td>Further develop the Bomaderry arrival and departure strategy in consultation with Shoalhaven City Council during detailed design. Implement the agreed urban and landscape design treatments proposed in the Bomaderry arrival and departure strategy. In consultation with Shoalhaven City Council, develop and implement the Bomaderry arrival / departure strategy further to maximise integration with the varying characteristics of the existing rural and town landscape context, to provide a safe and intuitive transition from the highway conditions to local urban roads.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Detailed design and construction</td>
</tr>
</tbody>
</table>

**Aboriginal heritage**

<table>
<thead>
<tr>
<th>AH-1</th>
<th>Management</th>
<th>Consolidate all Aboriginal heritage mitigation measures into a construction environmental management plan as either a stand-alone Aboriginal heritage management plan or as a distinct chapter within the construction environmental management plan. The plan will include:</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>• An outline of the protection measures that will be undertaken to avoid impacts to Aboriginal cultural heritage values along the proposal corridor.</td>
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<tr>
<td></td>
<td></td>
<td>• Specific measures to be applied to works undertaken in close proximity to identified Aboriginal objects and areas of Aboriginal cultural value to minimise and avoid impacts on these areas. This would include a component within the site induction program for construction workers on Aboriginal heritage along the proposal corridor.</td>
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<td></td>
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<td>• An outline of the test excavation and / or salvage collection / excavation (by either surface collection or archaeological excavation) activities that will be required to be undertaken prior to the commencement of construction works.</td>
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<td></td>
<td></td>
<td>• An outline of the procedure required if any development or ancillary works are proposed for areas outside of those areas already surveyed as part of the current concept design and identified within the review of environmental factors and the Aboriginal cultural heritage assessment report for the proposal.</td>
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<td></td>
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<td>• An outline of the process that will be followed for continuing consultation with registered Aboriginal stakeholders and the Office of Environment and Heritage, where required.</td>
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<td>• An outline of the process for management of Aboriginal heritage management plan procedures and how these will be adhered to during the operational life of the proposal, to prevent impact to heritage objects / areas additional to that already</td>
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<tr>
<td>AH-42</td>
<td>Stakeholder consultation</td>
<td>Undertake ongoing consultation with Aboriginal stakeholders in accordance with the Roads and Maritime ‘Procedure for Aboriginal Cultural Heritage Consultation and Investigation’ (RTA, 2011c).</td>
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<td>Advise the Aboriginal Focus Group of the final locations of ancillary facilities and any proposed mitigation measures applicable to these areas.</td>
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<td>Provide three copies of this report the Aboriginal cultural heritage assessment report for the proposal to NSW Office of Environment and Heritage.</td>
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<tr>
<td>AH-23</td>
<td>Impacts to items of Aboriginal archaeological significance within the study area</td>
<td>Undertake all subsurface testing and salvage in accordance with the methodology outlined in Appendix C of Appendix I - Aboriginal Cultural Heritage Assessment Report (Navin Officer Heritage Consultants, 2013) of the review of environmental factors.</td>
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<td>Apply for and obtain an Aboriginal heritage impact permit which will cover the entire construction footprint of the proposal, including impacted areas of site G2B A49 and G2B A53 (if construction impacts are expected to extend to the south of the current road reserve at this location) and temporary construction ancillary facilities, for both impact and salvage.</td>
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<td>Carry out surface artefact collection within impacted areas of G2B A1 and G2B A44.</td>
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<td></td>
<td>Follow the Roads and Maritime 'Standard Management Procedure: Unexpected Archaeological Finds' (Roads and Maritime, 2011a) in the event that construction related disturbance results in the discovery of Aboriginal objects or suspected human remains.</td>
<td>Roads and Maritime project manager and construction contractor</td>
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<td>In the event that landscaping or planting actions are required outside of the proposal corridor, prepare a supplementary cultural heritage assessment prior to the commencement of earthworks to:</td>
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<td></td>
<td>• Identify cultural heritage values which may be impacted by the works.</td>
<td>Roads and Maritime project manager, specialist heritage consultant and construction contractor.</td>
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<td>• Identify the extent and nature of the impact, including cumulative impact.</td>
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<td>• Identify statutory constraints and requirements.</td>
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<td>• Propose strategies to avoid or effectively manage and minimise impacts to cultural heritage values.</td>
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<td></td>
<td>If applicable, proposed landscaping work will be subject to compliance with the results of the cultural heritage assessment (as determined by Roads and Maritime) and any necessary statutory requirements, such as receipt of an Aboriginal heritage impact permit.</td>
<td></td>
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</tbody>
</table>
In the event that minor utility and service adjustments are required outside of the corridor, prepare a supplementary cultural heritage assessment prior to the commencement of any earthworks to:

- Identify any cultural heritage values which may be impacted by the works.
- Identify the extent and nature of the impact, including cumulative impact.
- Identify statutory constraints and requirements.
- Propose strategies to avoid or effectively manage and minimise impacts to cultural heritage values.

If applicable, proposed utility or service adjustments will be subject to compliance with the results of the cultural heritage assessment (as determined by Roads and Maritime) and relevant statutory requirements, such as the receipt of an Aboriginal heritage impact permit.

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<tr>
<td>AH-34</td>
<td>Impacts to items of Aboriginal archaeological cultural significance within ancillary facility areas</td>
<td>If ancillary area 8 is to be used, fence sites MTF25 and MTF26 to avoid any inadvertent impact to these sites. If ancillary area 12 is to be used, include the area of impact from the ancillary area in the recommended salvage excavation at site G2B A51. Where an Aboriginal site, or portion thereof, is situated adjacent to, but outside of the construction footprint, erect temporary fencing or other means where temporary fencing is not reasonably practicable, between the zone of construction activity and the adjacent site area and / or archaeological deposit, with the aim of defining a 'no–go' area for vehicles, material storage or other actions likely to result in ground disturbance. Signpost such sites as environmentally sensitive areas.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<tr>
<td>NH-1</td>
<td>General construction impacts</td>
<td>Follow the Roads and Maritime ‘Standard Management Procedure: Unexpected Archaeological Finds’ (Roads and Maritime, 2011a), or a Roads and Maritime approved revised version, in the event that unexpected heritage / archaeological finds are encountered during construction of the proposal.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Construction</td>
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<td></td>
<td>Include heritage awareness including requirements specific to the proposal, in the site induction training for proposal staff so that all staff working on the proposal are aware of the heritage values in the area and understand what measures must be implemented to protect them.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<td>Subject to stakeholder agreement, lodge any non-Aboriginal artefact materials recovered during archaeological or construction related excavations with either the Berry Museum (Berry and District Historical Society) or Nowra Museum (Shoalhaven Historical Society), depending on the location and the nature of the finds. The material will be appropriately inventoried and accompanied by supporting documentation.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction and construction</td>
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<td>Prepare and implement a heritage interpretation plan. The heritage interpretation plan would will contain:</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction and construction</td>
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<td>• An archival recording strategy for items where direct impacts are unavoidable. The strategy will include creating a documentary and photographic record of items, which will act as a form of information recovery and can be used as a reference in the future.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction and construction</td>
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<td>• A site interpretation strategy for the management of sites where archaeological excavation may be required. Where appropriate the strategy may include options such as physical memorials, interpretive signage, printed, internet and / or electronic media, and supportive local museum displays.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction and construction</td>
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<td>Establish no-go zones between construction zones and sites G2B H1, G2B H2, G2B H3, G2B H4, G2B H5, G2B H7, G2B H44, G2B H46, G2B H66, G2B H68, G2B H75, G2B H78, G2B H80, G2B H86, G2B H88 and G2B H91. The no-go zones will prevent impacts to areas or items with heritage value which are situated close and adjacent to the proposal, or constitute remnants of partially impacted sites. If temporary fencing is not practical at some heritage sites, adopt an alternate strategy to demarcate the boundaries of the no-go areas.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<td>NH-2</td>
<td>Impacts to heritage items within potential temporary construction ancillary facility sites</td>
<td>Where the root zone of trees located on heritage sites (G2B H5, G2B H66 and G2B H71) extend into adjacent ancillary areas (ancillary areas 1, 10 and 11), demarcate the likely root zone of those trees as ‘no-go’ areas.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<tr>
<td>NH-3</td>
<td>Direct impacts to road infrastructure</td>
<td>Prior to construction, carry out archival recordings for heritage items G2B H2 and G2B H7.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td>Notify the Heritage Council of NSW at least 14 days prior to the removal of item G2B H2 (Abernethys Creek Bridge) from the Roads and Maritime Section 170 Heritage Register.</td>
<td>Roads and Maritime project manager</td>
<td>Construction</td>
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<td>NH-4</td>
<td>Direct impacts to buildings and structure</td>
<td>In accordance with the heritage impact permit for the proposal, carry out test excavations to determine the presence and nature of archaeological deposits, and any further management strategies for the following heritage items:</td>
<td>Roads and Maritime project manager and specialist heritage consultant</td>
<td>Pre-construction</td>
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</tbody>
</table>
|     |                                            | • ‘Pomona’ Homestead, Meroo Meadow (G2B H46).  
|     |                                            | • Site of former Jaspers Dairy Co. and Jaspers Brush Dairy Co. Factory, Jaspers Brush (G2B H68).  
|     |                                            | • Approximate site of former Meroo Meadow Dairy Co. factory, Meroo Meadow (G2B H75).  
|     |                                            | • Site of former Berry Estate tenant ‘house’, Jaspers Brush (G2B H80).  
|     |                                            | • Site of former Meroo Station hut building, Meroo Meadow (G2B H88).  
|     |                                            | • Site of former Berry Estate tenant farm buildings, Meroo Meadow (G2B H92).  
|     |                                            | Further management strategies, if required, could include salvage excavation and / or the provision of site interpretation in accordance with the heritage impact permit.                                                                                                                                               | Roads and Maritime project manager and specialist heritage consultant | Pre-construction |
|     |                                            | At the ‘Pomona’ Homestead (G2B H46):                                                                                                                                                                                                                                                                                                                   | Roads and Maritime project manager          | Pre-construction |
|     |                                            | • Conduct an archival recording of the entrance gateway prior to construction impact.  
|     |                                            | • Disassemble and reconstruct the entrance gateway at a new location, to be determined in consultation with the owner.  
|     |                                            | • The reconstructed gateway should be Reassemble and reconstruct the entrance gateway as close to the original as is feasible and reasonable.  
|     |                                            | • Avoid impacts to the front garden and yard if feasible and reasonable.  
|     |                                            | • Review the proposal boundary adjacent to the ‘Pomona’ property with a view to minimise land acquisition and the net impact to the Eucalypt tree group on the north side of the intersection of Lamonds Lane and the Princes Highway.  

Princes Highway upgrade – Berry to Bomaderry  
Roads and Maritime Services  
Submissions report
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<td></td>
<td>With regard to the Former Meroo Meadow public hall (G2B H67):</td>
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<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td></td>
<td>• Commemorate and interpret this site the Former Meroo Meadow public hall (G2B H67) in an appropriate form and method in accordance with the heritage impact permit for the proposal.</td>
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<td>Depending on the results of further research and archaeological investigations, where reasonable and warranted, interpret the sites G2B H68, G2B H75, G2B H80, G2B H81, G2B H88 and G2B H91 in an appropriate form and method in accordance with the heritage impact permit for the proposal.</td>
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<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td>NH-5</td>
<td>Impacts to potential archaeological deposits</td>
<td>All subsurface archaeological investigations will be undertaken in accordance with a Section140 excavation permit (under the Heritage Act 1977), which will be required for the proposal.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td></td>
<td>At the site of the former Jaspers Dairy Co. and Jaspers Brush Dairy Co. Factory, Jaspers Brush (G2B H68) and Site of the former Meroo Station hut building, Meroo Meadow (G2B H88):</td>
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<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td></td>
<td>• Where feasible and reasonable avoid direct impact to the area of G2B H88 and to the land to the north of the current Jaspers Brush Reserve easement (Part of G2B H68).</td>
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<td>• If impact is not avoidable conduct an archaeological test excavation in the areas of anticipated impact within sites G2B H88 and G2B H68, prior to construction impact.</td>
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<td>• Based on the findings of the test excavation, conduct any further necessary management actions such as salvage excavation prior to construction impact.</td>
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<td>At the approximate site of the former Meroo Meadow Dairy Co. factory, Meroo Meadow (G2B H75):</td>
<td>• Conduct a program of archaeological test excavation to determine the presence and nature of any archaeological deposits within the portion of the proposal area which occurs within site G2B H75. Test excavation is not required if any additional historical analysis undertaken prior to construction determines that the factory is located outside of the proposal area. • Based on the findings of the test excavation program, any further management actions such as salvage excavation and / or the provision of site interpretation will be conducted prior to the commencement of construction.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td>At the site of former Berry Estate tenant ‘house’, Jaspers Brush (G2B H80), agricultural earth dam and former associated pipeline, Jaspers Brush (H81) and the site of former ‘Little Meadow’ Public (tent) School (G2B H91):</td>
<td>• Conduct a program of archaeological test excavation within the potentially impacted portions of sites G2B H80, G2B H81 and G2B H91 to determine the presence and nature of archaeological deposits, and required management strategies. • Based on the findings of the test excavation, further management actions such as salvage excavation and / or site interpretation are to be conducted prior to construction impact.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<tr>
<td>NH-6</td>
<td>Indirect impacts to buildings and structures</td>
<td>Implement urban design initiatives to minimise the visual and contextual impacts of the proposal in relation to viewsheds, noise and artificial light to and from heritage items, including G2B H1, G2B H4, G2B H44, G2B H46, G2B H66, G2B H71, G2B H77 and G2B H87.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td></td>
<td>At the Meroo Meadow Public Schoolhouse and residence (G2B H4):</td>
<td>• Define and fence off a no-go area in front of the buildings. The downslope extent of the no-go area should be as large as reasonably practicable. Retain a portion of the road reserve adjacent to G2B H4 as an open space curtilage in front of the heritage buildings.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction</td>
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<td><strong>At ‘Hotel Woodbyne’ (G2B H44) and ‘Fairview’ (G2B H71):</strong></td>
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<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Maintain or replace the visual barrier between the proposal and the heritage items G2B H44 (‘Hotel Woodbyne’, Jaspers Brush) and G2B H71 (‘Fairview’, Meroo Meadow) with appropriate planting of vegetation along the proposal.</td>
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<td><strong>At ‘Mount View’ Meroo Meadow (G2B H1):</strong></td>
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<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Undertake all feasible and reasonable measures to minimise the loss of open space on the eastern side of the buildings. Maintain this space as an effective curtilage between the building and the construction footprint of the proposal.</td>
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<td>NH-7</td>
<td><strong>Impacts to tree plantings</strong></td>
<td>For the tree plantings, Meroo Meadow (G2B H5):</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Minimise direct impacts to old growth tree plantings on the southern side of the proposal.</td>
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<td>• Undertake archival recordings of the whole tree planting group prior to direct construction impact.</td>
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<td>• Replace felled trees with new plantings using the same or similar tree species in an appropriate and safe location and configuration. This will maintain or restore and support the landscape character and heritage values of the plantings.</td>
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<td></td>
<td>• Avoid direct impacts to the trees on Turners Lane. This area, including the root zones of the trees, is to be fenced off and designated as a no-go zone.</td>
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<td>• Conduct dendro-chronological analysis of trunk-section samples from select felled trees in each group of tree plantings impacted by the proposal.</td>
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|    | For the tree plantings, Meroo Meadow (G2B H78): | - Avoid direct impacts to the trees adjacent to the Meroo Union Church (part of G2B H78), and the single pine on the south side of Boxsells Lane (part of G2B H78). These areas, including the root zones of the trees, are to be fenced off and designated as no-go zones.  
- Undertake archival recordings of tree plantings prior to construction.  
- Define no-go areas around trees to be retained, particularly around Meroo Union Church and on the opposite side of Boxsells Lane, where possible.  
- Conduct dendro-chronological analysis of trunk-section samples from select felled trees in each group of tree plantings impacted by the proposal. | Roads and Maritime project manager and construction contractor | Pre-construction and construction |
<p>|    | At the tree plantings (G2B H86): | - Define and fence off no-go areas around tree plantings within G2B H86 to avoid direct impacts throughout construction. | Construction contractor | Pre-construction and construction |
|    | At 'Westbury' (G2B H66): | - Retain the Camphor Laurel trees on either side of the driveway where feasible and reasonable. | Roads and Maritime project manager and construction contractor | Pre-construction and construction |
|    | Where feasible and reasonable, the construction and finishing of the proposal corridor, including embankments and cutting faces would will be undertaken in such a way to minimise and ameliorate adverse visual impacts, and facilitate the re-establishment of vegetation. This will be undertaken in a manner consistent with the Urban Design and Landscape Concept Plan, which is detailed in the Technical Paper: Urban Design, Landscape Character and Visual Impact Assessment (AECOM 2013c) provided at Appendix H of the review of environmental factors. | Roads and Maritime project manager | Pre-construction and construction |</p>
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<td></td>
<td>Establish new plantings in areas where existing heritage tree plantings would be directly impacted by the proposal. The new plantings would aim to maintain, restore and/or support the landscape character and heritage values of the existing tree plantings along the proposal and would be consistent with the Urban Design And Landscape Concept Plan, which is detailed in the Technical Paper: Urban Design Landscape Character and Visual Impact Assessment (AEOCM, 2013c) provided at Appendix H of the review of environmental factors. The type and variety of plantings used should seek to replicate those felled and/or be locally prominent.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction and construction</td>
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<td></td>
<td>Establish appropriate forms of vegetation along the proposal corridor and adjacent areas to assist in mitigating broad-scale landscape and visual impacts of the proposal corridor.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction and construction</td>
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<td>Carry out vegetation plantings with an awareness of maintaining important vistas from the road corridor, and the use of vegetation boundaries and alignments which conform to the rectangular patchwork of the surrounding landscape. This would serve to break up or scatter the dominant curvilinear character of the proposal.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction and construction</td>
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<tr>
<td>NH-8</td>
<td>Impacts to cultural landscape values, including the Southern Illawarra Coastal Plain and Hinterland Landscape</td>
<td>Where appropriate incorporate artistic elements in structures adjacent to the carriageway. This could include the use of designs derived from local cultural heritage themes, particularly at locations in close association to places/items of significance.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction and construction</td>
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<tr>
<td>NH-9</td>
<td>General construction impacts</td>
<td>Consider entering all heritage items which would remain in whole, or in part, within the easement of the proposal following the completion of construction, on the Roads and Maritime Section 170 Heritage and Conservation Register. This would likely include heritage items G2B H5, G2B H7, G2B H67, G2B H78, G2B H80, G2B H86 and G2B H88.</td>
<td>Roads and Maritime – Environment Branch</td>
<td>Operation</td>
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<tr>
<td><strong>Property and land use</strong></td>
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<tr>
<td>PL-1</td>
<td>Loss of agricultural land for use as ancillary sites.</td>
<td>Strip and stockpile topsoil during the preparation of any ancillary sites.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Reinstall topsoil as part of the rehabilitation of these areas for ongoing agricultural use.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<tr>
<td>PL-2</td>
<td>Traffic disruptions and changes to property access.</td>
<td>Undertake consultation and regularly communicate with affected landowners and residents where temporary property access changes will be required.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Provide property owners and residents with advanced notification of construction schedules and any changes to local roads and property access.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Provide community updates on changes to the local road network during construction, in accordance with the traffic management plan detailed in Section 6.1 of the review of environmental factors.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Continue consultation with all affected property owners regarding property acquisition during the detailed design of the proposal.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design and pre-construction</td>
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<td></td>
<td>Complete property adjustments for fencing, access tracks and other farm infrastructure in consultation with property owners.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td>Consider all land acquisition and property boundary adjustments requested in submissions to the review of environmental factors on a case by case basis during the acquisition phase of the proposal, in consultation with the relevant landowners.</td>
<td>Roads and Maritime project manager</td>
<td>Acquisition and detailed design</td>
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<td>Review property boundaries to reduce the number of kinks, angles and short straights in the new boundary lines of each property in consultation with the relevant property owners.</td>
<td>Roads and Maritime project manager</td>
<td>Acquisition and detailed design</td>
</tr>
<tr>
<td>PL-4</td>
<td>Changes to external property access.</td>
<td>Relocate property accesses that are lost would be removed as a result of the proposal in consultation with affected land owners.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Detailed design and pre-construction</td>
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<td>Further negotiate and develop locations and layouts of driveways that will be modified as a result of the proposal in consultation with land owners to suit individual property needs.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design and pre-construction</td>
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<td>Consider all adjustments to external property accesses requested in submissions to the review of environmental factors on a case by case basis during the detailed design phase of the proposal, in consultation with the relevant land owners.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design</td>
</tr>
<tr>
<td>PL-5</td>
<td>Land use impacts</td>
<td>Continue consultation with the property owner (property reference number 3) whose high ground would will be partially impacted by strip acquisition. This consultation would will determine the likely level of impact from the proposal and potential mitigation measures. If required acquisition would will be negotiated with the property owner.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design and pre-construction</td>
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**Socio-economic**
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<tr>
<td>SE-1</td>
<td>Community impacts</td>
<td>Implement a community involvement plan to provide timely, regular and transparent information about changes to access and traffic conditions, details of future work programs and general construction progress throughout the construction phase of the proposal. Provide information in a variety of ways including letter box drops, media releases, an internet site and variable message signs. Set up a 24 hour hotline and complaints management process.</td>
<td>Roads and Maritime and construction contractor</td>
<td>Pre-construction and construction</td>
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<tr>
<td>SE-2</td>
<td>Construction fatigue and noise impacts from construction works</td>
<td>Safeguards and management measures to address construction fatigue and noise impacts from construction works are described in Section 6.2 provided at NV1 to NV2 above.</td>
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<td>SE-3</td>
<td>Dust impacts from construction works</td>
<td>Safeguards and management measures to address air quality impacts during construction are described in Section 6.12 provided at AQ1 below.</td>
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<tr>
<td>SE-4</td>
<td>Visual impacts of construction works</td>
<td>Safeguards and management measures to address visual impacts during construction are described in Section 6.6 provided at LV1 above.</td>
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<td>SE-5</td>
<td>Potential community cohesion and severance impacts</td>
<td>Continue consultation with the Friends of Meroo Union Church throughout the detailed design and construction phases of the proposal, to develop and implement measures to minimise and mitigate amenity impacts to the church during construction.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design and construction</td>
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<td>Continue consultation with bus commuters at Croziers Road and Mullers Lane bus stops, including parents / carers of school children, throughout the detailed design and construction phases of the proposal, to develop and implement measures to minimise impacts on access to public transport facilities during construction.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design and construction</td>
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<tr>
<td>SE-6</td>
<td>Potential impacts from traffic delays and changed access</td>
<td>Advise residents, businesses and road users in a timely manner of any changes to road and property access arrangements.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>arrangements</td>
<td>In consultation with affected property owners, residents and businesses, provide temporary or alternative access arrangements to affected properties, where required to maintain uninterrupted access.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Prepare and implement traffic control plans to manage peak tourist/holiday traffic on Friday and Sunday afternoons and days immediately prior to and following public holidays.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<tr>
<td>SE-7</td>
<td>Impacts on the viability of agricultural land</td>
<td>Carry out property acquisition in accordance with the <em>Land Acquisition (Just Terms Compensation) Act 1991</em> and the Roads and Maritime ‘Land acquisition information guide’ (Roads and Maritime 2014).</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and post-construction</td>
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<td>Continue consultation with all affected property owners and agricultural business operators during detailed design and construction phases of the proposal, to develop and implement measures to minimise and mitigate impacts on land use viability, farm operations and infrastructure.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and post-construction</td>
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<td>Continue consultation with the owner of the residence to be demolished (property reference number 23) during the acquisition phase in accordance with the Roads and Maritime ‘Land acquisition information guide’ (Roads and Maritime, 2014).</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and post-construction</td>
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<td>Safeguards and management measures to address farm dam impacts are described in Section 6.4 provided at SW9 above.</td>
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<td>Maintain both internal and external property access for agricultural businesses for the duration of construction. Should temporary or alternative access be required this <strong>would</strong> be agreed and provided in consultation with the affected property owner(s).</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and post-construction</td>
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<td>Rehabilitate land as appropriate that has been acquired or leased for use as a temporary ancillary facility site for the construction, if it is not required during operations. Rehabilitate land for return to its previous use or for sale.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction Construction and post-construction</td>
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<td>SE-8</td>
<td>Amenity impacts</td>
<td>Provide architectural treatments and other noise management measures as detailed in Section 6.2. Safeguards and management measures to address potential amenity impacts (noise) are provided at NV1 to NV5 above.</td>
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<td>Implement the urban and landscape design strategy as detailed in Section 6.6 of the review of environmental factors.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction, construction and post-construction</td>
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<td>Safeguards and management measures to address potential amenity impacts (visual) during operation are provided in Section 6.6 at LV1 to LV5 above.</td>
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<td>SE-9</td>
<td>Changed traffic and access arrangements</td>
<td>Safeguards and management measures to address changes to traffic and access arrangements are described in Section 6.1 provided at TR1 to TR4 above.</td>
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<td>SE-10</td>
<td>Economic impacts to businesses and agriculture</td>
<td>Provide signposting to encourage highway traffic to visit tourist destinations and to indicate routes via u-turns to businesses on the other side of the carriageway. Signposting will be consistent with Roads and Maritime signposting guidelines.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction and operation</td>
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| GS-1| Short and long term stability of embankments and cuttings. | Create cut and fill batters at a maximum of 2:1 slope unless otherwise agreed during detailed design. In areas of particular risk of erosion, investigate measures which may include:  
- Retaining structures or soil nailing at steep or vertical cuts in areas where soft soils and highly weathered rock, such as the Berry Siltstone and Nowra Sandstone are present.  
- Retaining structures at bridge abutments.  
- Erosion protection measures, such as drainage structures, hydroseeding, hydro mulching and the use of geotextile fabric. Mitigation strategies designed to minimise the visual impact of these measures are discussed in Section 6.6 of the review of environmental factors. | Roads and Maritime project manager and construction contractor | Detailed design and Construction                      |
<p>| GS-2| Instability of soft soils                        | Where required, undertake ground improvements within areas of soft soils to provide sufficiently stable areas for construction to commence, and to provide long-term durability of the proposal. | Roads and Maritime project manager and construction contractor | Pre-construction and construction           |
| GS-3| Erosion and sedimentation                        | Refer to mitigation measures in Section 6.4. Safeguards and management measures to address erosion and sedimentation are provided at SW1 to SW2 above. | Roads and Maritime project manager and construction contractor | Pre-construction                           |
| GS-4| Disturbance of acid sulfate soils                | Develop an acid sulfate soil management plan in accordance with the Roads and Maritime ‘Guidelines for the Management of Acid Sulfate materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulphidic Black Ooze’ (RTA, 2005). Seek opportunities to avoid potential acid sulfate soils and to avoid lowering of the water table in the vicinity of potential acid sulfate soils. If it is not feasible and reasonable to avoid disturbance of potential acid sulfate soils, limit areas of disturbance as much as possible and implement management measures documented in the acid sulfate soil management plan. | Roads and Maritime project manager | Pre-construction, pre-construction and construction |</p>
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<td>GS-5</td>
<td>Contamination</td>
<td>Further assessment of areas of potential contamination concern will be required in areas that will be disturbed. Assessments could include:</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td>• Sampling of the fill mounds identified adjacent to the existing highway within the study area prior to the disturbance of these areas, if these fill mounds will be disturbed or utilised during construction of the proposal.</td>
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<td>• Conduct a hazardous materials audit on buildings requiring demolition, disturbance or alteration as part of the proposal.</td>
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<td>• Consult with the 10 landowners identified as having current or historical land use activities that store or may have previously stored petroleum hydrocarbons in order to evaluate whether potential contamination may have migrated into the construction footprint of the proposal.</td>
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<td>Undertake further investigation in the area identified as the truck spill site that occurred on 15 December 2012 at Jaspers Brush, to evaluate the presence of residual contamination prior to the commencement of construction. This will include a review of Environment Protection Authority records, inspection and sampling, as required. Subject to the findings of the additional investigation, recommendations will be made regarding the requirement for the management or remediation of contamination (if identified).</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td>Prepare and implement a procedure for handling the unexpected discovery of contamination prior to the commencement of construction. The procedure will be incorporated into the construction environmental management plan for the proposal and will outline the process for the identification and assessment of potentially contaminated material, in the event that previously unidentified contamination is discovered during construction of the proposal.</td>
<td>Roads and Maritime project manager</td>
<td>Pre-construction</td>
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<td>AQ-1</td>
<td>Air quality – dust generation</td>
<td>Develop an air quality management plan, which will form part of the construction environmental management plan. The air quality management plan will aim to minimise dust generation.</td>
<td>Construction contractor</td>
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<td>Undertake dust deposition monitoring at the nearest sensitive receivers to construction ancillary facilities that are in use to determine compliance with relevant Environment Protection Authority criteria.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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Princes Highway upgrade – Berry to Bomaderry
Roads and Maritime Services
Submissions report
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<td>AQ2</td>
<td>Operational air quality</td>
<td>Air quality impacts during operation of the proposal would <strong>will be minimal</strong> and therefore no mitigation measures have been proposed.</td>
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<td><strong>Hazard and risk</strong></td>
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<td>HR-1</td>
<td>General</td>
<td>Prepare site specific hazard and risk management plans as part of the construction environmental management plan, which includes items such as:</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Details of the hazards and risks associated with construction activities.</td>
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<td>• Risk management measures, including those identified in <strong>Chapter 6 throughout this Chapter (4)</strong>.</td>
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<td>• Procedures to comply with all legislative and industry standard requirements.</td>
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<td>• Contingency plans, as required.</td>
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<td>• Site-specific occupational health and safety plans and safe work method statements.</td>
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<td>• Training for all personnel (including subcontractors) in site inductions, including the recognition and awareness of site hazards and the location of relevant equipment to protect workers and manage any spills.</td>
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<td>HR-2</td>
<td>Contamination from accidental releases or improper transport, handling and storage of hazardous substances.</td>
<td>Transport all hazardous substances in accordance with relevant legislation and codes, including the <strong>Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998</strong> and the <strong>‘Australian Code for the Transport of Dangerous Goods by Road and Rail’ (National Transport Commission, 2008)</strong>.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Manage specific risks associated with the transport of hazardous substances to and from work sites, including the risks associated with temporary changes in local traffic conditions during the construction period, through the implementation of measures detailed in the construction environmental management plan.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Undertake a preliminary hazard analysis if the quantities of hazardous substances during construction are found to exceed threshold levels provided in ‘Applying SEPP 33: Hazardous and Offensive Development Application Guidelines’ (Department of Planning and Infrastructure, 2011).</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Store, handle and use hazardous construction materials in accordance with the Occupational Health and Safety Act 2000 and the ‘Storage and Handling of Dangerous Goods Code of Practice’ (Workcover NSW, 2005).</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Provide secure, bunded areas around storage areas for oils, fuels and other hazardous liquids.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td></td>
<td>Locate chemical storage areas outside areas subject to the 1 in 100 year flood event. Where this is not feasible, provide sufficient freeboard to avoid inundation during events of this size.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td></td>
<td>In the event of an incident leading to a spill of a hazardous substance during construction, use appropriate incident control measures in accordance with contingency plans for the worksite.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td></td>
<td>Construct temporary drainage structures as detailed in Section 6.4 and in accordance with the ‘Technical Guideline – Temporary Stormwater Drainage for Road Construction’ (Roads and Maritime, 2011b).</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Carry out regular maintenance and inspection of environmental and safety protection controls.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td>HR-3</td>
<td>Rupture or damage to underground utilities</td>
<td>Undertake utility checks (such as dial before you dig), consult with relevant service infrastructure providers and if required, relocate and / or protect utilities within the proposal area prior to the commencement of construction.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td>HR-4</td>
<td>Contamination from transportation of hazardous substances</td>
<td>Design water quality treatment measures to provide capacity to treat first flush from the pavement surface and reduce the risk of spills discharging onto adjacent land or into watercourses. Confirm locations and design capacity during the detailed design phase of the proposal.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design</td>
</tr>
</tbody>
</table>

**Waste management**

| WM-1 | Inappropriate management of waste | Manage and dispose of all waste in accordance with applicable State legislation and government policies, including:  
* Compliance with relevant Environment Protection Authority resource recovery exemptions. | Construction contractor | Pre-construction and construction |
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<td>Prepare a Waste Management Plan as part of the construction environment management plan, detailing appropriate procedures for waste management according to the waste management hierarchy:</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>• Avoidance of unnecessary resource consumption to reduce the quantity of waste being generated.</td>
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<td>• Recovery of resources for reuse onsite or offsite for the same or similar use without reprocessing.</td>
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<td>• Recovery of resources through recycling and reprocessing so that waste can be processed into a similar non-waste product and reused.</td>
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<td>• Disposal of residual waste material.</td>
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<td>In the instance that there are no other feasible and reasonable options for waste avoidance, reuse or recycling, residual waste material will be disposed to a suitably licensed landfill or waste management facility.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
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<td>Waste materials requiring removal from site will be classified, handled and stored onsite in accordance with the 'Waste Classification Guidelines: Part 1: Classifying Waste' (Department of Environment and Climate Change, 2009a), until collection by a contractor for disposal.</td>
<td>Construction contractor</td>
<td>Construction and operation</td>
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<td>Waste generated outside the site shall not be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997, if such a licence is required in relation to that waste.</td>
<td>Construction contractor</td>
<td>Construction and operation</td>
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| WM-2 | Unnecessary resource consumption | Avoid unnecessary resource consumption by making realistic and accurate predictions on the required quantities of resources, such as construction materials. Apply resource recovery principles, including reuse, recycling and reprocessing, to the management of waste generated during construction, including:  
  - Recovery of resources for reuse. Reuse waste materials generated by the proposal onsite or off-site where possible, including the reuse of topsoil within the construction footprint of the proposal. Onsite reuse will include landscaping works and re-contouring activities. Where such material cannot be reused for the proposal, it may be stockpiled for use on other road projects, or removed from the proposal site for other uses (subject to the third party obtaining any relevant approvals).  
  - Recovery of resources for recycling. Segregate resources such as paper, plastic, glass, aluminium cans and other recyclable materials for recycling during construction. These materials will subsequently be removed from the proposal site and disposed of at a local recycling facility for processing.  
  - Recovery of resources for reprocessing. Mulch or chip green wastes onsite and use for landscaping in the absence of a more beneficial use being identified (such as harvestable timber or fence posts). Larger green waste such as logs can be used for sediment and erosion control and habitat replacement as part of the landscaping and revegetation.  
  Use recycled products in construction to reduce the demand on resources, in instances where the use of such material is cost and performance competitive (for example, where quality control specifications allow). This may include the use of fly ash and slag within concrete mixes. | Construction contractor | Construction |
<p>| | | | | |
|    |                               |                                                                                                                                                                                                                                                                                                                                                           |                |          |</p>
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| WM-3 | Excess spoil  | Prepare a spoil management strategy to address excess spoil. (refer to Section 3.4.4). The strategy would will consider the following options:  
- Reduction of spoil volume through detailed design refinement or during construction (should increased quantities of spoil be encountered) through reuse within the proposal. This could include flattening batters or incorporating fill into landscaping (including landscaped mounds, if appropriate). The reuse of excess spoil during construction will be undertaken in accordance with the Roads and Maritime resource recovery exemptions detailed in Section 6.14.1 of the review of environmental factors.  
- Further geotechnical investigation during detailed design which may lead to design refinements that reduce the predicted volume of excess spoil.  
- Utilisation of excess spoil to flatten fill batters to blend the proposal into the existing landscape.  
- Utilisation of excess spoil in the formation of noise or landscape mounds, where feasible.  
- Utilisation of excess spoil in the construction of other road projects.  
- Provision of excess spoil to adjoining landowners, Shoalhaven City Council or other parties requiring spoil. This may include the provision of excess spoil to Shoalhaven City Council to provide stock mounds in flood prone areas as part of its flood mitigation works in the region which are still under investigation by Council. | Roads and Maritime project manager and construction contractor | Detailed design, pre-construction and construction |
| WM-4 | Roadside litter | Manage roadside litter in accordance with the existing Roads and Maritime road maintenance and litter collection program for the Princes Highway.                                                                                                                                                                                                                     | Roads and Maritime asset maintenance             | Operation                      |

5 Any provision of excess soil or similar materials to a third party will be dependent on the demonstration by the third party that it has obtained the necessary approvals for the use of the material (such as development consent from the relevant local council or a license under section 143 of the Protection of the Environment Operations Act 1997). Appropriate environmental controls will be installed at sites where excess materials are delivered and / or stockpiled.
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<td></td>
<td>Greenhouse gas and climate change</td>
<td>Where feasible and reasonable select the most fuel efficient plant, equipment and vehicles available through consultation with subcontractors and suppliers.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
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<td>Maintain all plant and vehicles regularly to maintain fuel efficiency.</td>
<td>Construction contractor</td>
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<td></td>
<td>Procure locally produced goods and services where feasible, reasonable and cost effective to reduce transport fuel emissions.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<td>Specify construction materials with lower emissions intensity in the detailed design (eg recycled steel in place of virgin steel and asphalt in place of concrete), where engineering and other technical specifications can be met and the alternative is feasible and reasonable.</td>
<td>Roads and Maritime project manager</td>
<td>Detailed design</td>
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<td>Seek opportunities to reduce the quantity of construction materials used through innovative design and construction methodologies.</td>
<td>Construction contractor</td>
<td>Pre-construction and Construction</td>
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<td>Where feasible and reasonable, procure recycled content road construction and maintenance materials such as recycled aggregates in road pavement and surfacing (including crushed concrete, granulated blast furnace slag, glass, slate waste and fly ash). This measure forms part of the Roads and Maritime implementation of the NSW Government's waste reduction and purchasing policy.</td>
<td>Construction contractor</td>
<td>Pre-construction and Construction</td>
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<td>Plan earthworks to minimise long haulage distances and reduce excess spoil.</td>
<td>Construction contractor</td>
<td>Pre-construction and Construction</td>
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<td>CI-1</td>
<td>Cumulative impacts – other projects</td>
<td>Consult with proponents of the North Nowra Link Road project and Shoalhaven Starches factory site proposed gas pipeline project to obtain information about project timeframes and impacts. Identify and implement appropriate safeguards and management measures to minimise cumulative impacts of construction, if either of these projects are constructed at the same time as the proposal.</td>
<td>Roads and Maritime project manager and construction contractor</td>
<td>Pre-construction and construction</td>
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</table>
4.3 Licensing and approvals

The proposal will require several licenses and approvals for its construction and operation. A summary of the licenses and approvals required for the proposal is provided in Table 4-2.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Timing</th>
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<tr>
<td>An Aboriginal heritage impact permit will be required for the proposal</td>
<td>Prior to commencement of construction</td>
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<tr>
<td>The proposal will require an excavation permit under Section 140 of the Heritage Act 1977 to undertake subsurface archaeological investigations.</td>
<td>Prior to commencement of construction</td>
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<tr>
<td>The proposal is classified as a scheduled activity under Schedule 1 of the Protection of the Environment Operations Act 1997 and therefore an environment protection licence for road construction will be required.</td>
<td>Prior to commencement of construction</td>
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<tr>
<td>Road occupancy licences will be obtained for each type of construction work involving closures in accordance with the Roads Act 1993.</td>
<td>Prior to commencement of construction</td>
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</table>

Flood work is expected to be undertaken as part of the proposal given that work will be undertaken on a floodplain that is likely to affect the distribution of floodwater. Roads and Maritime will continue to consult with NSW Office of Environment and Heritage and the Department of Primary Industries – NSW Office of Water prior to commencement and during construction to confirm that flood impacts have been adequately assessed and appropriate approvals are sought.
References


Department of Primary Industries (2012). *Guidelines for Riparian Corridors on Waterfront Land*. Department of Primary Industries (NSW Office of Water), Sydney.

Department of Primary Industries (2012a) *Policy and Guidelines for Fish Friendly Waterway Crossings*. NSW Department of Primary Industries (Fisheries NSW), Sydney.


Fairfull, S. and Witheridge, G. (2003), *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*. NSW Department of Primary Industries (Fisheries NSW), Sydney.


Gleeson and Gleeson (2012). *Reducing the Impacts of Development on Wildlife*. Pages 97 to 105. Published by CSIRO.


Navin Officer Heritage Consultants (2013b). *Berry to Bomaderry Upgrade Technical Paper, Non-Aboriginal Heritage*, ACT.


RTA (2006a) *Tip Sheet – Use of Reclaimed Water.* Sydney

RTA (2008). *Landscape Guideline – Landscape Design and Maintenance to Improve the Quality, Safety and Cost Effectiveness of Road Corridor Planting and Seeding.*

RTA (2009) *Policy 192 Transfer of assets and asset management functions between the RTA and other roads authorities.* Sydney.


RTA (2010). *Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in NSW.* Sydney.


Appendix A: Proposed Aboriginal heritage salvage methodology

Revised Section A3 of Appendix C of the Aboriginal Cultural Heritage Assessment Report

A3.1 Subsurface testing G2B A49/PASA47

It is proposed that the subsurface testing of G2B A49/PASA47 would take place prior to the possible commencement of stage 1 in that area and would inform any stage 1 program. Subsurface testing would be undertaken using the same hand excavation methodology as would be used for stage 1 and 2.

Test pits would be the same as those employed for the wider subsurface testing program, ie a transect of 11, 50 x 100 centimetres test pits at a 20 metre spacing (see Section A3.10 for mapping).

A3.2 Location and arrangement of salvage pits

The goal of the salvage excavation program is to excavate two per cent of those areas within sites G2B A42, G2B A44, G2B A45, G2B A47, G2B A51, and G2B A55 considered worthy of salvage. Salvage will also occur in G2B A53 if construction impacts are expected to extend to the south of the current road easement. All salvage pits would be situated within the proposed proposal easement and within the anticipated construction footprint (area subject to direct impact from the proposed road works).

Salvage Excavation would be conducted in two stages:

- Stage 1 pits would be 50 x 50 centimetres and concentrated around test excavation pits that contained artefact densities of five artefacts or higher, the exceptions being G2B A49 and G2B A44.
- Stage 2 pits would consist of extension of selected Stage 1 pits into broad area excavations 200 x 200 centimetres.

The selection of areas for salvage is based on the following criteria:

- Presence of lithic material showing technological diversity.
- Higher artefact density.
- Absence of gross disturbance.
- Location within the construction footprint.

A consistent artefact density of two to four artefacts across four pits and the presence of a surface site at G2B A44 suggest the site is of higher value for targeting for salvage.

See Maps in Section A4.9 for proposed salvage pit locations.
A3.3 Hand excavated salvage pits

General excavation methodology

The following excavation methodology would be followed for both stage one and stage 2 excavations.

1. Mark out and record pit location(s).

2. Excavate pit.

Pits would be excavated by shovel and trowel using standard by-hand archaeological methodologies including vertical and horizontal recording of spit levels and sedimentary, cultural and stratigraphic features. Hand held pneumatic hammers may also be deployed in compacted and/or stony sediments.

Spit intervals would be 100 millimetres, except in circumstances where the excavation of cultural features or stratigraphic units necessitate that this interval be varied.

Excavation would cease according to an on-site appreciation of the vertical extent of the archaeological deposit.

3. Where cultural features are identified, such as heat treatment pits or hearths, detailed plans would be drawn and samples of dateable material would be obtained.

4. Other samples may be obtained for the potential analysis of palaeo-environmental indicators such as pollen, phytoliths and microfauna.

5. All excavated archaeological deposit would be sieved either dry, or with the aid of pressurised water from a water truck. The latter is the preferred methodology. The use of a dry sieving technique would be determined according to an appreciation of on-site characteristics (such as the potential presence of fragile organic remains).

All material would be sieved through 5 x 5 millimetres mesh, with use of a larger top mesh where appropriate.

All identified or suspected cultural material recovered from sieving would be retained, bagged and labelled.

All pits would be backfilled with the remaining excavated sieved spoil and, as necessary, local or imported fill.

A3.4 Site specific methodology

G2B A42

Stage 1: 7 pits @ 50 x 50 centimetres 10 metre grid
Stage 2: extend selected pits out to an additional 4 m² (2 pits @ 200 x 200 centimetres)

G2B A44

Stage 1: 8 pits @ 50 x 50 centimetres 10 metre grid
Stage 2: extend selected pits out to an additional 4 m² (2 pits @ 200 x 200 centimetres)
G2B A45 (2 Areas)

Area 1 (concentrating on pit 9)
Stage 1: 3 pits @ 50 x 50 centimetres 10 metre grid
Stage 2: extend selected pits out to an additional 2 m²
       (1 pit @ 200 x 200 centimetres)

Area 2 (concentrating on pit 1)
Stage 1: 3 pits @ 50 x 50 centimetres 10 metre grid
Stage 2: extend selected pits out to an additional 2 m²
       (1 pit @ 200 x 200 centimetres)

G2B A47

Stage 1: 3 pits @ 50 x 50 centimetres 10 metre grid
Stage 2: extend selected pits out to an additional 2 m²
       (1 pit @ 200 x 200 centimetres)

G2B A51

Stage 1: 4 pits @ 50 x 50 centimetres 10 metre grid
Stage 2: extend selected pits out to an additional 4 m²
       (2 pits @ 200 x 200 centimetres)

G2B A49/PASA47

Stage 1 and Stage 2 pits will be determined following the subsurface testing program. The number and placement will be in keeping with the rest of the salvage program and will be confirmed with the Office of Environment and Heritage prior to commencement.

G2B A54 (2 Areas)

Area 1 (concentrating on pit 9)
Stage 1: 4 pits @ 50 x 50 centimetres 10 metre grid
Stage 2: extend selected pits out to an additional 4 m²
       (2 pits @ 200 x 200 centimetres)

Area 2 (concentrating on pits 3-6)
Stage 1: 9 pits @ 50 x 50 centimetres 10 metre grid
Stage 2: extend selected pits out to an additional 8 m²
       (4 pits @ 200 x 200 centimetres)

G2B A55

Stage 1: 5 pits @ 50 x 50 centimetres 10 metre grid
Stage 2: extend selected pits out to an additional 4 m²
       (2 pits @ 200 x 200 centimetres)
Salvage will only occur if construction impacts are expected to extend to the south of the current road easement.

The placement and number of Salvage pits will be determined if and when impact are known and will be confirmed with the Office of Environment and Heritage prior to commencement.

A3.5 Lithic analysis

All lithic items would be examined in detail by a lithic specialist using a low-power binocular microscope and incident illumination and/or hand lens. Descriptive recording of collected material would be to a level concomitant with the stated testing and salvage aims of the investigation, and the number of artefacts/ type of material recovered.

The primary aim of the analysis of the lithic items retrieved from the salvage excavations would be to realise the information potential of the deposits through the recovery and analysis of a larger sample of artefacts from this site.

Raw material type would be recorded for each stone artefact. Attributes for each artefact in the assemblage would be entered into a relational database and digital photographs may be taken of selected artefacts, where appropriate. Information for each specimen recorded in the analysis would be provided in a final report Appendix.

Analysis would be consistent with standards and guidelines defined by the statutory authority, the Office of Environment and Heritage.

A3.6 Report

The results of the investigation would be documented in a report, consistent with the Office of Environment and Heritage report standards, as appropriate.

In the event that an agreement or agreements cannot be duly carried by the Aboriginal Focus Group regarding the long term management of the recovered artefacts, then all Aboriginal objects for which a relevant resolution is absent, would be lodged with the Australian Museum.

A3.7 Protocol to be followed if suspected human remains are encountered

In the event that suspected human remains are encountered during the proposed salvage excavations, the Roads and Maritime 'Procedure for Unexpected Archaeological Finds' (Roads and Maritime 2011a) would be followed.

A3.8 Environmental safeguards

Minimal vegetation would be removed to facilitate the testing program.

All pits would be backfilled after completion of excavations at each location.

Sediment barriers would be set up around sieve stations to contain the spread and deposition of water-borne sediment. Sieve stations would be established in locations and managed so that surface run-off water does not reach the open water of creeks, rivers, lakes or swamps. A kit suitable for the containment of spillage of fuel for the water pump would be kept on site during the operations.
A3.9 Care and management of recovered artefacts

After examination and measurement all recovered artefacts would be stored individually in standard resealable plastic bags. These containers would be labelled in permanent black pen with the item’s unique identification number (where generated and appropriate), and details of its provenance within the excavation.

Following completion of the analysis of the assemblage, it is proposed that all Aboriginal objects would be repositioned back into the landscape (‘returned to country’) within Roads and Maritime controlled land, in as close a position (as is feasible and safe) to their original find locations. The manner, format and containment of the artefact repositioning would be according to current standing and future resolutions of the Aboriginal Focus Group, subject to Office of Environment and Heritage approval.

All locations of repositioned artefacts would be recorded on appropriate Office of Environment and Heritage forms and lodged with the Aboriginal heritage information management system, administered by the Office of Environment and Heritage.

In the event that the Aboriginal Focus Group resolves to retain some (or all of the artefacts) in the care and custody of one or more individuals or organisations, then this would be subject to the approval of a Care Agreement by the Office of Environment and Heritage.

A3.10 Salvage mapping

**All mapping remains unaltered**