OLD COOMA ROAD REALIGNMENT

REVIEW OF ENVIRONMENTAL FACTORS

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Report to
Queanbeyan City Council
in association with
Brown Consulting (ACT) Pty Ltd

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CERTIFICATION

This Review of Environmental Factors provides a true and fair review of the proposal in relation to its likely effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.

Name: David Hogg
Signed:

Designation: Director, David Hogg Pty Ltd.

Date: 9 December 2010

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APPENDICES

Appendix A is attached. The other appendices are separate documents.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACT	Australian Capital Territory
CEMP	Construction Environmental Management Plan
DECCW	NSW Department of Environment, Climate Change and Water
DWE	NSW Department of Water and Energy
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPA	Environmental Protection Authority
ESCP	Erosion and Sedimentation Control Plan
ESD	Ecologically Sustainable Development
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LEP	Local Environmental Plan
NES	National Environmental Significance
NPW Act	National Parks and Wildlife Act
NSW	New South Wales
NV Act	Native Vegetation Act
POEO Act	Protection of the Environment Operations Act
PSP	Preliminary Sketch Plan
QCC	Queanbeyan City Council
REF	Review of Environmental Factors
RTA	Roads and Traffic Authority
SEPP	State environment planning policy
SIS	Species Impact Statement
TSC Act	Threatened Species Conservation Act
TSR	Travelling Stock Reserve
WM Act	Water Management Act
WSUD	Water sensitive urban design

EXECUTIVE SUMMARY

The Queanbeyan City Council proposes to realign and duplicate Old Cooma Road between a point 400 metres south of the intersection with the proposed Edwin Land Parkway at Karabar and the intersection with Googong Road at Googong, New South Wales. The location of the proposal is shown in Figure 1.1.

The proposed works are required to accommodate increased traffic movements along Old Cooma Road resulting from the proposed new residential development at Googong.

Upgrade works would be undertaken in at least two stages. Stage 1 entails the construction of a new section of road, approximately 1.5 kilometres in length, as an alternative to the section of winding road which passes the entrance to the Cooma Road Quarry. A trunk services shared trench would be constructed in conjunction with the Stage 1 road works and would extend for the entire length of the ultimate proposal, from south of the Edwin Land Parkway intersection to Googong Road. The ultimate proposal is for the eventual duplication of the entire length of the 4.5 km section of road to form a four-lane dual carriageway.

The Stage 1 works, including the shared trench, are planned to be implemented during 2011, but the ultimate duplication is not expected to be constructed until about 2030. This Review of Environmental Factors (REF) assesses the environmental issues associated with both the Stage 1 works and the ultimate proposal.

A summary of the main environmental issues associated with the proposal is as follows:

Traffic noise. Traffic noise is a potential impact which is likely to be of concern at several locations along the route of the road, particularly where realignment during Stage 1 would bring the road closer to residential properties in the areas of Tempe Crescent, Heights Road and Talpa Road. Based on existing noise measurements and traffic noise modelling, the road design has incorporated noise mitigation measures designed to meet acceptable traffic noise criteria for a road of this type.

Impacts on native vegetation. The proposed works would involve clearing of some native vegetation beside the existing road, along the route of the Stage 1 realignment, and along parts of the shared services trench. The loss of native vegetation has been addressed through the provision of an offset area west and south of the Cooma Road Quarry. The purpose of the offset area is to allow regeneration of similar native vegetation over a larger area than that affected by the proposed works. The native quality of vegetation could also be affected by introduction of weed species, particularly during construction. Specific management measures are proposed to reduce such risks.

Effects on animal habitat. Effects on animal habitat would include:

- removal of hollow-bearing trees within the area of the works;
- increased interruption to ecological corridors (biolinks) that cross the route of the road and trench; and

- potentially increased risk of animal mortality due to the greater road width, although this risk would be reduced by the provision of two fauna underpasses.

Threatened species and ecological communities. Species and ecological communities listed under Commonwealth and/or New South Wales legislation that may be affected by the proposed works include the following:

- Box – gum woodland
- Hoary sunray
- Rosenberg's goanna
- Speckled warbler
- Brown treecreeper.

These have been addressed in detail in a separate Species Impact Statement and, in the case of Commonwealth-listed species, through a referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act.*

Taking account of the proposed offset and other mitigation measures, these processes have concluded that the proposal would not have significant impacts on any of the above species or communities.

Visual impacts. There is potential for the Stage 1 realignment to be visible from some nearby residences. Views of the road, however, would be partly screened by existing vegetation and, in the future, by additional landscaping established as part of the project. There are no important distant views of the area that are likely to be affected significantly by the road upgrade.

Views from the road. The view from the road has been a consideration in the design of the road and associated landscaping. The view from the future road would be fundamentally the same as those from the existing road for those sections which would be duplicated on the current alignment. The main change in views would result from the Stage 1 realignment, with the existing views of an open, rolling landscape with a large quarry as the major element being replaced with an enclosed valley, with a diversity of scenery embracing native vegetation, scattered pine trees, high cuttings and rural land.

Construction impacts. During the construction process, some impacts (e.g. noise, dust, movement of construction traffic) would be evident to nearby residents and road users. These impacts would be managed through a Construction Environmental Management Plan with a view to limiting such impacts to levels which are considered generally acceptable. Rock is expected to be encountered in the areas of large cut and some blasting of rock may be required during construction.

Effects on existing services and infrastructure. While some existing services (e.g electricity, telecommunications) would be affected by road construction, these would all be relocated as required as part of the project to maintain them in service.

Impacts on existing land use. The main impacts on land use would arise from resumption of land required for the construction of the Stage1 road works and the ultimate duplication. Affected landowners would be consulted with respect to land acquisition and alterations to access. A farm dam would be removed but would be replaced at an alternative site.

Soils, landform stability and erosion hazard. Geotechnical assessments have been undertaken which confirm that there are unlikely to be any major concerns of a geotechnical nature. Rock is expected to be encountered in the areas of large cut and some blasting of rock may be required during construction.

The management of soil to control erosion would be addressed through an erosion and sediment control plan, which would be incorporated into the Construction Environmental Management Plan for the project.

Landform modification. The proposed works would involve some major cut and fill earthworks, which would alter the local landform. For Stage 1, these include a deep cutting up to 16 metres high and filling to the depth of up to 10 metres, with these works being designed to accommodate the ultimate development in that section of the road. The remainder of the ultimate development would include widening the road formation in the northern and southern parts of the road, and would include filling of a deep gully in the northern part.

Hydrology and water quality. The drainage works associated with the road have been designed to address erosion control, scouring and downstream sedimentation and turbidity, as well as to prevent any increase in flooding.

Traffic impacts and access arrangements. While traffic volumes along Old Cooma Road would increase, this would be a consequence of the residential development at Googong, rather than the road upgrading. Existing access arrangements to some residences in estates along the road would be altered, but this would be beneficial in terms of traffic flow and safety.

Indigenous heritage. An indigenous cultural heritage survey has identified one Aboriginal artefact which would be impacted by the Stage 1 works, although others may be affected by the ultimate duplication. A permit has been obtained for salvage of that artefact.

Non-indigenous cultural and geological heritage. There are no sites assessed as having non-indigenous cultural heritage significance or geological heritage value that would be affected by the proposal.

Waste minimisation and management. A waste management strategy would be adopted to ensure that all wastes are appropriately recycled where possible, or disposed of off-site at an approved facility.

Other environmental issues. The proposal is not considered to raise any significant issues with respect to:

- demand on resources;

- climate and microclimate;
- air quality;
- socio-economic considerations;
- bushfire risks;
- operational hazards and risks;
- contaminated sites; or
- cumulative impacts.

In summary, the main benefits of the proposal would be to support the Googong development by providing a safe and efficient connection between Googong and Queanbeyan, and to provide a more direct and safer road for existing road users.

The main potential adverse impacts would be increased noise and visual impacts at residences nearest to the Stage 1 realignment and disturbance to native vegetation and fauna habitat. The impacts on residences have been addressed through noise mitigation and landscaping measures which form part of the proposal, while the ecological impacts have been largely offset by a proposed woodland regeneration area west and south of the Cooma Road Quarry. A series of environmental safeguards or mitigation measures addressing all of the main environmental issues during construction of the road is proposed for incorporation into a Construction Environmental Management Plan for the project.

The adverse environmental impacts of the proposal are unavoidable and relatively minor in the broad context of the development, and would be outweighed by the beneficial effects of the proposal.

PART A – PRELIMINARIES

1. INTRODUCTION

1.1 Overview

The Queanbeyan City Council (QCC) proposes to realign and duplicate Old Cooma Road between a point 400 metres south of the intersection with the proposed Edwin Land Parkway at Karabar and the intersection with Googong Road at Googong, New South Wales. The location of the proposal is shown in Figure 1.1.

Planned land releases for the proposed new residential development at Googong are expected to result in increased traffic movements along Old Cooma Road. Upgrading of this road is required as this route forms a key part of the regional transport corridor.

Upgrade works would be undertaken in at least two stages. Stage 1 entails the construction of a new section of road, approximately 1.5 kilometres in length, as an alternative to the section of winding road which passes the entrance to the Cooma Road Quarry. A trunk services shared trench would be constructed in conjunction with the Stage 1 road works but would extend for the entire length of the ultimate proposal, from south of the Edwin Land Parkway intersection to Googong Road. The ultimate proposal is for the eventual duplication of the entire length of the 4.5 km section of road to form a four-lane dual carriageway.

The objective of this Review of Environmental Factors (REF) is to provide sufficient information to allow Queanbeyan City Council to fulfil its obligations under Section 111 of the NSW *Environmental Planning and Assessment Act* 1979 (*EP&A Act*). Section 111 requires the proponent (Queanbeyan City Council) to assess to the fullest extent possible the environmental impacts of the proposal.

Stage 1 of the proposal is required for the early development of Googong, and has been designed to an advanced stage, as discussed in detail in this REF. The ultimate duplication would cater for the long term growth of Googong and is currently not expected to require construction to commence until approximately 2030. Allowing for potential changes to the environment, to relevant legislation and to road construction practices over the intervening period, it is feasible to address the ultimate duplication at a more general level only.

The contents of the REF are presented in the following parts:

- Part A – Preliminaries. This part provides background details on the proposal, its statutory context, the specialist studies and stakeholder involvement underpinning the proposal.
- Part B – Environmental Impact Assessment. This part details the level of environmental impact assessment undertaken for the REF. The section details the outcomes of the assessments and includes the Clause 228 Checklist.
- Part C – Finalisation. Part C summarises the important beneficial and adverse impacts, reviews the justification for the proposal and summarises the environmental safeguards that are intended to be implemented.

The REF also contains a set of appendices including detailed studies completed to inform the REF.

1.2 Proposal Identification

Name and locality of proposed activity: Realignment and duplication of Old Cooma Road, between Edwin Land Parkway and Googong Road, in the locality of Queanbeyan, New South Wales.

RTA region: The New South Wales (NSW) Roads and Traffic Authority (RTA) Southern Region office is the applicable office. RTA approval is required for the proposed works.

Council area: The proposal is located within the Queanbeyan City Council Local Government Area, in New South Wales.

Source of Funding: The proposed road construction works are jointly funded by the QCC and by Canberra Investment Corporation, who are the developers of Googong.

2. NEED FOR THE PROPOSAL AND OPTIONS CONSIDERED

2.1 Need for the Proposal

The need for the proposal arises primarily from the decision to allow residential development to occur at Googong. Implicit in that decision is a commitment to improve road access between Googong and other parts of Queanbeyan, including the realignment and eventual duplication of Old Cooma Road. Googong is about seven kilometres south of the Queanbeyan Central Business District and will be built over the next 20 to 25 years. Googong is expected to cater for approximately 16,000 people and consist of 5,550 new households, a town centre and business centre.

The *Queanbeyan City Council Residential and Economic Strategy 2031* (Ref. 1) identifies the realignment and duplication of Old Cooma Road as a priority transport issue for Queanbeyan, to be constructed by 2030. A recent transport study (Ref. 2) identified Old Cooma Road between Googong and Karabar as part of the road network placed under the most stress by future developments. That study predicted a combined total increase of 4,404 vehicle movements for the morning and evening peak periods by 2031 on Old Cooma Road between Googong and the future Edwin Land Parkway, attributable to the Googong development, and proposed that the road be upgraded to a four-lane carriageway to maintain a suitable level of service during peak periods. No other option considered in the study (including the Dunns Creek linkage) was able to reduce traffic flow along the two-lane Old Cooma Road to a level that would preclude the need for a four-lane upgrade.

Without the proposed deviation and upgrade of Old Cooma Road, the proposed residential area of Googong would remain poorly connected to the Queanbeyan CBD and local schools. Traffic congestion would increase, particularly in the vicinity of the Cooma Road Quarry, resulting in continuing and increasing delays to both local and through traffic during peak periods. The proposal is therefore necessary to cater for the future growth of the new suburb of Googong, and to contribute to the road capacity required to meet the expected transport needs of Queanbeyan over the next 25 years.

Stage 1 of the proposal is required specifically to provide a better road than the existing section of narrow, winding road that passes the Cooma Road Quarry. This new section of road is required to provide an alignment which can be duplicated readily in the future, and to enable the road to be designed to allow passing of slow vehicles on the steeper sections. The latter is important because of the increased volume of heavy construction traffic using the road during the early development of Googong, as well as to reduce conflict with trucks entering and leaving the Cooma Road Quarry.

The ultimate duplication would be required to cater for the general increase in traffic between Googong and Queanbeyan in the longer term. It is important that works undertaken for Stage 1 are compatible with the future duplication.

It is necessary for the Stage 1 development to also include the establishment of a services corridor adjacent to the full length of the road. This is required to accommodate a high pressure gas main pipeline and telecommunications cables to service the Googong development. It has been designed to be compatible with the

ultimate duplication of Old Cooma Road, but is to be established as part of Stage 1 because of the need for these services to be available at an early stage in the Googong development.

2.2 Development Options Considered

At a strategic level, there are no clear feasible alternatives to the proposal to upgrade the road transport corridor between Googong and Queanbeyan. Alternative direct routes between Googong and Queanbeyan do not currently exist, and any new routes would likely involve similar or greater overall environmental impacts. Not undertaking the proposal would effectively preclude the future Googong development and result in a substantial loss of growth potential in the Queanbeyan area. The scope for considering development options is therefore limited to the broad corridor of the existing Old Cooma Road.

In the course of investigating improved road access between Googong and the Queanbeyan road network (to Candlebark Road), the following concepts for various sections of Old Cooma Road were considered. The general alignment of the proposal has been endorsed by Council and is not subject to further analysis or review in the REF. Figure 2.1 shows the road sections as discussed below.

Section 1. Candlebark Road to Wickerslack Lane. Some detailed planning for the northern part of the alignment of Old Cooma Road was associated with and partly dependent on the final design of the intersection between Edwin Land Parkway and Old Cooma Road, which is located to the south of Candlebark Road. This intersection has been incorporated into the Edwin Land Parkway project and, as a consequence, the current proposal would commence approximately 400 metres south of the intersection of Cooma Road and Candlebark Road.

Two options have been considered for the section of road between Candlebark Road and Wickerslack Lane (see Figure 2.1). The initial proposal involved a route through native forest and woodland within an area subject to an Aboriginal land claim, which has since been granted. It was subsequently decided not to proceed with realignment at that location as this route would have increased the ecological impact of the proposal, due to the greater level of clearing required, and would also increase the cost of development.

The other option, which is preferred, is to duplicate the road on its existing alignment. This has been incorporated into the ultimate works of the current proposal.

Section 2. Wickerslack Lane to just south of Talpa Road. At present, most of this section consists of a relatively narrow length of winding road which passes the entrance to the Cooma Road Quarry, with access points at the northern end into Tempe Crescent and at the southern end into rural residential properties. Upgrading the existing road is not considered to be a feasible option due to the major impacts required on the steep slopes to achieve acceptable geometric standards and accommodate turning movements for quarry traffic, and allow for future duplication. The only general alignment considered acceptable for this section of road is within or adjacent to an existing road reserve which runs parallel to Heights Road. That road reserve is the original alignment planned for Old Cooma Road.

The main options with respect to this section relate to access into the nearby residential estates via Tempe Crescent and Heights Road. The initial design included separate egress points into these roads from the realigned Old Cooma Road, but this design was subsequently refined to provide a single egress point, midway between the two initial intersections (see Figure 2.1). The consolidation of the access points to one intersection improves the safety of access into and out of the rural residential estates.

At the southern end of this section, there is a dirt track, known as Talpa Road, which provides access to some of the rural residential blocks fronting Old Cooma Road and provides an informal connection to Mol Crescent in Talpa Heights. The end of the dirt track would be realigned and connected to Old Cooma Road via a T-intersection. The retention of this track for fire access is a requirement of the NSW Rural Fire Service Authority.

Section 3. South of Talpa Road to Googong Road. The only option considered for this section is the duplication of Old Cooma Road predominantly on its existing alignment, but with a separate service road to provide egress for the adjacent rural residential blocks (see Figure 2.1).

The feasibility of including a connection to the proposed Dunns Creek Road, which would link developments in Tralee and Googong, was initially examined but, as the traffic study (Ref. 2) determined that such a link would not be required in the 2031 planning horizon, allowance for the road connection is not included in the current design for the ultimate duplication. The current design, however, does not preclude the future inclusion of an intersection. Allowance for a connection to the future development at Hamlet West, to the north of the Googong township, is included in the preliminary designs.

3. OVERVIEW OF THE PROPOSAL

3.1 Location and Context

The ultimate alignment of Old Cooma Road runs approximately north to south. The northern extent of the proposal would be located approximately 3 km south of the centre of Queanbeyan, just south of the intersection with the proposed Edwin Land Parkway. The proposal would extend about 4.5 kilometres south to Googong Road, Googong. The development footprint covers approximately 21.5 ha and ranges from 30 metres to 90 metres in width. Stage 1, specifically the construction of a new section of road and the area required to merge the new and existing sections, would be approximately 1.5 kilometres in length.

The proposal would involve development predominantly within existing road reserves, although small additional areas would also be directly affected. Stage 1 road works would involve development primarily on land owned by QCC, while the services trench would require the establishment of an easement in areas located in some areas beyond the existing road reserve, to the east. The ultimate duplication would require minor land acquisition throughout the entire length of the road to enable the construction of the second carriageway and shared bicycle and pedestrian pathway.

Most of the proposal is surrounded by land zoned for rural or rural residential uses and has been cleared or otherwise modified. The northern part of the proposal passes through areas of woodland and forest, zoned for environmental protection. The area of forest and woodland on the west side of Old Cooma Road, between Edwin Land Parkway and Wickerslack Lane, is known as ‘Mirrabee’ and is owned by the Ngambri Local Aboriginal Land Council. A parcel of Crown Land on the east side of Old Cooma Road is the subject of a current Aboriginal land claim. The Googong Travelling Stock Reserve is located on Crown Land, at the southern end of the proposal, on the western side of the road.

3.2 Summary of Proposal

The ultimate proposal for upgrading Old Cooma Road is shown in Figure 3.1. This consists of a four-lane dual carriageway road between the proposed Edwin Land Parkway intersection and the Googong Road intersection, and would be required for the full development of Googong.

Stage 1 of the proposal involves construction of a new road throughout most of the length of Section 2 as described above (see Figure 3.2). This construction would take place within an existing road reserve shown on the Queanbeyan Local Environmental Plan (LEP). It is understood that the current alignment for Old Cooma Road was constructed to provide access to the Cooma Road Quarry, and that the original road reserve was retained for future use. The Stage 1 works would provide a two-lane road southbound and a single carriageway northbound. Stage 1 would be designed for duplication as part of the ultimate proposal.

The Stage 1 works would include intersections to provide access respectively to:

- the Cooma Road Quarry;

- Tempe Crescent and Heights Road; and
- Talpa Road and nearby rural residential blocks.

At the completion of Stage 1, the sections of road that would no longer be functional would be rehabilitated. These include the section of the existing Old Cooma Road at the northern end of Stage 1, the section of the road between the quarry entrance and the Talpa Road area, and the section of Tempe Crescent between the current egress point and Heights Road.

The Stage 1 works would include a services trench running the full length of the road from south of Edwin Land Parkway to Googong (see Figure 3.3). This trench would be designed to accommodate a high pressure gas main and telecommunications services.

The ultimate proposal would provide a four-lane dual carriageway the entire length of the road between the proposed Edwin Land Parkway intersection and the Googong Road intersection. A shared bicycle and pedestrian pathway would be constructed adjoining the road to the east. Construction of the ultimate proposal is expected to be commenced in approximately 2030.

3.3 Components

The components of the proposal include:

- construction of a single carriageway road, between the Tempe Crescent turnoff and Talpa Road;
- provision for new services in the road corridor (high pressure gas main, telecommunications);
- the eventual construction of a dual carriageway road;
- provision of a shared bicycle and pedestrian pathway;
- relocation of existing 11kV and 66kV overhead electricity lines, underground telecommunications cable, optical fibre lines and gas mains where required;
- rehabilitation of unused portions of road;
- minor creek crossings;
- construction of drainage and stormwater systems;
- construction of batters and benching;
- easements;
- landscaping, primarily with grasses and trees;
- lighting;
- installation of sound attenuation structures;
- provision of appropriately located fauna underpasses;
- fencing; and
- establishment of temporary stabilised access and works areas.

Further details of these proposed works are provided in Chapter 4.

3.4 Timing

Key dates have been identified in the program for the realignment and duplication of Old Cooma Road as follows:

Activity	**Date**
Completion of preliminary design (PSP)	September 2010
Stage 1	
Completion of detailed design	March 2011
Tender for construction released	May – June 2011
Commencement of construction	August 2011
Completion of construction	February 2012

Ultimate duplication

The program for detailed design and construction of the ultimate duplication would be determined by the rate of development at Googong. On current estimates, construction is likely to be required to commence in approximately 2030.

4. DETAILED DESCRIPTION OF PROPOSAL

4.1 Introduction

The following chapter describes in further detail selected aspects of the road design, particularly those which may have significant implications for the assessment of environmental impacts. These are generally described first in relation to the ultimate development, then in relation to the Stage 1 component, where this is applicable.

Old Cooma Road upgrade has been designed in accordance with Austroads guidelines and the RTA Road Design Guide. The Stage 1 design takes account of the requirement for the ultimate duplication.

Key design criteria are as follows:

- A posted speed limit of 80 km per hour along Stage 1.
- A maximum grade of 9 percent.
- Provision for a shared bicycle/pedestrian path. The formation would be provided in the Stage 1 works, with construction of the path in the ultimate duplication.
- Drainage design catering for runoff and existing creek flows. This is required because a significant portion of the road alignment follows an existing drainage path.
- Maintaining the extent of proposed works within the road reserve as far as possible. A small part of Stage 1 road works, sections of the services trench, sections of the cycle path, and a large component of the ultimate duplication would take place outside the existing road reserve.

Further details of the design are provided in the preliminary sketch plan report prepared by Brown Consulting (ACT) Pty Ltd (Ref. 3).

4.2 Road Cross Section

Typical cross sections of the ultimate and Stage 1 developments are shown in Figures 4.1 and Figure 4.2. The width of the development footprint would range from 30 metres to 90 metres, depending on the topography and amount of fill required.

Ultimate Development
The ultimate development would consist of a dual carriageway road, each carriageway with two lanes. Each traffic lane would be 3.5 metres wide, with shoulders between 1.5 metres and 2.5 metres in width. The two carriageways would be separated by a median of variable width, between about 4 metres and 9 metres, located between the edges of the adjacent pavements.

A shared path for bicycles and pedestrians would be constructed from Edwin Land Parkway to Googong Road, on the eastern side of the proposed duplication (Figure 4.1). The cycleway/ pedestrian path would be located adjacent to the road, separated by a wire rope safety barrier where required (see Figure 4.1).

Along the road, longitudinal drainage would generally consist of open table drains. Concrete-lined drains have been introduced to reduce the footprint of the development in areas where deep cuttings are required.

Noise barriers of variable heights would be constructed as required (see Section 11.3).

Stage 1
For most of its length the Stage 1 road would consist of a two-lane carriageway southbound and a single carriageway northbound, separated by a depressed medium of variable width. Each lane would have a width of 3.5 metres with 2 metre wide shoulders and a 2.5 metre verge on each side. The second lane southbound would function as a climbing lane for the length of Stage 1.

Earthworks for the second lane northbound would be completed in Stage 1, with road construction completed as a component of the ultimate duplication.

Longitudinal drainage would generally consist of table drains of variable width along the outer edges of the proposed road, with the depressed median between the carriageways contributing to stormwater management. The earthworks for the formation for a future cycle/ pedestrian path are proposed adjacent to the eastern side of the new road.

Noise barriers of variable heights would be constructed as required (see Section 11.3).

4.3 Horizontal Alignment

Ultimate development
The horizontal alignment for the ultimate development is shown in Figure 4.3. The southbound carriageway would follow the existing alignment of Old Cooma Road with minor deviation (between Ch. 900 and Ch. 1100) to the point where it would join the new Stage 1 alignment as described below, which it would then follow. At the southern end of the new Stage 1 alignment near Talpa Road (Ch. 3000 to Ch. 3300), the duplicated road sections would be located approximately 25 metres to the west, of the Stage 1 road, moving it away from the front of the adjacent rural residential blocks located on the east side of the road. The existing road would be converted to a service road providing access to those blocks.

The northbound carriageway would be constructed west of the southbound carriageway, the two carriageways being separated by a median between 6 metres and 9 metres wide, depending on topography and other constraints. Most of the northbound carriageway and the southern part of the southbound carriageway adjacent to the proposed service road would be located outside the existing road reserve, necessitating land aquisition.

Stage 1
The horizontal alignment for the new roadworks proposed in Stage 1 is shown in Figure 4.4. The new road would leave the existing Old Cooma Road approximately 400 metres south of Wickerslack Lane, where the road starts to curve west towards

the quarry. It would follow a route within the existing road reserve parallel to the start of Tempe Crescent and then Heights Road, curving away from Heights Road and passing through a saddle to rejoin the existing road in the vicinity of the Talpa Road junction. New T-intersections would be provided for the quarry access road, Tempe Crescent/Heights Road and Talpa Road as described further in Section 4.6.

4.4 Vertical Alignment

The vertical alignment of the ultimate development is shown in Figure 4.5, with the Stage 1 section indicated. The road climbs from Edwin Land Parkway in the north to a saddle just south of Talpa Road, and then passes through undulating terrain to Googong.

Grades at the northern end of the alignment are gentle, with typical grades of between 2 and 5 percent. Grades at the southern end of the climb are much steeper and are generally in the range of 5 percent to 9 percent, requiring construction of a climbing lane. RTA guidelines indicate that an overtaking lane is warranted based on grades, with southbound vehicles commencing to climb steeply immediately after the proposed egress point to Tempe Crescent/Heights Road. The proposed dual carriageway southbound, commencing from the quarry access road and extending to just beyond the top of the climb, would allow for overtaking traffic. This would extend from approximately Ch 1850 to Ch 3250, which equates to a length of 1400 metres, meeting the requirements for length of climbing lane recommended by the RTA Guidelines, i.e. minimum length of 700 metres including tapers.

4.5 Pedestrian and Cycle Path

A separate pedestrian and cycle path running parallel to the road is proposed as part of the ultimate development. This would be located on the eastern part of the road, approximately 4.5 metres from the edge of the southbound carriageway.

Earthworks for the formation of this path would be undertaken as part of the Stage 1 development (see Figures 4.2 and 4.4), but only for the section adjacent to the Stage 1 works. Because the path would not continue at either end of these works, completion of the path would not be undertaken until the later stage of construction.

It is intended that the path would be sealed, but further details of its construction would not be determined until the final design stage for the ultimate development.

4.6 Local Access

The proposed works would alter existing access arrangements to nearby properties, as shown in Figures 4.3 and 4.4. Most of these changes would occur as a result of the Stage 1 works.

The existing and proposed access arrangements are summarised as follows:

Cooma Road Quarry. The entrance to the quarry is off the existing section of Old Cooma Road, which would be replaced by the Stage 1 works. The future access to the quarry would be via a T-junction off Old Cooma Road, constructed in Stage 1 and

modified in the ultimate development. This would connect with the redundant section of the existing Old Cooma Road, which would be closed and rehabilitated just beyond the quarry entrance (see Section 4.10), precluding access to the quarry from the south. A new driveway off the realigned access road would provide access to the rural property located between the quarry and the Stage 1 works. This property is currently accessed from Tempe Crescent.

Tempe Crescent and Heights Road. Properties in Tempe Crescent and Heights Road are currently accessed via the lower section of Tempe Crescent which branches off Old Cooma Road near the northern end of the Stage 1 works. That section of Tempe Crescent would be closed and rehabilitated as part of the Stage 1 works, although driveway access at the junction would still be provided to one property (Ch. 1700).

The new access would be via a connection to Heights Road about 100 metres south of the bend in Tempe Crescent where Heights Road currently joins it (Ch. 2150). This would provide access in both directions along Heights Road, connecting to Tempe Crescent and other roads in the Talpa Heights estate. This connection would be provided as part of Stage 1 and would be retained and upgraded in the ultimate development.

Talpa Road. Talpa Road exits as a rough access track providing alternative or emergency access from the Old Cooma Road into the Talpa Heights area. The intersection with Old Cooma Road would be relocated about 150 metres to the south and upgraded to maintain this connection, although the proposed works do not include improvement of most of the track itself. A relocated section of Talpa Road would provide access to four rural properties which currently have direct driveway access from Old Cooma Road.

4.7 Drainage and Creek Crossings

The topography of the area along Old Cooma Road results in the need for a number of creek crossings and other drainage works throughout the project. The locations of major drainage works are indicated in Figure 4.6.

In general, drainage on the project would be designed in accordance with the following criteria:

- Cross drainage flows would be impacted as little as possible and flows would be directed downstream of the road to be consistent with the existing flow regime.
- Cross drainage would be designed to convey 100 year ARI flows.
- Longitudinal drainage would generally consist of open trapezoidal drains. In a number of locations the drains would be on very steep grades, which would result in high flow velocities causing erosion of the drain inverts even during the 20 year ARI storm event if the inverts were not protected. In such locations it is proposed that the drain inverts would be lined. Details of the lining would be resolved in the course of further design, but lining is likely to be concrete or alternatively stone pitching.

- Water sensitive urban design (WSUD) principles would be implemented where practicable in the construction of the proposal. The key objectives of WSUD for this project are to:
  - improve water quality in major waterways; and
  - not cause an increase in peak stormwater flows.

Extensive works would be required in Stage 1 where the new road alignment follows a major creek gully. The gully is substantially eroded in places. Earthworks would be undertaken to accommodate the ultimate development.

An existing farm dam (Ch. 2200) would be relocated as a component of the proposed Stage 1 works (see Figure 4.6). Minor creek training works would be undertaken at about Ch. 1850, towards the northern end of Stage 1 works where the reformed drainage system merges with the existing drainage line. Specific erosion control measures would be implemented as required.

Filling of a major creek gully east of the existing road at its northern end would be required for the ultimate development. Measures to accommodate flows down into this gully would be addressed in the design of those works.

4.8 Trunk Services Shared Trench

As part of the Stage 1 works, a new shared trench for gas and communications would be established along the full length of Old Cooma Road between a point just south of Edwin Land Parkway and Googong Road. The current proposal for this trench is on the eastern side of the ultimate road alignment (see Figure 3.3). Between Ch. 400 and Ch. 1050, an alternative route on the western side of the existing (and ultimate) road has also been considered. The environment described in this REF covers both of these options, but the preferred option on the eastern side is shown in Figure 3.3.

The services to be installed in the trench would include:

- a 200 mm diameter steel trunk gas main to supply gas to Googong township; and
- conduits for optic fibre telecommunications cables to service Googong township.

The trench would be between 600 mm to 1 metre in width and would require a construction corridor 3 metres to 5 metres in width to allow for vehicle access and materials storage. The trench would be constructed generally within the Stage 1 road formation works or otherwise as indicated in Figure 3.3, particularly where it adjoins the ultimate duplication. Between Ch. 400 and Ch. 1050, where the road would ultimately be duplicated on the eastern side, the preferred route for the trench would be located some distance from the existing road and would involve a separate narrow construction corridor.

4.9 Relocation of Existing Services

There are a large number of major services along Old Cooma Road, as shown in Figure 4.7.

Initial contact has been made with all relevant authorities with services in the vicinity of the project to determine whether:

- protection or relocation of services is required as part of the project including estimated costs; and
- there are plans for future construction of additional services in the vicinity of the project.

Electricity
Overhead electricity lines obliquely or directly cross the proposed alignment at about Ch. 1100, Ch. 1350, Ch. 2020, Ch. 2600, Ch. 2830, Ch. 3450 and Ch. 4080 and are located close to the road between Ch. 3100 and Ch. 3500. Otherwise the electricity lines are outside the road corridor.

Because of the multiple crossings and locations within the road alignment between Ch 2500 and Ch 3500 in the southern part of Stage 1, the electricity line may need to be relocated. The proposed route is to the west of the proposed road alignment, well clear of the ultimate duplication.

In addition, part of the existing 66kV overhead line north of Wickerslack Lane may need to be relocated prior to the ultimate duplication. This would be assessed as a separate project.

Telecommunications
Telstra has a number of assets within the vicinity of Old Cooma Road. A fibre optic cable is located generally parallel to the road from Ch. 1150 to Googong Road, and crosses under the proposed road alignment several times. The existing cable between Wickerslack Lane and the southern end of Stage 1 (about Ch. 1350 to Ch. 3000) would be relocated during Stage 1.

There are also some Telstra copper cables in similar locations. The live cables would be replaced and relocated as required, while the existing unused or redundant cables would remain in situ.

Gas
A low pressure gas pipeline is located along the east side of the Old Cooma Road reserve, from between Edwin Land Parkway and the bend on Heights Road (Ch. 2400). This pipeline supplies the residences in Tempe Crescent and Talpa Heights.

The section of the pipeline between about Ch. 400 and Ch. 1350 would be relocated towards the east, near the proposed cycleway, during the proposed ultimate duplication.

4.10 Landscaping and Rehabilitation

Following the completion of construction works and the removal off site of all (temporary) ancillary construction facilities, the area will be landscaped and revegetated as indicated in Figures 4.8 and 4.9.

A mixture of eucalypts (*E. albens, E. melliodora* and *E. polyanthemos*) and river oak (*Casuarina cunninghamiana*) would be planted alongside the road in areas where the existing trees have been removed. *Lomandra tanika, Pennisetum alopecuroides* and *Poa labillardieri* would be planted to stabilise banks, while a dryland grass mix comprising Chewings fescue, perennial ryegrass, creeping red fescue, white clover and non-invasive couch would be used to rehabilitate road surfaces and cleared areas affected by the proposal.

4.11 Noise Protection

The relocation of the road during the Stage 1 works would bring traffic closer to existing residences in Tempe Crescent and Talpa Heights, potentially increasing traffic noise at some of these properties. In addition, the increased traffic volumes with time in other parts of the road would also result in higher traffic noise levels, unless appropriate amelioration measures are implemented.

The design process for the road has included a detailed noise assessment (see Chapter 11 and Appendix E). Based on this assessment, noise barriers have been proposed for the locations indicated in Figure 4.10 and Figure 4.11. The measures proposed for limiting traffic noise levels are generally considered to be acceptable (see Chapter 11).

4.12 Lighting

Street lighting would be provided at the Tempe Crescent intersection in Stage 1 and the Wickerslack Lane intersection on duplication. Otherwise, no lighting would be installed along the road.

4.13 Fauna Underpass

Because of the existing bushland either side of the road in the southern and northern sections of the proposal, it is expected that a variety of wildlife would cross the road in these areas. To reduce the extent of animal mortality, it is proposed to provide two low fauna underpasses, one at approximately Ch. 900 and the other at Ch. 4480, with fencing for about 10 metres either side of both underpasses to channel wildlife through them (see Figure 4.3).

Because of road design limitations, the internal height of the underpasses would be limited, making them unsuitable for kangaroos, but they should be suitable for other ground-dwelling animals such as rodents, small marsupials, echidnas, reptiles and amphibians. The potential effectiveness of the underpasses is discussed further in Section 9.3.

The underpasses would be constructed as part of the ultimate development, i.e. probably not before about 2030. The habitat either side of the road may change somewhat in the intervening period, as might its fauna population. Also, the science of designing wildlife crossings is currently going through a period of rapid advancement. It is therefore not appropriate to propose specific details for the fauna underpasses, the design of which would be determined closer to the time of construction.

4.14 Fencing

Any boundary fencing removed for the proposal would be replaced or, where there are changes to property boundaries, would be repositioned.

For Stage 1 road works, new stock-proof fencing would be provided for the rural property adjacent the road and to the west. Existing fencing between Stage 1 and rural residential blocks on the east side of the road to Ch. 2800 would not be affected. From Ch. 2800, boundary fences would be replaced on the eastern side of the new section of Talpa Road constructed as an extended accessway from Old Cooma Road.

The specific location of any replacement fencing required for the ultimate duplication would be determined during the detailed design stage. A similar principle would apply in that fencing that was removed would be relocated or replaced.

Temporary fencing to manage construction works would be detailed in relevant construction management plans.

4.15 Temporary Works Area

Construction of the road would require the establishment of site compounds, stockpiles and parking areas for onsite vehicles. The site compounds would contain temporary office facilities with adjacent toilets and hand-washing facilities, storage areas, turning and access areas for vehicles and equipment, and parking areas for construction equipment/vehicles and workers' vehicles. In addition, sites would be required for the short term storage of fill during the period when earthworks are being undertaken.

It is common practice for such sites to be agreed with the contractor at the start of construction. Potential sites for the Stage 1 development have been identified as follows (see Figure 4.12):

- near the westwards bend in Old Cooma Road towards the Cooma Road Quarry;
- on a flat section of previously cleared ground at about Ch. 2200, adjoining Stage 1; and
- towards the southern end of Stage 1, with access onto an existing section of Old Cooma Road.

Figure 4.12 also indicates some indicative locations for stockpiles. These are subject to further negotiations with the contractor and any affected landholders, and may be amended at the time of construction.

Specific works areas for the storage of machinery and resources required for the construction of the shared services trench have not been identified at this time. The location of these sites would depend on the staging of the works and the type of vehicles used.

Temporary works areas for the ultimate development would be identified in the course of detailed design for that stage of the works, and may be influenced by land use and environmental changes during the intervening period. It is therefore not appropriate to identify them in this REF.

4.16 Construction Program and Practices

The construction period for Stage 1 is expected to run from about August 2011 to February 2012. Working hours would be between 7.00 am and 5.00 pm Monday to Saturday.

Construction equipment would include heavy machinery for processes such as clearing vegetation, earthworks, excavation of trenches, pavement construction and installation of services (lighting, shared trench). The equipment used would depend partly on the contractor, and cannot be specified in detail in this REF.

Overall, the proposal has balanced earthworks. Stage 1 would generate an excess of about 1400 m^3 of fill while the ultimate duplication would require an estimated 1400 m^3 of fill. The excess fill generated by Stage 1 could be stockpiled for later use. However, because of the time lag between the completion of Stage 1 and the commencement of works for the ultimate duplication, it could alternatively be used in other projects, with fill being imported when required for the ultimate works. Temporary storage of fill on site is likely to be required at times.

Quarried material would need to be imported for road base and other uses. This is expected to come from the Cooma Road Quarry. Other materials required include asphalt, concrete, pipes, guardrails and landscape supplies.

The majority of the works would be undertaken without substantially impacting existing traffic flows. Traffic would continue to be directed along Old Cooma Road until the completion of Stage 1. No detouring of local traffic is proposed for the construction of this stage, although partial road closure may be required during the merging of Stage 1 with the existing road alignment. In this event, one lane would remain open to traffic with alternating periods of access for northbound and southbound traffic. Alternatively, a temporary widening of Old Cooma Road to the north and south of the new works may be undertaken to maintain two-way traffic flow.

Construction access to the site would be from the northern end of Stage 1, with equipment, materials and workers transported along Old Cooma Road from Queanbeyan, with the exception of materials transported directly from the Cooma Road Quarry.

It is not feasible to discuss the construction program and practices in relation to the ultimate development in this REF.

The contractor would be required to prepare a construction environmental management plan for Stage 1 prior to commencement of construction for review by QCC. Information on the potential scope of that plan is provided in Section 25.5.

5. STATUTORY FRAMEWORK

5.1 Planning and Environmental Context

The following sections describe the statutory planning and environmental context of the proposal in terms of current or planned future land use, transport development and associated environmental impacts. Relevant legislation is examined at the Commonwealth, State and Local levels.

5.1.1 Commonwealth legislation

The Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (*EPBC Act*) requires actions, which are likely to have a significant impact on matters of National Environmental Significance (NES matters) or that have a significant impact on Commonwealth land, to be referred to the Commonwealth Minister for the Environment for approval. NES matters relevant to the proposal include threatened species and ecological communities listed under the Act.

5.1.2 NSW State legislation

State Environmental Planning Policies

State environment planning policies (SEPPs) are made by the Minister for Planning and deal with issues significant to the state and people of New South Wales. The proposal is not located on land reserved under the *National Parks and Wildlife Act* and does not affect land or development regulated by *State Environmental Planning Policy No. 14 – Coastal Wetlands, State Environmental Planning Policy No. 26 - Littoral Rainforests* or *State Environmental Planning Policy (Major Projects) 2005*.

State Environmental Planning Policy (Infrastructure) 2007

The relevant SEPP for the project is the State Environmental Planning Policy (Infrastructure) 2007 (ISEPP). This policy aims to facilitate the effective delivery of infrastructure across the State. Pursuant to Division 17 Subdivision 1 Section 94 of the ISEPP, development for the purpose of a road or road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land.

Part 2 of the ISEPP contains provisions for public authorities to consult with public authorities prior to the commencement of certain types of development.

NSW *Environmental Planning and Assessment Act* 1979

In NSW, assessment of proposed developments is prescribed by the *Environmental Planning and Assessment Act* 1979 (*EP&A Act*) and the *Environmental Planning and Assessment Regulation* 2000 (*EP&A Regulation*).

Certain developments, such as the construction of roads or electricity infrastructure by public authorities do not require development consent, and thus the environmental impacts are not assessed under Part 4 of the *EP&A Act*. For this reason, Part 5 of the

EP&A Act contains a 'safety-net' which is a separate environmental assessment procedure which applies to these types of developments and activities.

Under Section 111 Part 5 of the *EP&A Act*, QCC as the primary determining authority must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment if the activity goes ahead. The preparation of this REF assists the QCC in this process. It will also provide the basis for determining the requirement for an Environmental Impact Statement (EIS) in accordance with Section 112 of the Act.

The preparation of an environmental impact assessment in the form of a REF satisfies the requirements of Clause 228 of the *EP&A Regulation*. An REF has no statutory basis, but is required as part of the standard practice of the Department of Planning and other public authorities which are bound by Part 5 of the *EP&A Act*.
After considering the environmental impacts, the determining authority can then either approve or disapprove the activity, or, if the determining authority is also the proponent, they can decide to carry out the activity, modify it, or refrain from doing it.

The factors to be considered in determining the significance of potential impacts that the proposal may have on threatened species, populations or ecological communities, or their habitats, is addressed in Section 5A, Part 1 of the *EP&A Ac*t. This involves the application of the seven part test as outlined in Section 5A of the Act. The issue of threatened species and ecological communities is discussed further in relation to the *Threatened Species Conservation Act* (below).

NSW *Threatened Species Conservation Act* 1995

Threatened species, populations, ecological communities and habitats for threatened species are listed under the *Threatened Species Conservation Act* (*TSC Act*). An assessment of the potential impact of a proposal on threatened entities is required under Section 5A of the *EP&A Act*. If it is likely that a significant impact may result from a proposal, a Species Impact Statement (SIS), based on the Director General's Requirements, should be prepared.

The potential for the proposal to impact on threatened entities was identified in a flora and fauna report (Ref. 4). The preparation of a SIS was subsequently undertaken, in accordance with the requirements of Sections 109 and 110 of the *TSC Act* and with regard to the requirements as notified by the Director General of the Department of Environment and Conservation (Ref. 5).

Although it was deemed that the proposal would have a significant impact on threatened species listed under the *TSC Act*, the completion of an EIS for the proposal is not required because this REF has been completed in conjunction with a SIS, and the proposal is not likely to cause a significant impact on any other factor of the environment. Under Section 112 (1C) Subsections (a) and (b) of the *EP&A Act*, an EIS is not required if the ecological impact of the proposal has been addressed by way of an SIS.

NSW *Native Vegetation Act* 2003

The *Native Vegetation Act* (*NV Act*) regulates the clearing of native vegetation on all land in NSW except for urban areas, state reserves and forests, and National Parks lands. Native vegetation includes trees, saplings, shrubs, scrub, understorey, groundcover or wetland plants that existed in NSW prior to European settlement. Section 25 Subsection (g) of the *NV Act* states that the *NV Act* does not apply if:

> *any clearing that is, or is part of, an activity carried out by a determining authority within the meaning of Part 5 of the* EP&A Act *if the determining authority has complied with that Part*.

The clearing of native vegetation associated with the proposal does not require approval under the *NV Act* if it is authorised or permitted under other legislation, i.e the *EP&A Act*.

NSW *National Parks and Wildlife Act* 1974

The *National Parks and Wildlife Act 1974* (*NPW Act*) regulates and protects Aboriginal heritage through the administration of Part 6 of the Act. Implementation of the Aboriginal heritage provisions in the Act is the responsibility of DECCW. This Act, together with the policies of DECCW, provides the following constraints and requirements on land owners and managers:

- It is an offence to knowingly disturb an Aboriginal artefact or site without an appropriate permit.
- Prior to instigating any action which may conceivably disturb a ‘relic’, archaeological survey and assessment is required.
- When the archaeological resource of an area is known or can be reliably predicted, appropriate land use practices should be adopted which will minimise the necessity for the destruction of sites/relics, and prevent the destruction of sites/relics that warrant conservation.

An application should be made to the Director General for an *Aboriginal Heritage Impact Permit* under the provisions of Section 87 of the *NPW Act* should subsurface testing of potential archaeological sites be required, or if it is possible that an Aboriginal object would be disturbed or moved. Pursuant to Section 90 of the Act, consent is required to destroy, deface and damage identified Aboriginal objects. Prior to the application of a permit or consent, it would be necessary to implement the DECCW *Interim Guidelines for Aboriginal Community Consultation – Requirements for Applicants*.

NSW *Heritage Act* 1977

The NSW *Heritage Act* and NSW *Heritage Amendment Act* 1998 are concerned with all aspects of the conservation of items of heritage significance as listed on various registers including State government Section 170 registers, local government environmental plans and the State Heritage Register. In addition, the Act includes provisions which relate to the definition and protection of Aboriginal relics. Permits

must be obtained under the Act for works that have the potential to interfere with registered heritage items or places, or those subject to an interim heritage order, or if proposed works may disturb a relic that is situated below the ground surface.

NSW *Fisheries Management Act* 1994

The proposal would require the modification of two ephemeral creeks that drain to Barracks Creek in the northwest of the study area, although this would not interfere with the passage of fish, contribute to any key threatening process or impact on any key habitat for a threatened species. A permit for the proposal is not required under Division 8 of the *Fisheries Management Act.*

NSW *Protection of the Environment Operations Act* 1997

Certain road construction developments may require a license under Clause 35 of the *Protection of the Environment Operations Act* (*POEO Act*) where the development is classified as a scheduled activity.

The clause applies to road construction, meaning the construction, widening or re-routing of roads, but does not apply to the maintenance or operation of any such road. The road construction activity is declared to be a scheduled activity if it results in the existence of four or more traffic lanes (other than bicycle lanes or lanes used for entry or exit) for at least:

(b) where the road is classified, or proposed to be classified, as a main road (but not a freeway or tollway) under the Roads Act 1993:

(i) 3 kilometres of their length in the metropolitan area, or

(ii) 5 kilometres of their length in any other area.

The proposal would be classified as a main road. Stage 1 would not meet the requirements for a license under the *POEO Act* but the ultimate duplication, which is expected to have a length of up to 5 kilometres, may require a license under the Act. This would need to be reviewed as detailed planning for the ultimate development is progressed.

Under Section 5.7 of the *POEO Act* the appropriate regulatory authority must be notified of any pollution incident that occurs during the works completed for the proposal.

NSW *Water Management Act* 2000

The *Water Management Act 2000* (*WM Act*) provides for the management of surface and groundwater resources in NSW. The Act aims to protect sensitive waterway and riparian environments. The Act has provisions under Section 91 that require a Controlled Activity Approval to be sought from the Minister for Planning for excavations, fill and any other activity that affects the quantity or flow of water in a water source (rivers, estuaries and lakes), as these activities can cause significant impacts on habitat, water quality, flooding and erosion.

The proposal would require the modification of two ephemeral creeks that drain to Barracks Creek and then the Queanbeyan River, which is part of the Murrumbidgee River catchment. The proposed works may classify as a controlled activity as defined under the *WM Act*.

However, under the *Water Management (General) Regulation* 2004, public authorities (other than Landcom) and local councils are exempt from Section 91E (1) of the Act in relation to all controlled activities that they carry out in, on or under waterfront land. This provides Queanbeyan City Council with exemption from the requirement to hold a controlled activity approval.

Although it is not required under the *WMG Regulation* to obtain approval for the proposal from the NSW Department of Water and Energy (DWE), consultation with DWE would be undertaken.

NSW Road Traffic Authority Policies and Guidelines

Old Cooma Road is a Regional Road and is therefore subject to approval by the RTA. The preparation of this REF fulfils RTA requirements, as per the RTA manual *Environmental Impact Assessment Policy, Guidelines and Procedures* (Ref. 6).

RTA and NSW Government documents that were consulted for the REF or for the completion of specialist studies include:

- NSW DECCW Draft Threatened Biodiversity Survey and Assessment Guidelines;
- RTA Environmental Impact Assessment. Policy, Guidelines, Procedures;
- RTA Noise Management Manual;
- RTA Roadside Environment Strategic Plan;
- RTA's Water policy;
- RTA Community Involvement Practice Notes and Resource Manual;
- RTA Code of Practice for Water Management;
- RTA Guideline for Construction Water Quality Monitoring;
- Addressing Noise Fact sheet;
- NSW Waste Reduction and Purchasing Policy particularly with regards to construction and demolition materials;
- RTA Heritage and Conservation Register;
- RTA Heritage Guidelines;
- RTA Aboriginal Heritage Guidelines;
- Detailed urban design advice and guidelines:
  - Beyond the Pavement: RTA Urban and Regional Design Practice Notes;
  - Beyond the Pavement 2004 Update;
  - Design guidelines to avoid, minimise and improve the appearance of shotcrete;
  - Design guidelines to improve the appearance of noise walls in NSW; and

– Roadscape Guidelines.

5.1.3 Local environmental planning instruments

This section details the local planning provisions relating to the Queanbeyan LGA and any approvals required from the QCC.

Queanbeyan *Local Environmental Plan* 1998 and Yarrowlumla *Local Environmental Plan* 2002

The Queanbeyan City Council Area is comprised of the former Queanbeyan City and part of the former Yarrowlumla Shire. Each of the former councils had developed a Local Environmental Plan (LEP), in 1998 for Queanbeyan City and in 2002 for Yarrowlumla Shire. Queanbeyan City Council is currently reviewing these LEPs and will prepare a new, standardised LEP to cover the entire council area.

The area considered in the proposal falls within the current Queanbeyan City Council local government area, subject to regulation under the Queanbeyan LEP. The area adjoining the majority of the proposal to the east was formerly administered by the Yarrowlumla Council, and is regulated under the Yarrowlumla LEP until such time as the Queanbeyan LEP is finalised.

The majority of the proposal is located within a designated road corridor, zoned Queanbeyan LEP 1998 1(a) Rural A. Where the proposal is wider than the road easement, it overlaps areas zoned for other purposes.

The proposal may impact on lands zoned under the Queanbeyan LEP as:

- 1(a) Rural A
- 1(c) Rural C
- 7(a) Environmental Protection
- 7(b) Environmental Protection.

Areas that may be impacted under the Yarrowlumla LEP include those zoned:

- 1(d) Rural residential
- 1(a) General rural.

The proposal is consistent with the provisions under the LEPs. Current zoning for the area is shown in Figure 5.1.

***Queanbeyan City Council Residential and Economic Strategy* 2031**

The *Queanbeyan City Council Residential and Economic Strategy* outlines the QCC's long term residential and employment lands strategy to accommodate up to 25 years of residential and employment growth. The NSW Government conditionally endorsed the strategy, which has subsequently been reviewed and amended. The NSW Planning Minister approved the reviewed Strategy and associated maps with 13 conditions in December 2008.

The Strategy recognises the need for further work on transportation issues to ensure that the traffic network is able to respond to future demands from the proposed extent of residential development. In particular, the Strategy identifies the need to realign and duplicate Old Cooma Road as a priority transport issue for Queanbeyan in order to satisfy the expected transport needs over the coming 25 years (Ref. 1).

5.2 Licences and Approvals

The following approvals are being sought for the project:

- Approval under Part 5 of the *EP&A Act*.
- The proposal would have an impact on the environment and is subject to the provisions of the *NPW Act*, the *TSC Act* and the *EPBC Act*.
- In accordance with Clauses 86 to 91 of the *EP&A Regulation,* this proposal is considered to be a 'threatened species development' and is classified as a form of 'advertised development', requiring the Determining Authority to give written and published notice of the development application. QCC will undertake all such advertising as necessary.
- The Director General's specifications for a Species Impact Statement (SIS) have been sought for biota listed under the *TSC Act*. A license under Section 91 of the *TSC Act* is also required and would be sought in conjunction with the submission of the SIS. A draft SIS is in preparation for the proposal.
- The proposal impacts on several known artefact scatters. QCC has obtained approval under the *NPW Act* 1974 (consent to destroy, deface and damage aboriginal objects). Permit AHIP No. 1104555 was granted on 4 August 2009 to undertake this work.
- NSW Roads and Traffic Authority would assess the geometric design of the road under the provisions of the NSW *Roads Act*.

Exemption under the following Acts has been obtained or is applicable:

- Exemption applies under the *NV Act*, Division 4, *Excluded Clearing* because the clearing is being carried out in accordance with an approval from a determining authority within the meaning of Part 5 of the EP&A Act.

5.3 Confirmation of Part 5 Position under the NSW *EP&A Act*

As the proposed works involve the development of road infrastructure facilities and are being undertaken by QCC, a public authority, they are deemed to be covered by the Infrastructure SEPP. The Infrastructure SEPP prevails to the extent of any inconsistency with the relevant LEPs and, as such, development consent is not required pursuant to Part 4 of the *EP&A Act*.

As the road does not require development consent, and as it constitutes an 'activity' for the purposes of Section 110 of the *EP&A Act*, being carried out by (or on behalf of) a public authority, assessment under Part 5 of the *EP&A Act* is required.
Section 111 of the *EP&A Act* and Section 228 of the *EP&A* Regulation require the determining authority, in this case QCC, to consider the environmental impact of the road. QCC must examine and take into account, to the fullest extent possible, all

matters affecting or likely to affect the environment. These matters are examined within this REF.

In relation to the components of the proposal for which approval from the RTA is required (geometric design), this REF fulfils RTA requirements, as per the RTA manual *Environmental Impact Assessment Policy, Guidelines and Procedures* (Ref. 6).

6. BACKGROUND STUDIES AND CONSULTATION

6.1 Specialist Studies

The following specialist studies, mostly included as appendices to the REF, have been conducted in association with the study area and the proposed works:

- A **scoping report** was prepared as an initial stage in the preparation of the REF (Ref. 7, Appendix A). This involved reviewing the project against the environmental characteristics at a general level to identify the environmental issues that justify further analysis and their likely relative importance.

- **Flora and fauna habitat surveys** along the proposed Cooma Road realignment, i.e. Stage 1, were undertaken as follows:

  – Isobel Crawford in 2001 (Ref. 8) recorded the structure and composition of the vegetation and assessed the value as habitat for native animals along a 1.7 kilometre section adjoining the proposed road easement (Stage 1). A special search was made for threatened plant species and herbarium voucher specimens were collected and lodged with the Australian National Herbarium at CSIRO, Canberra. Although no threatened species or habitat for threatened species were recorded, remnant Blakely's red gum (*E. blakelyi*) – yellow box (*E. melliodora*) woodland and the plant species, hoary sunray (*Leucochrysum albicans*), were found to occur within the study area. The woodland community and the hoary sunray have been since listed as threatened under the *TSC Act* and/ or the *EPBC Act.*

  – Bushfire+Environmental Services (BES) in 2006 (Ref. 4, Appendix B) utilised a random meander technique to document the flora species present and the location and extent of vegetation communities (Stage 1). Literature reviews and desk-top surveys were also conducted. The survey identified the hoary sunray, listed as endangered under the *EPBC Act* and box – gum woodland, listed as the critically endangered ecological community White Box, Yellow Box, Blakely's Red Gum Woodland under the *TSC Act* and as White Box –Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands ecological community under the *EPBC Act*, within the study area. No other threatened plants, animals or ecological communities were recorded were recorded in the study area.

  – Geoff Butler and Associates in July 2007 (Ref. 9) undertook a survey to determine the presence and extent of box – gum woodland, listed as threatened under both NSW and Commonwealth legislation, using linear traverses and quadrat surveys. This study was undertaken as a component of the previous study by BES for Stage 1 of the proposal.

- **A draft Species Impact Statement (SIS)** was prepared by Eco Logical Australia Pty Ltd in 2010 (Ref. 5, Appendix C) to consider potential impacts on threatened species, populations and ecological communities listed under the

TSC Act in the area of the proposed realignment and ultimate duplication of Old Cooma Road, between Karabar and Googong, and to provide appropriate amelioration for any potential impacts resulting from the proposal. The SIS has been prepared in accordance with the requirements of Sections 109 and 110 of the *TSC Act* and with regard to the specific requirements notified by the Director-General of the NSW Department of Environment, Climate Change and Water (DECCW), in accordance with Section 111 of that Act. The subject species and communities to be considered were:

– box – gum woodland;
– button wrinklewort (*Rutidosis leptorrhynchoides*) ;
– silky Swainson pea (*Swainsona sericea*);
– little whip snake (*Suta flagellum*);
– golden sun moth (*Synemon plana*);
– pink-tailed worm-lizard (*Delma impar*);
– Rosenberg's goanna (*Varanus rosenbergi*);
– brown treecreeper (*Climacteris picumnus victoriae*);
– diamond firetail (*Stagonopleura guttata*);
– hooded robin (*Melanodryas cucullata cucullata*);
– speckled warbler (*Pyrrholaemus saggitatus*); and
– eastern false pipistrelle (*Falsistrellus tasmaniensis*).

An additional two subject species or communities were identified for consideration in recognition of the referral to the Commonwealth and to avoid duplication of the Director General Requirements in the event of a State/ Commonwealth bilateral assessment process:

– hoary sunray (*Leucochrysum albicans* var. *tricolor*); and
– Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory.

A review of previous flora and fauna studies and previous records in the locality, and of data base searches, indicated that the following additional threatened species or communities could potentially occur in the study area given the habitats that are present. These species were consequently considered in the SIS:

– gang-gang cockatoo (*Callocephalon fimbriatum*);
– turquoise parrot (*Neophelenma pulchella*);
– eastern bentwing bat (*Miniopterus schreibersii oceanensis*);
– greater long-eared bat (*Nyctophilus timoriensis*);
– flame robin (*Petroica phoenicea*);
– scarlet robin (*Petroica boodang*); and
– varied sittella (*Daphoenositta chrysoptera*).

Initial investigations involved a desktop analysis of previous reports conducted in the locality and collection of anecdotal evidence from various sources within the locality. The purpose of the review was to document the known locations and habitat requirements of each subject species and ecological community listed in the Director-General's Requirements within the locality. Species profiles were prepared for each subject species and community as well as subject species for consideration. Information included state wide, regional and local abundance and conservation status.

The profiles examined habitat requirements, such as home range, feeding, roosting and breeding requirements and included a discussion of the likely impact of the proposed activity on each subject species and ecological community. This information has been used to assist the assessment of the impacts of the proposal on affected subject species, and also to develop appropriate mitigation measures. The survey techniques used in the assessment process are considered adequate to gather the data necessary to assess the impacts of the proposal on all targeted species and their habitats, and targeted ecological communities.

The study area was found to support box – gum woodland (as defined under the *TSC Act* and the *EPBC Act*). Two threatened woodland birds, the speckled warbler and turquoise parrot, both listed as vulnerable under the *TSC Act*, were recorded in the study area. The study area was known to contain previous records of the brown treecreeper and Rosenberg's goanna, also listed as vulnerable under the *TSC Act*. No NSW listed threatened flora species were recorded within the study area, although further locations of the Commonwealth listed endangered hoary sunray were recorded. The scope, methodology and results of the SIS are documented within the report, provided as Appendix C.

- ***EPBC Act* referral.** The SIS assessed that the proposal may have a significant impact on matters of National Environmental Significance as listed under the *EPBC Act*. A referral to the Commonwealth Environment Minister was recommended and was undertaken in conjunction with the REF, pursuant to the provisions of the *EPBC Act.* The referral (Ref. 10) addressed the impact of the proposal on Commonwealth listed threatened species and ecological communities, specifically box – gum woodland and hoary sunray. A decision on the referral was made on 29 October 2010. The proposed action was determined not to be a controlled action, meaning that no further assessment or approval is required under the *EPBC Act* before the proposed works can proceed.

- A **cultural heritage assessment** of the area likely to be affected by the proposal was undertaken by Navin Officer Heritage Consultants, who undertook desktop studies and research, liaised with relevant Aboriginal organisations, undertook a field survey of the road corridor with representatives, and reported on the findings for Indigenous and Non-indigenous cultural heritage (Ref. 11, Appendix D).

  A number of Aboriginal sites comprising potential archaeological deposits, artefact scatters and isolated finds were identified. The DECCW Interim

Guidelines for Aboriginal Community Consultation were implemented and a permit, pursuant to Sections 87 and Section 90 of the *NPW Act*, was granted, subject to conditions in accordance with the permit. One historical site was identified but was assessed as having no heritage significance and as not posing a constraint to the proposal.

A potential route for the proposed realignment of a section of Old Cooma Road between Edwin Land Parkway and Wickerslack Lane is located in land currently owned by the Ngunnawal Local Aboriginal Land Council. That potential route is no longer being considered and the road would follow the existing alignment, located beyond the Aboriginal owned land.

The study concluded that, subject to the recommendations provided, there are no statutory constraints on the proposed development in relation to Aboriginal heritage and that no further archaeological investigations are required.

- **Traffic forecasts** developed to the year 2031 were provided by Brown Consulting Pty Ltd, based on hourly counts on the current roads and modelling undertaken by Gabites Porter (Ref. 2). The forecasts were used by Brown Consulting as a basis for determining the ultimate design capacity for the road, and for assessing the noise impacts and noise mitigation methods to be employed (see below).

- **Noise assessments** were undertaken by the Acoustics and Vibration Unit of the University of New South Wales at ADFA in 2009 (Ref. 12, Appendix E) to establish ambient noise levels at the nearest sensitive receptors. Noise modelling was undertaken to assess the potential impacts and the proposed noise attenuation measures to be adopted during both the construction phase and operational phase, particularly in relation to residential areas. The study assessed both the area affected by Stage 1 works (between Tempe Crescent and Heights Road), and the likely noise impacts associated with the later stages of development. Measurements of existing noise levels were taken and compared to relevant criteria as indicated in the NSW *Environmental Noise Management Manual* (Ref. 13) and as listed in the NSW Environmental Protection Authority *Environmental criteria for road traffic noise* (Ref. 14). Estimations of the noise impact from Stage 1 and the potential impacts from the ultimate development were calculated accordingly, using the traffic forecasts.

- **Geotechnical investigations** involving borehole drilling, excavation of test pits and laboratory testing were undertaken as follows:
  - Douglas Partners conducted investigations during 2009 (Ref. 15) in locations along Old Cooma Road, to the north and south of Stage 1. The results of the study have provided information and identified issues to be considered in the design and construction of the ultimate duplication.
  - Investigations undertaken by Coffey Geosciences Pty Ltd in 2001 provided comments and recommendations concerning subsurface conditions, excavation conditions, construction works, pavement subgrade conditions, cut and fill batter slopes and site drainage that

have been used in the design of Stage 1 road and construction works (Ref. 16, Appendix F).

- A **landscape character assessment** using photographic survey techniques was completed by JEA to assess the impacts of the proposal on landscape and visual amenity, and to identify the opportunities and constraints relating to the landscape in which the proposal is located (Ref. 17, Appendix G). The Western Australian Planning Commission report, *Visual landscape planning in Western Australia: A manual for evaluation, assessment, siting and design* (2007) was used as a guide for this assessment.

6.2 Stakeholder and Community Consultation

During the environmental assessment exhibition period under the NSW *EP&A Ac*t, the community, State Government agencies and other interested parties would be invited to make written submissions on the proposal. Once the proposal is approved, community and agency consultation would continue to be an important aspect of the project with tailored consultations to be undertaken during the preconstruction and construction phase activities.

The following sections describe consultation that has been undertaken to date with the community and government agencies.

6.2.1 Public consultation

The public consultation program implemented as part of the project includes:

- consultation by QCC with stakeholders considered to have an interest in the proposal, including affected adjacent residents;
- public meetings conducted by QCC to provide an opportunity for interested parties to discuss the matter with Council; and
- the REF and related documents being made available for public access in the QCC offices, pursuant to the *EP&A Act*, during the consultation period.

6.2.2 Indigenous community involvement

As part of the cultural heritage assessment completed by Navin Officer Heritage Consultants (see Section 6.1), the following groups were consulted regarding the proposal:

- Buru Ngunawal Aboriginal Corporation;
- Consultative Body Aboriginal Corporation;
- Ngarigu Currawong Clan; and
- Ngambri Local Aboriginal Land Council.

All were invited to send a representative to attend field surveys of the proposal site. Representation on the day of the field survey included:

- Mr Wally Bell, Buru Ngunawal Aboriginal Corporation;

- Carl Brown, Consultative Body Aboriginal Corporation;
- David Mundy, Ngarigu Currawong Clan; and
- Joe House, Ngambri Local Aboriginal Land Council.

Following the surveys, the groups were invited to provide a written report outlining their organisation's views and an assessment of the Aboriginal cultural values of the area surveyed. A response was received by Buru Ngunawal Aboriginal Corporation. A draft copy of the heritage assessment by Navin Officer Heritage Consultants was provided to each of the above groups for comment, although to date no comments have been received.

6.2.3 Government agency involvement

Ongoing consultation has been undertaken with the government agencies listed in below:

Table 6.1 Government agency involvement

Government Agency	**Matter**
NSW Department of Environment, Climate Change and Water	Completion of SIS for the proposal
Commonwealth Department of Environment, Water, Heritage and the Arts (now Department of Sustainability, Environment, Water, Population and Communities)	Referral of proposal due to potential for significant impact on box – gum woodland and hoary sunray
NSW Roads and Traffic Authority	Road development matters relating to the proposal
NSW Rural Fire Service	Provision of emergency access to areas affected by the proposal
Service providers including Country Energy and Telstra	Impact on existing and new services

PART B – ENVIRONMENTAL IMPACT ASSESSMENT

7. BACKGROUND

7.1 Introduction

This part of the REF provides a detailed description of the potential environmental impacts associated with the proposal during its construction and operation, and proposes site-specific safeguards to ameliorate the identified potential impacts, where relevant.

Stage 1 has been designed to an advanced stage as a requirement for the initial development phase of Googong. While the majority of the environmental studies have considered all stages of the proposal, detailed planning and construction for the ultimate duplication is not expected to commence until approximately 2030. In the intervening time period between the construction of Stage 1 and the commencement of the duplication, it is possible that changes in the environmental surrounds, legislative context or road construction technologies may occur. The potential impacts resulting from such changes may be adverse or beneficial, but cannot be fully determined at this time. The REF has therefore addressed the environmental impacts of Stage 1 in greater detail than is feasible for the ultimate duplication, which are addressed at a more general level only.

The presentation of the issues broadly follows the order of relative importance as identified in the scoping assessment, which was prepared at an early stage in the preparation of the REF (see Appendix A). The assessment is based on the specialist studies listed in Section 6.1 and additional field inspections conducted by David Hogg Pty Ltd.

The description of the proposed works and associated environmental impacts has been undertaken in the context of Clause 228 of the *EP&A Regulation*, the *TSC Act*, *EPBC Act* and *NPWS Ac*t. In doing so, the REF fulfils the requirements of Section 111 of the *EP&A Act*, i.e. that QCC examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

7.2 The Existing Environment in Relation to Impacts

This section provides an overview description of the existing environment in relation to the three sections of the road identified in Chapter 3 of the REF, namely:

- the area north of the Stage 1 road works (Ch 400 to Ch 1650);
- the area of the Stage 1 road works (Ch 1650 to Ch 3100); and
- the area south of the Stage 1 road works (Ch 3100 to Ch 4900).

Figures 7.1, 7.2 and 7.3 show the location of the main features described in the three sections respectively. While the Stage 1 road works would affect only the middle of these sections, all three sections would be affected by the associated construction of the shared services trench.

In describing the main features of the existing environment, this section also identifies in general terms how those features are likely to be affected by each of the stages of development. These specific impacts, together with potential mitigation measures, are discussed in detail in the later chapters of the REF.

7.2.1 North of Stage 1 – Ch. 400 to Ch. 1650

Between Ch. 400 and Ch. 1050, Old Cooma Road climbs gradually and is located largely on the eastern side of a forested hill (see Plate 1), which drops to the east below the road into a deep, steep-sided gully (Plate 2). At about Ch. 1050, the road passes through a saddle onto the western slope of a hill, which rises to the east (Plate 3). The road continues to the end of this section (Ch. 1650), where the road starts to bend westwards and uphill towards the quarry (Plate 4).

The parcel of land on the west as far south as Wickerslack Lane (Ch. 400 to Ch. 1350) is known as 'Mirrabee' and is owned by the Ngambri Local Aboriginal Land Council. On the eastern side of the road is a parcel of Crown land, subject to an Aboriginal land claim. Once past Wickerslack Lane, the area to the west of Old Cooma Road is rural land used for stock grazing. The area on the east side of the road contains rural residential properties, developed with long, narrow blocks aligned lengthwise parallel to the road.

There is a geological boundary which approximately follows the line of the road, with Ordovician sediments of the Pittman Formation to the west of the road, and Barrack Creek adamellite (a volcanic rock of Late Silurian to Early Devonian age) to the east (Ref. 18). The differences in geology are reflected in the soils and remnant vegetation. The poorer soil on the sediments, west of the road and extending for a short distance to the east, support dry sclerophyll forest containing red stringybark (*Eucalyptus macrorhyncha*), red box (*E. polyanthemos*), apple box (*E. bridgesiana*) and scribbly gum (*E. rossii*). On the richer volcanic soils east of the road, this merges into a grassy woodland dominated by red box and yellow box (*E. melliodora*), with some apple box also present, and an understorey of scattered colonising shrubs (e.g. *Cassinia* sp., wattles).

Although some of the land currently supporting forest vegetation either side of the road, particularly to the east, has been largely cleared in the past, the vegetation has since regenerated to provide a broad corridor of bushland approximately a kilometre wide along the southern edge of the Queanbeyan urban residential area. That corridor provides known or potential habitat for a wide range of native wildlife, including some listed threatened species (see Section 9.1).

Most of the original vegetation has been cleared from the area between Wickerslack Lane and the end of the section (Ch. 1350 to Ch. 1650), although remnant trees and shrubs have been retained within the road reserve and are scattered in the paddocks to the west. Trees have been planted or retained as screening vegetation between Old Cooma Road and the rural residential properties located to the east.

The shared trench constructed as part of the Stage 1 works is currently proposed to be located east of the road, outside the ultimate limit of earthworks, and below the road between the start of the works and the saddle at approximately Ch. 1050 (see

Plates 1 and 3). An alternative route for this section would be above the road to the west, just outside the 'Mirrabee' boundary, crossing the road at the saddle. From the saddle, the trench would continue upslope of the road outside the current road reserve on the eastern side to the end of this section. The trench construction would necessitate clearing of a corridor of native woodland for a length of about 950 metres (between Ch. 400 and Ch. 1350, i.e. Wickerslack Lane), and a corridor of mixed native and introduced species of about 275 metres, between Wickerslack Lane and Ch.1650. The width of the corridor would depend on topography and access, but may require disturbance of between 3 metres and 5 metres in width. The shared trench may encroach slightly onto the nearest rural residential property, located immediately south of Wickerslack Lane.

The ultimate duplication of the road between the start of the works and Wickerslack Lane would be mainly on the eastern side between the road and the shared trench but would also involve widening on the western side. This would result in clearing of some adjacent forest or woodland, with major earthworks in the vicinity of the deep gully, as well as some filling along the edge of 'Mirrabee' between the saddle and Wickerslack Lane. From Wickerslack Lane, the road would be duplicated on the western side of the existing road, requiring the removal of most of the trees located within the road reserve. The ultimate duplication of the road would encroach onto the edge of the single rural property located on the western side of the road.

7.2.2 Stage 1 – Ch. 1650 to Ch. 3100

Stage 1 of the proposed road upgrade would commence at the point where Old Cooma Road turns towards the west (see Plate 5) and would continue for about 1.5 kilometres before reconnecting with Old Cooma Road (Ch. 3100). The works in this section would involve substantial vegetation clearing, earthworks and access changes. The proposed new section of road generally follows the alignment of a major gully which climbs steadily to a saddle, before reaching the start of undulating terrain. Plates 6 to 10 illustrate the general nature of the area, with photograph locations and described features indicated in Figure 7.2.

A rural property adjoins the western boundary of Stage 1, with the associated residence located about 100 metres west of the centre of the proposed alignment (see Plate 6). A dam that provides water for stock is located within the drainage gully proposed for Stage 1, at about Ch. 2180 (see Plate 7).

The area to the east of Stage 1 is elevated above the proposed road, more so towards the southern end of the section where the gully sides are relatively steep (see Plate 8). Rural residential subdivisions are located on the eastern side of Stage 1 and are accessed from the north via Tempe Crescent and Heights Road, and from the south via Talpa Road, an unsealed track that provides alternative emergency access, connecting with Old Cooma Road at Ch. 2850 (see Plate 10).

The rural residential blocks in proximity to the road in the northern part of the section (Ch. 1650 to Ch. 2400) are aligned north-to-south and, consequently, only two blocks adjoin the Stage 1 works. The central area contains a cluster-housing subdivision (Talpa Heights Estate, Ch. 2400 to Ch. 2850), with residences on small blocks located across the top of a rise and the residual undeveloped land adjoining Stage 1. The

southern end of the section (Ch. 2850 to Ch. 3100) is characterised by narrow rural residential blocks with frontages to Old Cooma Road.
The vegetation within and adjoining the Stage 1 road works contains a mixture of remnant trees, shrubs and groundcover from the original woodland or forest communities, and introduced pasture grasses and weeds. Tempe Crescent and Heights Road, aligned parallel to and above Stage 1, are lined with remnant and planted trees, including rows of pines. On the western side of Stage 1, remnant eucalypts are sparsely scattered across the paddocks and, at a higher density, on the hill located at the southern end of the section.

The gully and low-lying areas further west probably supported yellow box – red gum grassy woodland up to an elevation of about 720 m (Ch. 2400). Beyond that point, as well as on the upper slopes above Tempe Crescent and Heights Road, the remnant vegetation is shrubby dry forest or woodland, dominated by red box, apple box and red stringybark. While the steeply sided gully where the road would be located supports some native trees and shrubs, it is in a highly degraded condition. There are many weeds and large patches of blackberry (*Rubus fruticosus* spp. agg.), while pine trees (*Pinus radiata*) dominate the steeper upper banks, particularly on the eastern or south-eastern side (see Plate 9).

The main physical impacts associated with the Stage 1 works would occur along the gully between Ch. 2100 and 2900, where major cutting and filling would be required to create a formation which would accommodate the ultimate duplication of the road as well as the shared trench. While this would not be close to existing residences, it would encroach on the rural property to the west of the road, necessitating replacement of a farm dam, and raises issues of noise and visual impact at some properties on the nearby estates, as well as changes in road access to those estates.

The southern end of the Stage 1 works is adjacent to some rural residential properties with frontages to the existing Old Cooma Road (see Plates 11 and 12). Some remnant woodland vegetation in this area would be cleared for the realignment of the end of Talpa Road and to accommodate the shared trench. The trench and realignment works would encroach on the fronts of about three blocks. No additional physical impacts on these blocks would result from the ultimate development, which would encroach on rural land on the western side of the road (see Plate 13).

7.2.3 South of Stage 1 – Ch. 3100 to Ch. 4900

The section of the road south of Stage 1 would traverse undulating terrain which is partly cleared but with some areas of remnant woodland or forest within the road reserve and on some of the adjoining land.

There are some further rural residential blocks on the eastern side of Old Cooma Road, some quite narrow, with frontages to Old Cooma Road (see Plate 14). Some of the existing residences are located between 35 metres and 60 metres from the road, while the rest are set well back.

The Stage 1 works would be confined to the shared trench which would be located immediately outside these property boundaries, potentially resulting in removal of some of the remnant or planted vegetation currently alongside the road.

The remaining areas on both the east and west side of Old Cooma Road, between Ch. 3100 and Ch. 4100, include rural properties where most of the original trees have been cleared, with some remnant vegetation remaining within the road reserve. The construction of the shared trench in Stage 1 and the cycle path in the ultimate development would impact on rural land east of the road, while the road duplication would encroach on rural land to the west (see Plate 15).

The southern end of the proposal, from Ch. 4100 to Ch. 4900, is surrounded by rural land that is more densely wooded (see Plates 16), with the exception of an open grassland area on the west side of Old Cooma Road (Ch. 4500 to Ch. 4900), opposite the intersection with Googong Road (see Plate 17 and Plate 18). The construction of the shared trench would result in some clearing of woodland on the east side of the road, while the ultimate duplication would impact on woodland on both sides of the road but particularly the western side, including a strip within the Googong Travelling Stock Reserve.

7.3 Scoping Summary

A scoping assessment (Ref. 7) was undertaken at an early stage in the project to identify the environmental issues that were relevant to the current stage in the decision-making process, and their relative importance. Such information is useful in guiding the project as well as assisting in the presentation of the REF.

The scoping assessment is attached in Appendix A. The most important issues identified at that time as being relevant to the design of the road and its subsequent implementation were seen potentially as follows:

- Traffic noise – in relation to existing residences close to the future road.
- Visual impacts – from private or public locations used by people, from which the road could be seen.
- Impacts on native vegetation or habitat, and particularly on threatened ecological communities, as well as other ecological impacts.
- Construction impacts – particularly on nearby residents and road users.
- Effects on existing services and infrastructure.
- Flood risks – specifically in the Barracks Creek area.
- Impacts on existing land uses, including land acquisition.
- Geotechnical assessment.

Other issues which were considered to be of sufficient importance to warrant discussion in the REF, or were required to be addressed in any case, included:

- Landform modification
- Soil management
- Drainage changes
- Water quality – particularly in relation to soil erosion and sediment control
- Traffic impacts – as background to noise assessment

- View from the road
- Cultural heritage – indigenous
- Improved access
- Waste management
- Resource demand – if relevant
- ESD principles.

Based on information at that time, issues which did not appear to be of sufficient relevance to warrant detailed discussion in the REF were as follows:

- Contaminated land
- Climate and microclimate
- Air quality
- Cultural heritage – non-indigenous
- Geological heritage
- Community characteristics – other than as addressed in relation to noise and visual impacts
- Property values
- Other economic effects
- Effects on recreational uses
- Effects on educational or scientific uses
- Natural resource management implications
- Bushfire risk
- Operational hazards and risks
- Energy implications
- Cumulative effects

The following chapters in this part of the REF deal in turn with the first two groups of issues, discussing in turn:

- their background or context and the existing environment;
- the potential impacts of the Stage 1 works and the ultimate development; and
- mitigation measures to address any significant adverse impacts.

The order in which the impacts are discussed in part reflects their importance as identified in the scoping assessment, and also their interdependencies, in that impacts which have implications for other impacts are discussed first (e.g. landform modification and vegetation clearing may lead to visual impacts). Issues which involve no significant impacts are acknowledged briefly at the end of this part of the REF.

8. LANDFORM MODIFICATION

8.1 Background and Existing Environment

The construction of a road with horizontal and vertical geometry which meets current design standards may involve significant cut and fill earthworks, which can substantially alter the local landform. Ideally these earthworks should be in balance to avoid the need to import or remove material, but this is unlikely to be achieved for Old Cooma Road. The Stage 1 works are likely to result in a surplus of about 14,000 cubic metres of excavated material, while the full development would result in a shortfall of about 20,000 cubic metres of fill. This represents a shortfall of 6,000 cubic metres over the entire project.

Landform modifications may not be significant in its own right, but may be of more concern through its secondary effects such as visual impacts, implications for traffic noise, impact on erosion, drainage changes, clearing of vegetation or interference with wildlife movement.

The corridor of the proposed road lies between elevations of approximately 600 metres and 800 metres, with a steady climb for about 3.5 km, followed by a section of more undulating terrain. Particularly on the uphill section, there are some areas containing relatively steep sideslopes or deep gullies where major earthworks would be required.

8.2 Potential Impacts

The areas where the proposed roadworks would significantly change the existing landform are indicated in the profile along the road in Figure 4.5 and in selected cross sections in Figures 4.1 and 4.2. The area of greatest change is in the Stage 1 works between Ch. 2100 and Ch. 2900 where the upper part of the slope would be excavated to create a deep cutting up to 16 metres high and a gully to the north would be filled to a depth of up to 10 metres. These works would involve constructing the formation for the ultimate development to avoid the need to undertake further earthworks subsequently, although the initial sealing of the road would provide only one northbound lane and one or two southbound lanes (see Section 4.3 and Figure 4.4).

There are several other locations involving cut and fill to a lesser extent throughout the Stage 1 works.

While the details of the ultimate duplication works in the northern and southern parts of the road have still to be finalised, duplication of the road would have impacts on the landform particularly where it would traverse steep sideslopes, resulting in major earthworks, including filling below the existing road and increasing the height of existing cuttings. This is likely particularly in the northern part of the road between Ch. 650 and Ch. 1000, where filling of a deep gully would be required. Duplication of the road south of the Stage 1 works would have only minor impacts on the existing landform, although cutting and filling would extend into the edge of adjoining properties.

8.3 Mitigation Measures

The scope for mitigating the impacts of landform modification is confined mainly to addressing any secondary effects through the design of cut and fill batters, provision of alternative drainage, and landscaping within the road reserve. These measures are discussed in relation to those secondary effects.

9. GENERAL BIODIVERSITY IMPACTS

9.1 Existing Environment and Potential Impacts

The proposal would result in a range of direct and indirect impacts on the biodiversity existing within the construction corridor and potentially in the surrounding study area. These impacts include the following:

- Removal of native vegetation
- Loss of fauna habitat, including hollow bearing trees
- Effects on ecological connectivity
- Impacts on wildlife mortality
- Introduction or removal of exotic plants and animals
- Effects of lighting on animal behaviour

These impacts are discussed on the following sections. The impacts on listed threatened species and ecological communities are discussed in Chapter 10.

The proposal is likely to impact on general ecological issues as follows:

Removal of remnant native vegetation. The ultimate development proposal, which takes account of Stage 1, has a development footprint of about 21.5 ha of which an estimated 17.2 ha supports vegetation (Ref. 10), including native trees and/or native understorey. This generally comprises grassy woodland in the undulating valleys, dry shrubby woodland or forest in upper gullies and more elevated hillslopes with shallow soils, and transitional vegetation between the grassy woodland and forested slopes. Figures 9.1, 9.2 and 9.3, adapted from the Species Impact Statement (Ref. 5) show the general vegetation communities within the area of the proposal. The grassy woodland mosaic (Figure 9.3) is considered to be a type of box – gum woodland.

The condition of the existing vegetation, however, varies from highly modified exotic pasture to more intact woodland or forest with an understorey dominated by native shrubs, grasses and forbs. Some of the vegetation meets the criteria for inclusion as the threatened box – gum woodland ecological community. This issue is discussed in Chapter 10.

For **Stage 1** (between Ch. 1650 and Ch. 3100), approximately 4.5 ha of box – gum woodland of low to moderate quality (Ref. 5) and approximately 4 ha of modified dry shrubby woodland/forest vegetation would be removed to allow for the road, altered access arrangements, the shared trench and cycle path formation.

The level of previous disturbance and current land uses is reflected in the condition of the vegetation within localised areas along the proposed road corridor. For example, in the roadside areas there is a mixture of planted shrubs and trees, remnant mature trees, some native grasses and introduced weeds. While there are patches of native grasses within the areas used for grazing, there is a high component of introduced pasture grasses and woody weeds.

The design of the Stage 1 road works (between Ch. 1650 and Ch. 2850) incorporates the construction of the **shared services trench** alongside the road and would not require the clearing of additional vegetation. The construction of the trench in the remaining area would necessitate the removal of a corridor of vegetation 3 metres to 5 metres in width, comprising about 1750 metres of forest or woodland areas and 1550 metres of native and modified vegetation located on the east side of the road. This includes areas where trench construction works would impact on the properties with frontages to Old Cooma Road, in particular on gardens and buffer vegetation from Ch. 2850 to Ch. 3000. Gardens and buffer vegetation located within the road reserve but outside property fences would be affected between Ch. 3000 and Ch. 3400.

The **ultimate duplication** would remove a corridor of vegetation, generally on the western side of the existing road but on the eastern side between the existing road and the proposed shared trench north of Stage 1. The proposed shared bicycle and pedestrian path, to be located on the eastern side of Old Cooma Road, would require the removal of an additional strip of vegetation, the width of which would be determined by the distance of the path from the existing road. The total width of the disturbance corridor in any specific location is dependent on local topography, which affects the amount of cutting and filling required, but is estimated to be between 30 metres and 90 metres, with a wider impact area at the northern end due to the steeper topography (Ref. 10).

The degree of the impact on native vegetation, in terms of an estimation of the amount to be cleared through the construction of the ultimate duplication, is dependent partly on the final design and partly on the condition of the vegetation at the time of removal. That calculation is difficult to determine with accuracy at this time, about 20 years prior to the commencement of the proposed works. The condition of the roadside vegetation may improve in this time, for example as a result of works programs involving planting local tree species or through weed control, or may diminish, due to factors such as weed invasion, tree loss or other disturbances. Some areas within the road reserve are currently dominated by introduced trees, grasses and weeds while other areas are virtually intact.

As a precautionary measure, it is assumed that all of the vegetated area to be removed, i.e. 17.2 ha, contains native vegetation. This is comprised of 8.7 ha of vegetation removed for Stage 1 and 8.5 ha removed for the ultimate duplication. The total area of modified box – gum woodland to be removed has been estimated at 7.5 ha (under NSW legislation), which includes 5.5 ha as defined under Commonwealth legislation (Ref. 10). The remaining vegetation is modified dry forest or shrubby woodland.

The removal of native roadside vegetation would be particularly noticeable for the ultimate duplication in areas where surrounding native vegetation is limited in extent (Wickerslack Lane to Ch. 1650 and Ch. 3100 to Ch. 4100). This issue is discussed in Section 12.2, in the context of visual impacts.

The removal of 17.2 ha of native vegetation would be offset by withdrawal from other uses of 127 ha with broadly similar vegetation characteristics (see Section 9.2.1), located in the vicinity of the quarry, with a view to actively assisting this area to improve in native condition.

Fauna habitat and hollow bearing trees. The Stage 1 road works would remove native and introduced gully vegetation and associated habitat features such as dense thickets (native shrubs, blackberry), hollow bearing trees, fallen logs and branches. The vegetation in places is shrubby and dense, providing relatively secure habitat for birds, small mammals and feral animals. The creek banks provide suitable sites for animal dens and warrens, including for wombats, foxes and rabbits. These would be removed during the construction process. The Stage 1 road works would have the greatest impact on the availability of habitat within the project area.

The earthworks proposed for the provision of the Stage 1 services trench would be confined to a relatively narrow corridor located to avoid the removal of trees and native vegetation where possible. The impact on the availability of habitat would not be significant given that the surrounding areas would not be affected.

Within the area affected by the ultimate proposal, the most intact forested areas and therefore the areas containing the greatest range of habitat features are located at the northern and southern ends of the proposal. The widening of the road would marginally reduce the extent of the available habitat in these areas.

The narrow linear corridors that support remnant roadside vegetation provide limited nesting, breeding or foraging habitat for native species. These areas are more valuable for the provision of connectivity or wildlife movement corridors than for the provision of habitat for specific fauna.

The proposal would remove about 15 of the 38 hollow bearing trees observed within the study area, which included forested areas beyond the road reserve (Ref. 5). Most of the hollow bearing trees to be removed are within the Stage 1 road works area, although the trees were considered likely to provide limited habitat only, given their proximity to the existing roadway and associated disturbances (Ref. 5). It was not feasible for fauna studies to include searches for tree hollows beyond the targeted areas. It is probable that such trees (e.g. located within the unaffected part of the Old Cooma Road reserve) contain additional habitat hollows that would not be impacted by the proposal.

Ecological connectivity. The Stage 1 road works would remove a corridor of dense gully vegetation located between cleared rural land, containing scattered trees, and rural residential land where the original vegetation has been cleared or replaced with introduced vegetation. The gully corridor connects with a narrow band of remnant roadside vegetation located at both ends of Stage 1, which in turn connect with remnant patches of forest located further to the north and south. The forested area to the north is part of a largely continuous area of habitat between the Queanbeyan River and Jerrabomberra. This area is recognised as part of a regionally significant biolink for flora and fauna (Ref. 19) and would function as a wildlife corridor for many fauna species, including threatened species. The forested area at the southern end of the proposal, while smaller and relatively isolated, has been identified as part of a disturbed local biolink between Jerrabomberra Creek and the Queanbeyan River (Ref. 19, see Figure 9.4).

Although the gully vegetation provides the most intact and direct wildlife movement corridor between the northern and southern road reserve areas, there is a secondary

corridor located to the east of Stage 1. This corridor is comprised of roadside vegetation (along Tempe Crescent and Heights Road) and stands of pine trees that would not be impacted by the proposed road or trench construction works.

The ultimate proposal would remove most of the remnant roadside vegetation north and south of Stage 1, reducing the linkages between the northern and southern biolinks. The construction of the shared trench between Ch. 400 and Wickerslack Lane would result in a narrower band of disturbance across the northern biolink. Existing alternative although less direct linkages, such as that located along the section of Old Cooma Road to be bypassed, would not be affected and would continue to provide some landscape connectivity. The rehabilitation and/or revegetation through the offset process of the area adjoining the quarry would improve the connectivity in the local area. Figure 9.5 shows the general impact of the proposal on ecological connectivity.

Animal mortality. The potential for additional animal deaths caused by collisions with cars along Stage 1 would be balanced somewhat by the reduction in wildlife mortality as a result of the existing section of Old Cooma Road becoming redundant. It is possible that there would be fewer collisions with animals as the new road would be located adjoining residential development, reducing the number of potential crossing points, whereas the existing road divides rural areas and areas containing open woodland.

The duplication of the road for the ultimate development would increase the width of the existing road corridor north and south of Stage 1. This has the potential to impact on larger terrestrial species, species with limited mobility or those that are vulnerable to traffic, such as kangaroos, wombats, lizards, tortoises and snakes, by increasing the rate of animal mortality. Increased injury or mortality from an eventual increase in vehicle numbers is an indirect impact of the proposal of the Googong development, rather than the road upgrade.

A fauna underpass, or modified culvert, would be constructed under the road within the habitat corridor north of Wickerslack Lane (Ch. 900). This would help to provide the Rosenberg's goanna with a safe passage under the road, and would be suitable for use by other reptiles and small mammals. An additional fauna underpass would be located at about Ch. 4480, within the wooded area towards the southern end of the proposal. These fauna underpasses have the potential to reduce the adverse affects of an increase in animal mortality resulting from an increase in the width of the road. Bandicoots, goannas and lace monitors have been recorded using box culverts to move under roads (Ref. 5). Birds would probably continue to fly over the road and the proposal is unlikely to have a significant impact on bird mortality rates.

Exotic plants and animals. The Stage 1 road works would remove vegetation that is sometimes dominated by invasive weeds, primarily blackberry but also St Johns wort, Paterson's curse and great mullein. Weed removal would have a beneficial impact on downstream drainage areas by reducing the potential for these species to be spread during rain events. The removal of thickets would also reduce the habitat available to feral animals such as rabbits and foxes.

There is potential for weed species to be transported by vehicles to parts of the proposal site where they do not currently exist. Machinery hygiene practices, such as cleaning and washing machinery after working in weed-infested areas and prior to working in more intact areas, would be employed as per the works management plans to prevent the spread of weeds in Stage 1 and during the ultimate duplication.

The appropriate cleaning of machinery and other equipment would be particularly important during the excavation of the shared services trench, which traverses areas containing invasive weeds as well as areas that are relatively weed-free. This applies particularly to the section of trench between Ch. 400 and Wickerslack Lane.

Effects of lighting. Street lighting would be provided at the Wickerslack Lane and Tempe Crescent intersections on duplication. Otherwise, no lighting would be installed along the road.

As there are existing roads through most of the area and major additional street lighting is not anticipated, the effects of lighting on animal behaviour is unlikely to result in any new impacts, although the intensity of any such impacts would be increased due to higher traffic volumes resulting from the development of Googong.

9.2 Mitigation Measures

9.2.1 Native Vegetation

The nature of the project means that the loss of native vegetation and habitat cannot be mitigated directly on the site, although the creation of an offset area on land away from the site where native vegetation would be conserved and regenerated would lead ultimately to a net gain in native vegetation and habitat. The proposed offset area is on land surrounding the Cooma Road Quarry in an area which is not suitable for quarrying and provides a buffer between the quarry and residential land in Jerrabomberra (see Figure 9.5). A large part of the offset area is located within a high value conservation area and forms part of a regional biolink (Ref. 19).

The offset site covers approximately 129 ha and is based around the northern end of a ridge which slopes gently to the west and south-east, and more steeply towards the north and north-west. The northern part of the site contains a gully surrounded by densely forested slopes (see Figure 9.6).

The area of native vegetation cleared for Stage 1 would be approximately 8.7 ha, and a further 8.5 ha would be cleared for the ultimate development. The offset area is located between elevations of 680 metres and 810 metres, and the remnant vegetation on site has similar characteristics to much of the area to be cleared, although it is still regenerating from past disturbance.

The southern and largest component of the site is dominated by various pasture grasses although supports scattered red box and a small number of yellow box trees (see Plate 19). A minor drainage line, located in the south-western corner also supports apple box and mealy bundy. The west-facing slope is more densely wooded, with red box and yellow box the most dominant tree species, although apple box is common within the drainage lines and mealy bundy is scattered on the upper slope

(see Plate 20). Native grasses and forbs are more common in this area, although there is a large component of non-native grasses and weeds within the understorey. The steeper south-facing slope, located towards the northern part of the site, supports woodland dominated by red box and scribbly gum, with scattered yellow box and brittle gum. The shrubby understorey contains tea trees, blackthorn, drooping she-oak and wattles, and has a groundcover dominated by native grasses and forbs (see Plate 21). The small forested area at the north-eastern corner of the site supports red box, brittle gum and scattered yellow box, with red stringybark and scribbly gum towards the top of the slope (see Plate 22). Hoary sunray plants are numerous within the upper slope area, where trees have been cleared (see Plate 23). Red-anthered wallaby grass is the dominant grass within the understorey, which has a high component of native forbs and shrubs. Plate 24 shows an alternate view of the northern part of the offset area, looking southwards.

There may be the opportunity for improving the habitat features within the offset area by importing fallen timber, dead trees and loose rocks from disturbed areas within the road works, if those features cannot be used for habitat improvement at the site itself.

9.2.2 General impacts on biodiversity

In order to reduce the impact on site of the proposed activity on general biodiversity values, the following mitigation measures would be implemented.

Fencing. Where it does not already exist, temporary or permanent fencing would be installed along the edges of the development footprint to control unnecessary movement of machinery and workers outside the works area during construction.

Worker training. An induction program for workers would be developed and implemented to inform workers of the importance of the remnant native vegetation and habitat, and the need to avoid any unnecessary impacts on such areas.

Timing of clearing. If practicable, the clearing of vegetation and particularly hollow-bearing trees would be timed to avoid the main bird breeding periods (i.e. spring) or times when bats using the hollows are in torpor (i.e. winter). The optimum time for clearing woodland habitat would be between late spring and early autumn, while bat species are active and able to seek alternative diurnal roosts if necessary, and the bird nesting and breeding season has finished.

Removal of fauna from hollows. If practicable, searches of tree hollows for animals would be carried out by a suitably qualified ecologist immediately prior to the clearing of any hollow-bearing trees at the site. If animals are detected in any of the trees to be removed, an attempt would be made to drive them away by causing disturbance around the tree, or alternatively the animal would be captured by a suitably qualified person.

If suitable personnel are not available for checking or capturing animals, the approach would be used of creating disturbance around the tree for at least one day prior to felling with a view to driving any animals away. Experience elsewhere indicates that animals will generally vacate hollows under such circumstances.

Retention of minor habitat features. The unnecessary removal of habitat features such as fallen timber, dead trees and areas containing dense leaf mulch would be avoided. These features provide important habitat for small fauna, even if they are considered to be unsightly. If removal is unavoidable, these features would be relocated into other suitable areas rather than removed from the site.

Retention of native groundcover. Areas containing native groundcover outside the areas of direct physical disturbance would be avoided as far as practicable (e.g. for storage or parking), with a view to allowing them to regenerate following construction.

Site landscaping. Indigenous eucalypts (e.g. yellow box, red box) would be used in site landscaping of previously cleared areas adjoining the road to replace some of the cleared vegetation.

Topsoil management. Careful stripping and storage of topsoil from areas containing native vegetation, and its reuse in landscaping and rehabilitation works is likely to encourage the regeneration of native species from seed within the topsoil. The native topsoil is also likely to have suitable physical, chemical and microbiological properties for encouraging native regeneration from seeds that are transported into the area by wind, water or other means.

Underpass connectivity. Where possible, the fauna underpass design would include the rehabilitation of vegetation (including an understorey component) on either side of the road, and the placement of habitat features such as fallen logs and rock piles within and around the entrance of the underpass. This would encourage use of the underpass and provide some protection from predators that may lie in wait. While provision of an underpass does not guarantee its use by target species, erection of fences for some distance either side of the underpass is planned to increase its level of use. Further details of the underpass and fencing design would be determined in the further design of the ultimate duplication.

Weed management. A weed management plan would be prepared for the site prior to works commencing and would be implemented before, during and after the works are completed to prevent the spread of introduced species and declared noxious species recorded within the proposed disturbance corridor, including blackberry (*Rubus fruticosus* spp. agg.) and serrated tussock (*Nassella trichotoma*). The plan would include the monitoring and control of invasive weeds in disturbed and undisturbed roadside corridors.

10. IMPACT ON THREATENED SPECIES AND ECOLOGICAL COMMUNITIES

10.1 Background and Existing Environment

The area within and adjacent to the proposal has been subject to extensive target surveys for a range of species and ecological communities that are listed as threatened under the NSW *TSC Act* or the Commonwealth *EPBC Act*. A wide range of species and ecological communities has been assessed in a separate Species Impact Statement (SIS), which concluded that the following were likely to be impacted by the proposal:

Table 10.1 Threatened entities that may be impacted by the proposal

Entity	Legislation	Listing
White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands (box – gum woodland)	*EPBC Act* *TSC Act*	Critically endangered Endangered
Hoary sunray	*EPBC Act*	Endangered
Rosenberg's goanna	*TSC Act*	Vulnerable
Speckled warbler	*TSC Act*	Vulnerable
Turquoise parrot	*TSC Act*	Vulnerable
Brown treecreeper	*TSC Act*	Vulnerable

Of these species and ecological communities, it is probable that the individual turquoise parrot recorded during the surveys was an aviary escapee. The occurrence of the species in the locality appears intermittent at best. The SIS assessed the probable impact resulting from the proposal would not be significant in relation to the turquoise parrot, and this species is not discussed further in this REF.

Of the remaining species examined in the SIS and associated seven part tests (see Section 6.1), none was recorded or was known to occur within the study area. For those species for which some potential habitat was recorded, none was assessed as likely to be significantly impacted by the proposal.

A referral prepared under the Commonwealth *EPBC Act* (Ref. 10) addressed the impacts on box – gum woodland and the hoary sunray, both of which are listed under that Act.

10.2 Potential Impacts

10.2.1 Box – gum woodland

In the context of the Queanbeyan area, box – gum woodland is interpreted as meaning woodland dominated by yellow box and red gum and having a predominantly grassy understorey. Such woodland does not necessarily have well defined boundaries, with yellow box trees often extending into other types of woodland, particularly woodland or forest with a shrubby understorey, and other eucalypts, such as apple box, occurring in a range of woodland and forest communities.

Box – gum woodland commonly is found in valleys and on lower slopes, above the elevation limits of natural temperate grassland, and merges into shrubby woodland or forest as the elevation increases. Box – gum woodland may persist along gullies in areas where it is absent from the adjacent slopes. The distribution of the various woodland and forest communities, however, is influenced also by aspect, geology and soils. The original (pre-European) vegetation pattern is often masked by the past changes due to land clearing, development and management.

The definition of the endangered ecological community known as box – gum woodland is open to interpretation, and is slightly different under Commonwealth and New South Wales legislation. The SIS (Ref. 5) has estimated that, of the 17.2 ha of native vegetation within the total area of the proposal, 7.5 ha would be defined as box – gum woodland under the New South Wales *TSC Act*, while 5.5 ha of this would also meet the Commonwealth *EPBC Act* definition of box – gum woodland. Because of uncertainty in the classification of some of these woodland areas, these estimates may be conservatively high. The loss of box – gum woodland equates to approximately 0.2 percent of the existing community in the Queanbeyan Local Government Area (Ref. 19).

The location of these woodland areas in relation to the proposal is shown in Figures 9.1 to 9.3. The largest of these areas is located mainly within the area of the Stage 1 works and extends along the route of the proposed new road alignment from Wickerslack Lane (Ch. 1330) to the bend in Heights Road (Ch. 2400), as well as the realigned section of the access road to the quarry. The lower part of this area appears to form the eastern (uphill) boundary of a more extensive area of former box – gum woodland, extending through undulating terrain to the west up to an elevation of about 720 m, with the remnants of shrubby woodland or forest on the steeper slopes immediately above the proposed road to the east. The upper part of the area follows a gully between slopes that appear to have originally supported shrubby woodland/ forest dominated by red box and apple box, with red stringybark scattered on the higher slopes.

The other smaller patches of box – gum woodland identified in the SIS (Ref. 5) would be affected mainly by the ultimate development, although some of these would also be affected slightly by the shared trench construction in Stage 1. The woodland classification of some of these areas is questionable, however, and their inclusion as box – gum woodland can be regarded as precautionary. Some patches no longer have an understorey dominated by native species while others may not have supported an overstorey dominated by yellow box or red gum prior to European settlement. Several patches are within a transitional area, containing some of the species common to box – gum woodland but a structure more consistent with shrubby forest/ woodland.

One of these patches is located west of the road at its northern end and, while the lower slopes would meet box – gum woodland criteria, the upper slopes contain dry forest dominated by red box, red stringybark and scribbly gum. This area would be affected in Stage 1 by the shared trench and ultimately by cutting to duplicate the road. A small patch is identified at the southern limit of the Stage 1 works, where Talpa Road would be realigned. This area contains mainly red box and red stringybark, with some scribbly gum, apple box and yellow box. Similar vegetation is

present at two other sites further to the south, which also support brittle gum, candlebark and broad-leaved peppermint. While yellow box is present within or close to all of these areas, it does not appear to be a dominant species.

Any doubts about the classification of the woodland would not affect the conclusions of the SIS, which used the prescribed seven-part test to assess the significance of impacts on box – gum woodland (Ref. 5). That seven-part test determined that the proposal:

- would be unlikely to substantially and adversely modify the composition of box – gum woodland such that its local occurrence is likely to be placed at risk of extinction;
- would not isolate or fragment habitat for the box – gum woodland, as the fragmentation has already occurred in association with historic disturbances, and the box – gum woodland to be removed represents a relatively minor addition to the existing fragmentation;
- would not affect any critical habitat that has been declared under the *TSC Act*;
- through the proposed offset (see Section 10.3), is consistent with the objectives of the recovery plan for box – gum woodland; and
- through the proposed offset (see Section 10.3) that would protect and recover approximately 129 ha of box – gum woodland, the proposal would not increase the impact of the key threatening processes.

With the implementation of an appropriate offset plan, the impact on box – gum woodland as a result of the proposal, would not be significant. This is confirmed by the notification of the referral decision (EPBC 2010/5663), which determined that the proposal was not a controlled action and, therefore, the proposed action would not result in a significant impact on the ecological community.

10.2.2 Hoary sunray

Based on previous surveys, the SIS estimated that he proposal would remove an estimated 2,500 individuals of hoary sunray. More recent inspections undertaken in September 2010 indicate that the species is more widespread within and outside the road reserve than previously indicated due to favourable seasonal conditions, and that the number of plants removed could be significantly larger. In September 2010, the hoary sunray was present in large numbers through most of the route of the proposal, particularly on the eastern side, and in scattered locations on the western side. It is also relatively abundant in suitable habitat on adjacent land, particularly where there is remnant woodland or forest vegetation.

Based on the surveys undertaken for this and other assessments within the Queanbeyan LGA, the size of the local population of the species is estimated to be at least tens of thousands of individuals in size and probably in the hundreds of thousands of plants (Ref. 10). It is also present in large numbers in parts of the ACT (e.g. Mount Ainslie, Mount Majura, Mount Pleasant). It is a ready coloniser of disturbed ground and, notwithstanding its *EPBC* Act listing, does not appear to be threatened by development in the Canberra – Queanbeyan area. The impact of the proposal on the hoary sunray was assessed in the referral and SIS as unlikely to be

significant. Because of its ability to recolonise disturbed ground, there is the prospect that areas beside the road affected by the proposed earthworks may be recolonised by the hoary sunray over time. The species may well spread further into other ungrazed areas near the road by the time that the ultimate works are implemented.

10.2.3 Rosenberg's goanna

Based on the vegetation characteristics and the presence of numerous termite mounds, the shrubby woodland or forest north of Wickerslack Lane is likely to be used, possibly as breeding habitat, by a low number of resident Rosenberg's goanna individuals. Although there were no observations of the species in this area during fauna surveys undertaken for the current SIS, previous studies and Wildcare records of reptiles killed, injured or rescued have recorded the species within or near the study area (Ref. 5). The broad bushland corridor between the existing urban edge and Wickerslack Lane could be used by transient individuals or dispersing juveniles moving between the habitat areas in 'Mirrabee' to the west of the road and the Crown land to the east. Old Cooma Road currently bisects this corridor.

Stage 1 of the proposal would involve constructing the shared trench along the edge of potential habitat but this is unlikely to have any impact on this species. The ultimate duplication, however, would widen the break in habitat by up to 70 metres, particularly in the section where extensive cutting and filling is required (Ch. 650 to Ch. 1100). In addition to increasing the discontinuity in the habitat, there would be an increased risk of animal mortality due to higher traffic volumes arising from Googong development and a wider road surface to traverse.

The relevant sections of the seven-part test as applied in the SIS to Rosenberg's goanna considered that:

- The direct impacts of the proposal (removal of habitat) are not likely to place the local population at risk, particularly considering the species large home range and extent of surrounding habitat. However, the eventual indirect impacts of increased traffic volume and road width through an area of known habitat would have greater impacts on the population through an increase in road mortalities. The local population, as defined by the *TSC Act* and guidelines (Ref. 21), consist of those individuals known or likely to use habitats within the study area. Given the above, it is possible that the eventual indirect impacts of the proposal may have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
- While the removal of potential habitat is likely to have an adverse effect on the species in the locality (i.e. within a 10 kilometre radius of the site), it is not likely to threaten the long-term survival of the species in the locality.
- The loss of 3.5 ha of vegetation, containing five termite mounds and similarly low amounts of bushrock and fallen timber, from known habitat is unlikely to substantially contribute to the key threatening processes affecting the species.

The main impact on the species appears to result from an increase in the width of the road in the northern part of the ultimate duplication which has the potential to increase road mortality rates. This assumes that the habitat on both sides of the road would

remain undeveloped, and would continue to be suitable habitat for Rosenberg's goanna.

10.2.4 Speckled warbler

Large, relatively undisturbed remnants are required for the speckled warbler to persist in a given area. The understorey component appears to be important for the species, and it prefers an open grassy understorey with tussocks, fallen timber and rocks. Pairs are sedentary and occupy a breeding territory of about 6 to 12 ha, with a slightly larger home range when not breeding (Ref. 22).

The speckled warbler is known to occur in the study area and was recorded during the survey period in the less disturbed vegetation in the north and south of the study area. The species has been recorded from numerous sites in the locality, often associated with larger intact areas of habitat. The species is patchily distributed through much of the region, with 469 Bionet records (Ref. 5).

The main areas of speckled warbler habitat in the study area are located in the northern and southern-most sections, where areas of relatively intact dry forest and woodland occur. The potential habitat south of the Stage 1 works, however, is more disturbed than that located in the northern part of the study area, and is not regarded as high quality habitat or likely breeding habitat for the speckled warbler (Ref. 5).

The construction of the shared trench for Stage 1 of the proposal would be adjacent to the road and is unlikely to have a significant impact on the speckled warbler or habitat for the species. The ultimate duplication of the road, however, would result in the remove of approximately 3.5 ha of suitable habitat in the northern part of the study area and 2.5 ha in the southern part. The loss of this habitat in itself is not expected to have a significant impact on this species, however, due to the extensive area of habitat remaining (Ref. 5).

The duplication would nevertheless extend the current discontinuity between known habitats for the species at two points in the study area along Old Cooma Road (north and south) by between 15 metres and 70 metres. Birds are often less affected by the impacts associated with roads than other species because of their greater mobility. The speckled warbler is mobile, but tends to utilise habitats close to the ground, which may render it more susceptible to vehicle impacts when moving across roads.

The seven-part test undertaken to assess the significance of potential impacts on this species (Ref. 5) determined that the removal of 6 ha of suitable habitat (including one likely nesting gully) and an eventual increase in traffic volume through areas of known habitat may have a significant affect on the local population of the speckled warbler. This assessment is based on the definition of a local population as those individual birds that are known or likely to use the study area, i.e. the family group probably using the gully adjoining the northern part of the study area.

Stage 1 of the proposal is unlikely to have a significant impact on the speckled warbler as it is unlikely to impact on potential or actual habitat for the species. While it is possible that disturbance to the gully area during the proposed ultimate duplication in the northern part of the study area may affect potential breeding habitat for this

species and result in the loss of the local population in that gully, it is uncertain if that loss would be attributable to the duplication of Old Cooma Road as opposed to the construction of Edwin Land Parkway and/or the impacts associated with the development of Googong, such as an increase in traffic volumes locally, increases in noise, light and air pollution.

The SIS (Ref. 5) concluded that the potential cumulative impacts of known proposals in this location may have a significant impact on the local population of the speckled warbler in the long term but are unlikely to have a significant impact of the conservation of the species in the Queanbeyan region in the wider context. The speckled warbler has been recorded within the proposed offset area and it is possible that the proposed management of the area would improve habitat for this species within that area.

10.2.5 Brown treecreeper

The brown treecreeper inhabits eucalypt woodlands and dry open forest dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey. The species is not often recorded in woodlands with a dense shrub layer. Fallen timber is an important habitat component for foraging, while hollows in standing dead or live trees and tree stumps are essential for nesting. Brown treecreepers are generally sedentary although some birds may disperse locally after breeding. The species is usually observed in pairs or small groups of eight to 12 birds and is active, noisy and conspicuous while foraging on trunks and branches of trees and amongst fallen timber. Home ranges average 4.4 ha (Ref. 22).

The brown treecreeper was not recorded during targeted surveys undertaken within the Stage 1 road works area in 2006 (Ref. 4) or in the most intact habitat within 50 metres of the proposed road easement for the ultimate duplication in 2008 (Ref. 5). However, as there is one previous record of the species within dry forest in the south-east of the study area and another of nestlings being rescued from the Wickerslack Lane/Old Cooma Road area, and as suitable foraging and breeding resources are located within the forested areas at the northern and southern ends of the ultimate proposal, it is possible that the species utilises the habitat in these areas at least on occasions (Ref. 5). Survey results suggest that the species does not regularly use habitat located close to the existing road and is unlikely to use the more disturbed habitat located within Stage 1.

An assessment of significance (seven-part test) undertaken for this species (Ref. 5) found that:

- No likely nesting habitat or other core habitat would be removed by the proposal and as such, the proposal is unlikely to have an adverse effect on the life cycle of the brown treecreeper such that a viable local population is likely to be placed at risk of extinction.

- The proposal would remove about 4 ha in the north and 2.5 ha in the south of native vegetation considered potential habitat for the brown treecreeper, including four hollow-bearing trees although none that are considered likely nesting

resources for the species. Habitat to be affected is not considered critical to the long-term survival of the brown treecreeper in the locality.

- The proposal would increase the width of existing habitat fragmentation along Old Cooma Road although would not isolate any habitat or further fragment any areas of likely habitat.

The seven part test concluded that the proposal is unlikely to result in a significant impact to the brown treecreeper.

10.3 Mitigation Measures and Offsets

The mitigation measures identified in Section 9 for limiting the impacts on general biodiversity, including native vegetation, would assist in mitigating impacts on box – gum woodland and the threatened species present within the project area, to the extent that this is practicable. Such measures include fencing the edge of the development footprint to control machinery and worker movement, appropriate induction of workers, avoiding unnecessary disturbance to native groundcover and minor habitat features, topsoil management and provision of fauna underpasses.

The primary means to be implemented for the conservation of box – gum woodland, however, is an offset area which has been proposed for a parcel of land to the west of the proposal containing 129 ha of land assessed as box – gum woodland (Ref. 20). The plan would involve long-term protection and improvement of the woodland community and associated threatened species. The site is located south-west of the Cooma Road Quarry and is contiguous with suitable habitat to the west of the study area (see Section 9.2.1). The offset site contains some potential (although degraded) habitat which would be managed for conservation purposes. This would improve the condition of the existing habitat over time and effectively extend the area of habitat available to the population in the locality. A draft credit statement prepared by an accredited Biobanking Assessor shows a surplus of 29 ha at the offset site. That assessment suggests that the proposed offset site, if managed appropriately, would well offset the loss of box – gum woodland.

The establishment of the offset area has the potential to benefit some of the threatened species affected by the proposal, as the native habitat of that area regenerates. In particular, the hoary sunray is present on the offset site with high concentrations of individuals in the disturbed areas on the upper slope adjacent to the northern boundary. The species is common in Stringybark Reserve, just to the west of the proposed offset site.

It is probable that the hoary sunray would recolonise the disturbed road reserve over time, given the proximity of undisturbed colonies to the proposal and the species' relatively long-range wind dispersal capabilities. The appropriate reuse of topsoil in rehabilitation works may assist the species to recolonise disturbed areas, due to its known ability as a coloniser species.

While there are no mitigation measures that are specifically designed to benefit the other potentially affected threatened species, such species may benefit from the establishment of the offset area and the general mitigation measures outlined in

Section 9.4. In particular, the provision of the fauna underpass as part of the ultimate development in the northern part of the road is located where it may reduce mortality risks to Rosenberg's goanna.

One feature of the proposal that may mitigate potential road mortality for the speckled warbler and the brown treecreeper is the topography and height of the trees above the road. These can create a favourable situation which allows birds in general to pass over the road at a higher level than the vehicles, thus reducing the potential incidence of speckled warbler strikes by with vehicles. In the southern biolink, the road currently passes through a cutting that lowers the height of traffic relative to vegetation on either side. Where possible, the proposal would enhance this attribute to keep the road level low while minimising the removal of vegetation on either side to facilitate bird movements over the cutting.

Advisory signs for motorists and maintenance of the (70 km/h) speed limit through the corridor north of Wickerslack Lane may help to mitigate impacts to larger fauna species crossing the road, including Rosenberg's goanna.

Mitigation measures would also involve long-term monitoring and management strategies where appropriate, particularly in adjacent habitats of high conservation value. This may include the development and implementation of a species monitoring program in consultation with Government agencies and the QCC to incorporate the study area and offset sites in the locality. The species monitoring program may include:

- monitoring for road kill, particularly threatened species;
- monitoring of the known population of hoary sunray in the study area to be directly impacted by the proposal to assist in determining the species' persistence in the study area and effects of direct and indirect impacts; and
- undertaking species and ecological surveys in the proposed offset sites to determine if offset areas are providing suitable potential offsets for threatened flora and fauna including the hoary sunray, Rosenberg's goanna and threatened bird species.

11. TRAFFIC NOISE

11.1 Background and Existing Environment

The scoping assessment identified traffic noise as a potential impact likely to be an important environmental concern at several locations along the route of the road, particularly from a community viewpoint. The level of noise associated with a road is a factor that may be strongly influenced by the design of the road and possible noise protection measures.

Road traffic noise has the potential to negatively impact on local residents by creating an annoyance, by disturbing listening activities and/ or interrupting sleep. The NSW Government Environmental Protection Authority (EPA) has developed *Environmental criteria for road traffic noise* (Ref. 14) that sets out noise impact limits for various road developments in recognition of the need to balance the provision of an efficient road transport infrastructure with the control of adverse affects of road noise.

Noise is measured in terms of decibels (dB) which is a logarithmic unit related to the response of the human ear to sound. An 'A' weighting filter, which has a similar frequency response to the human ear, is normally used for environmental noise measurement. The noise levels measured with such a filter are referred to as dB(A). A change in sound level of 1 dB(A) is a just noticeable difference in noise level under ideal listening conditions, i.e. in a very quiet acoustic test room. A sound level has to change by 2 to 3 dB(A) for a just noticeable difference under normal listening conditions. It is generally agreed that a noise level has to increase by 10 dB(A) for it to appear to be twice as loud.

Environmental noise levels generally fluctuate over time. In order to assess the noise impact of a development, fluctuating sound levels within a given time period are measured, the total sound energy determined, and then the sound levels recalculated as if they were produced by a steady or constant level sound source over the same time period with the same total sound energy, giving a L_{eq} value. Noise levels pertaining to roads can be represented by the following values:

- $L_{Aeq(1hr)}$ – essentially the 'noisiest' level over an hour during a specified time period, i.e. 7 am to 10 pm (day) or 10pm to 7am (night);
- $L_{Aeq(15hr)}$ – the L_{eq} noise level for the day period 7 am to 10 pm; and
- $L_{Aeq(9hr)}$ – the L_{eq} noise level for the night period 10 pm to 7 am.

For example, a noise value expressed in the format $L_{Aeq(15hr)}$ 55 means that fluctuating noise levels as calculated over the course of a day (i.e. 15 hours between 7 am and 10 pm) produce an equivalent constant sound level of 55 dB. Social surveys have shown that for existing noise, a level of L_{Aeq} 55 dB(A) equates to ten percent of a population exposed to this noise level being highly annoyed (Ref. 14).

Noise level criteria provided by the EPA are given for different types of roads, with those relevant to the proposal shown in Table 11.1. The noise levels indicated are the levels that are recommended not be exceeded. These levels are provided as a guide for road developments, however, and are not prescriptive.

Table 11.1 EPA noise level criteria (extracted from Ref. 14)

Type of development	**Criteria**		
	Day (7am – 10 pm) dB(A)	Night (10 pm – 7am) dB(A)	Where criteria are already exceeded
New arterial road corridor	$L_{Aeq\ (1hr)}$55	$L_{Aeq\ (1hr)}$50	The new road should be designed so as not to increase existing noise levels by more than 0.5 dB.
Redevelopment of existing arterial road	$L_{Aeq\ (15hr)}$60	$L_{Aeq\ (9hr)}$55	In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB.
Redevelopment of existing local road	$L_{Aeq\ (1hr)}$55	$L_{Aeq\ (1hr)}$50	In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB.

The QCC has determined that the noise criteria for the redevelopment of an existing arterial road should be applied to the proposed Stage 1 and the ultimate duplication.

Measurements of the existing noise levels were undertaken between 18 and 24 May 2008 at three locations in the vicinity of Stage 1, within rural and rural residential areas and in proximity to existing residences (see Figure 11.1). A summary of the relevant data is provided in Table 11.2. The full noise assessment report is provided as Appendix E.

Table 11.2 Measured typical and predicted noise levels at tested locations

Location	**$L_{Aeq\ (15hr)}$ dB(A)**	**$L_{Aeq\ (9hr)}$ dB(A)**	**$L_{Aeq\ (1hr)}$ dB(A)**
Tempe Crescent	54 – 55	42 – 43	56 – 58
Tempe Crescent/ Heights Road	45 – 46	33 – 34	No significant increase
Talpa Road	57 – 59	44 – 46	62 – 63

The $L_{Aeq(1hr)}$ values represent the typical values over the test time while the $L_{Aeq(1hr)}$ values represent the loudest noise level recorded over any one hour period within the test time, which is generally during the time of greatest traffic flow.

Noise monitoring and attended observations indicate a noise environment that is primarily influenced by traffic noise emanating from the local road network. Day and night time noise levels at Tempe Crescent and Talpa Road were lower than the guideline for an existing arterial road corridor, i.e. $L_{Aeq(15hr)}$ 60 dB(A), although noise levels were above the standard during morning peak periods (Ref. 12). Noise levels at the Tempe Crescent/ Heights Road intersection were below the guideline for a local road.

11.2 Potential Impacts

The development of Googong will result in increased traffic movement and therefore traffic noise along Old Cooma Road. The proposal to construct a new section of road (Stage 1) would increase the exposure to additional traffic noise of residences located in the vicinity of the new road, although existing traffic noise is generated by local traffic on Tempe Crescent, Heights Road and Talpa Road, as well as from Old Cooma Road, where it deviates from the rural residential development.

It should be noted that, for the most part, the increase in traffic noise would be related to the increase in traffic resulting from the development of Googong and not as a direct result of the construction of the road. Mitigation measures undertaken for Stage 1 have been designed, however, to reduce the potential noise impacts related to future developments.

The prediction of traffic noise impact has been undertaken using the TNOISE software package. This software was developed by Main Roads in Western Australia and is based on the modelling procedure of the Calculation of Road Traffic Noise (CORTN) method developed in the UK.

For modelling purposes, estimated peak hour vehicles per hour, as provided by Brown Consulting Pty Ltd, are:

- 415 vehicles per hour in 2010;
- 1,100 vehicles per hour in 2021; and
- 2,800 vehicles per hour in 2031.

Traffic speed along Old Cooma Road was modelled at 80 km/hr and it was assumed that heavy vehicles would comprise 6 percent of total traffic over the entire time period. Guidelines require noise modelling to be undertaken on the basis of the traffic volumes projected for 10 years time, although traffic volumes are not expected to peak until 2031.

The daytime criterion has been determined as the critical metric for compliance as most of the increase in traffic noise is expected to occur during this time (Ref. 12). The prediction of the noise levels for the key locations near to existing residences indicates that, in the absence of mitigation measures, the criteria goals may be exceeded at some locations.
There is some potential for elevated noise levels to be experienced at the following locations along the proposed new section of Old Cooma Road and along the section proposed for duplication. These locations are identified on Figures 4.10 and 4.11.

For Stage 1, there are two residences located on the east side of the proposal (within about 100 metres from the road) and one on the west side (90 metres) that may be affected by increased noise (Ch. 1900 to Ch. 2100). Although both residences on the eastern side are in proximity to the existing road, the proposal would reduce the distance between the residence and the road. The residence on the west side would be located at a similar distance from Stage 1 as from the existing road.

There are two newly constructed residences at approximately Ch. 2450 east. These are located about 250 metres from the proposed road and are partly screened by the topography and vegetation. A residence that overlooks the gully location for Stage 1 is located in Talpa Heights at about 150 metres from the centre of the proposed road (Ch. 2650 east). The predicted noise levels at all of these locations is less than 60 dB(A) (Ref. 12).

A residence is located about 175 metres from Old Cooma Road (Ch. 3000), on the eastern side. Informal dirt tracks parallel to Old Cooma Road provide access from Old Cooma Road to the residence and also to Talpa Road. Talpa Road would be extended, replacing the dirt track with a sealed access road at this location. The realignment of Talpa Road would bring the access road closer to the residence, although the amount and type of traffic using the access road is unlikely to change. Preliminary noise assessments (Ref.12) suggest that predicted noise levels at the residence in 2031 are unlikely to exceed the guidelines.

Generally access corridors in urban areas are selected many years before the road is built. It should be noted that the location of Stage 1 appears on the Queanbeyan LEP and that the Talpa Heights estate was developed after the location for the road was identified.

For the ultimate duplication, there appears to be six residences located less than about 100 metres from the proposal, two on the northern alignment between Wickerslack Lane and Stage 1 (Ch. 1500), and four on the southern alignment between Stage 1 and Googong Road (Ch. 3100 to Ch. 3400).

A house at Ch. 3700 (west) is visible from Old Cooma Road and is above the level of the proposed duplication. As the house is well set back, noise mitigation measures would not be required (Ref. 12). No other residences are likely to experience increased noise levels to the extent that mitigation measures are required.

11.3 Mitigation Measures

In the course of designing the road, a range of options has been examined for appropriate noise attenuation measures. These take account of the effectiveness of proposed cuttings and embankments in providing a barrier to noise transmission. Additional measures include noise mounds or fences strategically located between the road and sensitive land uses, including nearby residences.
The effectiveness of cuttings and embankments in minimising the transmission of road traffic noise is increased when the line of sight between the noise source and the receiver is interrupted. The edge of an embankment or the top of a cutting can often act as an effective acoustic barrier.

The final noise mitigation option selection and design would occur during the project's detailed design stage (currently underway), taking into account any subsequent changes from the concept design and consequent refined assessment of the issues relating to feasibility and reasonableness. In general, noise barriers have been identified as the preferred option for Stage 1 as there is limited space for noise mounds at the locations described.

The following noise mitigation measures were identified during the noise modelling process as a means of achieving acceptable noise levels at the residences most likely to be affected by the proposal. The location of each residence is provided as an approximate chainage and is described as east or west, depending on the side of the road on which it is located (see Figures 4.10 and 4.11). For reasons of efficiency and cost effectiveness, the measures required to mitigate the expected noise levels for 2031 have been incorporated into the design of the road for Stage 1.

Stage 1

- **Ch. 1900 east.** The house is set back on top of the cutting and has a timber boundary fence. Improvements to the fence are considered a sufficient sound attenuation measure to provide a one metre high barrier on the edge of the road cutting. Improvements to the fence will be incorporated into the construction phase for Stage 1.
- **Ch. 2000 west.** The residence is currently exposed to the existing alignment of Old Cooma Road, to the north. Stage 1 would create an additional exposure on the west side. A two metre high barrier integrated with a safety barrier would be incorporated on the edge of the road cutting.
- **Ch. 2100 east**. The residence is set back on the top of a cutting and faces north, with few windows facing the proposed road. A four metre high barrier would be constructed on the edge of the road cutting.

Ultimate development

- **Ch. 1500 east.** The residence is elevated and has a view towards the existing road on the northern façade. The current chain fence would be replaced with a one metre high solid fence on the top of the road cutting.
- **Ch. 1500 west.** A two metre high barrier would be integrated with a safety barrier during the proposed road duplication.
- **Ch. 3200 to 3400 east.** The section of Old Cooma Road would become an access road for the properties along this section, with a single egress point provided to the duplicated road. A 1.5 metre barrier would be constructed between the access road and the duplicated road.

The timing for the implementation of the proposed noise mitigation measures near Ch. 1500 is dependent on funding and may be undertaken prior to the construction of the ultimate duplication.

Table 11.3 provides a summary of the noise predictions for 2031 before and after the proposed noise mitigation measures as described are employed (Ref. 12).

Table 11.3 Noise modelling predictions at specific locations

Location (approximate Chainage)	**Predicted noise level in 2031 $L_{Aeq\ (15hr)}$ dB(A)**	**Predicted noise level with proposed mitigation measures $L_{Aeq\ (15hr)}$ dB(A)**
Stage 1		
Ch. 1900 east	60 - 62	59
Ch. 2000 west	63	60
Ch. 2100 east	62	60
Ultimate duplication (north of Stage 1)		
Ch. 1500 east	64	59
Ch. 1500 west	66	59
Ultimate duplication (south of Stage 1)		
Ch. 3200 to Ch. 3400	63	59

The noise modelling indicates that the proposed noise mitigation measures would meet the selected noise criteria for the proposal.

12. VISUAL IMPACTS

12.1 Background and Existing Environment

The development of a road has the potential to create short and long term visual impacts on residences facing the road and on views from public areas. Such impacts can result from the removal of trees and other vegetation, earthworks and the presence of a new road surface with moving traffic. Such changes are generally regarded as potentially adverse. The visual impact of the road may be strongly influenced by its design, as well as landscaping and retention of trees within the road corridor.

The assessment of the visual impacts resulting from the Old Cooma Road upgrade depends on who can actually see the road from outside it, and on the personal perceptions of any changes to the landscape. Such assessment is necessarily subjective.

The people other than road users who are most likely to experience the visual impacts of new road construction or duplication include:

- local residents whose houses or land faces the road;
- other local residents travelling along roads which are close to the proposed route of Old Cooma Road (e.g. Tempe Crescent, Heights Road); and
- people viewing the area of the road from distant locations, particularly scenic lookout points.

12.2 Potential Impacts

12.2.1 Local residents

There are a small number of properties in the Tempe Road – Talpa Estate area which overlook the gully where the new section of road would be constructed as part of the Stage 1 works. The potential for visual impacts would result from a combination of the removal of trees and other vegetation within the road reserve, the earthworks which would create large cut or fill batters at some points along the road, and the road surface itself, including part of the cross section which would be formed for the ultimate duplication but would not be sealed for its full width (see Section 4.2).

The actual visual impacts, however, may be moderated by the retention of existing tall vegetation between the road and the affected properties, and by proposed landscaping which is intended to screen the road or soften the visual impact of major earthworks.

The visual impact assessment is based largely on field inspections along the route of the road to determine which residences are visible from the road alignment or the locations of proposed cuttings, on the assumption that if a residence is clearly visible from the location of the proposal then the proposal would be visible from the residence. It takes account also of the profile of the land surface between potentially

affected residences and the proposed road, as well as the presence of intervening vegetation.

On the east side of the proposed Stage 1 road between Ch. 1800 and Ch. 2100, there are two residences that can just be seen from Tempe Crescent or Heights Road (see Figures 12.1 and 12.2). These dwellings are set back from the road and largely screened from Tempe Crescent by trees planted within the property boundaries and along Tempe Crescent/ Heights Road, and by a row of trees planted on the east side of Heights Road. Those trees would be retained. As indicated in the profile in Figure 12.1, those dwellings could potentially have views of the road, although the road would be largely screened by existing vegetation. In the longer term, this screening would be enhanced by landscaping along the road.

There is one rural residence on the opposite side of the road in this area, approximately 150 metres to the west (see Figure 12.1). There are some scattered trees between the residence and the proposed road, although most of the original vegetation has been cleared. In the short term, the road would be clearly visible from the residence, although its visibility would be reduced over time as landscaping within the road reserve matures.

In the Talpa Heights area there are several residences, particularly one house at about Ch. 2650, which overlook the gully where the road would be located. While the road surface and the cutting beyond it would be potentially visible from these residences (see Figure 12.2), in practice the vegetation (particularly pine trees) on the slopes between the residences and the road is likely to provide at least partial screening. In the longer term, landscaping beside the road would further conceal the road surface.

In general the visual impacts of the ultimate duplication are likely to be less significant than those of Stage 1, as those works would involve widening an existing intrusive element in the landscape, rather than introducing a new one. Particularly in the case of the Stage 1 road works, the incremental impacts of the duplication would be minimal, as the major earthworks would have already been undertaken and any landscaping works to screen the road should become well established over the intervening years.

There are some areas, however, where duplication of the road on the western side would result in the loss of a narrow corridor of trees along the roadside. This may affect the local landscape as seen from the few houses on the west of the road in particular and, to a lesser extent, from some of those on the east. The sections of road particularly affected in this way are immediately south of Wickerslack Lane (Ch. 1330 to Ch. 1650, and between Talpa Road and Googong Travelling Stock Reserve (Ch. 3100 to Ch. 4100). In the longer term, however, landscaping within the road reserve could restore the landscape to a condition similar to that existing.

Residences on the eastern side of the road, where the small rural holdings are located, are less likely to be affected visually than those on the larger properties on the western side. Those on the east, however, may be affected by any tree removal that is required for construction of the shared trench in Stage 1.

Where tree removal is required, either for construction of the shared trench or for the ultimate duplication, on the edge of extensive forest or woodland areas, the visual impact will be less significant, due to the presence of remaining vegetation with similar characteristics. There may be increased visual impacts, however, resulting from road cuttings and other major earthworks. Areas where the existing vegetation is extensive enough to limit the visual impacts of clearing for the ultimate duplication are located between the northern end of the project and Wickerslack Lane (Ch. 440 to Ch. 1330) and at the southern end between Ch. 4100 and Ch. 4600.

The impact of any tree clearing which reduces the level of screening may be more noticeable at night time in relation to the movement of car lights. Vegetation clearance in areas where there is limited tree cover beyond the road reserve would reduce existing road screening and have a greater impact on visual amenity for both residents and general road users.

The removal of features many people consider to be undesirable visual aspects, such as weedy areas along gullies and eroded areas, has the potential to improve the aesthetics of the area for local residents. The changes to the landform resulting from the Stage 1 earthworks, together with the landscaping proposals for the road reserve, could lead ultimately to an improvement in visual quality for those residents who experience views of the road corridor.

12.2.2 Distant views

Parts of the road are potentially visible from surrounding public areas including the southern edge of the existing Queanbeyan urban area and the upper slopes of Jerrabomberra Hill. The Stage 1 works, however, would be largely concealed by the topography from surrounding areas, with no resulting visual impact on those areas. In any case, the forest on the upper slopes of Jerrabomberra Hill generally precludes long views to the south. The impact of the Stage 1 works on distant views is therefore considered to be negligible.

In the ultimate development, widening of the road on the hill rising from the existing urban edge of Queanbeyan is expected to be visible from some houses on the urban edge. By that time, however, the view from those houses would be quite different from what exists today, with Edwin Lane Parkway constructed in the foreground to the Old Cooma Road intersection. In that context, the additional visual impact of the road widening with a higher cutting in the background may be considered only minor, particularly if it is partly screened by landscaping associated with Edwin Land Parkway. Other parts of the ultimate development would generally be subject to topographic shielding or would be too elevated to be visible from high points or other public viewing locations in the surrounding area.

12.3 Mitigation Measures

The main measures proposed to mitigate any visual impacts of the proposed development would be through landscaping within the road reserve. This landscaping would be designed to partly screen the road and associated cut and fill batters from existing residences and nearby access roads.

Where the visual impacts result from the removal of bands of existing trees along the road verge in the course of duplicating the road, those trees would be replaced by landscaping along the outer part of the expanded road reserve. Ideally, this would be most effective if the planting were done well in advance of the ultimate development, but this would mean acquiring the land and withdrawing it from productive grazing several years before it would otherwise be necessary. There is also a risk that the new plantings would be damaged in the course of road construction. It is therefore likely to be several years after the tree removal before the newly planted trees had matured to the point of mitigating the visual impacts of tree removal.

13. VIEWS FROM THE ROAD

13.1 Background and Existing Environment

The view from the road has the potential to enhance the experience of people travelling along it. This is a consideration in the design of the road and associated landscaping. In this case, the location of the road has been determined. The view from the road should be treated not as an impact of the proposal but rather as an opportunity for environmental enhancement.

A visual landscape character assessment undertaken as part of the Old Cooma Road study area identified significant views and key landscape character elements and the constraints and opportunities for managing these elements (see Appendix G).

The character of the area as a whole is generally rural, with stands of scattered trees amongst open grasslands, rural buildings and livestock. The landscape contains some natural elements, particularly as remnant areas of woodland or as a linear feature adjoining the road. Long vistas are achieved from elevated and cleared valley areas, particularly in the south, while views are enclosed along sections of the road by steep hills covered in woodland vegetation on either side.

In broad terms, the assessment identified four landscape character units within the ultimate road corridor (see Figure 13.1) including:

- woodland on slopes and hills located at the northern and southern ends of the ultimate duplication;
- wooded upper valley with a predominantly rural land use, located generally north and south of Stage 1 and within the northern part of Stage 1;
- open valley with grassland, mostly within Stage 1; and
- ephemeral creekline riparian zone, wholly located within Stage 1.

13.2 The Future Environment

The view from the future road would be fundamentally the same as from the existing road for those sections which would be duplicated on the current alignment. Those sections are north of the existing Tempe Crescent intersection (Ch. 1700) and south of the Talpa Road intersection (Ch. 3000). While the near view from the road would be modified following duplication due to tree removal, earthworks and other construction works, over time with the establishment of new trees and regeneration of groundcover the views from the road would be broadly similar to those existing.

The main change in views would result in Stage 1, with the existing views of an open, rolling landscape with a large quarry as a major element being replaced with an enclosed valley, with a diversity of scenery embracing native vegetation, scattered pine trees, high cuttings and rural land. While the impacts of construction would be evident in the short term, these would become less evident over time. The realignment of the road to avoid views of the quarry would generally be considered as beneficial from a visual viewpoint.

13.3 Mitigation Measures

Any aspects of the views from the road which may be considered undesirable from the travellers' viewpoint (e.g. new cut and fill batters) would be addressed through the landscaping measures which are aimed at reducing the visual impacts of the road generally.

14. SOILS, LANDFORM STABILITY AND EROSION HAZARD

14.1 Background and Existing Environment

The proposal would traverse undulating terrain with several road cuttings and filled gullies, underlain by variable geological conditions.

Geotechnical assessment is important in relation to the design of the road, particularly in addressing slope stability in cuttings, suitability of fill and/or potential groundwater discharges. Geotechnical assessments were completed for the proposal to provide information on surface and subsurface conditions and to inform the design of the proposed road works (Refs. 15, 16). The survey results were used to determine the parameters for site preparation, excavation, batters, reuse of excavated material, filling placement and filing compaction and to identify issues to consider for pavement design. The materials to be excavated were assessed as being suitable for use as fill under specified conditions (Ref. 16).

Stage 1 would result in the exposure of a relatively large area of sloping land during construction. Under these circumstances, there may be the potential for slope instability and extensive erosion. The final design for the ultimate duplication is not addressed in the REF.

14.2 Potential Impacts

The proposal would involve site disturbance through excavations, construction of access, construction of drainage systems and other construction activities. These activities have the potential to impact on soil stability and erosion.

Machinery and support vehicles driving off road may result in the disturbance of surface soils. These vehicles could then track dirt and mud onto nearby sealed roads resulting in erosion and sediment loss and the potential sedimentation of nearby watercourses or irrigation channels, with potentially adverse impacts on water quality.

Materials stockpiles located off road and the access of these materials by machinery and support vehicles may result in the disturbance or compaction of surface soils. This may impact on later rehabilitation works.

Flooding of the construction site has the potential to cause erosion. Suitable environmental management strategies would be implemented to manage the environmental risks associated with this aspect of the proposed works.

Apart from the direct impacts within the construction area, the proposal is expected to have a low impact on the local soils and geomorphology.

The road would be designed to respond to any identified geotechnical constraints, and there are unlikely to be any major residual concerns of a geotechnical nature.

14.3 Mitigation Measures

The geotechnical report (Ref. 16) identified key considerations and recommendations that would be employed in the design and construction phase as required including:

- Site preparation for the construction of road formations is likely to include topsoil stripping depths of up to 0.1 metre.
- The filling, residual soils and bedrock up to low strength could be expected to be removed using conventional earthmoving plant while large excavators with toothed buckets, single tyne rippers or rock hammers will most likely be needed to remove low strength (or greater) weathered rock in trenches/footing excavations below the level of test pit refusal.
- For permanent excavations in filling, residual soil and weathered rock, maximum gradients of 2.5H:1V (horizontal:vertical) for filling/residual soils and 1H:1V for extremely low to very low strength bedrock are recommended.
- To minimise surface erosion, batters should be protected with toe and spoon drains and vegetated as soon as possible after construction.
- For temporary excavations, maximum gradients of 1H:1V and 0.5H:1V are suggested for residual soils and extremely low to very low strength rock respectively. Batters for low strength or greater bedrock should be individually inspected and treated accordingly.
- Specified conditions would apply to materials excavated for use as fill (see Ref.16).
- In areas that require filling, the stripped surfaces should be proof rolled in the presence of a geotechnical engineer to ensure that appropriate processes are undertaken in areas of risk.
- All filling placed within construction platforms should be compacted to a minimum of 95% modified maximum dry density. To validate compaction levels within any proposed filling, field inspections and in-situ testing should be undertaken.
- The standard of construction, the selection of materials and quality of workmanship for the roads should satisfy the requirements of Queanbeyan City Council.
- Appropriate surface and subsoil drainage, as per the guidelines provided within the report, should be installed and maintained to protect the pavement and subgrade.
- Unlined open spoon drains at least 0.5 m deep would be expected to be effective in intercepting water from upslope areas entering the sites. Similar drains along the low sides would also assist in controlling surface water build up and held minimise delays due to wet weather.

An erosion and sedimentation control plan (ESCP) would be developed and incorporated into the Construction Environmental Management Plan (CEMP). The plan would include control measures developed within this REF, incorporate specifications outlined in the references above, identify areas requiring management controls, include inspections and checklist sheets, and would be reviewed by QCC prior to the commencement of works.

Particular details that may be included within the ESCP include:

- Comprehensive erosion and sedimentation controls in all areas although particularly where batters are required, in fill areas and where creek lines would intersect or run parallel to the proposal.
- Installation of sediment fences or similar erosion control devices downslope of stockpile and excavation areas.
- Protection of exposed soil surfaces in the vicinity of drainage lines with geotextile fabric during construction to prevent erosion during rainfall events.
- Stabilisation of creek banks and beds within the channels around creek crossings using rock protection where there is the potential for erosion to occur.
- Stabilisation of creek banks outside the channel by planting appropriate plant species.
- Limiting areas of vegetation and soil disturbance through delineating work areas to minimise the potential for erosion.
- Stabilising unsealed construction access routes through use of coarse aggregates.
- Diverting clean upstream waters around construction areas.
- Progressively rehabilitating and revegetating areas of disturbance including, where necessary undertaking short-term stabilisation of temporary stockpiles, disturbed areas.
- Maintenance and checking of the erosion and sedimentation controls would be undertaken on a regular basis, particularly following rainfall, and records kept and provided at any time upon request. Sediment would be cleared from behind barriers on a regular basis and all controls would be maintained effectively at all times.
- Efficient phasing and sequencing of work to minimise the time that surface areas remain bare and prone to erosion, with rehabilitation works commencing as soon as practicable.
- Stabilisation of fill and cut batters as early as possible to prevent soil erosion and sedimentation.
- Not undertaking stockpiling activities during rainfall events.
- Installation of hay bales or geotextile fences downslope of disturbed areas and stockpiles.
- Design and siting of drainage to collect and channel stormwater for discharge at suitable locations, taking account of the need to prevent erosion, scouring and downstream sedimentation.
- Minimisation of disturbance to soils and vegetation by identifying and limiting the areas required for construction and access.

14.4 Summary and Conclusions

An erosion and sedimentation control plan would be developed and incorporated into the Construction Environmental Management Plan. The plan would be implemented,

reviewed and adjusted where required to ensure that the proposal did not have a significant impact on soils and erosion.

15. HYDROLOGY AND WATER QUALITY

15.1 Background and Existing Environment

The proposal is located within the Murrumbidgee River catchment. Stormwater flows from within the proposal area drain to the Queanbeyan River via several ephemeral watercourses. Googong Reservoir is located upstream of the drainage flow, approximately 3.5 kilometres to the south-east of the southern end of the proposal.

Stormwater run-off from Old Cooma Road generally flows into unlined drainage ditches or realigned minor drainage lines located beside the road, where it is directed towards minor creeks located on the downhill side and, where water is collected on the uphill side, is channelled underneath the road via underground pipes.

At the northern end of the ultimate proposal, Old Cooma Road is situated above and to the west of a minor drainage gully that flows intermittently into Barracks Creek. The gully and surrounding area have been modified by previous road works and land uses although the area shows minor erosion only and supports a dominance of native vegetation.

Stage 1 is located within a separate tributary to Barracks Creek. The gully has been disturbed by long term stock grazing, the construction of roads, farm tracks and dams, and through the installation of underground services. The vegetation supports remnant native trees and shrubs as well as a significant amount of invasive weeds, particularly blackberry. The southern part of the creek is deeply incised and eroded, and the eastern bank of the gully is dominated by pine trees and pine saplings.

15.2 Potential Impacts

Stage 1 is located within an existing gully and, therefore, the proposal would require the creek to be filled and the sides of the gully to be cut. Stormwater flows would be redirected into constructed drains located on either side of the new road formation, prior to re-entry into the undeveloped part of the creek. The drainage system would be relatively steeply inclined at the top of the gully. The existing dam, which currently collects stormwater run-off, would be removed and a hard surface, i.e. the road pavement, would be introduced. These factors have the potential to impact on hydrological patterns by:

- reducing the amount of water absorbed directly into the ground during a rain event, thereby increasing the amount of water entering the creek downstream of the proposed works;
- increasing the velocity of stormwater water flows down the gully sides (where cut) and alongside the road, thereby increasing the risk of erosion and scouring; and
- increasing the risk of flooding at the lower end of the proposed works.

The shared services trench would not impact on local hydrology as the ground surface would be reinstated after the completion of the works.

The ultimate duplication would require modification to the banks of an ephemeral creek located parallel to and on the east side of Old Cooma Road, at the northern end of the proposal. The existing road corridor is narrow and does not have the current capacity to carry an additional dual carriageway. The degree of modification required to the banks of the creek is dependent on the final alignment and the amount of space gained by cutting into the side of the hill located on the western side of the road corridor. The final design works for the ultimate duplication are not addressed in the REF.

The drainage channels located at the southern end of the proposal are small. Drainage works similar to the current arrangements are expected to be implemented for the ultimate duplication.

The increase in traffic resulting from the development of Googong may increase the risk of vehicle related pollutants being spilled onto the road surface, and subsequently impacting on water quality in the surrounding streams. This would be an indirect impact of the ultimate proposal.

The ultimate proposal is unlikely to impact on water quality within the major creeks or rivers in which the stormwater would eventually flow. The construction process and design of the stormwater system would be managed to prevent sediments and pollutants from being carried downstream.

15.3 Mitigation Measures

Potential impacts would be managed by employing appropriate mitigation measures during the construction and operation of the road and services trench, as outlined in environmental management plans that would be prepared for the proposal. Such measures include the use of sedimentation fencing and barriers where there is a risk of sediment flows into drainage channels or natural watercourses and minimal use of chemicals/fertilisers in the landscape rehabilitation works. Further examples are provided in Section 21.

Mitigation measures considered in the design phase include:

- Design and siting of drainage to collect and channel stormwater for discharge at suitable locations, taking account of the need to prevent erosion, scouring and downstream sedimentation and turbidity.
- Inclusion of drainage designed to prevent any increase in flooding. For example, the depth of the stormwater drains would manage the anticipated increase in stormwater flows due to the introduction of hard surfaces.

16. LAND USE

16.1 Background and Existing Environment

The land uses surrounding the ultimate development area include reserves, rural residential developments and rural land uses such as stock grazing or agistment.

Forested reserves are located at the northern end of the proposal. ‘Mirrabee’, held under Aboriginal title, is located on the western side of the road, between the commencement of the ultimate proposal and Wickerslack Lane. The forested area on the eastern side is a crown reserve, subject to an Aboriginal Land claim.

The Googong Travelling Stock Reserve, which is partly forested, is located at the southern end of the proposal, on the east side of Old Cooma Road.

Rural residential developments and small rural blocks are located on the eastern side of Old Cooma Road, between Wickerslack Lane and about Ch. 3600. The remaining area supports rural uses or contains larger rural residential blocks.

16.2 Potential impacts

The main impacts of the proposal on land use arise from the resumption of land required for the construction of the road and ultimate duplication, with some blocks additionally impacted by the inclusion of a services easement within the property boundary. The resumption of land would reduce the area available for current land uses and would reduce the size of the privately owned blocks adjoining the road. Wherever the services trench is located within private property, the property owner would be obliged to ensure that the easement was accessible as required for maintenance purposes or other works.

The road works for Stage 1 are generally contained within a road reserve identified in the Queanbeyan LEP. The western part of the road reserve is currently used for stock grazing and the creek supports a dam. The resumption of this land would reduce the area available to the property owner for stock grazing and would require the relocation of the dam.

Most of the proposed extension to Talpa Road is outside the existing road reserve and would require land acquisition between Ch. 2800 and Ch. 3000. This would impact on three rural residential blocks. Otherwise, alterations to existing access arrangements associated with Stage 1 are located within the road reserve.

The shared services trench would be located on the boundary of or within the road reserve with the exception of the eastern side of the road, between about Ch. 1000 and Ch. 1350, Ch. 1475 and Ch. 1550, Ch. 2850 and Ch. 3000 and for the majority of the route between Ch. 3500 and Ch. 4800. Between Ch. 1000 and Ch. 1350, the easement would be on crown land. Otherwise, the easement would be located on land in private ownership.

The ultimate duplication would impact on land immediately adjacent Old Cooma Road and, although mostly located within an existing road corridor, limited land acquisition

would be required. This would be mostly restricted to the east of the road reserve between Ch. 400 and Ch.1100 and to the west of the road reserve from Ch. 1100 to the Googong Road. Minor variations to that proposed may occur but would be identified during the detailed planning stage for the ultimate duplication.

The boundary fence adjoining 'Mirrabee' is currently located within the road reserve. The fence would be relocated further west to the actual property boundary. The trench would be constructed within the road reserve.

The proposed development has the potential to promote indirectly the redevelopment of rural properties for residential or rural residential use. Future subdivision is, however, dependent on approvals processes regulated by the Queanbeyan City Council.

16.3 Mitigation measures

The design of the proposed alignment has taken surrounding land uses into consideration in consultation with Council, the RTA and the community. The main measures proposed to mitigate the impacts of the proposal are as follows:

- The farm dam (Ch. 2200) would be replaced in a location approved by all concerned parties.
- The section of Old Cooma Road no longer required, i.e. from the quarry entrance south to Talpa Road, would be rehabilitated and available for rural uses.
- There is an additional road reserve located between Stage 1 and the current alignment of Old Cooma Road. This reserve would not be required once Stage 1 was completed and would be formally incorporated into the property on which is currently located.
- Proposed land use changes involving subdivision would continue to be addressed under existing legislation. This issue is beyond the scope of the REF.
- Consultation with affected landowners has been and would continue to be undertaken. Land acquisition would be undertaken in accordance with the RTA's *Acquisition Policy* and compensation would be in accordance with the *Land Acquisition (Just Terms Compensation) Act* 1991.

17. TRAFFIC IMPACTS AND ACCESS ARRANGEMNTS

17.1 Background Existing Environment

Current traffic volumes along Old Cooma Road within the proposed development area are estimated at approximately 4,150 vehicles per day, of which apparently 515 (12.4 percent) are heavy vehicles. The number of vehicles using Old Cooma Road is expected to rise to over 11,000 in 2021, although traffic flow from Googong is not expected to peak until 2031. The volume of heavy vehicles, mostly derived from the Cooma Road Quarry is expected to be maintained at current levels until the development of Googong is commenced, where an additional 10 percent of traffic is expected to comprise heavy vehicles.

The impacts of increased traffic flows, both on Old Cooma Road itself and elsewhere within the Queanbeyan road network, are a consequence of the decision to allow residential development at Googong and are not determined by the design of the road. A discussion of these impacts is therefore beyond the scope of the present REF. Information on projected traffic flows is nevertheless relevant to the assessment in the REF of some other impacts, particularly traffic noise, and the information on traffic flows is presented in this context.

The impacts of the proposal on traffic movements have been addressed in Section 2.1, where the need for the proposal is discussed. In summary, the proposal is expected to increase the carrying capacity of the current road so that the efficiency of traffic flows is improved and the safety of road users is enhanced. Stage 1 would bypass a winding, narrow and steep section of road and introduce a passing lane towards the top of an incline. The single carriageway would be duplicated for the ultimate proposal over the whole distance between Edwin Land Parkway and Googong Road.

Safe speed limits are often determined by the gradient, alignment, location and type of road surface. Changes to any of these elements may affect a road's speed limit. Current traffic speed along Old Cooma Road is limited to 70 km per hour from the intersection with the proposed Edwin Parkway, increasing to 100 km per hour south of Talpa Road, at the southern end of Stage 1. Traffic speed along Stage 1 would increase to 80 km per hour.

Changes in the design or location of a road may impact on the existing access arrangements from properties and residential estates adjoining the road. A number of residences have driveways with direct access to Old Cooma Road. Talpa and Talpa Heights are rural residential estates with egress from Tempe Crescent, which intersects with the existing Old Cooma Road at the northern end of Stage 1.

Effective road design would need to consider future and existing road networks so that linkages and intersections can be efficiently and effectively managed. The proposal would commence south of the intersection with Edwin Land Parkway. The development of that intersection is addressed in the design of Edwin Land Parkway. The location of Dunns Creek Road, a proposed southern arterial route that would link Googong residents to the Monaro Highway, has yet to be determined.

17.2 Potential Impacts

The increase in speed limits for Stage 1 would improve the flow of traffic in the vicinity of Stage 1. The introduction of a passing lane would allow traffic to flow past slow moving vehicles. The redirection of quarry traffic, at least for a portion of the route, would improve traffic flows in the area, and reduce a potential source of frustration for drivers. These would be beneficial impacts of the proposal (Stage 1). These impacts would be greatest for traffic flows away from Queanbeyan. The speed at which individual cars can manage a steep uphill grade is variable, and the possibility of a faster moving car being caught behind a slower moving vehicle would be reduced.

The benefits derived from the ultimate proposal would be dependent on the increased flow of traffic from Googong and the ability of the traffic network beyond the proposal (north of Edwin Land Parkway) to manage the additional traffic load.

Access points into individual residences and rural residential estates would be managed as described in Section 4.6, and shown in Figure 17.1 and 17.2. Residents travelling to the Talpa estates from Queanbeyan would be required to travel no more than an additional 300 metres under the proposed arrangements. Residents returning to the estates from the south would have the travel distance reduced by up to 900 metres, depending on their final destination. The additional distance would not be significant and would be offset by the increase in safety afforded by the relocation of a new access point in an area of increased visibility to oncoming traffic.

The access road into Talpa Heights from the south would be improved for a section of the route, which would be upgraded from a dirt track to a bitumen road. The relocation of the intersection of Talpa Road and Old Cooma Road would afford greater visibility and therefore safety for drivers using the access road, and for oncoming traffic. Other direct driveway access arrangements would not be altered.

Preliminary designs for the ultimate duplication show that a section of Old Cooma Road at the southern section of Stage 1, that currently provides direct driveway access for several properties onto Old Cooma Road, would be redesigned to a single access point. This would improve overall safety along this section of the road.

Access arrangements for quarry traffic would be altered by the construction of Stage 1, so that this traffic would have to reduce speeds or stop prior to entry onto or exiting from the new access point from Old Cooma Road. The visibility of the proposed entry/exit area would be increased by the location on a straight section of road as compared to existing arrangements, where quarry traffic has direct access onto Old Cooma Road from a winding and steep section of road.

17.3 Mitigation Measures

Proposed traffic and access changes would generally improve traffic flow and safety. As these are beneficial impacts, no mitigation methods are described. Monitoring of the traffic changes would identify the effectiveness of the proposal and allow for readjustments as required. Appropriate signage at intersections would be an essential component of the proposal.

18. INDIGENOUS HERITAGE

18.1 Background and Existing Environment

Consideration of indigenous cultural heritage is a legislative requirement of environmental assessment in New South Wales. Cultural heritage assessments of the proposal have been undertaken in 2003 and 2005. A twenty metre wide corridor located along the proposed route for Stage 1 and parallel to the existing road that would be duplicated was the subject of a recent archaeological assessment.

A total of ten Aboriginal sites, comprising six artefact scatters, three isolated finds and one potential archaeological deposit, have been identified in the study area. In general, the survey area has been highly disturbed through the laying of services, the construction of roads and by adjoining rural and rural residential land uses.

18.2 Potential Impacts

Most of the proposed works would occur within the existing road corridor and is unlikely to further impact on the present landscape. Of the Aboriginal sites identified, one isolated find is likely to be impacted by Stage 1. The remaining sites may be impacted by the ultimate duplication.

18.3 Mitigation Measures

- A permit for consent with salvage has been obtained under Section 90 the *NPW Act* for Stage 1 of the proposal. Once the artefact has been collected and relocated, it is envisaged that there would be no further heritage issues to be addressed for Stage 1.
- Further investigations would be undertaken and/or a Section 90 application (permit) would be obtained as required for the ultimate duplication. These matters would not be considered until the final design is determined.
- If indigenous relics or suspected relics are located during construction of the proposal, the works would cease and NPWS and RTA would be notified. Section 87 or Section 90 permits would be sought, as required and approval obtained before recommencing the works. Any heritage item found on site would be protected to prevent any damage or disturbance.

19. NON-INDIGENOUS CULTURAL AND GEOLOGICAL HERITAGE

19.1 Background and Existing Environment

The Googong Travelling Stock Reserve (TSR) is a historical heritage site identified by the cultural heritage study undertaken by Navin Officer Heritage Consultants. Otherwise there are no other sites of non-indigenous cultural heritage value that have been recorded within the vicinity of the proposal.

There are no known features of geological heritage value that would be affected by the proposal.

19.2 Potential Impacts

The Googong TSR site was assessed as having no heritage significance and does not fulfil the NSW Heritage Council's criteria for local heritage listing. The site does not pose any constraints to the proposal.

There are no potential impacts on features of geological heritage value.

19.3 Mitigation Measures

As it is unlikely that cultural or geological heritage would be impacted by the proposal, no mitigation measures are likely to be required.

20. WASTE MINIMISATION AND MANAGEMENT

20.1 Existing Environment

The site for Stage 1 is largely undeveloped and any waste found on site is likely to be minimal. There is the potential for the creek to have been used a dump site for waste materials by the property owner.

The site for the ultimate duplication is generally adjacent to an existing road. General litter such as that thrown from car windows or blown into the road reserve may be present. There are minor access ways and dirt tracks partially hidden from the road that may provide dumping sites for materials such as green wastes by local residents. The potential for the occurrence of dumping sites requires further investigation to ensure there are no potential contaminants within the area.

20.2 Potential Impacts

The proposal has the potential to generate and accumulate wastes and surplus materials that could impact upon the surrounding environment and landscape. Likely waste materials could include:

- green waste from tree removal;
- clean fill or rock from excavation of abutments and road foundations;
- bitumen and other road base wastes from the removal of existing road surfaces; and
- general litter from miscellaneous construction activities and employees' site use.

The proposal does not involve the demolition of existing structures within the road reserve. The removal of existing road surfaces on sections of roads that are no longer required is anticipated and the existing bitumen surface of adjoining roads may need to be removed and replaced with a new surface.

Wastes could be generated during the construction phase by site establishment, road construction, and site cleanup. Site establishment is likely to involve the erection of security fencing around the construction site and works compound. Temporary barriers may be erected in areas close to the existing road. Earthworks may also be required during site establishment to facilitate the erection of site sheds and amenities, and connection to services such as electricity and water. Temporary toilets would be expected to serve the site staff and would be regularly collected and emptied by a licensed contractor.

During site establishment, topsoil would be excavated and stockpiled on site in designated laydown areas (see Figure. 4.12). It is anticipated that a number of large native trees and some groundcover vegetation would be cleared from within the road reserve.

Garbage and recycling bins would be provided at strategic locations within the proposal site, particularly near lunchrooms, portable offices, toilets and washrooms.

An expected small amount of general mixed waste would be difficult to segregate and would accordingly be disposed of to landfill.

Following the proposal's completion, there is unlikely to be any additional waste generated by the operation and maintenance of the road.

20.3 Mitigation Measures

A Waste Management Plan would be prepared in accordance with the principles of the *Waste Avoidance and Resource Recovery Act* 2001. An overall waste minimisation and management strategy would be adopted to ensure that wastes would be appropriately recycled wherever possible, or disposed of off-site at an approved facility. The waste minimisation and management strategy would be applied to all three distinct phases, these being demolition, construction, and operation and maintenance. Issues that could be considered include the following:

- the potential to recycle the old road surface or to reuse the gravel and/or fill material underlying the bitumen surface in the road upgrade;
- management of resources to ensure the correct amount of materials are purchased and wastage is minimal;
- reuse in other projects of temporary barriers such as concrete partitions and safety barriers or, if damaged or destroyed during the works, removal to an appropriate recycling centre;
- the reuse of removed topsoil for site rehabilitation works;
- the reuse of materials excavated for trenching works as backfill;
- mulching cleared vegetation on site and stockpiling for later reuse in rehabilitation works for road embankments and median strips;
- transporting any surplus green waste associated with the cleared trees to the green waste facility (Mugga Lane Resource Recovery Facility);
- recycling any recyclable waste generated by the proposed works, including plastics, paper and cardboard, aluminium and glass; and
- the segregation of any timber and metals generated from building or maintenance activities to permit their collection by recycling contractors.

21. CONSTRUCTION IMPACTS

21.1 General

Construction impacts are a potential concern in relation to any major project, particularly in terms of the ways in which they may affect existing road users or nearby residents. Such impacts can include:

- noise and vibration, including blasting;
- movement of construction traffic;
- dust and air pollutants;
- runoff management and erosion control;
- construction waste disposal;
- impacts of site sheds, storage areas and other works areas; and
- operation hazards and risks.

These impacts would be experienced to varying degrees throughout the construction period which would be approximately seven months in duration. Impacts at a given location are generally likely to be experienced for only part of that period. These impacts are addressed in the REF in general terms, although specific details may need to be resolved at the subsequent implementation stage through the development by the contractor of a CEMP.

21.2 Noise and Vibration Effects

The construction of both Stage 1 and the ultimate duplication of the road, as well as establishment of the services trench in Stage 1, would involve a typical range of construction machinery throughout the length of the road. The details of this machinery would depend in part on the contractor. For the ultimate duplication, the range of machinery may be somewhat different from that available at the present time.

The guidance on construction noise is provided in *Interim Construction Noise Guideline* (Ref. 23) with information sheet explaining the key features. This Guideline contains extensive information on options for work practices to minimise noise. There is a focus on applying all ‘feasible’ and ‘reasonable’ work practices to minimise construction noise impacts.

For major construction projects:

Recommended standard hours:	Monday to Friday 7am to 6pm Saturdays 8am to 1pm No work on Sundays or public holidays
Noise level guideline	Background + 10 dB(A) and L_{Aeq} 75 dB(A)

Outside recommended standard hours:

Noise level guideline	Background + 5 dB(A)

In due course, a noise management plan for the construction would be developed and would include:

- identification of nearby residences;
- a description of approved hours of work and the work that would be undertaken;
- a description of the work practices to be applied to minimise noise; and
- a description of the complaints handling process.

It is anticipated that construction noise would not be in excess of the guidelines as most of the residential properties are some distance from the road works. The estimations of the noise impact would be made as part of the noise management plan and appropriate noise minimisation options would be implemented.

The options for minimising noise impact would be based on the recommendations in the *Interim Construction Noise Guideline* (Ref. 23) and would include the following:

- All site workers should be sensitised to the potential for noise impacts onto local residents and be required to take practical and reasonable measures to minimise noise during the course of their activities.
- The construction contractor should establish contact with the local residents and communicate the construction program and progress on a regular basis, particularly when especially noise generating activities (e.g. paving) are planned.
- All work should be kept within the recommended standard working hours and in particular trucks should not arrive on site before 7:00 am. Should there be a need for any work outside the recommended hours, reasonable and feasible methods will be used to achieve compliance with the noise guidelines for such activities.
- Available fixed and mobile equipment should be reviewed and more recent and silenced equipment should be selected for use whenever possible. In any case, all equipment used on site should be in good condition and good working order.
- Equipment which is adequate for the required tasks in terms of power requirements should be used in preference to larger equipment with higher noise levels.
- All engine covers should be kept closed while equipment is operating.
- As far as possible, materials dropping heights into or out of trucks should be minimised.
- All combustion engine plant, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers.
- Vehicles should be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes should be eliminated, where practicable.
- Where practical, machines should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods.
- Machines found to produce excessive noise should be removed from the site or stood down until repairs or modifications can be made.

- Install where feasible and reasonable less annoying alternatives to the typical 'beeper' alarms such as smart alarms that adjust their volume depending on the ambient level of noise and pulsed broadband alarms.

Rock is expected to be encountered in areas of large cut and fill and some blasting of rock may be required during construction. Any blasting would be undertaken in accordance with relevant Australian Standards, and with a view to minimising the risk of any vibration impacts associated with blasting.

21.3 Movement of Construction Traffic

Traffic on the Old Cooma Road may experience temporary short-term delays when the new section of road (Stage 1) is joined to the existing sections, or during the construction of new access points on existing accessways. At these locations, one lane would remain open to traffic during the works, with alternating periods of access for north-bound and south-bound traffic.

A Contractor's Traffic Management Plan would need to consider the safe access and circulation of construction traffic within the site, taking into account the guidance provided by the *Code of Practice - Traffic Control at Work Sites*, 1998*.* The Traffic Management Plan would need to be linked to other key elements of the site management plan including:

- location and function of wheel wash facilities close to the site entry / exit point;
- location of areas for parking and turning movements by construction vehicles and equipment;
- adequate access for vehicles and equipment to any loading / unloading areas and stockpiles;
- a circulation pattern which minimises truck reversing movements in order to reduce the noise of associated truck alarms;
- use of temporary traffic signs on the site to inform all parties of any changes in traffic conditions during the construction period; and
- ensuring that signs, road markings and traffic signals and maintained and are in working order.

21.4 Dust and Air Pollutants

Road users and the residences in the vicinity of the proposed route are likely to be the main receptors affected by dust resulting from the proposal. During the construction phase, air quality could be affected by:

- excavation and transportation of cut and fill materials;
- vehicle and equipment movement within disturbed areas; and
- wind erosion of material from disturbed surfaces.

Construction vehicles and equipment are likely to use diesel fuel and would emit various gaseous pollutants including particulates, carbon monoxide, nitrogen oxides and hydrocarbons. The resultant ambient concentrations of these pollutants would be too low to cause any health, amenity or environmental problems.

The following measures would be implemented to minimise dust generation during the construction period:

- Dust generation would be visually monitored by the contractor during the works and water carts would be used as required to suppress dust.
- Construction equipment would be regularly inspected to ensure that it is operating in a satisfactory manner and not releasing excessive fumes.
- All vehicles and equipment would be required to travel at appropriate speeds along unsealed roads to minimise dust generation.
- Disturbed areas would be stabilised as soon as practicable after completion of the earth works in order to minimise the generation of dust.
- All construction vehicles would be maintained in accordance with manufacturer's requirements to minimise exhaust emissions.
- All construction vehicles transporting material to or from the site would have their loads covered to minimise the generation of dust.

21.5 Runoff and Erosion

The proposal would involve site disturbance through excavations, filling, compaction of soils, construction access and other construction activities. These activities have the potential to impact on soil stability and erosion.

Flooding of the construction site after heavy rain has the potential to cause erosion. Suitable environmental management strategies would be implemented to manage the environmental risks associated with this aspect of the proposed works.

The proposal is expected to have a low impact on the soils and geomorphology of the study area.

Further discussion of the impacts of road construction works and proposed mitigation on runoff and erosion is provided in Chapter 14.

21.6 Location of Temporary Ancillary Construction Facilities

The area directly affected by the proposal (i.e. the road and trench corridor) is regarded as the maximum area required to complete the construction. Accordingly, it is likely that potential impacts on both fauna species and forest remnants would be significantly reduced by locating ancillary construction facilities such as site compounds, works areas and batch plants in previously cleared areas of the site and within the proposed road footprint itself. No work site compounds would be placed outside the proposed road corridor.

During the entire construction period, temporary fencing would be placed along the entire surveyed alignment route to prevent the accidental clearing of any additional vegetation or habitat. Temporary fencing would be solid and rigid enough to not be removed easily by hand (e.g. not plastic barrier tape and stakes).
The use of temporary protective fencing at sites containing the hoary sunray, box – gum woodland and native vegetation in good condition identified outside proposed works areas is aimed at reducing the potential for any accidental encroachment of

plant and equipment and clearing into these areas during the construction works phase. The fences in these areas would prevent any significant impacts on threatened or important species and potential habitat. These fences would remain in place until the site construction works are completed.

Following the completion of construction works and the removal off site of all (temporary) ancillary construction facilities, the areas would be landscaped and revegetated, as appropriate. Materials stockpiles located off road and the access of these materials by machinery and support vehicles may result in the disturbance or compaction of surface soils, which would be addressed in the rehabilitation of the site.

A weed management plan would be prepared for the site prior to works commencing and would be implemented before, during and after the works are completed to prevent the spread of introduced species and declared noxious species recorded within area including Paterson's curse, blackberry and serrated tussock.

21.7 Operational Hazards and Risks

There is likely to be limited use of hazardous substances and dangerous goods on the site during construction. Any such goods are expected to be limited to fuel and oil. Such substances could pose a potential risk of fire or pollution to land, water or air, in the event that a spill occurs. The Construction Contractor would be required to comply with all related legislation, standards and procedures for the safe handling of hazardous substances and dangerous goods and must meet all relevant occupational health and safety requirements, based on the preparation of an Occupational Health and Safety Plan.

22. OTHER ENVIRONMENTAL ISSUES

22.1 Demand on Resources

Resources that would be in demand during construction and/ or maintenance of the proposal include fill material, road base and sub-base gravels, pavement, fuels and oils, sand, cement, steel, bitumen and water. These resources are readily available within the region and therefore supply of these materials is unlikely to substantially diminish local supplies or incur high transportation costs.

The design of the road addresses the issue of ensuring an appropriate balance between the amount of excavation undertaken and the amount of fill required.

After the proposal's completion, it is not expected that the operation and maintenance of the road infrastructure would place any significant demand on personnel, fuel and materials, which might be required for road maintenance.

22.2 Climate and Microclimate

There are no features of the Queanbeyan climate or the local microclimate of the road corridor which suggest any particular constraints on the design or construction of the road, or which are likely to pose exceptional hazards in its use (e.g. through shading/ice formation).

22.3 Air Quality

No targeted air quality study has been undertaken for this proposal. However, the air quality in the region is expected to be typical of a rural and rural residential area. Road users and the residences in the vicinity of the proposed route are likely to be the main receptors affected by dust resulting from the proposal (see Section 21.4).

The volume and nature of traffic on the Old Cooma Road following the development of Googong is most unlikely to result in air quality concerns at nearby residences, and is not considered to be a factor influencing the design of the road.

22.4 Socio-economic Considerations

Socio-economic considerations include potential impacts on surrounding land uses, communities, access issues, property values and other economic issues. The implications for the rural and rural residential communities currently established along Old Cooma Road are likely to arise from the future residential development at Googong, rather than from the road itself, and hence are beyond the scope of the REF.

Delays in access for local road users may be caused by the proposal during construction, when heavy machinery is transported to the project site. These delays are however only likely to be short term and temporary. The proposal would not impinge on local access to shops and facilities, and would not impact on school bus routes or timetables.

It may be expected that, if there are adverse impacts on residential properties close to the road, these impacts may reflect negatively on property values, but may be offset by improvements in access and road safety. There are many other factors, however, including the Googong development itself, which may be more significant in influencing property values along the road, particularly in the longer term. It is therefore not considered practicable in the REF to make a meaningful assessment of the impacts of the road upgrade on property values.

22.5 Bushfire Risks

Bushfires in relation to roads are often from sources such as vehicles and roadside litter, i.e. cigarette butts. Compared with the existing situation, the proposal does not appear to raise any additional concerns with respect to bushfire risk. It may be marginally beneficial in providing improved access and a wider buffer between flammable vegetation on either side of the road.

22.6 Operational Hazards and Risks

The realignment and duplication of Old Cooma Road is unlikely to have a detrimental or significant impact on the existing level of operational hazards and risks. The proposal is unlikely to increase the potential use of the road for the transportation of hazardous goods. The design of the road to a safer standard has the potential to reduce risk such as spillage or accidents with hazardous vehicles that may result in spillage.

22.7 Contaminated Sites

There are no known contaminated sites in the vicinity of the existing road or the proposed Stage 1 realignment.

22.8 Cumulative Environmental Effects

A number of proposed developments may occur in the future on adjacent land and/or within the locality. The Edwin Land Parkway is an approved project that would occur immediately to the west of the northern end of the ultimate duplication and investigations are being undertaken for the potential construction of Dunns Creek Road, towards the southern end of the ultimate duplication. Urban development at Googong has been approved through a separate process.

The potential implications of these proposed activities for the ecological values of the study area have not been directly assessed.

The improved traffic conditions between Googong and Queanbeyan should improve accessibility, reduce travel time and reduce the risk of traffic accidents for road users between Queanbeyan and Googong.

23. ENVIRONMENTAL MANAGEMENT

23.1 Pre-construction Investigations

Geotechnical investigations were undertaken by Douglas Partners and Coffey Geosciences Pty Ltd involving test pit excavations at two locations and borehole drilling at 31 locations along Old Cooma Road (Refs 15, 16). Further details of the investigations are provided in Chapter 14. The full reports are provided in Appendix F.

Other pre-construction investigations have involved a combination of desktop studies supplemented by field studies, as described in Chapter 6.

23.2 Construction Environmental Management Plan

Following approval by QCC, the Superintendent would prepare contract documents which would require the Construction Contractor to prepare and submit a CEMP which incorporates and expands upon the preliminary list of environmental safeguards and measures listed in this REF (Section 25.5). The Superintendent would critically review the Contractor's Draft CEMP and advise Queanbeyan City Council accordingly. The Contractor's CEMP acts as an environmental management manual for the proposal's construction and would be required to specifically include:

- an expanded outline of sound environmental safeguards and measures to mitigate any potential adverse impacts related to the proposal's construction and later operation and maintenance;
- assignment of particular environmental management responsibilities related to implementation of the Contractor's CEMP;
- an outline of monitoring requirements, the related methods, procedures, nature and frequency of such monitoring, the responsible parties, the procedures for reporting and acting upon the results of such monitoring and the possible need for follow-up action and by whom;
- an outline of procedures for recording and responding to any complaints related to the proposal's implementation;
- an outline of (internal) auditing procedures and reporting to confirm adherence to the Contractor's CEMP and to propose corrective or remedial actions where adherence to the CEMP is inadequate; and
- inclusion of environmental requirements in the project completion reporting and transfer of ongoing commitments at project handover to QCC.

24. CONSIDERATION OF STATE AND COMMONWEALTH ENVIRONMENTAL FACTORS

24.1 Clause 228(2) Factors

The factors that need to be taken into account when considering the environmental impact of an activity are listed in Clause 228(2) of the NSW *Environmental Planning and Assessment Regulation,* 2000. Details of where these factors have been addressed in the REF are listed in Table 24.1, although, given the general nature of the items, they may be discussed in other sections within the report that are not specifically recorded in the table below.

Table 24.1 Compliance with Clause 228(2) of the *EP&A Regulation 2000*

Clause 228 Factor	**Reference in the REF**
a) Community impact	2.1, 4.5, 4.6, 11, 21, 22.4
b) Transformation of locality	8, 22.1, 22.4
c) Impact on ecosystems	9, 10
d) Reduction of environmental quality	4.10, 11, 12, 19
e) Effect on locality, place or building	18, 19
f) Impact on habitat of fauna	9, 10
g) Endangering of species	9, 10
h) Long term effects on the environment	11, 12, 13, 16, 17
i) Degradation of the environment	9, 11
j) Risk to safety of the environment	14, 15, 17, 21
k) Reduction of beneficial uses	16
l) Pollution of the environment	15, 21, 22.3
m) Waste disposal problems	20
n) Demands on resources	22.1
o) Cumulative effects	22.7

24.2 Clause 228 Checklist

Each of the Clause 228(2) factors is addressed within the REF. Summary comment is provided in Table 24.2.

Table 24.2 Clause 228 Checklist

Factor	**Impacts**
a. Any environmental impacts on a community?	
Comments: The proposal, particularly Stage 1, would alleviate traffic congestion and improve traffic access between Queanbeyan and the proposed residential development area of Googong. The safety of access to existing rural residential areas and rural residences would be improved.	Long-term positive Long-term positive

Stage 1 may have localised adverse visual and/or noise impacts on nearby residences.	Negative
There may be minor traffic delays during construction.	Short-term negative
b. Any transformation of a locality? **Comments:** The proposal to construct a new road within a gully would alter the appearance of the immediate area. The proposal is, however, unlikely to cause any major transformation to the local community structure or otherwise cause a transformation within the locality.	Nil
c. Any environmental impacts on the ecosystems of the locality? **Comments:** Native vegetation would be cleared along the length of the proposal to construct a new section of road (Stage 1) and to widen the existing corridor in preparation for the duplication of an existing section of road (the ultimate duplication). The removal of vegetation, dead trees, rocks etc has the potential to impact on the availability of fauna habitat.	Long-term negative
The widening of the road may increase animal mortality rates.	Long-term negative
Road works would include modification to minor creeks and drainage areas. This would require the removal of existing invasive and noxious weeds.	Long-term positive
Rehabilitation works would be undertaken including tree replacement at a higher level than tree removal.	Long-term positive
Appropriate management of the offset site would have a long-term beneficial effect on the ecosystems within the locality.	Long-term positive
d. Any reduction of the aesthetic, recreational, scientific or other environmental quality of value of a locality? **Comments:** The proposal would not impact on areas of recreational or scientific value.	Nil
The removal of vegetation may impact on aesthetic values until the replacement vegetation matures.	Short-term negative
The transformation of a natural gully, although in a degraded condition, through road construction works may have an initial impact on the aesthetic values of the surrounding area, particularly for residences that overlook the proposed new section of road. Over time, the road would become integrated into the overall landscape.	Short-term negative
Appropriate landscaping and rehabilitation works would enhance aesthetic values over the long term.	Long-term positive

e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological architectural, cultural, historical, scientific or social significance or other special value for present or future generations? **Comments:** The proposal Stage 1 would require the relocation of a single Aboriginal artefact, for which a permit has been obtained. Further investigations would be undertaken and/or a Section 90 application (permit) would be obtained as required for the ultimate duplication. Otherwise, the proposal is unlikely to impact on aspects relating to this criterion.	Nil
f. Any impact on the habitat of any protected or endangered fauna? **Comments:** The proposal would remove a small area of threatened box – gum woodland in poor to moderate condition. This would result in some short-term impact on species that utilise this habitat. Potential adverse impacts would be offset by the setting aside and appropriate management of woodland greater in area than that removed.	Short-term negative Long-term positive
g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? **Comments:** The widening of the road corridor (the ultimate duplication) in areas that native fauna are likely to move through has the potential to increase mortality rates resulting from collisions with cars. This may have a negative impact on the local population of the threatened Rosenberg's goanna and speckled warbler. The long term viability of these species, however, is unlikely to be impacted at a regional level as large areas of habitat will remain unaffected by the proposal. The inclusion of proposed small animal crossings at strategic locations may reduce the impact of the road widening. The proposal would remove hoary sunray, which is endangered under the *EPBC Act*, although this plant species is widespread within the locality and may recolonise disturbed areas in the long-term.	Short-term negative Long-tem nil Short-term negative
h. Any long-term effects on the environment? **Comments:** No long term adverse effects on the environment are anticipated. The views from the road would be improved for visitors travelling towards Queanbeyan from the south. Appropriate management of the offset site would have a long-term beneficial effect on the local environment.	Nil Long-term positive Long-term positive
i. Any degradation of the quality of the environment?	
Comments: No long-term degradation of the quality of the environment is anticipated. Monitoring of existing noise levels has been undertaken and will provide baseline data if required.	Nil

The proposal would result in the removal of native vegetation and potential habitat for native fauna. This would be mitigated by the creation of an offset area managed for enhanced environmental values.	Long-term positive
j. Any risk to the safety of the environment? **Comments:** The proposal is unlikely to cause any significant risk to the safety of the environment. Access arrangements have been altered to improve the safety of road users and speed limits have been determined by anticipated environmental conditions.	Nil
k. Any reduction in the range of beneficial uses of the environment? **Comments:** Road construction works would generally be limited to the existing road reserve.	Nil
l. Any pollution of the environment? **Comments:** The proposal would be appropriately managed to ensure that any pollution of the environment would not be significant. This includes construction activities and future maintenance works.	Nil
m. Any environmental problems associated with the disposal of waste? **Comments:** A Waste Management Plan would be developed and implemented to ensure no significant impacts would result from waste disposal.	Nil
n. Any increased demands on resources, natural or otherwise which are, or are likely to become in short supply? **Comments:** The resources required for the proposal are not limited in supply at a local or regional level.	Nil
o. Any cumulative environmental effect with other existing or likely future activities? **Comments:** The locality is expected to undergo development over the long term to provide for the urban expansion of Queanbeyan and surrounding areas. The potential implications of future proposals on the ecological values of the locality have not been directly assessed. It is probable that conflicting demands on remaining areas of undeveloped land in proximity to Queanbeyan and Canberra would diminish natural and social values over the long-term.	Long-term negative

24.3 Matters of National Environmental Significance

The factors which need to be considered under the Commonwealth *Environment Protection and Biodiversity Conservation Act (EPBC Act)* are listed in Table 24.3 together with an assessment of each of these factors. None of these factors are considered to result in impacts which would be considered significant under the guidelines applying to the *EPBC Act.*

Table 24.3 EPBC Act checklist

Factor	**Impacts/comments**
Matters of National Environmental Significance	
(a) Any environmental impact on a World Heritage Property?	No
(b) Any environmental impact on a National Heritage Place?	No
(c) Any environmental impact on wetlands of international importance?	No
(d) Any environmental impact on Commonwealth listed species or ecological communities?	While hoary sunray and box – gum woodland have been identified within the study area of the proposal, an SIS and *EPBC Act* referral have been undertaken for both these entities. The studies have concluded that the proposal would not have a significant impact on Commonwealth listed species or ecological communities. The referral process deemed the proposal as not a controlled action.
(e) Any environmental impact on Commonwealth listed migratory species?	No
(f) Does any part of the proposal involve a nuclear action?	No
(g) Any environmental impact on a Commonwealth Marine Area?	No
(h) Any impact on Commonwealth land?	No

PART C – FINALISATION

25. CONCLUSIONS

25.1 Summary of Beneficial Impacts

The proposal would support the Googong development by providing a safe and efficient connection between Googong and Queanbeyan, and would also provide a more direct and safer road for existing road users.

The proposal would:

- improve traffic flows by reducing congestion, particularly by the construction of Stage 1, which would bypass an existing winding and steep section of Old Cooma Road;
- provide savings in travel time and a possible reduction in vehicle collisions, yielding a positive benefit cost ratio;
- improve access to and from Old Cooma Road for residents of the surrounding rural and rural residential communities; and
- provide a local economic benefit as a result of increased employment opportunities during the construction phase for local residents.

The proposal provides an opportunity to improve, protect and restore an area supporting modified woodland vegetation to offset the unavoidable ecological impacts of the proposed works. Sensitive landscaping and rehabilitation of disturbed areas would provide additional mitigation of these impacts.

25.2 Summary of Adverse Effects

The proposal would result in some direct impacts on the existing biodiversity within the potential construction corridor and potential indirect impacts on biodiversity in the surrounding study area. These impacts are primarily associated with the clearing of native vegetation and the associated disturbance of fauna habitats.

Ecological assessments completed for the SIS have concluded that the proposal is likely to cause significant impacts for the speckled warbler and Rosenberg's goanna, listed as vulnerable species under the NSW *TSC Act*, although these impacts are more directly related to the increase in traffic arising from the development of Googong. Otherwise, the proposal is unlikely to have a significant impact on threatened species, their habitats, or ecological communities listed under the *TSC Act* or the *EPBC Act.*

The stage 1 realignment would bring the road closer to some rural residences, increasing traffic noise levels in those locations. The road design incorporates noise mitigation measures designed to meet acceptable traffic noise criteria for a road of this type.

The construction process is likely to impact on the surrounding rural and rural residential areas, although the impacts would be temporary and localised. Appropriate and informed management strategies would mitigate these impacts.

25.3 Justification

The key decision resulting in the need for the proposal is the decision to allow residential development to occur at Googong. Implicit in that decision is the decision to improve road access between Googong and other parts of Queanbeyan, including the realignment and eventual duplication of Old Cooma Road.

The *Queanbeyan City Council Residential and Economic Strategy* 2031 highlighted the social and economic benefits that the proposal would deliver, including the provision of safe and efficient access between Queanbeyan and Googong. The proposal is necessary to provide the road capacity to meet the expected transport needs of Queanbeyan over the next 25 years.

Without the proposed deviation and upgrade to Old Cooma Road, the proposed residential area of Googong would remain poorly connected to the Queanbeyan CBD and local schools. Traffic congestion would increase, particularly in the vicinity of the Cooma Road Quarry, resulting in continuing and increasing delays to both local and through traffic during peak periods.

The adverse environmental impacts of the proposal are unavoidable and relatively minor in the broad context of the proposed development, and would be outweighed by the beneficial effects of the proposal. The proposed offsets and mitigation measures would reduce the overall adverse impacts.

25.4 Principles of Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) includes the following four interrelated principles:

- The precautionary principle.
- Inter-generational equity.
- Conservation of biological diversity and ecological integrity.
- Improved valuation and pricing of environmental resources.

The goal of ESD is to ensure that all development is sustainable in terms of environmental, social, and economic values. This can be achieved by addressing environmental, social and economic issues in decision making processes.

The proposal relates to these four principles as follows.

Precautionary principle. The realignment and duplication of Old Cooma Road is unlikely to cause serious or irreversible environmental damage. The precautionary principle has been addressed by the identification and assessment of all potential impacts that would result from the proposed works, and the identification of mitigation measures to deal with such impacts.

Intergenerational equity. The proposal addresses the principle of intergenerational equity by providing long term benefits of a safer road for future generations. The proposal imposes no long-term requirements on future generations, other than the need for appropriate maintenance.

The proposed offset would safeguard the health, diversity and productivity within the locality, and ensure these environmental values are maintained and enhanced for the benefit of future generations.

Conservation of biological diversity and ecological integrity. The principle has been addressed through the comprehensive flora and fauna assessments undertaken in relation to the proposal and the development of mitigation measures, including the appropriate management of the proposed offset site, to reduce the potential adverse impacts of the development and construction process. The results of the flora and fauna assessments, including the SIS and draft referral, have been used to guide the design of the proposal wherever feasible.

Improved valuation and pricing of environmental resources. A number of commitments to ongoing environmental management have been proposed to avoid or reduce adverse environmental impacts and take up environmental enhancement opportunities. These include implementation of environmental management plans as addressed in the REF.

The costs of implementing these commitments have been included in the total project cost. In addition to this, and in line with the principle, the concepts outlined throughout the REF are aimed at maximising benefits and minimising costs, as well as providing protection of environmental and social values.

The provision of improved traffic access to Googong is integral to the development of Googong, and indirectly, to the economic prosperity of Queanbeyan. The proposal requires a financial contribution from the Googong developer, who will derive a direct economic benefit from the proposal, and from Queanbeyan residents via the financial contribution made by QCC.

The proposal would:

- provide employment and training opportunities for road construction workers;
- contribute to the economic growth of the region
- improve local infrastructure; and
- improve local ecology through environmental offsets.

25.5 Summary of Environmental Safeguards

Within this REF, a number of environmental safeguards have been identified for implementation, before or during the construction phase, as well as during post-construction and operation. These safeguards provide a guide for the development of a CEMP for the project, and would be included in the induction procedures for all personnel working on the proposal. The safeguards are summarised in Table 25.1.

Table 25.1 Site Specific Environmental Safeguards

Timing	Environmental Safeguard/ Mitigation Measure
Landform, Geology and Soils	
Prior to construction	• Development of erosion and sediment control plan.
During construction	• Implementation of erosion and sediment control plan. • Comprehensive erosion and sedimentation control for Stage 1, located within the unnamed tributary to Barracks Creek. • Installation of sediment fences or similar erosion control devices downslope of stockpile and excavation areas, with particular focus on the down slope side of the northern part of the ultimate duplication, adjoining the minor creek. • Protection of exposed soil surfaces on the cutting for Stage 1 with geotextile fabric during construction to prevent erosion during rainfall events. • Stabilisation of creek banks and beds inside the channel using rock protection where there is the potential for erosion to occur. • Stabilisation of creek banks outside the channel by planting appropriate locally native vegetation species. • Limiting areas of vegetation and soil disturbance through delineating work areas to minimise the potential for erosion. • Stabilising unsealed construction access routes through use of coarse aggregates. • Diverting clean upstream waters around construction areas. • Progressively rehabilitating and revegetating areas of disturbance including, where necessary, undertaking short-term stabilisation of temporary stockpiles and disturbed areas. • Weekly inspections of erosion and sediment controls during construction and following any rainfall events. • Maintenance and checking of the erosion and sedimentation controls would be undertaken on a regular basis and records kept and provided at any time upon request. • Efficient phasing and sequencing of work to minimise the time that surface areas remain bare and prone to erosion, with rehabilitation works commencing as soon as practicable. • Stabilisation of fill and cut batters as early as possible to prevent soil erosion and sedimentation. • Installation of hay bales or geotextile fences or alternative measures downslope of disturbed areas and stockpiles. • Design and siting of drainage to collect and channel stormwater for discharge at suitable locations, taking account of the need to prevent erosion, scouring and downstream sedimentation and turbidity. • Minimisation of disturbance to soils and vegetation by identifying and limiting the areas required for construction and access. • Site rehabilitation of disturbed areas would be undertaken progressively as stages are completed.
Post construction	• Site rehabilitation of disturbed areas would be undertaken progressively as stages are completed.

Timing	Environmental Safeguard/ Mitigation Measure
	• Disturbed areas would be restored to their natural condition at the completion of works.
Climate	
Prior to construction	• The Australian Bureau of Meteorology website will be reviewed each day and works scheduled according to suitable weather conditions.
During construction	• Works would not be undertaken during periods of high rainfall. • Sufficient time would be allowed to vacate and clean up the site and install erosion controls where required, prior to the commencement of heavy rainfall. • Construction activities that generate high dust levels would be avoided during high wind periods. • Where winds cause raised dust, the frequency of dust suppression measures such as watering would be increased appropriately.
Post construction	N/A
Landuse	
Prior to construction	• The clearing of native vegetation is addressed in the Species Impact Statement completed for the proposal. • All pipelines, communications cables and power lines have been accurately identified and mapped for incorporation in the development plans to avoid major disruption. • The development of the proposed alignment has taken surrounding land use into consideration in consultation with Council, the RTA and the community. • Consultation with affected landowners has been, and would continue to be undertaken.
During construction	• Consultation with affected landowners would continue to be undertaken during construction and where there is a modification to the project.
Post construction	N/A
Hydrology and Water Quality	
Prior to construction	• Implementation of the mitigation measures identified in Section 14.3 of this REF relating to erosion control. • Development of erosion and sediment control plans. • Design and siting of drainage to collect and channel stormwater for discharge at suitable locations, taking account of the need to prevent erosion, scouring and downstream sedimentation and turbidity. Drainage would be designed to prevent any increase in flooding.
During construction	• Implementation of the mitigation measures identified in Section 14.3 of this REF relating to erosion control. • Any material deposited onto pavement surfaces would be swept and removed at the end of each working day. • Provision of a bunded area for washdown of vehicles and equipment. • Off-site refuelling and servicing of vehicles and equipment. • Minimisation of on site storage of hazardous substances or dangerous goods (fuel, oil and chemicals).

Timing	Environmental Safeguard/ Mitigation Measure
	• An incident emergency spill plan would be developed and incorporated into the CEMP. The plan would include measures to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into any adjacent/ nearby waterways, and would detail procedures for how to deal with chemical spills if they occur. • An emergency spill kit would be kept on site at all times. All staff would be inducted into the incident emergency procedures and made aware of the location of where the emergency spill kit would be kept. • Should a spill occur during construction, the incident emergency spill plan would be implemented, and DECCW would be notified as soon as practicable.
Post construction	• Implementation of the mitigation measures identified in Section 14.3 of this REF relating to erosion control. • Development of a landscaping program for the project with performance measures for rehabilitation, e.g. reuse of topsoil likely to contain a seed bank dominated by native species. • Minimal use of chemicals/ fertilisers in the landscape rehabilitation works.
Air Quality	
Prior to construction	N/A
During construction	• Dust generation would be visually monitored by the Contractor during the works and water carts would be used as required to suppress dust. • Construction equipment would be regularly inspected to ensure that it is operating in a satisfactory manner and not releasing excessive fumes. • All vehicles and equipment would be required to travel at appropriate speeds along unsealed roads to minimise dust generation. • All vehicles would be maintained in accordance with manufacturers requirements to minimise exhaust emissions. • All vehicles transporting material to or from the site would have their loads covered to minimise generation of dust.
Post construction	• Disturbed areas would be stabilised as soon as practicable after completion of the earth works in order to minimise the escape of dust.
Noise and Vibration	
Prior to construction	• Plan to use equipment, which is fit for the required tasks in terms of power requirements. • All combustion engine plant, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers.
During construction	• All site workers should be sensitised to the potential for noise impacts on local residents and encouraged to take practical and reasonable measures (as described below) to minimise noise during the course of their activities.

Timing	Environmental Safeguard/ Mitigation Measure
	• The construction contractor should establish contact with the local residents and communicate the construction program and progress on a regular basis, particularly when noise activities are planned. • All work should be kept within the working hours prescribed by the Environmental Noise Construction Manual. Trucks should not arrive on site before 7.00 am. Should work outside these hours be needed, the work methods and recommendations of the RTA's Environmental Noise Management Manual should be considered. • Review available fixed and mobile equipment fleet and prefer more recent and silenced equipment whenever possible. In any case, all equipment used on site should be in good condition and good working order. • As far as possible, materials dropping heights into or out of trucks should be minimised. • Vehicles should be kept properly serviced and fitting with appropriate mufflers. The use of exhaust brakes should be eliminated, where practicable. • Where practicable, machines should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods. • Machines found to produce excessive noise should be removed from the site or stood down until repairs or modifications can be made. • Where practicable, impact wrenches should be used sparingly with hand tools or quiet hydraulic torque units preferred. • If blasting is required, prior warning should be given to nearby residents, and the structural condition of any potentially affected buildings should be checked prior to blasting. • Blasting should be undertaken in accordance with relevant Australian Standards, with the blast designed to minimise risks to any surrounding buildings.
Post construction	• The predicted noise levels should be verified by noise monitoring immediately following project opening (and as traffic volume approach the projected 10 year volumes) to confirm performance against the road traffic noise criteria • Feasible and reasonable noise control options should be investigated: – where non-compliance to site-specific traffic noise goals is detected for existing residential houses; and – in the event of any proposed new residential development being constructed in close proximity to the modelled roadways.
Biodiversity Prior to construction	• Site induction for all staff. • Development of erosion and sediment control plan. • Fauna inspections to take place prior to clearing of forest/ woodland habitat.

Timing	Environmental Safeguard/ Mitigation Measure
	• Timing and staging of permanent construction works. If practicable, clearing of woodland habitat should not be carried out during winter, when micro-chiropteran bat species are in torpor, or during spring, when bird are nesting. • Temporary ancillary construction facilities such as site compounds, works areas and batch plants would be located in previously cleared areas of the site and within the proposed road footprint itself. • A weed management plan would be prepared for the site prior to works commencing.
During construction	• Fauna underpass and fencing. • Temporary fencing to prevent the accidental clearing of any additional vegetation or habitat.
Post construction	• Following the completion of construction works and the removal off site of all (temporary) ancillary construction facilities, the area will be landscaped and revegetated. • Monitoring of the new and duplicated sections of Old Cooma Road for road kill, particularly threatened species. • Monitoring of the known population of hoary sunrays in the study area to be directly impacted by the proposal to assist in determining the species persistence in the study area and effects of direct and indirect impacts. • Monitoring and control of invasive weeds should be undertaken throughout the life of operation of the proposal.
Bushfire	
Prior to construction	• Works would be scheduled taking into account weather conditions and fire hazard risk.
During construction	• The provisions of the NSW *Rural Fires Act* 1997 and the ACT *Emergencies Act* 2004 would be observed at all times. • Information regarding daily fire danger ratings would be obtained daily by the construction manager before the commencement of work. • Machinery capable of generating sparks (e.g. bulldozers, graders, slashers, chainsaws, grinders) would not be used on declared Total Fire Ban Days. • Fires are to be reported to the NSW Rural Fire Service and ACT Emergency Services Authority immediately. • Flammable liquids are to be stored, handled and dispensed from approved containers or safety cans only. • Fire extinguishers must be available during the operation of petrol driven equipment.
Post construction	N/A
Visual Amenity/ Landscape	
Prior to construction	• N/A
During construction	• All works sites would be maintained in a neat and orderly fashion.
Post construction	• Removed roadside vegetation should be offset with planted landscape buffers to screen views into the site and increase visual character. Several laneways intersecting the proposed road extension from the surrounding residential subdivision should be targeted for increased landscape screening.

Timing	Environmental Safeguard/ Mitigation Measure
Indigenous Heritage	
Prior to construction	• Prior to commencement of construction work a Section 90 Consent with salvage would be obtained from DECCW to allow collection of Aboriginal artefacts. After collection and relocation of the Aboriginal artefacts it is envisaged that there would be no further heritage issues to be addressed.
During construction	• If indigenous relics or suspected relics are located during construction of the proposal, the works would cease and NPWS and RTA would be notified. Additional Section 87 or Section 90 permits would be sought, as required and approval obtained before recommencing the works. • Any items of indigenous heritage identified on site would be protected to prevent any damage or disturbance. • All personnel working on site would receive training in their responsibilities under the *National Parks and Wildlife Act* 1974.
Post construction	N/A
Waste Minimisation and Management	
Prior to construction	• A Waste Management Plan would be prepared in accordance with the principles of the *Waste Avoidance and Resource Recovery Act* 2001. The plan would include: – identifying the waste types and quantities; – identifying appropriate means for recycling; – identifying recycled materials that can be re-used on site (e.g. crushed concrete road base etc); – identifying the legal requirements for waste disposal for the specific materials encountered, and the appropriate place for disposal; – determining the appropriate management methods and disposal of non-recyclable wastes; – determining the methods for controlling litter generation and collection; – ensuring no litter, unwanted waste or surplus demolition debris is dumped on any land on or adjacent to the site; – disposing of chemical, fuel and lubricant containers, solid and liquid wastes in accordance with the requirements of the relevant authority; – ensuring no soil is disposed of off-site without prior approval from the relevant authority; – providing sufficient numbers of appropriate receptacles in which to deposit litter and other waste materials, and disposing of their contents off-site on regular basis at a suitable facility; and – keeping weekly records of the waste types and approximate quantities encountered and the method of disposal used.
During construction	• Burning or incineration of waste would not be permitted on site. • All noxious weeks and exotic plant species removed would be bagged and disposed of at a licensed landfill facility. • All construction materials and wastes generated from the proposal would be stockpiled and stored at the compound site prior to reuse, recycling or disposal.

Timing	Environmental Safeguard/ Mitigation Measure
	• All working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.
Post construction	• Wastes would not be stored for long periods (greater than two weeks) during construction of the proposal. Empty drums of fuels, oils or chemicals and fluids would not be stored on site during construction. • Following the completion of construction, the site clean-up would cover general waste and recyclables, as well as erosion and sediments control structures (silt fences and hay bales).
Traffic Management	
Prior to construction	• A Contractor's Traffic Management Plan would need to consider the safe access and circulation of construction traffic within the site, taking into account the guidance provided by *Traffic Control at Work Sites* 1998. The Traffic Management Plan would need to be linked to other key elements of the site management plan including: – location and function of wheel wash facilities close to the site entry/ exit point; – location of areas for parking and turning movements by construction vehicles and equipment; – adequate access for vehicles and equipment to any loading/ unloading areas and stockpiles; – a circulation pattern which minimises truck reversing movements in order to reduce the noise of associated truck alarms; and – use of temporary traffic signs on the site to inform all parties of any changes in traffic conditions during the construction period.
During construction	• Implement Traffic Management Plan.
Post construction	• Ensure signs, road markings and traffic signals are maintained and in working order.

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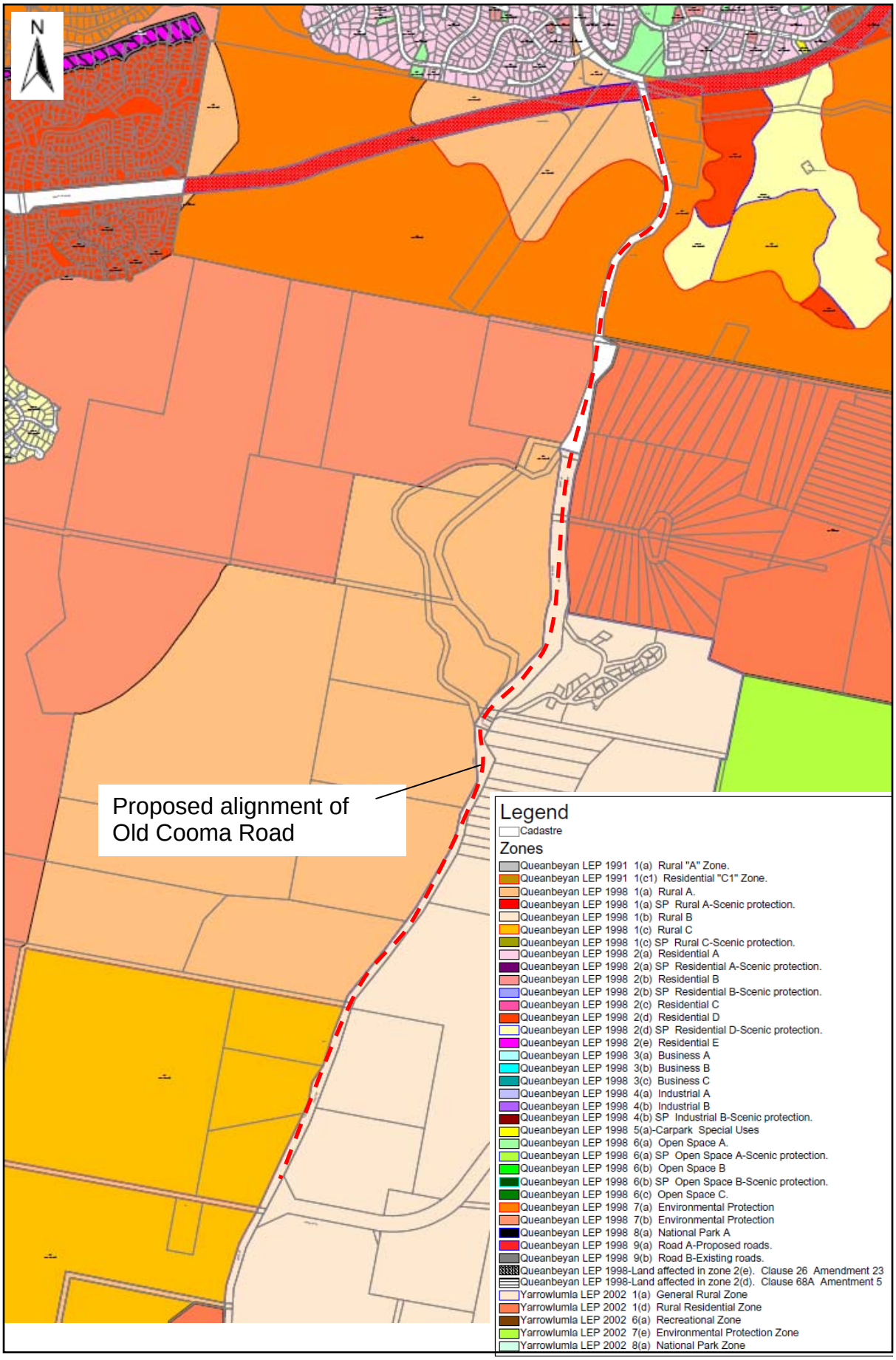
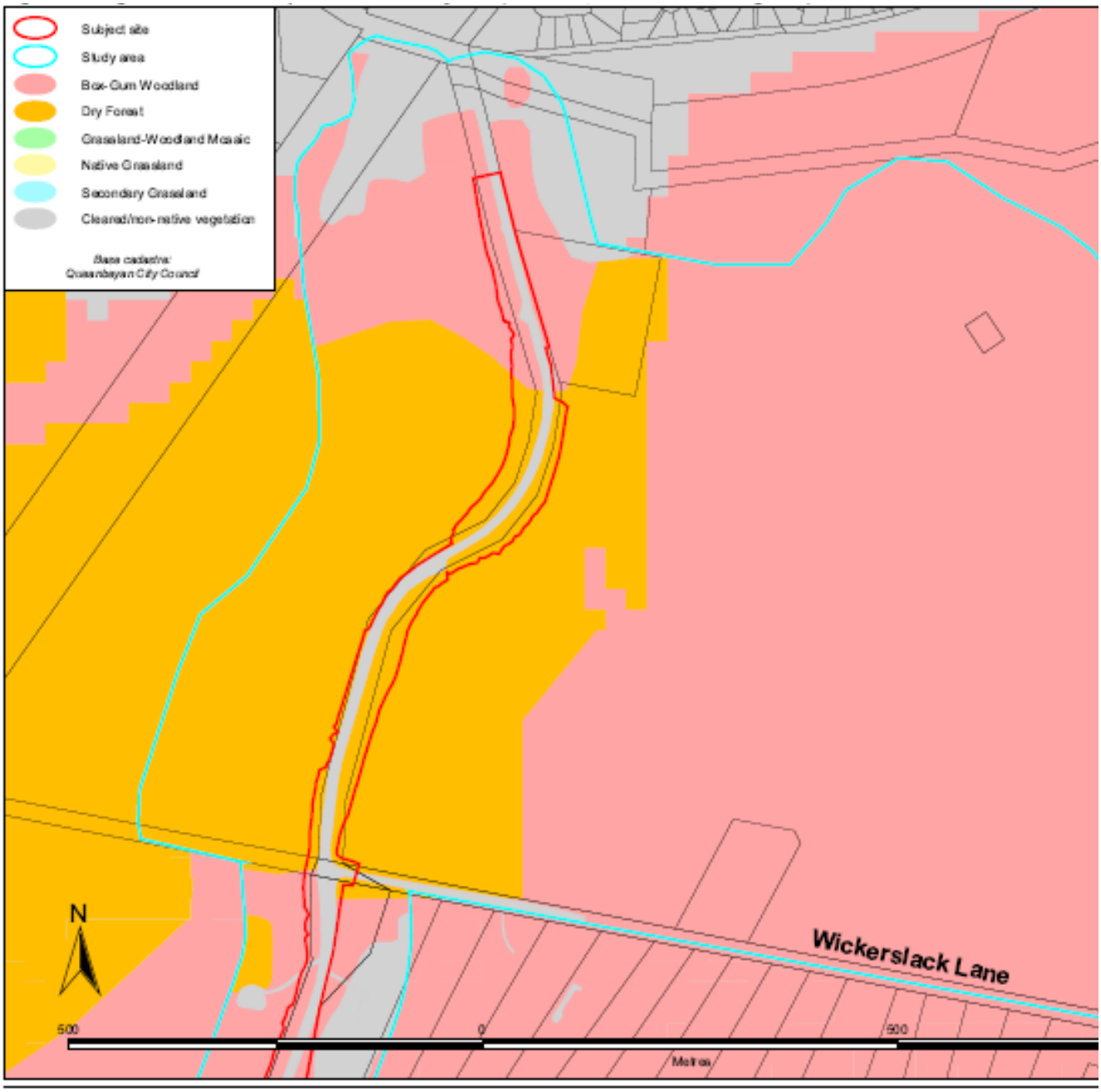


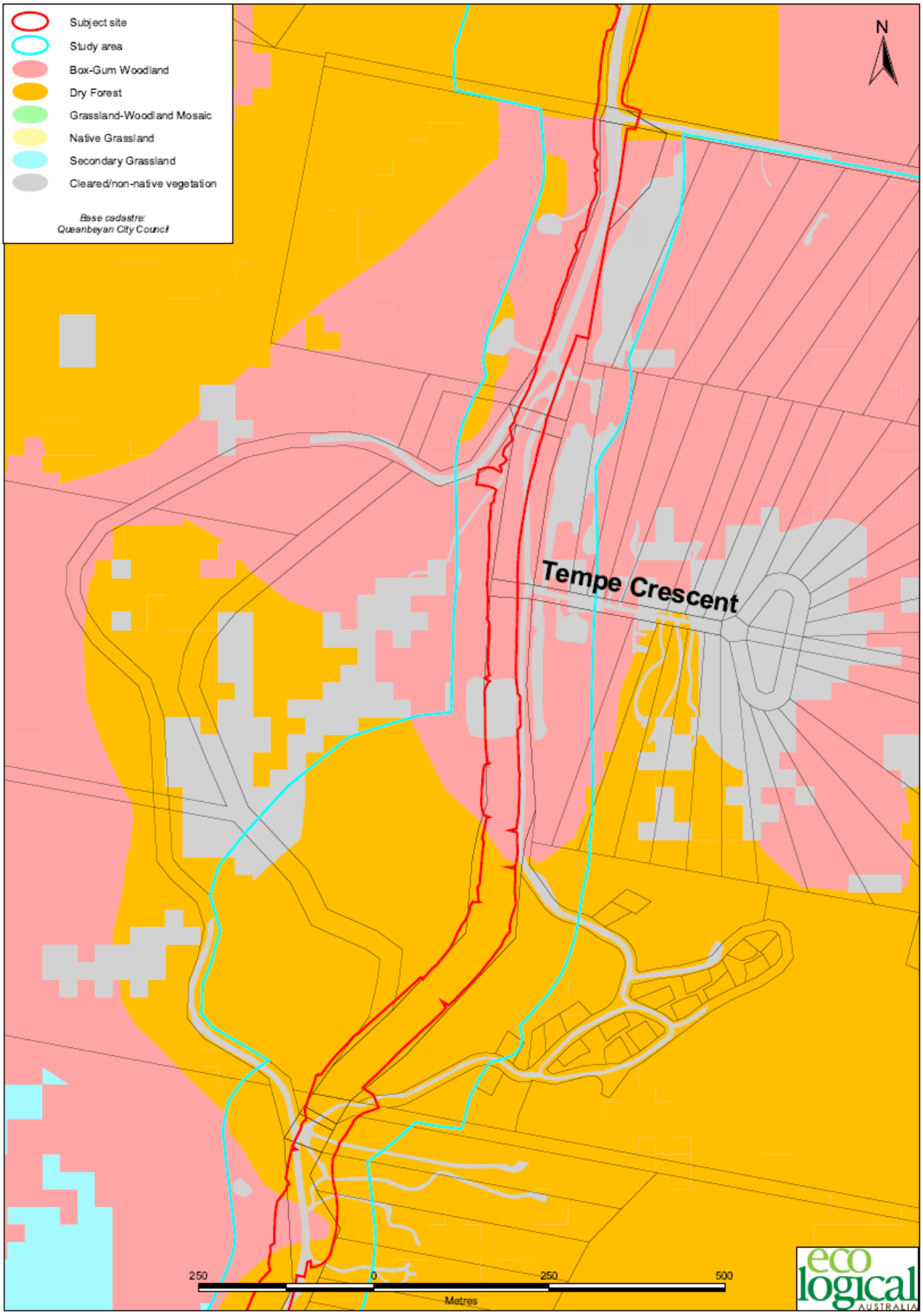
Adapted from Queanbeyan LEP

Figure 5.1. Land use zoning



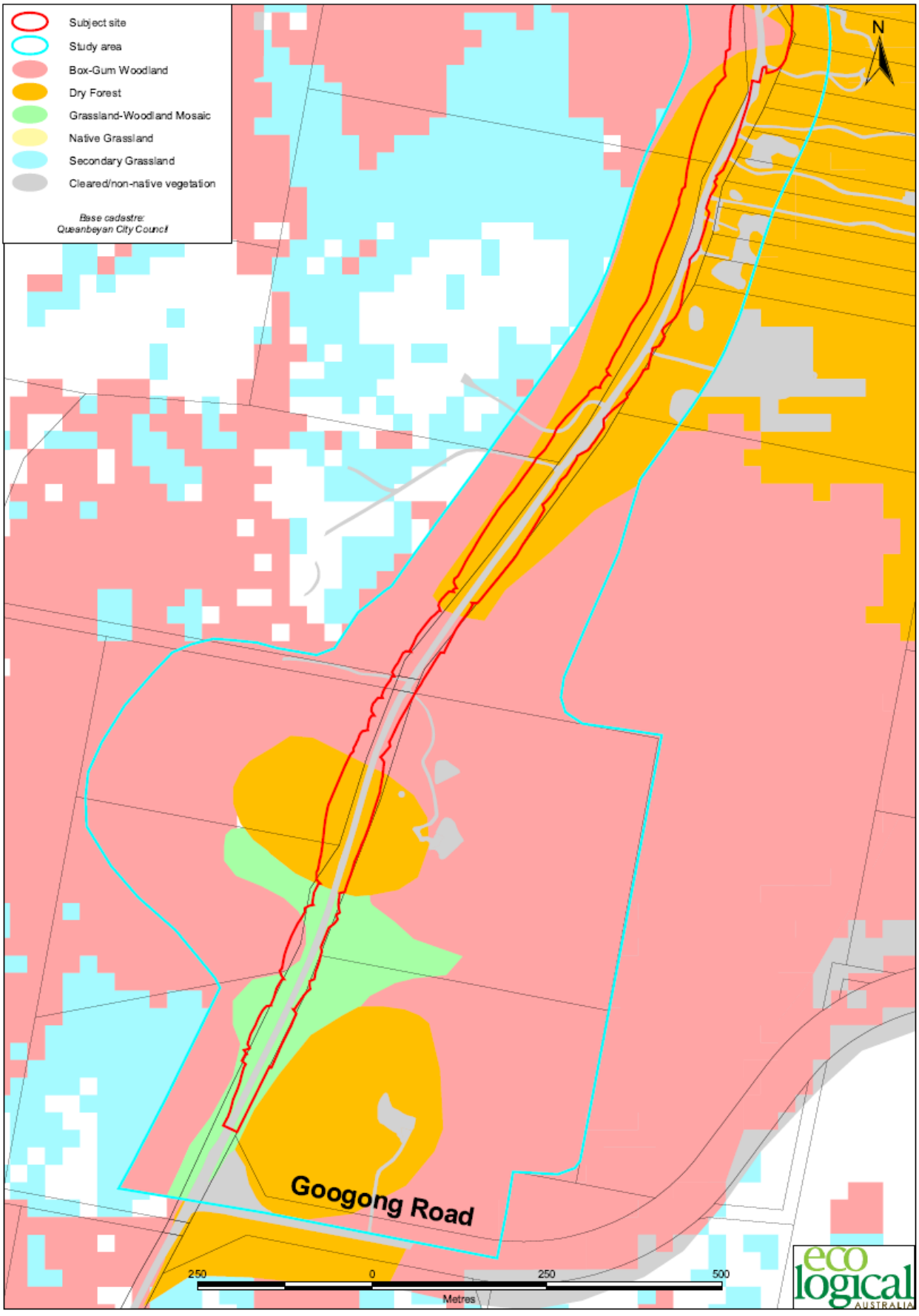
Extracted from Ref. 5

Figure 9.1 Vegetation communities – northern area



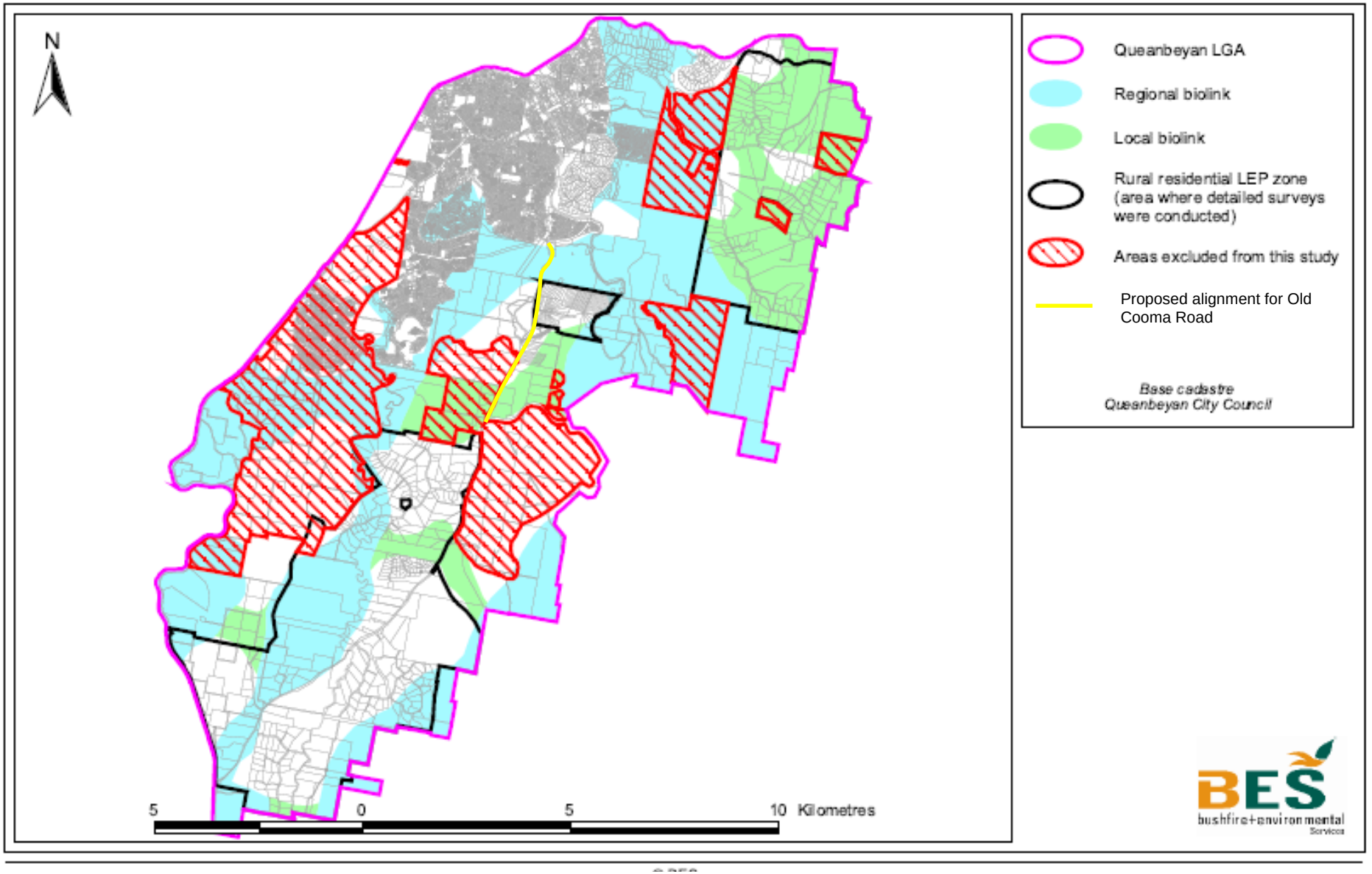
Extracted from Ref. 5

Figure 9.2. Vegetation communities – Central area (Stage 1)



Extracted from Ref. 5

Figure 9.3. Vegetation communities – Southern area



Adapted from Ref. 19

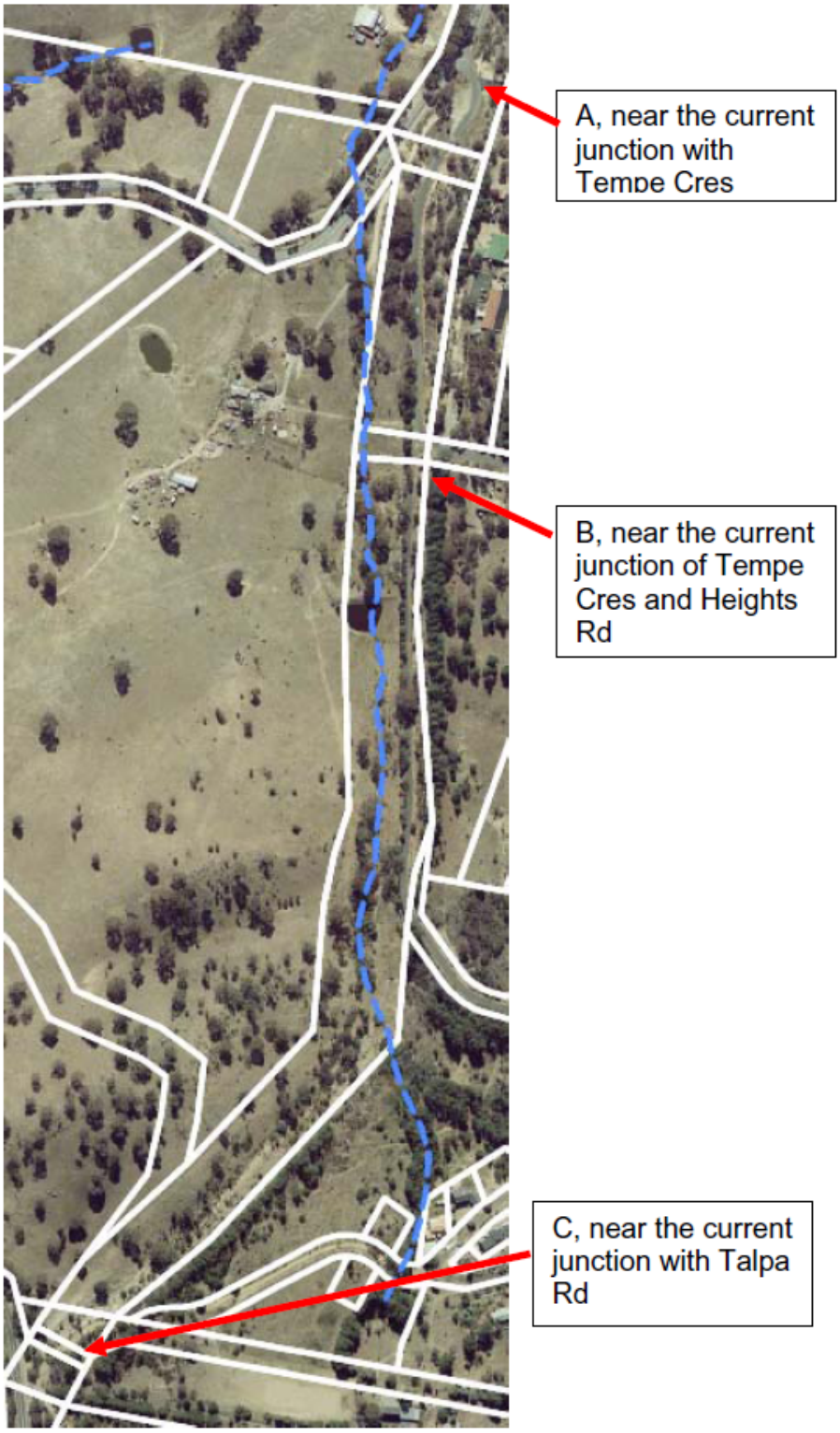
Figure 9.4 Regional and local biolinks within the Queanbeyan LGA

Potential and existing wildlife corridors

Figure 9.5 Ecological connectivity

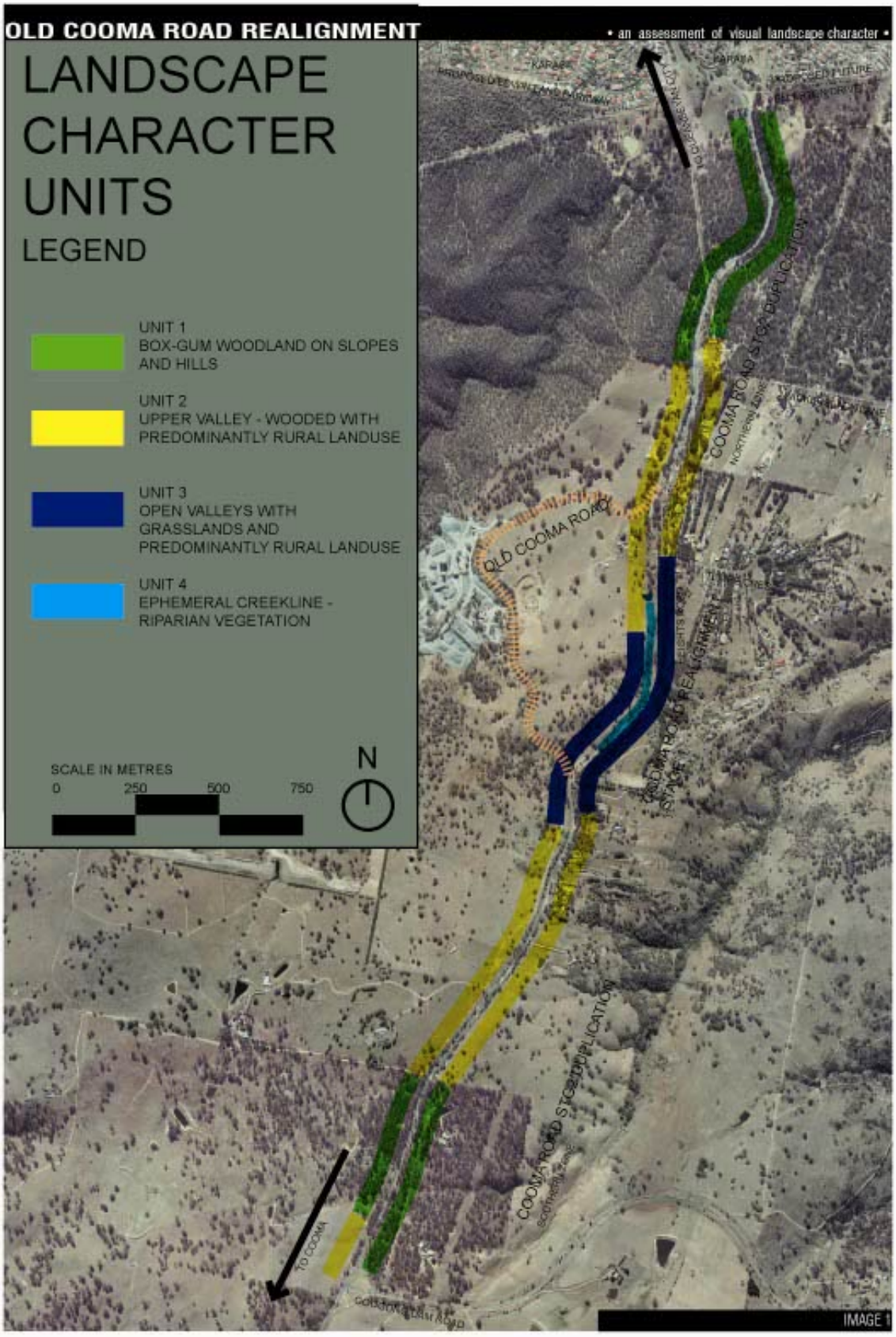
Adapted from Ref. 20

Figure 9.6 Proposed offset site



Extracted from Ref. 12

Figure 11.1 Location of noise monitoring sites



Extracted from Ref. 17

Figure 13.1 Landscape character units

Plate 1. Between Ch. 400 and Ch. 1050, Old Cooma Road is located adjoining the 'Mirrabee' property and on the eastern side of a forested hill, shown on the right side of the photograph.

Plate 2. A steeply sided forested gully is located adjoining the eastern side of Old Cooma Road, shown on the left side of the road in this photograph.

Plate 3. At about Ch. 1050, the road passes through a saddle onto the western slope of a hill, which rises to the east (left side of photograph).

Plate 4. Old Cooma Road continues to the end of this section, where the road starts to bend westwards and uphill towards the Cooma Road Quarry, after the intersection with Tempe Crescent.

Plate 5. Old Cooma Road veers right (westwards) south of the Tempe Crescent intersection, located to the left (east). Stage 1 would be aligned between the two roads, as shown in the photograph.

Plate 6. The realigned section of Old Cooma Road would be located within the gully area shown on the left of the photo. The photograph is taken from the current section of the road that would be retained to allow access to the quarry and to the rural residence shown on the right.

Plate 7. Stage 1 would continue through the gully as shown. Tempe Crescent is aligned parallel to the Stage 1 works, on the left. The dam would be relocated.

Plate 8. The new section of road would continue alongside the gully and around the hill. The road would be partly visible from the house in Talpa Heights, located on the left of the photograph and indicated with an arrow.

Plate 9. The road would continue along the gully which would be filled. Stormwater would be redirected along roadside drains.

Plate 10. Towards the southern end of Stage 1, just prior to the location where the new road would rejoin Old Cooma Road.

Plate 11. Most of the vegetation shown in this photograph would be removed to allow for the services trench, access road and the southern end of Stage 1.

Plate 12. The southern end of the Stage 1 works is adjacent to some rural residential properties with frontages to the existing Old Cooma Road. The trench and extended Talpa Road would be located to the left of the dirt track in the photograph, potentially impacting on the adjoining properties.

Plate 13. The arrow indicates the approximate location of the Talpa Road intersection. The ultimate development would encroach on rural land on the western (right) side of the road.

Plate 14. Although the proposal would not encroach on the rural residential properties adjoining the road, most of the trees to the right of the property fences would be removed to allow for the shared services trench.

Plate 15. While the trench would be located to the left of the trees to avoid impacts, the narrow strip of trees on both sides of the road would be removed during duplication. The removal of the line of trees on the right would remove vegetation that partly screens the residence overlooking the road, indicated with an arrow.

Plate 16. The construction of the shared trench would result in some clearing of woodland on the left (east) side of the road, while the ultimate duplication would impact on woodland on the right (west) side.

Plate 17. The photograph shows the southernmost section of the proposed duplication, with the turnoff to Googong Road in the background and the Googong Travelling Stock Reserve on the right.

Plate 18. This photograph, looking northwards, presents an alternative view of the southern end of the proposed duplication.

Plate 19. A view of the scattered trees and pasture grasses that form a large component of the offset site.

Plate 20. The west facing slope within the offset site.

Plate 21. A view of the woodland gully area located towards the northern part of the offset site. The ground layer supports native grasses and forbs, and shrubs are commonly occurring.

Plate 22. The photograph features the forested south-facing slope, located at the northern part of the offset site.

Plate 23. A view of the hoary sunray along the northern boundary of the offset site. The site adjoins a larger area of forest which forms part of a regional biolink.

Plate 24. The photograph is taken from the northern boundary of the offset site, looking at the north facing slope and gully area. Lower quality vegetation is located towards the top of the hill (in the background), with moderate to high quality vegetation on the lower slope.