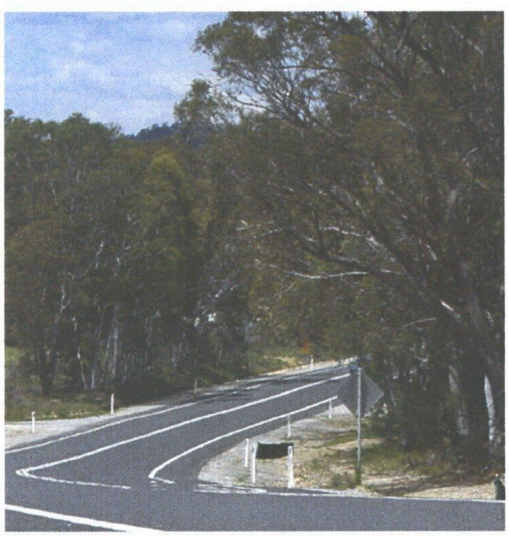
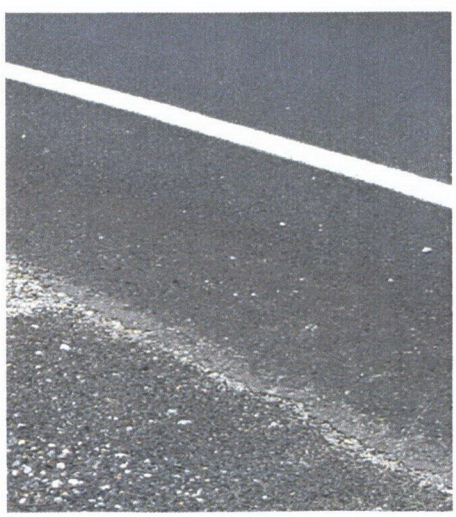
Deviation of Castlereagh Highway (SH18) - Capertee

Review of Environmental Factors

March 2004





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Contents

1 Proposal Identification

Name of Proposed Activity
Deviation of Castlereagh Highway (SH18), at Capertee.

Local Government Area
Greater Lithgow City Council.

RTA Region
Western – Bowenfels.

2 Introduction and Background

2.1 Introduction

The NSW Roads and Traffic Authority (RTA) proposes to carry out the construction of a deviation to the Castlereagh Highway (SH18) at Capertee, approximately 41km north of Lithgow. The Proposal would create a deviation to the west of the current highway for a length of 1.1km.

This Proforma 2 Review of Environmental Factors (REF) has been prepared by Environmental Technology Branch (RTA Operations Directorate) on behalf of RTA Western Region.

For the purposes of these works, the RTA is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment (EP&A) Act 1979*.

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

The description of the proposed works and the associated environmental impacts have been undertaken in the context of Clause 228 of the *Environment Planning and Assessment Regulation 2000*, the *Threatened Species Conservation (TSC) Act 1995*, the *Fisheries Management (FM) Act 1994*, and the (Commonwealth) *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. In doing so, the REF helps fulfil the requirements of Section 111 of the EP&A Act, that the RTA examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

This REF has been prepared in accordance with the RTA's Proforma 2 REF as presented in the RTA's *Environmental Impact Assessment Policy, Guidelines and Procedures, Version 4* (RTA, April 2001).

The findings of the REF would be considered when assessing:

- whether the Proposal is likely to have a significant impact on the environment and therefore the necessity for an Environmental Impact Statement (EIS) under Section 112 of the EP&A Act;
- the significance of any impact on threatened species as defined by the TSC Act, in Section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement (SIS); and

- the potential for the Proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Commonwealth Environment Minister in accordance with the EPBC Act.

2.2 Background

Substandard sections of the Castlereagh Highway have recently been subject to minor upgrades. However a section of Highway 41km north of Lithgow has been identified as so deficient as to warrant a deviation of the existing route. The Highway is traversed by a relatively large number of heavy vehicles, accounting for approximately 11% of all vehicle movements. The Highway alignment at this section is characterised by a dangerous substandard horizontal curve and a very steep vertical curve. The combination of these factors has resulted in a large deviation from the Highway average accident rate of 0.35 million vehicles per kilometre travelled (mvkm), producing a rate close to 0.50/mvkm. The RTA has committed to the improvement of this dangerous section of the Castlereagh Highway by deviating from the existing alignment, and constructing a straighter alignment further to the west.

2.3 Methodology

The method in which this document has been prepared is as follows:

1. A discussion was held with the Project Manager to consider the Proposal.

2. RTA representatives undertook a site visit on 11 November 2003, to provide an overview of the Proposal and discuss any issues relevant to the completion of the REF.

3. Consultation was undertaken with the following agencies and RTA personnel:

    - Greater Lithgow City Council;
    - Department of Infrastructure, Planning and Natural Resources (DIPNR);
    - Department of Environment and Conservation (DEC);
    - Bathurst Local Aboriginal Land Council (BLALC); and
    - RTA Aboriginal Programs Consultant, Western Region.

4. A search was conducted on the following databases to identify any potential issues:

    - Australian Heritage Commission Register of the National Estate;
    - NSW Heritage Office State Heritage Register;
    - RTA Heritage and Conservation Register (s170);
    - Council Heritage Listings (LEP);
    - DEC Aboriginal Heritage Information Management System (AHIMS); and
    - Environment Australia (EPBC Act) Databases.

5. As part of the environmental assessment undertaken for this REF, a series of specialist studies were undertaken to identify Proposal constraints and to provide environmental impact mitigative measures. Details and findings from the relevant investigations are further discussed in this REF and a copy of each specialist study is included as an appendix to this REF. Specialist investigation leading up to and during the REF development phase include:

- Terrestrial Flora Assessment;
- Terrestrial Fauna Assessment;
- Indigenous Heritage Assessment; and
- A Desktop Noise Impact Assessment.

6. A literature review was undertaken to determine issues relating to:

- Landform, geology and soils and Potential Acid Sulphate Soils;
- Local Environmental Plan (zoning);
- State Environmental Planning Policies; and
- Regional Environmental Plans.

3 Proposal Description

3.1 Location

The Proposal is located approximately 41km north of Lithgow on the Castlereagh Highway (SH 18 – 'Mudgee Road'), and approximately 1km north from the village of Capertee.

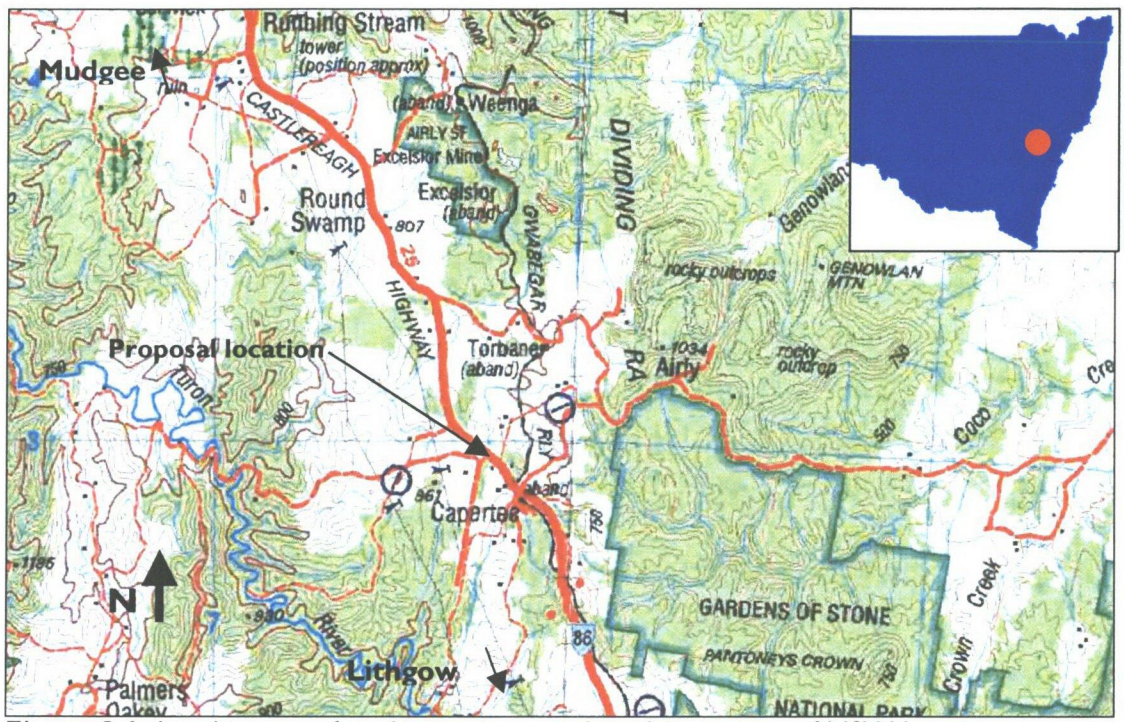

Figure 3.1: Locality map of study area, surrounds and insert map of NSW location.
Source: NSW Land and Property Information Centre. (Not to scale)

3.2 General Description of Site and Surroundings

The study area is defined as the area surrounding the Proposal within a 2km radius. Refer to Figure 3.1 above for a locality map of the study area. The Proposal is located 1km north of the village of Capertee, which is a small village with a population number below one thousand. Currently, the Castlereagh Highway is a two-lane single carriageway with lane widths of 3.5m, formal shoulders of 1m and no option for overtaking. The pavement surface of this section of Highway is in a good state of repair having undergone resurfacing works in the last five (5) years. The posted speed limit 500m north of Capertee village is 100km/h, although this is restricted to 75km/h where the road meets a steep horizontal curve (referred to locally as the Capertee Crest), approximately 1km further north along the existing Highway.

The local landscape is characterised by undulating hills, with most of the area being approximately 650 to 800m Australian Height Datum (AHD). The Proposal is located along an elevated ridgeline of approximately 825m AHD, hence there are no creeks or formal drainage lines found within the study area. The nearest watercourses to the Proposal are tributaries of Round Swamp Creek (approximately 2km northwest) and Turon Creek (approximately 1km southwest). Adjacent land use is dominated by agricultural practices, predominantly stock grazing. The vegetation within the study area is comprised of large stands of remnant woodland, remnant grassland and cleared grassland vegetation. The

designated route for the proposed deviation of the Castlereagh Highway includes remnant woodland interspersed with grazed grassland vegetation.

The existing Highway within the site of the Proposal is accessed by four (4) residential dwellings, three (3) of which are directly adjacent to the southbound side of the Highway and one (1) that is located at the end of an unnamed track, 350m east from the northbound lane of the Highway. Turon Gates Road intersects the Highway at the most northern extent of the Proposal and this unsealed road services approximately ten (10) farms. The closest farm to the Proposal serviced by this road is approximately 600m west. Two (2) other unnamed tracks also intersect the Highway on both the northbound lane and the southbound lane. A church is located at the start of the Proposal area approximately 100m from the current Highway edge. A detailed description of the existing environment is provided in Chapter 9 of this report and photographs of the study area and its surrounds are provided in **Appendix A**.

3.3 Description of the Proposal

3.3.1 General Description of the Proposal

The Proposal involves the construction of a route that deviates to the west of the existing highway alignment for a length of 1.09km. The footprint of the Proposal is defined as the area encompassing the proposed extent of the works (1.09km), in addition to an area of 20m either side of the centre line. The extent of the Proposed works are depicted as starting at Chainage 0.0 through to Chainage 1090 at the most northern extent of the proposed works. Details of the proposed route include the provision of two 3.5m travel lanes, 1m shoulders and formed drain verges on either side. Cross drainage would be augmented with the addition of concrete drainage pipes laid traverse along the proposed route.

The Proposal would require a large amount of cutting and filling of earth material and consequently the removal of approximately five (5) hectares of native vegetation. Along much of the route batter slopes would be required on either side, with a gradient of 1.5 to 1 for the cuttings and 4 to 1 for the embankments.

Property acquisition would be required as part of the Proposal. This acquisition would total 3.93 ha of land and would comprise six (6) separate parcels of land, two (2) of which are in private ownership.

The intersection with Turon Gates Road at Ch. 960 would receive an upgrading in the form of a new pavement surface, improved signage and new road markings. An 'auxiliary right' turning treatment is to be applied at each main intersection, which includes left turn bays on the Highway to allow a left turning vehicle to safely clear the path of the through traffic. Other unnamed roads intersecting the Proposal would receive a bitumen overlay treatment to enable vehicles to be grounded on a bitumen surface when entering the Highway.

The Proposal also involves utility adjustments, stockpiling of material and rehabilitation works. Minor landscaping works are envisaged for the Proposal. Further information on design considerations is provided in Chapter 8 of this report and **Appendix B** provides a concept design of the proposed activity.

3.3.2 Cost and Source of Funds

The Proposal would cost approximately $2.5 million and funding allocation would be sourced from the State Road Development Fund (Regional Development and Accessibility).

3.3.3 Timing

It is anticipated that works would commence in February 2004 and be completed approximately 52 weeks after commencement given ideal working conditions.

4 Statutory Requirements

4.1 Local Environmental Plan

Development in the Lithgow Local Government Area (LGA) is controlled by Lithgow Greater City Council under it's Local Environmental Plan (LEP), 1994.

Under the LEP the following zone applies to this Proposal:

- 1(a) General Rural.

The primary objective of the General Rural 1(a) zone is to promote the proper management and utilisation of natural resources. This is to be achieved through protecting, enhancing and conserving natural resources and preventing the development of prime agricultural land for purposes other than agriculture. The secondary objective of this zone is to provide land for other non-agricultural purposes, in accordance with the need for that development.

Under this LEP listing, road works undertaken on land zoned 1(a), would ordinarily require development consent. However, as the works are for the purposes of a classified road, Clause 11C of State Environmental Planning Policy 4 (SEPP 4) operates to remove this consent requirement. For further information regarding SEPP 4, refer to Section 4.3 of this report.

4.2 Regional Environmental Plans

No Regional Environmental Plan (REP) applies to the Central West region.

4.3 State Environmental Planning Policies

State Environmental Planning Policy No. 4 (SEPP 4) - Development without Consent and Miscellaneous Complying Development

Clause 11C(2) states "*where, in the absence of this clause, development for the purposes of a classified road or toll work, or a proposed classified road or toll work, may be carried out only with development consent being obtained therefore, that development may be carried out without that consent*".

SEPP 4 applies to the Proposal, as the proposed works are for the purposes of a classified road as defined by the *Roads Act 1993*. Therefore, the RTA would not require consent from Greater Lithgow City Council prior to undertaking the proposed works. This activity has therefore been assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*.

State Environmental Planning Policy 44 (SEPP 4) – Koala Habitat Protection

The Greater Lithgow City Council Area is identified under Schedule 1 of SEPP 44 (Koala Habitat Protection) as a Local Government Area in which Koalas are known to occur. While the requirements of the SEPP do not technically apply to this Proposal, as it is not subject to Council consent, it is the RTA's practice to consider SEPP 44 criteria in its EIA process. These criteria relate to the percentages of feed tree cover, particularly trees listed under *Schedule 2 - Known Feed Trees*. The assessment criteria consider the percentage cover of known feed trees, and whether these are greater or less than 15% of the total tree canopy.

The ecological assessment undertaken for this REF (refer to the Flora Report in **Appendix C**) identified Koala feed trees, as listed on Schedule 2 of SEPP 44 (Grey Gum [*Eucalyptus punctata*] and Scribbly Gum [*Eucalyptus signata*]) within the study area. However, the percentage cover of these trees is substantially less than 15% of the total canopy cover. Therefore, it is concluded that the study area does not provide potential Koala habitat and it is unlikely that the proposed works would have any impact on this species.

4.4 Confirmation of Part 5 Position

All relevant statutory planning instruments have been examined for the Proposal. SEPP 4 operates to remove development consent requirements, thereby permitting assessment of the Proposal under Part 5 of the EP&A Act.

4.5 Licences and Approvals

It is anticipated that water required for the proposed works would be withdrawn from Jews Creek, which is approximately 12km southeast of the Proposal. The average amount of water withdrawn per day would be 80kl, with a total Proposal usage of 4000kl. A permit has been issued to the RTA from the Department of Infrastructure, Planning and Natural Resources (DIPNR), for this purpose.

If any activities were likely to cause pollution of waterways, a licence would need to be obtained for the works pursuant to the *Protection of the Environment Operations Act 1997* (PoEO Act).

The Proposal would require the removal of approximately 5ha of native vegetation, resulting in the triggering of the *Native Vegetation Conservation Act* (NVC Act). However, the land required for this Proposal would be gazetted as a road corridor before any proposed works occur. The clearing of this native vegetation is permissible under *section 12(n)* of the Act, which exempts the clearing where the clearing is covered by *Section 88* of the *Roads Act*, 1993. Therefore this removes any statutory requirements under the NVC Act that the RTA would have regarding vegetation clearance.

With respect to Crown Land, "A licence may authorise the use or occupation of Crown land for such purposes as the Minister thinks fit" (Section 45, *Crown Lands Act 1989*). However, under the provisions of Section 12 of the *Roads Act 1993*, the Minister may dedicate any unoccupied Crown land as a public road, by publication of notice in the Government Gazette. Section 7 of the Crown Lands Act stipulates that, in relation to other legislation, it shall "not be construed so as to affect the operation of a provision of any other Act which...authorises Crown land to be disposed of or dealt with in any manner inconsistent with this Act". It is therefore not anticipated that a licence for the use or occupation of Crown Land for the purposes of the Proposal would be required.

5 Specialist Studies and Consultation

5.1 Specialist Studies

Geoff Cunningham Natural Resource Consultants undertook a terrestrial flora assessment in January 2004. A summary of that study is provided in Section 9.5 of this REF. The full report is included as **Appendix C.**

Countryside Ecological Consultants undertook a terrestrial fauna assessment in January 2004. A summary of that study is provided in Section 9.5 of this REF. The full report is included as **Appendix D**.

OzArk Consultants undertook an indigenous heritage assessment in December 2003. A summary of that study is provided in Section 9.7 of this REF. The full report is included as **Appendix E**.

RTA Environmental Technology undertook a noise impact assessment in February 2004. A summary of that study is provided in Section 9.10 of this REF. The full report is included as **Appendix F**.

5.2 Consultation

The NSW Department of Infrastructure, Planning and Natural Resources (DIPNR), the NSW Department of Environment and Conservation (DEC) (the then NSW National Parks and Wildlife Service) and Greater Lithgow City Council were asked to provide written comments on the Proposal on 14 November 2003. The issues raised, and the section of the REF in which those comments are addressed, are outlined in Table 5.1 below. A complete copy of all correspondence is provided in **Appendix G**.

Table 5.1: Summary of issues raised and section in REF where addressed.

Greater Lithgow City Council	
Issue	**Where in REF**
Any part 5 reviews should take into consideration all heritage items listed on the LEP, in addition to all relevant items listed as part of the Council's heritage study, currently in draft format.	Section 9.7 and 9.8
Council has no record of any contaminated land sites in the Proposal area.	Section 9.11
DIPNR	
Issue	**Where in REF**
1. The **REF introduction** should include: • relevant background information on the region and study area.	Section 3.1 and 3.2
2. Information on **the Proposal** should include: • a general description of, and justification for, the Proposal; • a description of the construction methodology,	Section 3.3 and 6.2

sequencing, site preparation and pre-construction controls; • information on waste soil or rock disposal, including physical characteristics of any "rejected" material, quantities and disposal locations; • area of vegetation to be removed and management of vegetation to be retained; and • potential impacts on flooding patterns.	Section 8.10 Section 9.1 and 9.12 Section 3.3 and 9.5 Section 9.4
3. The following elements should be described in the **Existing Environment** section of the REF: • topography, drainage, geology, vegetation, soils, existing landuse and flooding pattern / intervals.	 Section 9.1 – 9.6
4. An *Integrated Soil and Water Management Plan* should be prepared prior to construction that should include information on the following: • soil management, water management, erosion and sediment control, and rehabilitation plans.	 Section 9.1
DIPNR is responsible for administering the *Rivers and Foreshores Improvement (R&FI) Act* 1948. If there is any creek, drain, channel (artificial or natural) or depression, etc. which conveys water, or there is a foreshore, a *Part 3A Permit* may be required from DIPNR under the Act. However, works that are undertaken by Public Authorities (not including business ventures such as state-owned corporations or commercial undertakings), or works on Crown Land, do not require a 3A permit prior to commencing works. However, all works undertaken still need to comply with Government policy, and if it is deemed that they could degrade the protected lands of the watercourse, the Department can require works to cease and issue a remedial notice to repair any damage.	Noted
With regard to the clearing of native vegetation, under the *Native Vegetation Conservation Act* 1997, a permit to clear would normally be required for any clearing within 20m of the bed or bank or any part of a river or lake. This includes any tree, whether alive or dead, standing or fallen, or whether it is indigenous. The REF should discuss that tree removal is permissible under *section 12(n)* of the Act, which exempts the clearing where the clearing is covered by *Section 88* of the *Roads Act*, 1993, as it is in this case.	Noted Section 4.5

DEC	
Issue	**RTA Response**
The REF should include the following: • Comprehensive assessment of flora and fauna and Aboriginal heritage attributes of the site; • Consideration of options to ensure impacts on areas and items of conservation significance are avoided; and • Measures to mitigate impacts.	Section 9.5 and 9.7 Section 7.3 Section 9

6 Strategic Stage

6.1 General

The Proposal is part of an ongoing commitment by the RTA to address road safety in accordance with the RTA's responsibilities for ensuring a maximum level of service to road users and to maintain appropriate services for adjacent landholders.

The Proposal incorporates the initiatives of the NSW Government's integrated transport plan, *Action for Transport 2010 - An Integrated Transport Plan for NSW. Action for Transport 2010* develops a long-term vision for how the State's transport needs can be met. Two of the main points addressed in this plan which relate to this Proposal are:

- Improving access for rural communities; and
- Preventing accidents and saving lives.

The companion program *Rebuilding Country Roads,* targets routes that are strategically important to support rural industry and services, such as resource industries and tourism. It includes the undertaking to:

- Boost economic growth in regional centres;
- Assist rural towns cope with major change; and
- Reverse the negative view of regional centres as places to invest and live.

The Castlereagh Highway is a State Highway and a major link in the state's inter-regional road network. This is particularly so for the section between Lithgow and Mudgee as it provides the only link between the intensive agricultural and tourist areas around Mudgee and their primary market of Sydney.

6.2 Justification and Need for the Proposal

The Castlereagh Highway displays poor alignment and consequently has a high accident rate in its southern sections. It is also subject to significant heavy vehicle traffic associated with the coalmine industry. The section of the Highway between Lidsdale and Cudgegong is highly deficient in many aspects, in particular the alignment of low standard sections at Cullen Bullen, Ben Bullen and the northern end of Rylstone Shire.

Width improvements have been undertaken within the last five (5) years for the Capertee Crest section. This treatment was of a minor nature that allowed for small improvements, but did not decrease the accident rate by a large degree. The primary deficiency at this location is the horizontal and vertical alignment.

The road has a 90 km/h horizontal curve combined with a 50 km/h stopping sight distance vertical curve. The deficiency in the vertical curve alignment is extreme and has the lowest sight distance of any crest on the route. The combination of the horizontal and vertical alignments makes the situation even more extreme and the section is notorious with local motorists. The accident rate for the Capertee Crest section is high. The mean accident rate for this section is 0.50 /million vehicle kilometres with a concentration of accidents on the curves, which compares poorly with the route goal of 0.35 /million vehicle kilometres.

The Proposal is therefore required to improve traffic flow and safety along the Castlereagh Highway. The Proposal satisfies the initiatives of *Action for Transport 2010* by improving the

level of service to the region and local community and providing a safer route for motorists. If the Proposal was not undertaken, the level of safety for road users and local residents would remain at this very low level and a maximum level of service would not be realised.

7 Concept Stage

7.1 Proposal Objectives

The primary aim of the Proposal is to provide an alternative deviation of the Castlereagh Highway, 1km north of Capertee.

The objectives of the Proposal are to:

- Provide an alternative alignment to the existing road alignment, which has a dangerous steep crest and tight curve combination;
- Provide safer, more efficient travel and improved local access for motorists and road freight operators;
- Provide a 100 km/h horizontal and vertical alignment for this section of the Highway;
- Provide a standard 13m width formation for the road corridor;
- Reconstruct and operate the intersections to meet local and main road traffic needs;
- Provide an improved road user comfort;
- Provide improved vehicle operating costs and fuel efficiency;
- Reduce accident costs;
- Satisfy environmental requirements;
- Achieve community acceptance; and
- Minimise disturbances and delays to traffic during construction.

7.2 Constraints

The Proposal has the following constraints:

- Property acquisition required to complete the Proposal;
- The proximity of residences and farms to the proposed works and the need to retain access to these residential and commercial properties;
- Relocation and protection of telecommunication and electric power utility services;
- Minimising disruptions to traffic;
- Statutory environmental obligations; and
- One threatened flora species (*Eucalyptus cannonii*), listed as vulnerable under the TSC and EPBC Acts, located within the study area.

7.3 Options Considered

During the concept planning stage several options were prepared and a summary of the options considered is presented below:

'Do Nothing' Option
This option does not satisfy the Proposal's objectives, failing to address the current dangerous combination of a sharp vertical curve and a sharp horizontal curve associated with this section of the Castlereagh Highway. Furthermore, it fails to meet RTA's commitment to road safety.

Regrading of existing road / Minor deviations
Other concept options considered varied from regrading the existing road on the existing horizontal alignment to regrading and incorporating minor deviations. The concept design

speeds varied between 80km/h and 100km/h. The 80km/h designs were considered inappropriate due to the *Planning Route Strategy* for the Castlereagh Highway requiring a 100km/h standard be achieved where possible. All the options that retained the existing alignment were considered to create too much interference to the existing traffic. Furthermore, it was considered too unsafe to both the travelling public and the construction personnel to construct the road under traffic, due to the quantity of earthworks and earthmoving equipment required for upgrading this section of road to the RTA National Highway standard.

Preferred Option

The preferred option involves the deviation of the route at this section of the Highway as outlined in Section 3.3.1 of this report. It best satisfies the objectives of the Proposal and contains the following benefits:

- Road safety would be improved resulting in a reduction of accidents;
- Travel speed would be improved to the highest level practicable for this section of Highway; and
- Provides the least impact on the existing road use and the least access impacts to the local community.

Disadvantages of the preferred option would be the greater potential for environmental impacts, including the removal of 5ha of vegetation and the higher short-term costs of constructing a deviation of the route.

8 Design Considerations

8.1 Existing Road

The existing Castlereagh Highway between 1km north of Capertee village and the intersection with Turon Gates Road 1.09km further north, has the following characteristics:

- A two-lane single carriageway along the entire route with a good pavement surface;
- Lane widths are approximately 3.5m and the shoulders are 1m wide;
- A posted speed limit of 100km/h for some of the distance, reduced to 75km/h where the crest in the Highway occurs;
- The majority of the verges are wide, varying from 2 to 4m, which serve as informal table drains for the Highway;
- The Highway is crossed by three (3) concrete drainage pipes of 300mm in diameter;
- Four unnamed local accesses form T-intersections with the Highway and one named road, Turon Gates Road, intersects the Highway at the most northerly extent of the Proposal. None of these roads are presently sealed; and
- Located in the vicinity of the steep crest at the southbound lane there is a large 'chevron sign' warning of the upcoming steep crest in the Highway. Also associated with this are 75km/h and 85km/h speed limit signs.

8.2 Existing and Forecast Traffic

The existing and forecast traffic volumes for the Castlereagh Highway are:

Existing AADT (1999) = 1600 vehicles per day with 11% heavy vehicles;
Forecast AADT (2010) = 1800 vehicles per day with 11% heavy vehicles; and
Growth rate is approximately 1% per annum.

8.3 Design Parameters

The following design parameters have been used to formulate the design for the proposed works:

- A 100 km/h design speed for both horizontal and vertical alignment;
- Two 3.5m travel lanes;
- Two metre wide sealed shoulders;
- 100km/h design speed curve resulting in a 460m curve radius;
- Pavement width not greater than 13m;
- No additional vegetation landscaping;
- Twenty year pavement design life; and
- Pavement roughness of 55mm or lower.

8.4 Urban and Regional Design

The road pavement, markings and drainage, would be designed to be consistent with the development of the Castlereagh Highway, and would be sympathetic with regional design requirements for roads. All roadway furniture would be designed to meet regional design requirements without compromising the existing visual landscape of the area.

8.5 Design Constraints

Design constraints for this Proposal would include the following:

- Minimise property acquisition and the impact of proposed works on privately owned land;
- Minimise impacts on the local community, including minimising disruption to access, particularly at the intersections within the study area;
- Minimise the impacts associated with telecommunications and electric power, utility services;
- Minimise the potential impacts on indigenous cultural artefacts located in the vicinity of the Proposal;
- Minimise the environmental impacts on flora and fauna within and surrounding the study area, including *Eucalyptus cannonii*, (threatened flora species).

8.6 Design Outcomes

The design outcomes for the Proposal would be:

- Improved driving conditions and level of comfort for motorists at this section of Highway;
- A route which meets current design standards for width and travel speed;
- Improved safety for motorists, cyclists and pedestrians;
- An improved intersection at Turon Gates Road; and
- A route that promotes the long-term development of the region.

8.7 Additional Fill Material

The earthworks (i.e. cut to fill) would be predicted to balance at approximately 20,000 cubic metres. There may be a small quantity of unsuitable material to be removed off-site, although this is expected to be minimal at around fifty (50) cubic metres.

Material for the select layer, sub-base and base layers used for the road pavement would need to be obtained from the Hyrock Quarry in Excelsior Road, approximately 12km north of Capertee. The quantity of material required would be 7,400 cubic metres. Dense grade rock would be required for a bridging layer for the base of the embankment, for a drainage layer under the pavement layer through the cuttings and for rock mattresses to be used in the drainage. This rock would need to be imported and would be sourced from the Pioneer Quarry at Bathurst, approximately 80km from the site of works. The quantity required would be 5,000 cubic metres

8.8 Additional Truck Movements

It is anticipated that at the height of the construction up to 40 additional heavy vehicle movements would be experienced per day, although typically an average of 10 extra movements per day would be expected. This would result in approximately 2,500 additional heavy vehicle movements experienced for the project total. This compares with a daily volume of approximately 1600 vehicles including 176 heavy vehicles on the Castlereagh Highway at this location. It is expected that the increase in volume of heavy vehicles would be accepted due to the very low level and the benefits that the Proposal would bring to the local residents.

8.9 Stockpile and Compound Sites

The main site compound would be located at the existing stockpile site, 100m along Turon Gates Road from the Highway intersection. This area would also be used to stockpile small amounts of road construction materials such as road base or topsoil. A second minor site office / compound area would be created on the northwest corner of the Highway and Turon Gates Road. No trees or native undergrowth would need to be cleared for both these compound sites.

Both sites would be subject to all appropriate environment protection measures and managed according to the RTA's *Stockpile Site Management Procedures* (RTA 2001b). The location of any additional stockpile or compound site would be subject to approval by the RTA in consultation with the RTA Regional Environmental Adviser, Western Region. Mitigation measures for the stockpile and compound sites are provided in Section 9 of this report. Either of these compound sites would not present any problems, such as noise, site restrictions, etc with local property owners/community members or the travelling public.

8.10 Construction Activities

A Contractor, selected via a Single Invitation Contract, would undertake the works that would include the following activities:

- Establishment of site compound;
- Installation of temporary sedimentation and erosion controls;
- Relocate telecommunication utilities clear of the proposed roadworks;
- Clearing and grubbing of the entire site within the clearing limits;
- Construct sidetracks for the existing vehicular traffic that uses the Highway clear of proposed cuts and fills. These sidetracks would be constructed adjacent to the existing highway and would involve a widening of the existing sealed pavement, within the already cleared road verge;
- Strip and stockpile topsoil;
- Strip and dispose of approximately 50 cubic metres of unsuitable material;
- Construct stormwater cross drainage pipelines;
- Place rock bridging layer in the base of embankments as required;
- Excavate cuttings and place and compact excavated earth into the embankments;
- Place sub-base and base material for pavement;
- Apply bitumen seal;
- Place line marking and sign posting;
- Removal of temporary erosion and sedimentation controls; and
- Site rehabilitation.

8.11 Construction Equipment

Plant and equipment required for the works:

- Heavy dozer with ripper;
- Grader;
- Scraper;
- Loader;
- Vibrating roller;
- Water cart;
- Haul trucks and other heavy transport;
- Back hoe;
- Compressors;
- Light commercial vehicles; and
- Concrete delivery agitator trucks.

8.12 Workforce and Working Hours

The workforce would comprise approximately twelve (12) personnel subcontractors, and work would be undertaken during standard working hours as follows:

Monday-Friday:	7.00am to 6.00pm
Saturday:	8.00am to 1.00pm
Sunday and Public Holidays:	No work

Should work be required outside of the standard working hours, the procedure contained in the RTA Noise Management Manual, "Practice Note vii – Roadworks Outside of Normal Working Hours" shall be followed.

9 Environmental Assessment

9.1 Geology, Soils and Landform

Existing Environment

The Proposal is located within the western foothills of the Great Dividing Range, which is covered by the *Bathurst 1:250 000 Soil Landscape Sheet – Capertee Soil Landscape* (Kovac, Murphy and Lawrie 1989). The landform of Capertee region is characterised by undulating low hills ranging in elevation from 730 – 940m with local relief mainly from 60 – 80m and slopes that are gently inclined at 3 - 8%. The landscape of the study area is comprised of slightly sloping land, declining to the southwest at a slope of approximately 3%. The Castlereagh Highway within the Proposal area is situated along a ridgeline, with creeks generally draining in a southwesterly direction to the direction of the Turon River valley located approximately 10km southwest.

Capertee lies within an area of Palaeozoic undifferentiated Shoalhaven group claystone, comprised of light brown to grey, fine grained, clayey-sandstone, shales and coarser sandstones, which date from the Permian period. Small pockets of Illawarra coal measures are found to the east with Ordovician volcanic deposits found to the west.

Capertee soil landscape comprises moderately deep (50 – 150cm) Yellow Podzolic Soils on midslope areas; moderately deep to deep (50 – 150 cm) Red and Brown Podzolic Soils on upper slopes. Limitations include moderate gully erosion especially after clearing vegetation. Mass movement hazard is low, drainage is moderate to good and pH is generally neutral.

Potential Impacts

- Risk of erosion and scouring due to exposure of soils through earthworks and vegetation removal, and the construction of steep batter slopes; and
- Potential degradation of aquatic habitats and water quality further away from the Proposal through sedimentation.

Mitigation Measures

- The ESCP would address the management measures detailed in Section 6.5.1 (Erosion and Sedimentation Control), and 6.5.2 (Stockpile Management) of the RTA's QA Specification G36;
- An Erosion and Sedimention Control Plan (ESCP) would be prepared as part of the CEMP prior to the commencement of construction. This ESCP would address the environmental requirements for any stripping, stockpiling and respreading of topsoil;
- Should any spillage occur during the construction activity the Environmental Adviser, Western Region, would be contacted immediately, and contaminants would be immediately contained, removed, treated (if necessary) and disposed of to the satisfaction of the DEC;
- The management of any temporary stockpiles would be in accordance with the RTA's Stockpile Management Procedures (November 2001);
- Excavation works would not take place during heavy rainfall (where this would cause movement of soil off site as a result of erosion);
- Exposed areas would be revegetated progressively and restored as work is completed. A cover crop of locally occurring native vegetation species or a suitable geo-textile fabric would be used to stabilise the batter slopes; and
- Batters 2:1 and steeper would be treated with some form of organic erosion blanket or synthetic woven geo-textile to stabilise the slope and where feasible cleared

native vegetation would be mulched and spread over exposed areas to aid in longer-term revegetation.

9.2 Climate

Existing Environment

Lithgow (Birdwood Street) is the closest weather station to the study area and is located approximately 40km south of the Proposal. Summers are generally warm and wet, and winters are generally mild and relatively dry, with mean daily maximum temperatures of 25°C and 11°C occurring in summer and winter respectively. Average annual rainfall for the area is 862.5mm, with rainfall being generally higher and more reliable in summer and early autumn (http://www.bom.gov.au). In addition, the Proposal is within an elevated area and thus may be prone to outbreaks of fog and mist.

Potential Impacts

- Heavy fog could pose a danger to construction personnel and motorists using the existing Highway.

Mitigation Measures

- In the event of heavy fog, works would be delayed until such time as the fog has satisfactorily dissipated.

9.3 Air Quality

Existing Environment

Air quality in the locality would be expected to be very good, given the rural nature of the region and the lack of any polluting industries or cities in the region. The Proposal would not affect greenhouse gas levels, as the length of this Highway section would remain similar to the previous section and the amount of cars using the Highway would not be reduced or increased as a direct result of this Proposal.

Potential Impacts

- The Proposal has the potential to locally reduce air quality during the construction phase from increased dust levels and exhaust from machinery. However, these impacts would be highly localised and short in duration, and can be adequately ameliorated with appropriate controls;
- Pollutants would include dust and emissions from vehicles during the construction phase, however this short term impact would be mitigated with safeguards below and would be likely to be accepted by the community given the short period of duration of the works; and
- Works during periods of high wind would result in impacts on air quality.

Mitigation Measures

- Air quality with respect to the Proposal would be managed through the implementation of safeguards detailed in Section 6.6 (Air Quality) and Section 6.18 (Restoration of Site) of the RTA's QA Specification G36;
- Stockpiles would be protected from wind erosion through dampening or covering;
- Unsealed access roads, compound areas and other areas with traffic would be regularly dampened using water sprays;
- Truck loads would be wet down or covered to suppress dust generation;
- There would be no burning of any material on site; and

- If winds are high and works are creating high levels of dust that are likely to cause discomfort to local residents or a safety hazard to traffic or work personnel, the works would be modified or stopped until the dust hazard is eliminated or has reduced to an acceptable level.

9.4 Water Quality and Hydrology

Existing Environment
The Proposal is located along a ridgeline and as a result there are no creeks or creek tributaries located within the area. The nearest watercourse to the Proposal is a tributary of Turon Creek approximately 1km southwest. A small temporary stock dam (2m radius) is located at the southern end of the proposed deviation. No major drainage lines cross the existing Highway and it is not anticipated that there would be a change in the flooding and drainage regime in the locality, as a result of this proposed deviation.

Potential Impacts
No impacts to water quality hydrology within the study area are envisaged during construction works or operation of the Proposal. However, soil attached to haulage trucks may have the potential to increase sedimentation of waterways within the wider vicinity.

Erosion and sedimentation safeguards as provided in Section 9.1 of this REF would minimise impacts to water quality. In addition the following mitigation methods are proposed:

Mitigation Measures
- Water quality would be managed according to details in Section 6.5.3 (Water Quality), 6.5.4 (Water Extraction) and 6.13 (Spillage Prevention and Contamination Management) of the RTA's QA Specification G36; and
- Mud and dirt would be removed from the wheels and bodies of haulage equipment before they enter public roads or other sealed pavements. Any washing down of equipment would be undertaken on a grassed or bunded area.

9.5 Ecology

Existing Environment
The study area is known to contain a population of *Eucalyptus cannonii,* a threatened flora species listed under both the TSC Act and EPBC Act. Three (3) other threatened flora species and twenty-nine (29) threatened fauna species have also been recorded within a 20km radius of the study area. As a result of this background information it was determined that a terrestrial flora and fauna ecological assessment should be undertaken for the study area to assess the potential impact of the Proposal on the surrounding environment. Geoff Cunningham Natural Resource Consultants undertook a flora assessment for the Proposal in January 2004. A summary of that assessment is provided below and the full report is contained in **Appendix C.** In addition, Countrywide Ecological Services undertook a terrestrial fauna assessment for the Proposal in January 2004. A summary of that assessment is provided below and the full report is contained in **Appendix D**.

Flora
Flora species within the study area were surveyed by undertaking a general habitat assessment as well as targeted searches for threatened species, in particular *Eucalyptus cannonii.* Incidental observations of other species were also recorded. Existing vegetation within the study area consists mainly of open woodlands and grasslands that have been previously modified as a result of clearing activities, grazing and other urban development.

Small stands of more intact woodland are present towards the northern end of the study area.

It is considered that the study area generally comprised a mosaic of three (3) vegetation community types:

Community 1 – Open Grassland (populated by introduced and native grass species). This community generally occurs at the start of the proposed deviation at chainage 0.0.

Community 2 – Indicative species of this community were Capertee Stringybark (*Eucalyptus cannonii*), Red Stringybark (*E. macrorhyncha*), Broad-leaved Peppermint (*E. dives*), Apple Box (*E. bridgesiana*) and Brittle Gum (*E. praecox*). This community generally extends from the Capertee Catholic Church at chainage 200 to the north of a private road at about chainage 650 - 700. It is partly cleared along the Telstra easement corridor though less cleared nearer to the Castlereagh Highway.

Community 3 - Indicative species of this community were Narrow-leaf Stringybark (*Eucalyptus sparsifolia*), Scribbly Gum (*E. rossii*) and Grey Gum (*E. punctata*). This community extends from the northern extremity of Community 2 (approximate chainage 650 – 700) to the northern point of the study area where the proposed deviation meets the existing Highway.

The extent of these communities can be seen in Figure 1 of **Appendix C** of this report. None of the communities located during the surveys are thought to be representative of any endangered vegetation community.

The canopy cover of both woodland communities was sparse owing to the species type and number of individuals present. The shrub layer of Community 2 was sparse, with typical species including Black Wattle (*Acacia decurrens*), Chinese Shrub (*Cassinia arcuata*), Briar Rose (*Rosa rubiginosa*), Blackberry (*Rubus* spp), Sticky Daisy Bush (*Olearia elliptica*), Tea Tree (*Leptospermum continentale*) and Native Blackthorn (*Bursaria spinosa*). The density of the shrub layer in Community 3 was moderate, with typical species including Cranberry Heath (*Astroloma humifusum*), Cough Bush (*Cassinia laevis*), False Sarsaparilla (*Hardenbergia violacea*), Sunshine Wattle (*Acacia terminalis*), Pill Flower (*Ozothamnus diosmifolius*) and Poverty Wattle (*Acacia dawsonii*).

Introduced plant species were recorded throughout the study area and were confined to shrub and grass species. Of the introduced species, only Blackberry (*Rubus fruticosus [agg. spp.])* is listed as a declared noxious weed species within the Lithgow Council area, under the *Noxious Weeds Act 1993*. Details of the control and management necessary for this noxious weed can be found on the following website http://www.agriapproximatelynsw.gov.au/noxweed/.

The targeted survey for *Eucalyptus cannonii* within the study area located one (1) individual within Community 2. Whilst up to 26 other Stringybark hybrids (*E. cannonii* x *E. macrorhyncha*) were located during the survey, the flora consultant assessed these as not forming part of the genetic material of *E. cannonii.* Hence, these individuals are not protected under the provisions of the TSC Act or the EPBC Act.

Survey effort included a search for other threatened plant species that may be likely to occur in the study area. No other threatened plant species were recorded during the survey. Further discussion on the habitat requirements for each species potentially occurring in the area is detailed in the ecological assessment, Table 4 of **Appendix C**. Based upon habitat requirements, the likelihood of these threatened plant species or populations

occurring within the study area is regarded as unlikely, as the vegetation of the study area either does not have the specific habitat requirements for the species or has been subjected to structural modification through disturbance.

Fauna

Fauna species were surveyed by undertaking active searching and listening, in addition to recording incidental observations. An Anabat II ultrasonic detector was used to record the echolocation calls of bats species. A fauna habitat assessment of the study area was also undertaken.

The study area is considered to represent limited fauna habitat due to its modification by the construction of the existing Highway and the existence of residential properties close by. However, the study area does contain a number of fauna habitat features including trees bearing small hollows, fallen timber, leaf litter and food resources, which would provide shelter and foraging habitat for birds, reptiles and small mammals. No aquatic habitat occurs in the study area apart from a very small and temporary dam of approximately 2m in radius.

A total of twenty-four (24) terrestrial fauna species were recorded within the study area during the current survey. Species recorded include fifteen (15) common native bird species, eight (8) native mammals and one (1) introduced mammal. Six (6) of the native mammals detected were microchiropteran bat species detected with an Anabat II detector, one of which was the Great Pippistrelle (*Falsistrellus tasmaniensis*), listed as vulnerable under the TSC Act. No amphibian or reptile species were recorded during the survey.

Under the TSC Act, twenty-nine (29) fauna species listed as threatened have been recorded within a 20km radius of the study area. The species names and the recorded locations are detailed in Figures 3 and 4 of **Appendix D**. However, the study area was considered sub-optimal habitat for all these species apart from the Regent Honeyeater (*Xanthomyza phrygia*).

Potential Impacts

Flora

The Proposal footprint would remove approximately 5ha of vegetation that includes native woodland and one threatened flora species (*E. cannonii*) listed under the TSC Act and the EPBC Act. An Eight Part Test (TSC Act) and 'assessment of significance' (EPBC Act) undertaken for *E. cannonii* concluded that a significant impact would not occur to this species as a result of this Proposal. It is anticipated that the Proposal would only require the removal of only one individual *E. cannonii*. This corresponds to approximately 0.01% of the total population of known *E. cannonii* in the region. A Species Impact Statement or referral under the EPBC Act is not recommended for this species.

Additionally, the clearing of remnant native vegetation for the purposes of this Proposal could be considered a 'Key Threatening Process' under the Schedules of the TSC Act. Cleared areas within the Proposal footprint may become subject to encroachment of weeds from the surrounding bushland, particularly in the area of the batter slopes.

Fauna

The Proposal has the potential to impact upon fauna habitat that would provide shelter and foraging resources for common birds, reptiles and small mammals. There are potentially a number of trees that contain small tree hollows, which may also provide breeding habitat for fauna. In addition, the study area could potentially be utilised by several threatened fauna species listed under the TSC Act and EPBC Act, although the assessment in **Appendix D** has considered this as unlikely.

Eight Part Tests conducted for *Falsistrellus tasmaniensis* and *Xanthomyza phrygia* concluded that a Species Impact Statement is not recommended for these species. It is possible that these species use resources within the study area, but this would be on a temporary basis only. Therefore, the study area is not considered to be critical habitat for any of these species. Furthermore, these species are considered to be highly mobile and are unlikely to be dependent on the resources within the study area. Based on Environment Australia guidelines, it is unlikely that the Proposal would have a significant impact on these species. Referral under the EPBC Act is not recommended.

The study area is located within a region that is characterised by patches of remnant vegetation allocated for nature conservation purposes. In addition, remnant vegetation and isolated trees provide connectivity for mobile wildlife species capable of moving between isolated habitat resources. The Proposal would involve the overall widening of the pavement area at this location, which would increase the distance fauna species would be required to traverse to move within an east / west direction. These factors may result in fragmentation of existing fauna habitats and could potentially increase the incident of 'road strikes' within the study area.

However, given the relative size of the development footprint, it is unlikely that the Proposal would result in the modification or removal of a major faunal habitat resource. Further construction management protocols would be implemented to ensure that fauna within the study area are not adversely impacted by the Proposal.

Mitigation Measures

- Flora and fauna would be managed in accordance with Section 6.9 (Vegetation), Section 6.10 (Fauna) and Section 6.18 (Restoration of Site) of the RTA's QA Specification G36;
- Areas of native vegetation in proximity to construction areas would be fenced with protective fencing prior to work commencing in the area. The limits of protective fencing would be set at a maximum of 25m either side of the surveyed centreline;
- Contractors would be instructed on the limits of clearing and not allowed to encroach into areas outside the identified road construction limits defined by the protective fencing. This includes preventing any materials or construction equipment from entering into protected areas;
- Immediately prior to clearing, trees would be inspected by an ecologist to locate any tree hollows. Any tree hollows found would be inspected for presence of native fauna and any found would be relocated by a licensed ecologist;
- Any tree hollows affected by clearing must be relocated to suitable undisturbed bushland sites adjacent to the Highway corridor;
- Following the completion of works, the area disturbed would be rehabilitated and revegetated with locally indigenous grass and woodland species using locally collected seed stock. This would require the preparation of a Landscape Rehabilitation Plan to be carried out in liaison with DEC. The preparation of the Landscape Rehabilitation Plan would be managed by the RTA and prepared by a suitably qualified contractor satisfying the DEC criteria. Close consultation would be required between DEC, RTA and the contractor during preparation of the Landscape Rehabilitation Plan;
- Suppression of Blackberry *Rubus fruticosus (agg. spp.)* shrubs listed as W3 on the noxious weeds register for the Lithgow Council area would be carried out for the entire footprint of the works to prevent the incursion of the identified weed into the newly excavated areas;
- Site induction would be provided to all personnel prior to working on site. This induction should ensure that all site personnel observe the limits of clearing and are made aware of the importance of any trees of significant value. It would include

general information on *Eucalyptus cannonii*, threats to their survival and the legislative penalties incurred following any damage or disturbance to them; and

- Stockpile areas, compound sites and access tracks would be located in areas previously disturbed and that require no clearing of native vegetation. Care would be taken to not stockpile materials within five metres of any trees.

9.6 Socio-economic Considerations Including Landuse

Existing Environment

The predominant landuse within and surrounding the study area is for agricultural grazing purposes. In addition, a small amount of residential land (approximately four (4) residences and ten (10) farm properties) is accessed via the Castlereagh Highway within the length of the Proposal. The village of Capertee is located 1km south of the Proposal area. Property acquisition of approximately 3.93ha of land would be required as part of the Proposal. It would be necessary to acquire up to 6 parcels of land within the proposed Highway deviation. Details of this land acquisition can be found in **Appendix B.**

The proposed acquisition would not result in severance of any properties or any demolition of existing buildings. However, several existing property fences would require adjustment.

Potential Impacts

- In the construction phase the Proposal would delay through traffic during working hours, although appropriate traffic control measures would minimise the delays experienced along the road;
- The Proposal has the potential to affect access to private properties during construction;
- The Proposal would result in an additional 10 to 40 truck movements per day during earthworks and pavement construction, increasing the amount of local traffic;
- During construction of the Proposal, access to and from residential properties at Turon Gates Road would be retained. This road would also be used as access to the compound / stockpile site, although the construction vehicles using this road would only be small utility type vehicles with the occasional single unit truck. This extra traffic on Turon Gates Road would not cause any disturbance to the very low volumes of local resident traffic. When semi-trailer trucks are required to access the compound / stockpile site, manual traffic control flagmen would be used to control the traffic safely.

Mitigation Measures

- Traffic would be managed during the reconstruction works in accordance with Section 6.4 (Access and Traffic Management) of the RTA's QA Specification G36;
- Low speed traffic zones would be implemented before the works commence;
- Construction traffic would enter and leave the site at two locations only; located at Ch 150 and 900 on the proposed alignment. These sites would be located to ensure good visibility for both construction traffic and other road users;
- The entry and exit of large trucks delivering or removing machinery, concrete, etc would be controlled by Manual Traffic Controllers at all times;
- Access would be maintained to private residences at all times during construction;
- Local residents within the area of the proposed deviation that would have access disrupted during the construction of the Proposal would be notified by the RTA prior to construction and made aware of any revised travel paths. Consultation protocols described in *RTA Community Involvement: Practice Notes and Resource Manual* (1998) would be followed; and

- All property acquisition would be undertaken prior to construction and would be negotiated in accordance with the RTA's *Land Acquisition Policy* and compensation would be in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.

9.7 Indigenous Heritage

Existing Environment
Preliminary investigations regarding Aboriginal heritage were undertaken, which involved a search of the DEC Aboriginal Heritage Information Management System (AHIMS) for known or potential indigenous archaeological or cultural heritage sites within or surrounding the study area (within a 10km radius). The search identified two (2) sites with the closest, a carved tree, being located within 500m of the existing Highway.

The study area is situated on a high ridge and given the geology of the region, the study area is considered to possess a moderate potential for containing sandstone outcrops suitable for axe grinding or containing shelters used by Aboriginal people. Furthermore, the study area has generally dense vegetation and as such has received little disturbance to the ground cover. In light of this knowledge, Ozark Cultural Heritage Management Consultants undertook an indigenous heritage assessment in December 2003. A summary of that assessment is provided below and the full report is contained in **Appendix E**.

As part of the assessment, consultation, including an inspection of the study area, was undertaken with the Bathurst Local Aboriginal Land Council (BLALC) and representatives from the RTA. The archaeological survey conducted on 20 November 2003 involved inspection of the entire length of the proposed works to a width of 50m either side of the proposed centreline of the deviation, creating a study area of approximately 12ha.

The results of the survey included:

- One (1) Aboriginal site was located during the survey inspection of the study area. This scarred tree (CHC-ST1) was located approximately 50m from the proposed centreline on the south western side of the proposed deviation, and has been assessed as having generally low significance;
- No stone artefacts were noted in the vicinity of this scarred tree;
- No other identification of any Aboriginal archaeological sites, materials or isolated artefacts or identification of any areas within the study area that were considered to possess Potential Archaeological Deposits (PAD's) were found during the current survey;
- No items listed on the AHIMS database were located during the survey despite intensive searches. It is presumed that the co-ordinates for these items are incorrect or that the items have since been destroyed; and
- The lack of Aboriginal artefacts within the study area can be attributed to three factors, they are:
  - The study area did not transect any creeklines, where evidence for open camp sites may be more likely to occur;
  - That previous disturbance within the study area (namely the establishment of the current Castlereagh Highway and associated infrastructure) may have disturbed / destroyed any previously extant sites; or
  - That other sites exist within the study area but remain undetected due to the lack of ground surface visibility.

The entire study area can be assessed as being of low-moderate archaeological sensitivity, due to its distance from any water source and due to the inclined nature of much of the

land. Disturbance to the area, has been sporadic but would be generally assessed as moderate to low. Overlaying the sensitivity of the area with the assessed disturbance, provides an assessment of the potential for intact, sub-surface archaeological deposits to remain undetected within the boundaries of the study area as low.

According to the report produced by the Bathurst LALC following the inspection, they were satisfied that the survey identified any Aboriginal places of significance that may be impacted by the Proposal, and also stated that the BLALC would have no objection to the Proposal commencing (refer to **Appendix G** for details of this correspondence).

Potential Impacts

- The Proposal has the potential to damage the scarred tree identified in this survey. The scarred tree is approximately 25m outside of the direct impact area for the proposed works, however, the artefact could be damaged indirectly by machinery or soil disturbance; and
- During the initial vegetation clearing works and subsequent earthworks, there is the potential to impact on Aboriginal archaeological sites, materials or isolated artefacts. However, given that the potential for intact, sub-surface archaeological deposits to remain undetected within the boundaries of the study area was assessed as low, the potential for any impact would be considered minimal.

Mitigation Measures

- The management of Indigenous heritage would be in accordance with Section 6.14 (Indigenous Heritage) of the RTA's QA Specification G36;
- In the event that any indigenous artefacts or items are located during the works, all work would cease in the vicinity of the find, and the RTA's Environmental Adviser, Western Region, Aboriginal Programs Consultant and NSW DEC would be contacted;
- The scarred tree (CHC-ST1) must be identified in the field by an archaeologist or a BLALC representative prior to any works being undertaken. A curtilage must be delineated around this tree using a highly visual physical barrier (e.g. 1m high orange roadwork fencing); and
- All members of the construction team, including sub-contractors, machine operators and truck driver would undergo site induction concerning cultural heritage issues, prior to working on the site. An individual who has a good working knowledge of indigenous sites and of the legislation protecting them would preferably undertake this induction. This induction would inform site personnel of the location of the Aboriginal site, and of its legislative protection under Section 90 of the NSW *National Parks and Wildlife Act 1974*. These inductions would be recorded in a register, with all those present signing their complicity with these guidelines.

9.8 Non-indigenous Heritage

Existing Environment

A desktop review of non-indigenous heritage was carried out for this Proposal. As part of this investigation, searches were undertaken for the Capertee region on a number of databases to assess the cultural heritage of the study area. Searches were undertaken on the NSW Heritage Office State Heritage Register, RTA s.170 Heritage Conservation Register, Schedule 1 of the *Lithgow Greater City Council Local Environmental Plan (LEP) 1994*, a list of Lithgow Council's heritage study for the Capertee area (Draft 2003) and the Australian Heritage Commission Register of the National Estate Database. No recorded sites were shown to exist within or near the study area (refer to **Appendix H** for copies of the database searches undertaken for the Proposal).

During the indigenous heritage assessment undertaken by OzArk in December 2003, three items of non-indigenous heritage significance were located approximately 25m beyond the western boundary of the Proposed deviation within the study area. The items included:

- The remains of what looked like timber cutter's camps, which were found at the north end of the study area, and are believed to predate the 1950s. Two of these were found with one more intact than the other. The more intact camp remains consisted of many tins of various sizes and types as well as shards of ceramic vessels and glass bottles. Slightly to one side of this camp was a tree branch (shaped like a wish bone) lying on the ground, filled with squared pieces of bark. This structure is indicative of a rudimentary bed. Nearby, in the surrounding bush are the stumps of trees cut down long ago. Saw marks on the stumps indicate use of a two-handed saw and it appears that the use of the timber was that of railway sleepers. The other camp was similar although much less intact; and
- The remains of a horse corral, which were located at the southern end of the study area constructed between existing trees of roughly hewn branches tied together with wire. The gauge of the wire was assessed as being possibly only approximately 50 years old. It is possible that this corral was to do with fencing activities, as the nearby fences appear to have the same wire, and also appear quite old.

No level of significance was given to either of the above items during the indigenous heritage assessment, however, it was indicated that they would likely qualify as 'relics' as defined in s.139 of the *Heritage Act 1997*.

Potential Impacts

- It is not anticipated that the Proposal would impact upon any listed items of non-indigenous heritage significance; and
- The remnant horse corral and timber cutters camps are located approximately 25m outside of the works footprint. Therefore, they are unlikely to be impacted by the Proposal. However, should works be required outside of the proposed footprint that could potentially impact upon the two items, the mitigation measures described below would minimise the level of impact.

Mitigation Measures

- The management of Non-Indigenous heritage would be in accordance with Section 6.15 (Non-indigenous Heritage) of the RTA's QA Specification G36;
- The three (3) known non-indigenous items must be identified and located in the field prior to any works being undertaken. A curtilage would be delineated around these items using a highly visual physical barrier (e.g. 1 m high orange roadwork fencing);
- There would be no incursions of vehicles or machinery further than 35m west of the centreline. Care would also be taken when felling trees, ensuring that they fall away from the western edge of the works boundary;
- Should any works, including utility relocations, be likely to impact upon any items of cultural heritage, a suitably qualified archaeologist would be consulted to conduct a heritage assessment of the significance of the recorded items and to detail any necessary mitigation strategy required;
- In the event that any other non-indigenous artefacts or items are located during the works, all work would cease in the vicinity of the find, and the RTA's Environmental Adviser, Western Region, and a suitably qualified archaeologist would be contacted; and
- Site personnel would be inducted as to the location of these sites and their legislative protection under the NSW Heritage Act. These inductions would be recorded in a register and signed off by all team members.

9.9 Visual, Landscape and Urban Design

Existing Environment
The Proposal would involve deviating the Highway from its current route through an area of woodland to the west. The visual amenity of the area is characterised by a rural landscape and the farmhouses and residential dwellings of Capertee village. The existing section of the Highway within the study area is lined with woodland on one side and paddocks with grassy slopes and houses on the other.

Towards the northern end, views to the Great Dividing Range and distant national parks can be seen in a north easterly direction through the trees, although these views would not be affected by the Proposal. No section of the study area offers unobstructed scenic views and therefore the area is likely to be assessed as having a moderate visual amenity.

Potential Impacts
The Proposal would require the removal of a wide area of vegetation in addition to filling and cutting activities during construction. This would potentially impact on the visual amenity of the study area in the short term and would affect both road users and local residents. Construction activities may reduce the aesthetics of the area, although this would not substantially alter the general environmental characteristics off the road or the landscape in the long-term. With the application of the mitigation measures below this impact would be further reduced.

Mitigation Measures
To mitigate against any potentially negative impacts on visual amenity, the following are proposed:

- Design of the pavement and associated road infrastructure would be in line with existing road developments in the area, and sympathetic with regional design requirements for Highways; and
- Revegetation of all exposed surfaces created during the Proposal including fill batters, cuttings and table drains would occur using native grass species.

9.10 Noise and Vibration

Existing Environment
The existing highway is in a rural area that has a low ambient noise level. Sources of noise within or adjacent to the study area are mainly limited to the vehicles using the existing Highway. Residential properties are located on both sides of the Highway within the study area. The closest residential dwelling is located on the eastern side of Castlereagh Highway 50m east of the proposed deviation and at approximate chainage 620. St Jude's Catholic Church is found near the start of the proposed deviation at chainage 0.0 and is located approximately 10m from the existing alignment. Both of these buildings are identified as sensitive noise receivers. .

RTA Environmental Technology undertook a desktop noise and vibration impact assessment of the Proposal to ascertain the potential impacts during construction and operation of the Proposal. This report is provided in full in **Appendix F** and a summary of findings is presented below.

Potential Impacts
Construction:
The period of construction of the Proposal is estimated to be 12 months, however due to the progressive nature of the construction works for the Proposal it is unlikely that

construction noise impacts would be experienced at the identified receivers for the full duration of work. It is therefore considered more appropriate to adopt the criteria for construction periods, described in the *Environmental Noise Control Manual* (EPA 1999), of between 4 and 26 weeks duration (background noise +10dBA).

Long-term noise measurements were not possible at either of the two noise sensitive receivers due to logger security difficulties and extraneous noise from pet dogs. Part 3 of AS 1055 *"Acoustic – Description and Measurement of Environmental Noise"* provides a guideline for estimated average background A-weighted sound pressure levels (LA90,T) for different areas containing residences in Australia. Refer to **Appendix F** for the table extracted from AS 1055.3.

Although there are a high percentage of heavy vehicles for this section of the highway (11%), the traffic volume is low. Therefore, a conservative approach would be to incorporate the background noise levels for noise area category R2 as summarised below in Table 9.10.1.

Table 9.10.1: Conservative estimate of ambient background noise levels as per AS 1055.3.

Day L_{A90} 7am-6pm	Evening L_{A90} 6pm–10pm	Night L_{A90} 10pm– 7am
45	40	35

The plant and equipment to be used during construction is shown in Section 8.11 of this report. For the purposes of calculations, a conservative assumption of equipment that would be likely adopted for the proposed works include 1 back hoe, 1 grader, 1 scraper, 1 excavator, 1 vibratory roller, 1 roller, 1 water cart, 2 dump trucks, 1 compressor and 1 agitator truck. Experience shows that the L_{10} is generally between 5 and 12 dB(A) less than the sound pressure level predicted from sound power levels and this can be discounted by a further 2 dB(A) because all equipment will not be working at the same time.

The predicted sound pressure level at the monitoring site with the proposed construction is likely to be 80 dB(A). The construction noise levels would exceed the project specific noise goals for both sites. The calculations used mean values for a range of assumed construction equipment to predict the sound pressure level at the monitoring site. Experience shows that the L_{10} is generally between 5 and 12dB less than the sound pressure level predicted from sound power levels and this can be discounted by a further 2dB because all equipment would not be working at the same time, i.e. these dB(A) predictions are a 'worst–case' scenario only. Table 9.10.2 shows the predicted L_{10} that has been conservatively discounted by a total of 7dB and compares against calculated guidelines and reasonable criteria for the identified receiver.

Table 9.10.2: Construction noise level objectives and predicted levels

Location	EPA Construction Noise Goal L_{10}	Predicted Construction Noise		Exceedance of EPA Goal dB
		L_{10} dB(A)	L_1 dB(A)	
A	50	73	80	23
B	50	74	81	24

Site A is St Judes Catholic Church
Site B is residential dwelling 620 metres north of the church and 50m from proposed highway.

Daytime construction activities are predicted to exceed the current EPA criteria by up to 24dB. It is recommended that best practice work methods be adopted to ensure that

potential impacts would be minimised. A procedure for dealing with complaints should also be developed.

From experience it may be expected that residences located 20m from road construction work would experience vibration levels up to 3 mm/sec when vibratory rolling is being undertaken at the closest point to the residence. As the distance between the residential dwelling and Castlereagh Highway is greater than 20m, it is not expected that there would be any adverse impact in terms annoyance from construction vibration. However, the church is located within 10m of the start of the Proposal and close liaison between the RTA and the church parishioner would be required so as to time the works outside of services.

Operation:
The Proposal would not move the traffic closer to either of the two noise sensitive receivers adjacent to Castlereagh Highway, and it is expected that there would be no increase in traffic carrying capacity, traffic mix or speed. Consequently, there would be no impact regarding traffic noise.

Mitigation Measures

- Noise and vibration would be managed through the implementation of mitigative measures detailed in Section 6.7 (Noise Control) and 6.8 (Ground Vibration and Air Blasting) of the RTA's QA Specification G36;
- The provision for a line of communication between the local community and Project Management would be established prior to construction;
- Best management practice should be applied in development of a noise and vibration management plan (NVMP); and
- Where work is conducted outside normal working hours and noise goal exceedances are predicted, all feasible and reasonable noise mitigation measures should be evaluated and included in the NVMP. If after the application of all feasible and reasonable noise mitigation measures, it is still predicted that there will be noise goals exceedances, the RTA's out of normal hours construction programming and consultation protocols should be followed.

9.11 Contaminated Land

Existing Environment
Known and potential contaminated land information was obtained from Greater Lithgow City Council's contaminated lands register. No known or potentially contaminated land was identified within the study area. The study area is comprised of land that is relatively undisturbed in terms of agricultural practice or industrial land use.

Potential Impacts

- The Proposal has a very low potential to expose soil that is contaminated. Potentially contaminated land is usually associated with past or current landuses, such as automotive service stations and garages, landfills and sewage treatment plants or cattle and sheep dips, which are not known from the study area. Therefore, it is unlikely that there would be contaminated land in the study area; and
- The Proposal has the potential to create contaminated land through the spillage of fuels and other chemicals used during construction. However, the risk is minimal as the amount of fuels and chemicals used for this type of works is relatively low.

Mitigation Measures

- Any contaminated lands identified during construction would be managed in accordance with Section 6.16 (Contaminated Ground) of the RTA's QA Specification G36.

9.12 Waste Minimisation and Management

Existing Environment

There are currently no waste-generating activities conducted within or within the immediate vicinity of the study area.

Potential Impacts

Potential wastes streams generated by the Proposal would include:

- Bitumen, concrete and asphalt as a result of some removal of existing Highway pavement;
- Cleared vegetation including up to 5000m^3 of timber;
- Excavated earth material that is unsuitable for re-use (approximately 50m^3);
- Waste oils and liquids from maintenance of construction plant and equipment; and
- Garbage and sewage from the site compound.

Mitigation Measures

The principles of waste management are to minimise the amount of waste generated, recycle waste wherever possible and dispose of the remainder in a responsible manner in accordance with appropriate RTA policy. The RTA adopts the Resource Management Hierarchy principles embodied in the *Waste Avoidance & Resource Recovery Act 2001* (WARR Act).

Accordingly, the following waste minimisation and impact mitigation methods are proposed:

- The management of waste would be undertaken in accordance with Section 6.17 (Waste Management) of the RTA's QA Specification G36;
- Unnecessary resource consumption would be avoided as a priority;
- Where waste is created resource recovery would be employed (including re-use of materials, reprocessing, recycling and energy recovery). Examples for this project include:
  - recycling of waste road surface materials such as bitumen and asphalt and including them in the embankment construction on the proposed deviation;
  - reusing excavated material from the cutting as fill material to raise the grade level for the Proposal;
  - reuse of native branches and logs by placing them in nearby areas of vegetation to provide habitat for native species;
  - processing and reuse of mulched timber either within the Proposal or through sale or supply to Council or local businesses; and
- Disposal would be undertaken as a last resort when the previous four options have been exhausted and where re-use is not acceptable. For example, exotic shrub species would be disposed of to a licensed landfill to prevent the spread of seeds.

9.13 Associated Infrastructure and Activities

Existing Environment

There are two electricity aerial powerlines located within a cleared easement to the west of the Proposed works. Telstra copper and fibre optic cables with associated pits also exist

within the vicinity of the proposed works. There are no gas, water, sewer mains pipes, or underground electricity lines in the area.

Impacts

- The utilities affected by the Proposal are:
  - Integral Energy power lines;
  - Telstra optical fibre; and
  - Telstra local cables.
- The effect on powerlines would be minimal with the likely relocation of some poles, the erection of four (4) new poles and the restringing of the aerial cables. Telstra copper cables and associated pits would need to be adjusted. The optical fibre would be relocated over a length of 300m between approximate chainage 350 to 650. The preferred highway alignment has been positioned so as to involve minimal impact on these utilities;
- Inconvenience for affected residents as a result of the loss of services would be kept to a minimum as the new powerlines would be erected prior to dismantling of the existing lines; and
- Disturbance to the ground vegetation and subsequent earthworks may impact on the heritage artefacts or the native flora located within the area. In addition, these works may result in some minor soil erosion and sedimentation if undertaken during heavy rainfall.

Mitigation Measures

- Affected residents would be provided with advanced notice of any service interruptions anticipated from the relocation of the power poles, by mail. This information would include the nature, date and expected duration of the interruption;
- The "dial before you dig" hotline would be contacted prior to construction to confirm that no utility infrastructure would be affected by the earthworks; and
- Environmental impacts associated with the utility relocations would be subject to the same environmental safeguards concerning soil erosion, the protection of threatened flora and the protection of heritage artefacts that are applicable to the remainder of the Proposal.

9.14 Demand on Resources

The demand on resources is not expected have a major impact as a result of the Proposal. Fill material required for the earthworks would be obtained from cut activities involved in this Proposal. Material for the select layer, sub-base and bridging layers would need to be imported from near-by quarries and the quantity of material required would be approximately 12,400 cubic metres. This material is not in short supply, and no other materials currently in short supply would be required for the Proposal. Road base and pavement materials would be sourced locally wherever possible.

9.15 Cumulative Environmental Effects

The RTA has recently undertaken investigations into a rehabilitation program for the Castlereagh Highway approximately 45km north of Capertee. The works would involve the reconstruction of a stretch of highway pavement 14km long and would include widening of the Highway along certain sections. It is envisaged that the proposed works for this upgrade would commence in approximately February 2005. In addition, the RTA is currently undertaking re-alignment works for the Castlereagh Highway at Lidsdale, approximately

30km south of Capertee. It is envisaged that these works would finish in early 2005. As a result of the coincidental timing of the works and their proximity, there is the potential for a number of positive and negative cumulative impacts to occur over the short and long term. These are discussed below:

Vegetation
The current Proposal would contribute to the cumulative environmental effect of the removal of native vegetation on the land surrounding the Castlereagh Highway. Up to 5ha of vegetation would be removed as part of the Proposal, although none of this vegetation community is listed under the TSC Act 1995 or the EPBC Act 1999. It is anticipated that the Proposal described in this REF would require the removal of only one individual *Eucalyptus cannonii*. However, the threatened *E. cannonii* species is found within the Castlereagh Highway area designated for a rehabilitation program approximately 45km north of Capertee. It is unknown at the time of writing this REF what the impact to this species would be within this future Proposal, however preliminary findings indicate the removal of up to fifteen (15) individuals may be required for this Proposal.

Visual Amenity
During construction, the three Proposals may run concurrently for a short period of time and considered together would have a greater impact on the visual amenity of the locality, as the impact area would be increased. However, the current Proposal would have a low visual impact as it is not located in an area of high visual amenity and the works are confined to a very small area i.e. only 1.1km. Landscape treatments for all works would minimise the impacts.

Socio-economic
During construction, the three Proposals considered together would affect the use of the Highway for road users, with delays in travel times likely in the short term. However the Proposals are at least 30km apart from one another and therefore the impacts are not likely to be perceived to any great extent by motorists. In addition, increased amounts of agricultural and residential land would be acquired as a result of the three Proposals. A long term positive cumulative impact would result from a reduction in the travel time and contribute to a reduction in accident rates on this section of the Castlereagh Highway

9.16 Operational Hazards and Risks

Operational hazards and risks may include an increase in the number of wildlife road strikes due to the isolation of a small block of vegetation to the east of the Proposal, and the encroachment of the Highway deeper into a wooded area. This may be further exacerbated by the increase in speed, attainable once the Highway alignment is changed. There are no waterways within the vicinity of the Proposal and as such the risk of pollution to such waterways by heavy vehicles is minimal to nil.

Improvements in risk and the degree of operational hazards are anticipated as a result of the Proposal. The improved vertical and horizontal alignment would reduce the severity of the crest and bend currently on the route and therefore reduce the risk of vehicle collisions and road run-offs at this Highway section.

9.17 Principles of Ecologically Sustainable Development

The National Strategy for Ecologically Sustainable Development (NSESD) has been formulated to ensure ESD is accounted for in all Proposals. There are three core objectives:

- to enhance individuals' and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;

- to provide for equity within and between generations; and
- to protect biological diversity and maintain essential ecological processes and life-support systems.

These objectives are complemented with a number of guiding principles that are considered below in Table 9.17.1 in terms of the Proposal.

Table 9.17.1: Principles of ESD Applied to the Proposal

Principle	Application to the Proposal
Precautionary Principle	In developing the concept design a route was chosen that minimised the potential environmental impacts as far as was practicable, during construction and operation of the Proposal. Detailed environmental studies have been undertaken as part of the preparation of this REF. No issues have been identified that would cause any serious or irreversible environmental damage as a result of the Proposal at this location. Tests for the significance of the impacts of the Proposal have been undertaken in regard to threatened species found in the region. No significant impacts are considered likely and the construction of the deviation would be managed to keep impacts to any threatened species to a minimum. The introduction of mitigative measures as outlined in Chapter 10 of this REF would ameliorate potential environmental impacts.
Intergenerational Equity	The Proposal would benefit the community by providing improvements in safety, access and travel conditions for existing and future generations. The Proposal would assist in maintaining the strategic, economic and tourism role of the Central West region, and be consistent in the overall upgrading of the Castlereagh Highway strategy. Concurrently, the Proposal considers and minimises impacts to the local environment through the introduction of mitigative measures to ensure the integrity of natural and social values of the environment for future generations.
Conservation of Biological Diversity & Ecological Integrity	The upgrade of the Castlereagh Highway considered within this REF has been the subject of investigations on the biological diversity and ecological integrity of the surrounding environment. Thorough assessment of the local ecology, along with consultation with key State Government agencies, has been undertaken to identify and manage any potential environmental hazards or risks associated with the Proposal. Ameliorative measures outlined in Chapter 10 of this REF would ensure that the Proposal does not significantly contribute to the loss of, or create an unacceptable risk to, an endangered community, threatened species or important fauna habitat.
Improved Valuation & Pricing of Environmental Resources	The criteria used in the option evaluation process focuses on a range of environmental and community factors, as well as using economic, traffic and engineering considerations. This approach has ensured that appropriate values have been attached to all environmental factors considered and assessed. The proposed route was selected in particular on the basis of minimal impact to flora and fauna and heritage items.

Principle	Application to the Proposal
	A number of specific mitigation measures would be undertaken to protect such resources. These include: • Keeping vegetation removal to a minimum so as not to create a barrier to fauna movement; and • Fencing of known heritage items in the area so as to protect them from disturbance during the construction phase. These measures reflect the value of environmental resources in accordance with best practice procedures adopted by the RTA.

9.18 Matters of National Environmental Significance (NES) and Commonwealth Land

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires that the following factors must be considered:

Matters of National Environmental Significance:

- World Heritage Properties;
- Wetlands of International Importance;
- Commonwealth Listed Threatened Species and Ecological Communities;
- Commonwealth Listed Migratory Species;
- Nuclear Actions; and
- Commonwealth Marine Areas.

Other Factors:

- Commonwealth Land;
- Regional Forest Agreements; and
- Conservation Reserves.

Details of the ecological assessment undertaken for this Proposal are presented in Section 9.5 of this report. The factors which need to be taken into account when considering the environmental impact of an activity on matters of NES are listed and considered in Section 11.2 of this report. A search of Environment Australia's EPBC Act Online Database was undertaken on 7 November 2003 using a 5km buffer. A summary of that search is provided below:

Threatened ecological communities:

Grassy White Box Woodland was recorded as a community that is likely to occur within the area, which is listed as endangered under the EPBC Act. During flora surveys of the proposed Highway corridor none of the tree species indicative of this woodland community were found. It was therefore concluded that no impact to this community would occur as a result of this Proposal.

Threatened species:

Twelve (12) threatened species were found during the study area search. One threatened flora species, *Eucalyptus cannonii,* was recorded within the study area, which is listed as vulnerable under the EPBC Act. An 'Assessment of Significance' was conducted for this species (refer to **Appendix C**) using Environment Australia guidelines. This concluded that a significant impact was unlikely as a result of the Proposal and a Referral under the EPBC Act would not be required.

Limited potential habitat for one (1) threatened fauna species, the Regent Honeyeater (*Xanthomyza phrygia*) as listed on the EPBC Act as endangered occurs within the study area.

An 'Assessment of Significance' was conducted for this species (refer to **Appendix C**) using Environment Australia guidelines. It concluded that the Proposal is unlikely to have a significant impact on these species and a Referral under the EPBC Act would not be required.

Migratory species:
Six (6) migratory species were found during the study area search. Limited potential habitat for the Regent Honeyeater (*X. phrygia*), as listed on the EPBC Act occurs within the study area. An 'Assessment of Significance' was conducted for these species (refer to **Appendix C**) using Environment Australia guidelines. It concluded that the Proposal is unlikely to have a significant impact on these species and a Referral under the EPBC Act would not be required.

Marine protected species:
Seven (7) marine protected species were found during the study area search. No marine protected species would be directly impacted upon as a result of the Proposal and indirect impacts would be minimised through the implementation of mitigation measures described in Section 9.4 of this report.

World Heritage areas:
One World Heritage area was found during the study area search, the *Greater Blue Mountains Area*. This does not occur within the vicinity of the Proposal area. There would be no impact on a World Heritage area because of the proposed works.

Ramsar sites:
One Ramsar site was found during the study area search, the *Macquarie Marshes Nature Reserve*. The Proposal study area occurs within the same catchment as this listed Ramsar site. However, no permanent water bodies would be affected by this Proposal and consequently there would be no impact on listed Ramsar wetlands as a consequence of the proposed works.

Commonwealth areas:
No Commonwealth areas are found within a 5km radial search of the study area.

Conservation reserves:
The *Gardens of Stone National Park* is located 3km east of the Proposal. It is not anticipated that this conservation reserve would be directly impacted upon as a result of the Proposal and any indirect impacts would be minimised through the implementation of mitigation measures described in Chapter 9 of this report.

Regional Forest Agreement:
No Regional Forest Agreement area is found within a 5km radial search of the study area.

9.19 Assistance to Assessing Officer

9.19.1 Summary of Key Issues

- Presence of a threatened flora species, *Eucalyptus cannonii* listed as vulnerable under both the TSC Act and EPBC Act, and the potential loss of one individual of this species;
- Potential for construction noise impacts on adjacent residents;
- Potential socio-economic impacts from disrupted access and traffic delays through the construction zone; and
- Presence of a heritage item in close proximity to the proposed Highway corridor.

9.19.2 Summary of Beneficial Effects

The beneficial effects resulting from the construction of the Proposal include:

- Encouraging road safety and assisting in the realisation of strategic framework goals as presented in *Action for Transport 2010 – an Intergrated Transport Plan for NSW* (DoT 1998);
- Improved safety of the alignment with the elimination of the dangerous horizontal and vertical curve in the highway;
- The Proposal would provide an opportunity to install improved drainage along the length of this section of the Highway;
- Improved travel times for vehicles travelling the Castlereagh Highway;
- Improved access for residents and safer intersections with the Highway; and
- The Proposal would provide long-term benefits to the social and economic development of the region.

9.19.3 Summary of Adverse Effects

The Proposal would result in some adverse effects, which would include:

- The removal of up to 5000m^2 of grassy woodland vegetation which includes a single specimen of *Eucalyptus cannonii*, a threatened flora species;
- Potential reduction in habitat and foraging areas for common native birds, reptiles and small mammals;
- Minor disruption of a potential habitat corridor in addition to an increased potential for road strikes, arising from the realignment of the Highway deeper into a vegetated area;
- The Proposal would require the acquisition of land (approximately 3.93ha) from private landowners and a small amount of Crown Land;
- A short-term increase in noise levels for residents during construction; and
- A short term disruption to traffic flow along the Castlereagh Highway during construction.

10 Implementation Stage

10.1 Summary of Proposed Safeguards

A Contractor's Environmental Management Plan (CEMP) would be developed in accordance with the specifications set out in the RTA's *Environmental Protection (Management Plan) – QA Specifications G36, Soil and Water Management (Erosion and Sediment Control Plan) – QA Specification G39* and *Clearing and Grubbing – QA Specification G40.* The CEMP would incorporate additional site-specific requirements, outlined below, which are not covered by G36, G39 or G40. The CEMP would be reviewed and certified by the RTA Environmental Adviser, Western Region, prior to the commencement of any site works.

Geology, Soils and Landform	• An Erosion and Sedimention Control Plan (ESCP) would be prepared as part of the CEMP prior to the commencement of construction. This ESCP would address the environmental requirements for any stripping, stockpiling and respreading of topsoil; • Should any spillage occur during the construction activity the Environmental Adviser, Western Region, would be contacted immediately, and contaminants would be immediately contained, removed, treated (if necessary) and disposed of to the satisfaction of the DEC; • The management of any temporary stockpiles would be in accordance with the RTA's Stockpile Management Procedures (November 2001); • Excavation works would not take place during heavy rainfall (where this would cause movement of soil off site as a result of erosion); • Exposed areas would be revegetated progressively and restored as work is completed. A cover crop of locally occurring native vegetation species or a suitable geo-textile fabric would be used to stabilise the batter slopes; and • Batters 2:1 and steeper would be treated with some form of organic erosion blanket or synthetic woven geo-textile to stabilise the slope and where feasible cleared native vegetation would be mulched and spread over exposed areas to aid in longer-term revegetation.
Climate	• In the event of heavy fog, works would be delayed until such time as the fog has satisfactorily dissipated.
Air Quality	• Stockpiles would be protected from wind erosion through dampening or covering; • Unsealed access roads, compound areas and other areas with traffic would be regularly dampened using water sprays; • Truck loads would be wet down or covered to suppress dust generation;

	• There would be no burning of any material on site; and • If winds are high and works are creating high levels of dust that are likely to cause discomfort to local residents or a safety hazard to traffic or work personnel, the works would be modified or stopped until the dust hazard is eliminated or has reduced to an acceptable level.
Water Quality and Hydrology	• Mud and dirt would be removed from the wheels and bodies of haulage equipment before they enter public roads or other sealed pavements. Any washing down of equipment would be undertaken on a grassed or bunded area.
Ecology	• Areas of native vegetation in proximity to construction areas would be fenced with protective fencing prior to work commencing in the area. The limits of protective fencing would be set at a maximum of 25m either side of the surveyed centreline; • Contractors would be instructed on the limits of clearing and not allowed to encroach into areas outside the identified road construction limits defined by the protective fencing. This includes preventing any materials or construction equipment from entering into protected areas; • Immediately prior to clearing, trees would be inspected by an ecologist to locate any tree hollows. Any tree hollows found would be inspected for presence of native fauna and any found would be relocated by a licensed ecologist; • Any tree hollows affected by clearing must be relocated to suitable undisturbed bushland sites adjacent to the Highway corridor; • Following the completion of works, the area disturbed would be rehabilitated and revegetated with locally indigenous grass and woodland species using locally collected seed stock. This would require the preparation of a Landscape Rehabilitation Plan to be carried out in liaison with DEC. The preparation of the Landscape Rehabilitation Plan would be managed by the RTA and prepared by a suitably qualified contractor satisfying the DEC criteria. Close consultation would be required between DEC, RTA and the contractor during preparation of the Landscape Rehabilitation Plan; • Suppression of Blackberry *Rubus fruticosus (agg. spp.)* shrubs listed as W3 on the noxious weeds register for the Lithgow Council area would be carried out for the entire footprint of the works to prevent the incursion of the identified weed into the newly excavated areas;

	• Site induction would be provided to all personnel prior to working on site. This induction should ensure that all site personnel observe the limits of clearing and are made aware of the importance of any trees of significant value. It would include general information on *Eucalyptus cannonii*, threats to their survival and the legislative penalties incurred following any damage or disturbance to them; and • Stockpile areas, compound sites and access tracks would be located in areas previously disturbed and that require no clearing of native vegetation. Care would be taken to not stockpile materials within five metres of any trees.
Socio-economic Considerations including Landuse	• Low speed traffic zones would be implemented before the works commence; • Construction traffic would enter and leave the site at two locations only; located at Ch 150 and 900 on the proposed alignment. These sites would be located to ensure good visibility for both construction traffic and other road users; • The entry and exit of large trucks delivering or removing machinery, concrete, etc would be controlled by Manual Traffic Controllers at all times; • Access would be maintained to private residences at all times during construction; • Local residents within the area of the proposed deviation that would have access disrupted during the construction of the Proposal would be notified by the RTA prior to construction and made aware of any revised travel paths. Consultation protocols described in *RTA Community Involvement: Practice Notes and Resource Manual* (1998) would be followed; and All property acquisition would be undertaken prior to construction and would be negotiated in accordance with the RTA's *Land Acquisition Policy* and compensation would be in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.
Indigenous Heritage	• In the event that any indigenous artefacts or items are located during the works, all work would cease in the vicinity of the find, and the RTA's Environmental Adviser, Western Region, Aboriginal Programs Consultant and NSW DEC would be contacted; • The scarred tree (CHC-ST1) must be identified in the field by an archaeologist or a BLALC representative prior to any works being undertaken. A curtilage must be delineated around this tree using a highly visual physical barrier (e.g.

	1m high orange roadwork fencing); and • All members of the construction team, including sub-contractors, machine operators and truck driver would undergo site induction concerning cultural heritage issues, prior to working on the site. An individual who has a good working knowledge of indigenous sites and of the legislation protecting them would preferably undertake this induction. This induction would inform site personnel of the location of the Aboriginal site, and of its legislative protection under Section 90 of the NSW National Parks and Wildlife Act 1974. These inductions would be recorded in a register, with all those present signing their complicity with these guidelines.
Non-Indigenous Heritage	• The three (3) known non-indigenous items must be identified and located in the field prior to any works being undertaken. A curtilage would be delineated around these items using a highly visual physical barrier (e.g. 1 m high orange roadwork fencing); • There would be no incursions of vehicles or machinery further than 35m west of the centreline. Care would also be taken when felling trees, ensuring that they fall away from the western edge of the works boundary; • Should any works, including utility relocations, be likely to impact upon any items of cultural heritage, a suitably qualified archaeologist would be consulted to conduct a heritage assessment of the significance of the recorded items and to detail any necessary mitigation strategy required; • In the event that any other non-indigenous artefacts or items are located during the works, all work would cease in the vicinity of the find, and the RTA's Environmental Adviser, Western Region, and a suitably qualified archaeologist would be contacted; and • Site personnel would be inducted as to the location of these sites and their legislative protection under the NSW Heritage Act. These inductions would be recorded in a register and signed off by all team members.
Visual, Landscape and Urban Design	• Design of the pavement and associated road infrastructure would be in line with existing road developments in the area, and sympathetic with regional design requirements for Highways; and • Revegetation of all exposed surfaces created during the Proposal including fill batters, cuttings and table drains would occur using native grass species.

Noise and Vibration	• The provision for a line of communication between the local community and Project Management would be established prior to construction; • Best management practice should be applied in development of a noise and vibration management plan (NVMP); and • Where work is conducted outside normal working hours and noise goal exceedances are predicted, all feasible and reasonable noise mitigation measures should be evaluated and included in the NVMP. If after the application of all feasible and reasonable noise mitigation measures, it is still predicted that there will be noise goals exceedances, the RTA's out of normal hours construction programming and consultation protocols should be followed.
Waste Minimisation and Management	• Unnecessary resource consumption would be avoided as a priority; • Where waste is created resource recovery would be employed (including re-use of materials, reprocessing, recycling and energy recovery). Examples for this project include: – recycling of waste road surface materials such as bitumen and asphalt and including them in the embankment construction on the proposed deviation; – reusing excavated material from the cutting as fill material to raise the grade level for the Proposal; – reuse of native branches and logs by placing them in nearby areas of vegetation to provide habitat for native species; – processing and reuse of mulched timber either within the Proposal or through sale or supply to Council or local businesses; and • Disposal would be undertaken as a last resort when the previous four options have been exhausted and where re-use is not acceptable. For example, exotic shrub species would be disposed of to a licensed landfill to prevent the spread of seeds.
Associated Infrastructure and Activities	• Affected residents would be provided with advanced notice of any service interruptions anticipated from the relocation of the power poles, by mail. This information would include the nature, date and expected duration of the interruption; • The "dial before you dig" hotline would be contacted prior to construction to confirm that no utility infrastructure would be affected by the earthworks; and

- Environmental impacts associated with the utility relocations would be subject to the same environmental safeguards concerning soil erosion, the protection of threatened flora and the protection of heritage artefacts that are applicable to the remainder of the Proposal.

11 Consideration of Environmental Factors

11.1 Clause 228 Checklist (NSW Legislation)

Factor	Impact
a) Any environmental impact on a community? **Comments:** In the short term there would be negative impacts on the community, including disruption to traffic flow along the Castlereagh Highway, an increase in ambient noise levels, in addition to minor, short term visual and air quality impacts.	Short term -ve
In the long term, local residents and the wider community would benefit from the Proposal through the provision of a safer and more comfortable Highway section.	Long term +ve
b) Any transformation of a locality? **Comments:** In the short term the Proposal would impact on the visual amenity of the study area through the removal of a wide tract of roadside vegetation, a change in the access arrangements for the Highway at this section and the use of the area by construction machinery.	Short term -ve
In the long-term the locality would be transformed by the Proposal through the relocation of the Highway alignment to the west and the acquisition of a minor amount of private land that is currently used only for grazing. However, the impact would be minor and the familiarization with these changes would occur in a relatively short time frame.	Long term Nil
c) Any environmental impact on the ecosystems of the locality? **Comments:** The Proposal would require the removal of grassy woodland vegetation and would result in the removal of a *Eucalyptus cannonii* specimen (a threatened species). However, with the introduction of mitigative measures (refer to Chapter 10 of this report) and the current design described within this report, the potential impact on this species would be considered to be minor.	Minor -ve
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? **Comments:** There would be a short-term negative impact on the aesthetic and environmental quality of the locality, as some vegetation would be removed.	Short term -ve
f) Any impact on the habitat of any protected or endangered fauna (within the meaning of the National Parks and Wildlife Act 1974? **Comments:** A small area of vegetation (approximately 5ha) would be removed as part of this Proposal. The vegetation within the study area would provide	Long-term Nil

Factor	Impact
shelter and foraging habitat for common birds, reptiles and small mammals. During the specialist fauna study the Great Pippistrelle Bat was detected using the site as a foraging ground. The Proposal is unlikely to impact on this species as the vegetation represents marginal habitat for this species, with higher quality habitat being located in the surrounding areas. With the introduction of mitigative measures (refer to Chapter 10 of this report), the potential impact on this species would be considered to be minor.	
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 Proposal would require the removal of approximately 3.93ha of a grassy woodland community (unlisted) and also require the removal of a single individual of the flora species *E. cannonii* (TSC Act and EPBC listed). Mitigative measures outlined in Chapter 10 of this REF would minimise the potential impacts on these communities.	Short-term -ve Long-term Nil
h) Any long-term effects on the environment? **Comments:** No long term negative effects on the environment are predicted upon completion of the works, provided the mitigation measures described within Chapter 10 of this report are adopted.	Nil
i) Any degradation of the quality of the environment? **Comments:** There would be a short-term negative impact on the local terrestrial environment as vegetation would be removed and disturbed. There would also be a small, short-term increase in noise levels experienced at some sensitive noise receptors within the study area during construction.	Short-term -ve Long-term Nil
j) Any risk to the safety of the environment? **Comments:** No risk to the safety of the environment is likely during the proposed construction works. The Proposal has been designed in response to an unacceptable safety record over this section of the Castlereagh Highway. The elimination of curves is expected to dramatically improve the safety of this section of the Highway, during operation.	Long-term +ve
k) Any reduction in the range of beneficial uses of the environment? **Comments:** The Proposal would require the acquisition of approximately3.9ha of private and crown land. Therefore, a small reduction in the range of beneficial uses of the environment would result. To minimise property impacts and prevent severance, the section of land to be acquired runs close to the existing alignment.	Minor -ve
l) Any pollution of the environment? **Comments:** During construction, the Proposal has a minor potential to pollute the soil and the air. The mitigation measures outlined in Chapter 10 of this report	Minor -ve

Factor	Impact
would reduce or eliminate those impacts.	
m) Any environmental problems associated with the disposal of waste? **Comments:** All waste generated by the Proposal would be reused and recycled where possible and disposed of in an appropriate manner where recycling is not possible. There would be no environmental problems associated with the disposal of waste.	Nil
n) Any increased demands on resources, natural or otherwise which are, or are likely to become in short supply? **Comments:** There would be no increased demand on resources, natural or otherwise, which are, or are likely to become in short supply as a result of the Proposal.	Nil
o) Any cumulative environmental effect with other existing or likely future activities? **Comments:** The Proposal construction timing is likely to overlap with other upgrades to sections of the Castlereagh Highway located 40km north and 30km south of the Proposal. As a result of the coordinated timing of the works and their proximity, there is the potential for a number of negative cumulative impacts to occur, especially during the construction period. These impacts are described in Section 9.15 of this report. In a regional context, and with mitigation measures to ameliorate effects, the contribution of the Proposal to the above environmental effects is anticipated to be minor.	Short term -ve
However, in the long term it is anticipated that there would be a positive cumulative effect. This would result from a more efficient road network and a safer environment for users of the Highway.	Long term +ve

11.2 EPBC Act 1999 (Commonwealth Legislation)

The EPBC Act requires that the following matters of National Environmental Significance (NES) be considered:

Factor	Impact
a) Any environmental impact on a World Heritage property? **Comments:** The nearest World Heritage property is the Greater Blue Mountains Area, found within 5km of the Proposal. However, the Proposal would have no impacts to this area due to the minor nature of the works and the distance between it and the works.	No
b) Any environmental impact on wetlands of international importance? **Comments:** The closest wetland of international importance is Macquarie Marshes Nature Reserve, which is located approximately 250km northeast of the Proposal. The wetland would not be impacted upon as a result of the Proposal.	No
c) Any environmental impact on Commonwealth listed threatened species or ecological communities? **Comments:** One threatened flora species, *Eucalyptus cannonii,* was recorded within the study area, which is listed as vulnerable under the EPBC Act. The Proposal would involve the removal of up to five (5) individuals of this species. An 'Assessment of Significance' was conducted for this species (refer to **Appendix C**) using Environment Australia guidelines. This concluded that a significant impact was unlikely as a result of the Proposal and a Referral under the EPBC Act would not be required.	Yes Minor -ve
Grassy White Box Woodland Community, was recorded as a community that is likely to occur within the area and is listed as endangered under the EPBC Act. During flora surveys of the proposed Highway corridor none of the tree species indicative of this woodland community were found. It was therefore concluded that no impact to this community would occur as a result of this Proposal. No other threatened ecological community or species would be impacted upon as a result of the Proposal.	No
d) Any environmental impact on Commonwealth listed migratory species? **Comments:** Limited potential habitat for one migratory species (Regent Honeyeater) as listed on the EPBC Act occurs within the study area. However, an 'Assessment of Significance' was conducted for this species using Environment Australia guidelines. It concluded that the Proposal is unlikely to have a significant impact on these species.	No
e) Does any part of the Proposal involve a nuclear action? **Comments:** The Proposal does not involve a nuclear action.	No

Factor	Impact
f) Any environmental impact on a Commonwealth marine area? **Comments:** The study area is located approximately 100km inland therefore there would be no environmental impact on any Commonwealth Marine area.	No
In addition, any impact on Commonwealth land? **Comments:** No Commonwealth land would be affected, indirectly or directly, as a result of the Proposal.	No

12 Certification

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

C Havelock

Christopher Havelock
Environmental Officer
04/03/04

I have examined this Review of Environmental Factors and the certification by Christopher Havelock and accept the Review of Environmental Factors on behalf of the RTA.

S Sreekantapathy

S. Sreekantapathy
Project Manager

Date: 11/03/04

13 References

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Roads & Traffic Authority 2001d, *NSW Roads and Traffic Authority Action for Transport 2010 - An Integrated Transport Plan for NSW.*

Appendix A

Site Photographs

Photo 1: *View north along Castlereagh Highway approximately 100m from the southern limit of the proposed works. Note the proximity of St Jude's Church to the road corridor.*

Photo 2: *View of vegetation community at approximate Chainage 200 adjacent to the cleared power line easement.*

Photo 3: *View of vegetation community at approximate Chainage 350.*

Photo 4: *View east to the southbound lane of the Highway. The residential dwelling is the closest to the proposed works. The pavement would become an access track for the residents currently fronting the Highway.*

Photo 5: *View of vegetation community at approximate Chainage 700 near the northern limits of the proposed works.*

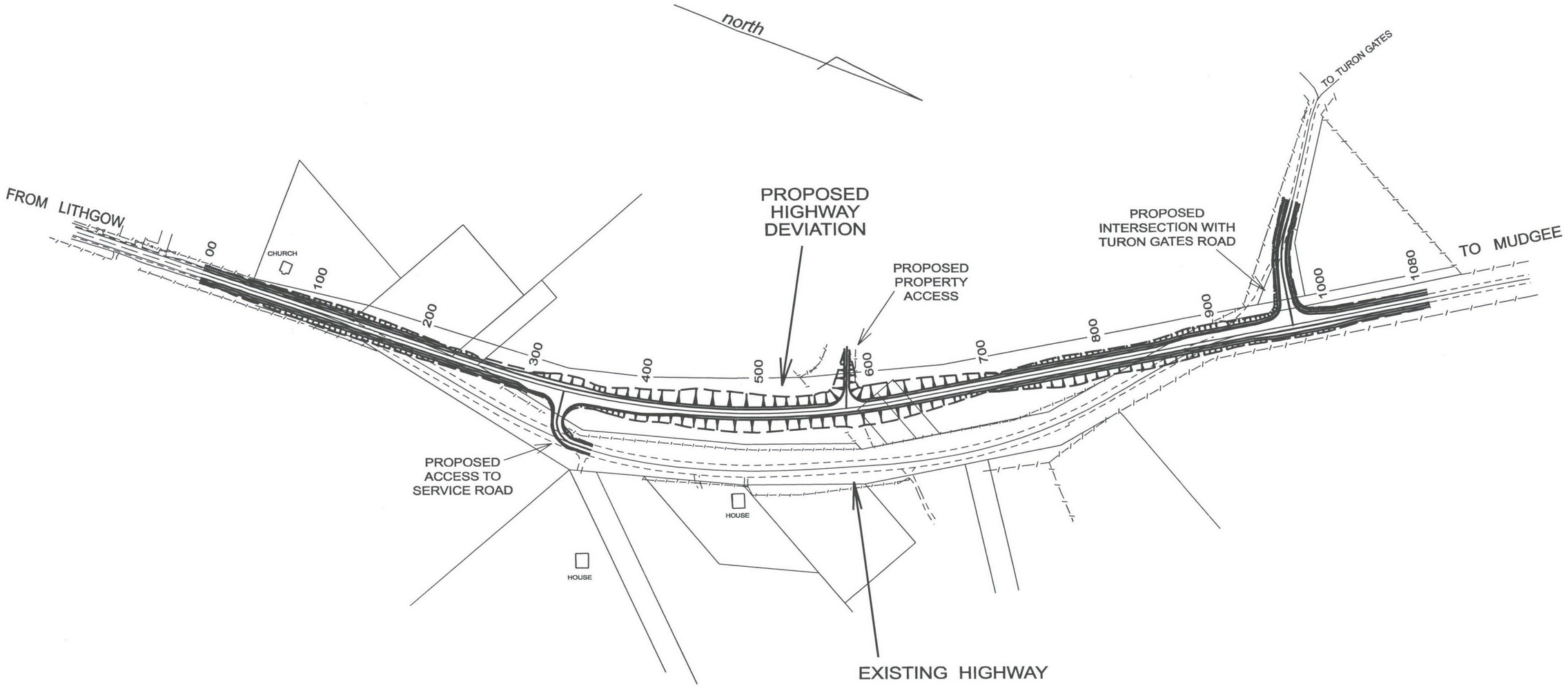
Photo 6: *View south to section in the Highway known as the 'Capertee Crest' at approximate Chainage 650. Note the short sight distances for travelling vehicles.*

Photo 7: *View of Turon Gates Road intersection at approximate Chainage 950 near the northern limits of the proposed works.*

Photo 8: *View of proposed compound site area adjacent to Turon Gates Road near the northern limits of the proposed works.*

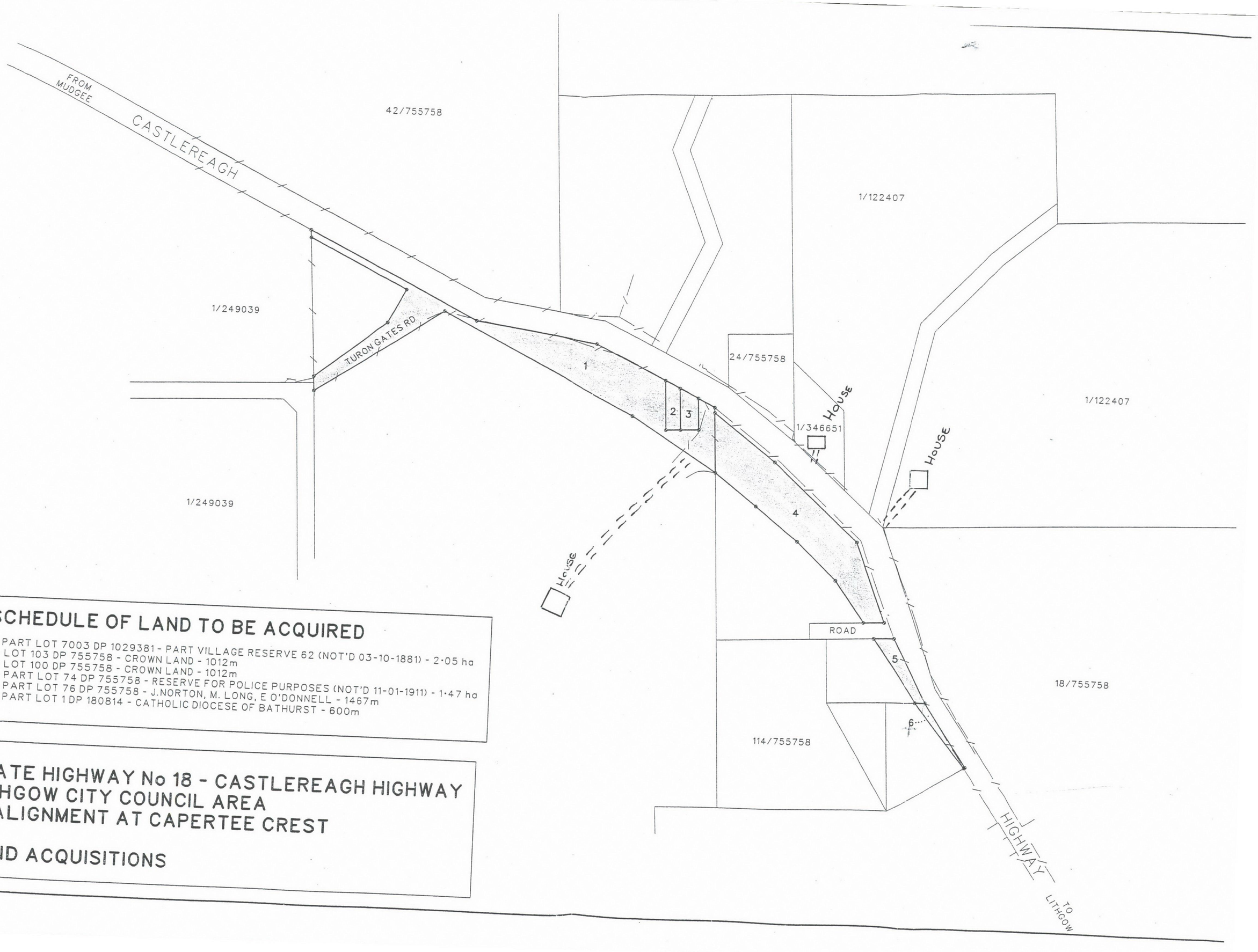
Appendix B

Concept Design & Land Acquisition



PLAN
not to scale

STATE HIGHWAY No 18 - CASTLEREAGH HIGHWAY
PROPOSED DEVIATION AT CAPERTEE CREST
1 km NORTH OF CAPERTEE
(44.8 km TO 45.9 km NORTH OF LITHGOW)



SCHEDULE OF LAND TO BE ACQUIRED

LOT 1 - PART LOT 7003 DP 1029381 - PART VILLAGE RESERVE 62 (NOT'D 03-10-1881) - 2·05 ha
LOT 2 - LOT 103 DP 755758 - CROWN LAND - 1012m
LOT 3 - LOT 100 DP 755758 - CROWN LAND - 1012m
LOT 4 - PART LOT 74 DP 755758 - RESERVE FOR POLICE PURPOSES (NOT'D 11-01-1911) - 1·47 ha
LOT 5 - PART LOT 76 DP 755758 - J.NORTON, M. LONG, E O'DONNELL - 1467m
LOT 6 - PART LOT 1 DP 180814 - CATHOLIC DIOCESE OF BATHURST - 600m

STATE HIGHWAY No 18 - CASTLEREAGH HIGHWAY
LITHGOW CITY COUNCIL AREA
REALIGNMENT AT CAPERTEE CREST

LAND ACQUISITIONS

Appendix C

Ecological Assessment (Flora)

FLORA STUDY OF THE ROUTE FOR A PROPOSED DEVIATION OF THE CASTLEREAGH HIGHWAY NORTH OF CAPERTEE, NSW

Prepared For: Roads and Traffic Authority
Bowenfels Works Centre
15-33 Cooerwul Road
BOWENFELS NSW 2790

By: Geoff Cunningham Natural Resource Consultants Pty Ltd,
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January, 2004

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EXECUTIVE SUMMARY

On the basis of the flora survey conducted in November and December, 2003, the assessment of the samples obtained in December, 2003, the data obtained from the National Parks and Wildlife Service and EPBC databases and the details of Endangered Ecological Communities provided by the NSW Scientific Committee and the EPBC Act Schedules, it is concluded that one tree of one Threatened flora species [*Eucalyptus cannonii*] exists within the study area

It is further concluded that the proposed work associated with the deviation of the Castlereagh Highway will not have a significant impact on the survival of *Eucalyptus cannonii* in the Capertee area or within its distribution range given the number of individuals of this species that exist within the range.

No Endangered Ecological Communities, Endangered Populations of flora or Critical Habitat exist within the study area.

Completion of the 8-Part Test [NSW Threatened Species Conservation Act] and an assessment under the Commonwealth Environment Protection and Biodiversity Conservation Act indicates that there will be no significant impact on any Threatened flora species, Endangered Populations of flora, Endangered Ecological Communities or Critical Habitat resulting from the proposed work.

FLORA STUDY OF THE ROUTE FOR A PROPOSED DEVIATION OF THE CASTLEREAGH HIGHWAY NORTH OF CAPERTEE, NSW

1.0 INTRODUCTION:

Geoff Cunningham Natural Resource Consultants Pty Ltd was engaged by the RTA, Bowenfels to provide advice on the possible occurrence of the Threatened tree *Eucalyptus cannonii* [Cannon's Stringybark, Capertee Stringybark] within the area proposed to be used for construction of a deviation of the Castlereagh Highway just to the north of Capertee.

The brief was later expanded in scope to cover the preparation of a full flora study of the proposed highway deviation corridor with appropriate discussion of threatened species issues.

2.0 A PROFILE OF *Eucalyptus cannonii*

Johnson and Blaxell [1973] note that *Eucalyptus cannonii* was first collected by R.T.Baker in 1892 in the Mount Vincent area near Rylstone and then again at Rylstone in 1895. The description of the species is based on the most complete specimen collected by Baker.

This species was first described as a form of Red Stringybark [*Eucalyptus macrorhyncha*] but Baker [1919] later separated it as *Eucalyptus cannonii.*

Subsequently the species has been reduced to subspecies rank and more recently in the Flora of New South Wales [2002] it has once again been given full species rank.

Hunter and White [1999] note that the main distinguishing characteristics that separate *Eucalyptus cannonii* from *Eucalyptus macrorhyncha* are the fewer flowered umbels [3-7 as opposed to 7-11], shorter pedicels [1-4mm as opposed to 2-8mm], the usually larger distinctly angular buds and the usually larger fruits with a distinct and prominent medial rim.

There are other differences between the species including the length of the pedicel of the umbellaster.

Hunter and White [1999] provide a discussion of the habitat and distribution of *Eucalyptus cannonii*. They also note that there are populations of this species reserved in Wollemi and Gardens of Stone National Parks and in Winburndale Nature Reserve.

These authors also discuss the reputed propensity for hybridisation exhibited by *Eucalyptus cannonii*. Putative [reputed] hybrids between *Eucalyptus cannonii* and a large number of other eucalypts have been recognised - particularly with *Eucalyptus macrorhyncha, Eucalyptus sparsifolia and Eucalyptus tenella.*

Hunter and White [1999] note that it is likely that *Eucalyptus cannonii* was rare prior to European settlement and that it is presently adequately conserved as most of the situations in which it occurs are unlikely to be cleared for agricultural purposes. They recommend that the classification of 'vulnerable' [Schedule 2] under the *Threatened Species Conservation Act,* 1995 is no longer appropriate.

The difficulty in separating true specimens of *Eucalyptus cannonii* from hybrids and some forms of *Eucalyptus macrorhyncha* is quite considerable and at times leads to doubts about the true identity of particular trees or groups of trees.

In fact specimens with fruit that appear to be without doubt *Eucalyptus macrorhyncha* when collected can change to be good specimens of *Eucalyptus cannonii* when dry.

3.0 DETAILS OF THE INITIAL *Eucalyptus cannonii* STUDY

3.1 General

A 1050 metre long corridor between the existing Castlereagh Highway pavement and a surveyed western boundary of a proposed deviation of the Highway [**the study area**] was inspected on 7th November, 2003 to ascertain the identity of the Stringybark trees growing within the corridor.

The study area commenced to the south of the small galvanised iron Catholic Church on the northern outskirts of Capertee at a point marked on the pavement as indicating ST94. [**Figure 1**]

The northern end of the study area was delineated by a marker indicating ST 97.

The southern part of the study area [south of the church] has been cleared for agriculture.

To the north of the church, for some distance, the proposed deviation route appears to largely coincide with the area that had apparently been cleared by Telstra in the past as a route for above-ground telephone lines. Remnants of posts were noted. [*Subsequently, this route appears to have been used as an underground cable corridor.*]

This once-cleared corridor supports few large trees but a good regeneration of eucalypt saplings and other shrubs.

The previously cleared corridor diverges to the west in the northern section of the current study area with the result that the proposed road deviation passes through remnant bushland in the north.

The field survey revealed the occurrence of Stringybark trees along the entire corridor although in the southern section there were fewer trees and these were on or near the present road reserve or near the western boundary of the corridor cleared by Telstra.

Further to the north the proposed deviation route passes through moderately densely timbered land.

3.2 Identity of the Stringybark Trees at the Site

3.2.1 General

It should be emphasised that the task of identifying *Eucalyptus cannonii* is a difficult one even with an abundance of flowering and new fruits because of the intergrades between this species and Red Stringybark [*Eucalyptus macrorrhyncha*] and other eucalypts.

There was a lack of recent fruits on the ground and on trees - probably due to last year's drought.

The fruit material that could be found was very scarce and often weathered with the result that identification was often inconclusive.

3.2.2 Results of Initial Field Survey

[a] Church to Chainage approx. 650

From the fruits on the ground [as no flowers were available] it was evident that the Stringybark trees within the study area from the church to approximately chainage 650m [ie. just north of the Private Road] appeared to be a mixture of *Eucalyptus cannonii* and *Eucalyptus macrorhyncha* or hybrids, with two types of fruit at times being found under the same isolated tree.

[b] Chainage approx. 650 to Northern Extremity

From about chainage 650 to the northern extremity of the study area another Stringybark - *Eucalyptus sparsifolia* [Narrow-leaved Stringybark].

Eucalyptus sparsifolia is not endangered and so poses no issues under the Threatened Species Conservation Act, 1995.

3.2.3 Determinations of the National Herbarium

On Friday 8th November, 2003 a limited number of fruit specimens collected in the study area were examined at the NSW National Herbarium by eucalypt expert Dr Ken Hill.

Dr Hill was of the view that there were some of the fruits that had been collected that could definitely be called *Eucalyptus cannonii* but that others were "probably *Eucalyptus cannonii*". His determination was tempered by the weathered nature of the fruits and the lack of flowers [particularly unopened buds].

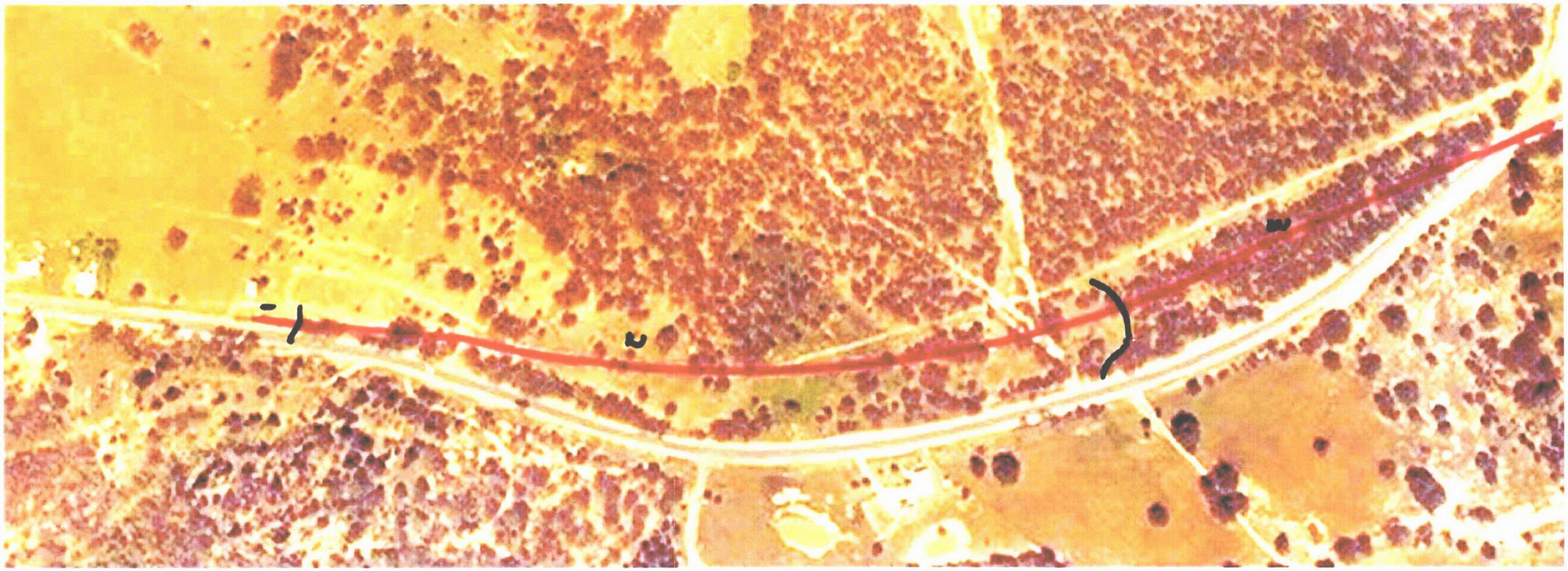

FIGURE 1 - VEGETATION COMMUNITIES AND LOCATION

1 - Community 1

2 - Community 2

3 - Community 3

4.0 SUBSEQUENT "*Eucalyptus cannonii*" STUDY [Assessment of the Stringybark Specimens from the Study Area]

4.1 Study Details

After the results of the initial study appeared somewhat inconclusive with regard to the identity of the Stringybark trees on the southern section of the study area, the RTA hired a "cherrypicker" and operator on 12th December, 2003 to obtain fruit samples from all of the Stringybark trees on the southern section of the study area that were likely to be affected by the proposed roadworks.

The southern section of the proposed deviation was the only area of concern as the Stringybark community further north did not contain *Eucalyptus cannonii* trees.

Samples of leaves and fruit were taken from 26 trees but few had any buds present. The remaining four trees in the study area were young saplings and did not have fruit at sampling.

The samples were dried for some weeks as previous experience has shown that the fruits of *Eucalyptus cannonii* can change quite dramatically in shape during the drying process.

4.2 Results of Subsequent "*Eucalyptus cannonii*" Study

4.2.1 Methodology

The twenty six specimens [leaves and fruit] collected within the study area were examined under a binocular microscope in January, 2004 after they had had adequate time to dry out after collection.

For each specimen a large range of characteristics was examined to ascertain whether the trees present within the study area were true samples of *Eucalyptus cannonii*.

The characteristics observed and measured were:

- number of flowers [capsules] per umbellaster
- size of the fruit
- leaf width and length
- characteristics of leaf venation
- pedicel length
- peduncle length
- fruit shape
- presence or absence of the flange on the disc

The samples from the Stringybarks growing on the southern section of the study area were examined in detail by myself due to the unavailability of Dr Ken Hill. The results of the determinations are contained in **Table 1**.

In addition the original description of this species in Hardwoods of Australia [Baker, 1919] was consulted. This description is as follows:

"An average forest tree with typical "Stringybark", abnormal leaves ovate to broadly lanceolate, up to 5 inches long, acuminate, recurved at the tip, shining, petiolate, venation well marked, oblique, prominent veins distant, intramarginal veins well removed from the edge, oil glands very numerous, normal leaves oblique, with mostly parallel edges, with a prominent acuminative coriaceous venation strongly marked, lateral veins oblique, distant marginal vein removed from the edge, spotted by insect punctures, as in *E. camphora* R.T.B.

Inflorescence axillary, about six flowers in the umbel on a peduncle about an inch long; buds rather large, calyx and pedicel quadrangular, operculum strongly acuminate; stamens red, anthers renantherous.

Fruits large, over half inch in diameter, rim pronouncedly domed, edge of capsule conspicuously broadly flanged. Illustrated in "Eucalypts and their Essential Oils", Baker and Smith, under *E. macrorhyncha.* Fruits shown under Fig. 5 of that work."

This species was first considered a form of *Eucalyptus macrorhyncha* with larger and conspicuously flanged fruits. It was considered to be a "grandiflora" form of *Eucalyptus macrorhyncha* and was illustrated in Maiden [1907] [figure 39 diagrams 15 and 19a].

Blakely [1965] provides a more detailed description of the species and emphasises presence of a distinct projecting flange on the fruit in *Eucalyptus cannonii* compared with *Eucalyptus macrorhyncha.* Other aspects such as differences in number of flowers per umbellaster, pedicel and peduncle length and peduncle shape are also described.

Figure 39 of Maiden [1907] shows the very definite flange of *Eucalyptus cannonii* fruit. The photo in Brooker and Kleinig [1999] and the diagram in Harden [2002] also illustrate this feature.

4.2.2 Results of Examination

Of the specimens examined from the Capertee study area, only one - number 21 - showed the characteristic fruit shape described originally for *Eucalyptus cannonii.* Even then this specimen exhibited other characteristics that differed slightly from the published description.

All of the other specimens showed combinations of characteristics that suggested that while they may be related to *Eucalyptus cannonii*, they were sufficiently different to not be determined as this species. ***It is likely that they are hybrids of this species and other eucalypts growing in the vicinity as noted by Hunter and White [1999].***

One feature noted during the examination of these Capertee specimens was that fruits differed in shape on the one tree and even in the one umbellaster, again suggesting some sort of hybridisation process in progress. This provides the answer to the riddle of the different fruits under a single isolated tree that was posed after the original field study.

4.2.3 Legal Position on Hybrids

Advice has been taken from the NSW Department of Environment and Conservation's Threatened Species Unit [Robert Humphries pers.comm.] that hybrids are not legally considered to form part of the genetic material of *Eucalyptus cannonii*

and so are not protected under the provisions of the Threatened Species Conservation Act, 1995.

4.2.4 Conclusion

It is concluded that only one tree that can truly be ascribed to *Eucalyptus cannonii* is present in the study area. The remainder are hybrids and not subject to protection under the provisions of the Threatened Species Conservation Act, 1995.

This tree, number 21, is located on the existing road reserve to the north of the opening in the fence [gateway] to the north of the Capertee Catholic Church yard's northern fence. The location is 185 metres north and 17 metres west of the position of the south gate post of the entry to the Capertee Catholic Church and so it may not be affected by the proposed roadworks.

Table 1
Identity of the Stringybarks Sampled at the Study Area

SPECIMEN NUMBER	LOCATION EASTING/ NORTHING	IDENTITY
1	777883E / 6328706S	sapling - no sample
2	777883E / 6328706S	sapling - no sample
3	777883E / 6328706S	sapling - no sample
4	777884E / 6329767S	hybrid
5	777884E / 6329767S	sapling - no sample
6	777881E / 6328770S	hybrid
7	77879E / 6328768S	hybrid
8	777871E / 6328771S	hybrid
9	777877E / 6328776S	hybrid
10	777878E / 6328785S	hybrid
11	777880E / 6328785S	hybrid
12	777876E / 6328787S	hybrid
13	777876E / 6328792S	hybrid
14	777876E / 6328790S	hybrid
15	777872E / 6328796S	hybrid
16	777871E / 6328810S	hybrid

Table 1 [cont]
Identity of the Stringybarks Sampled at the Study Area

17	7778872E / 6328815S	hybrid
18	777869E / 6328823S	hybrid
19	777853E / 6328874S	hybrid
20	777851E / 6328881S	hybrid
21	777855E / 6328891S	*Eucalyptus cannonii*
22	777846E / 6328890?S	hybrid
23	777833E / 6328966S	hybrid
24	777829E / 6328992S	hybrid
25	777804E / 6328965S	hybrid
26 [TWO TREES]	777773E / 6329210 - 11S	hybrid
27	777765E / 6329030S	hybrid
28	777749E / 6329109S	hybrid
29	777710E / 6329134S	hybrid
30	777696E / 6329144S	hybrid

5.0 OVERALL FLORA STUDY OF THE CORRIDOR

5.1 Previous Vegetation Descriptions of the Capertee Area

The area lies just outside the western boundary of the Wallerawang 1:100 000 vegetation map sheet area produced by Benson and Keith [1990] that is the most westerly published vegetation mapping for this part of New South Wales.

There are no other published descriptions of the vegetation of the area.

However, the vegetation of the study area probably equates to Benson and Keith's Scribbly Gum [*Eucalyptus rossii*] – Stringybark [*Eucalyptus sparsifolia*] Woodland that is described as follows:

"On the drier western aspects of the Triassic sandstone plateaus and extending onto Permian sandstones further west is woodland with *Eucalyptus rossii* [Scribbly Gum] and *E. oblonga* [now *sparsifolia*] [Stringybark]. It is particularly common in Ben Bullen

State Forest. Rainfall is less than 900 mm p.a. and, generally, this vegetation occurs on upper ridge slopes where soils are dry, shallow, infertile sandy loams. *Eucalyptus sieberi* and *E. piperita* may be found around sandstone outcrops and in small gullies, where soils are slightly deeper and better-drained. Southerly aspects may have E. *macrorhyncha*.

On the sandstone plateau the understorey is shrubby with *Oxylobium ilicifolium, Acacia buxifolia, A. terminalis, Boronia microphylla, Dillwynia phylicoides, Monotoca scoparia, Leucopogon muticus, Brachyloma daphnoides* and *Persoonia linearis*. Groundcover species include *Chionochloa pallida, Lomandra multiflora, L. glauca, Pseudognaphalium luteo-album* and *Dianella revoluta*. Where *E. rossii* and *E. oblonga* [*sparsifolia*] extend onto Permian sediments this unit intergrades with the Tablelands Grassy Woodland Complex and grasses predominate in the understorey, particularly *Chionochloa pallida* but also with *Agrostis avenacea, Dichelachne rara, Echinopogon ovatus, Poa sieberiana* and *Austrostipa* species."

5.2 Details of the Present Study

The study area was divided into a number of recognisable sections as outlined in **Table 2**. The sections relate to the start and finish points for the proposed deviation, surveyed chainages and the location of the Capertee Catholic Church. Sections were used rather than fixed small quadrats to obtain a better record of the flora species - especially the trees - that were present in the corridor.

Following the field survey it was possible to identify three plant communities within the study area. These were:

Community 1 - Open Grassland - Highly Invaded By Introduced Species

Community 2 - Capertee Stringybark [*Eucalyptus cannonii*] - Red Stringybark [*Eucalyptus macrorhyncha*] - Broad-leaved Peppermint [*Eucalyptus dives*] - Apple Box [*E. bridgesiana*] - Brittle Gum [*Eucalyptus praecox*]

Community 3 - Narrow-leaf Stringybark [Eucalyptus *sparsifolia*] - Scribbly Gum [*Eucalyptus rossii*] - Grey Gum [*Eucalyptus punctata*] Community

The locations of the three communities are shown in **Figure 1**.

5.3 Community Descriptions

5.3.1 Community 1 - Open Grassland - Highly Invaded By Introduced Species

This community occurs between the deviation commencement point and the Capertee Catholic Church. It is mainly cleared farmland with scattered Apple Box [*Eucalyptus bridgesiana*].

Shrubs are basically absent with some scattered *Rubus* spp. * [Blackberry] and *Rosa rubiginosa* [Briar Rose] bushes present.

Ground cover species include *Paspalum dilatatum** [Paspalum], *Bromus molliformis** [Silky Brome], *Cynodon dactylon** [Couch Grass], *Echium plantagineum** [Paterson's Curse], *Geranium homeanum, Triptilodiscus pygmaeus* [Common Sunray], *Hypochaeris radicata** [Flatweed], *Sanguisorba minor* ssp. *muricata** [Salad Buurnet], *Sonchus oleraceus** [Sowthistle], *Sonchus asper** [Prickly Sowthistle], *Tragopogon*

*porrifolius** [Salsify], *Trifolium campestre** [Hop Clover] and *Trifolium dubium** [Yellow Suckling Clover].

A complete list of ground cover species recorded from this community is contained in **Table 3.**

5.3.2 Community 2 - Capertee Stringybark [*Eucalyptus cannonii*] - Red Stringybark [*Eucalyptus macrorhyncha*] - Broad-leaved Peppermint [*Eucalyptus dives*] - Apple Box [*E. bridgesiana*] - Brittle Gum [*Eucalyptus praecox*] Community

This community extends from the Capertee Catholic Church to north of a private road at about chainage 650 - 700. It is partly cleared along the Telstra corridor and not cleared closer to the to the Castlereagh Highway.

Trees include *Eucalyptus bridgesiana* [Apple Box], *Eucalyptus rossii* [Scribbly Gum], *Eucalyptus dives* [Broad-leaved Peppermint], *Eucalyptus punctata* [Grey Gum], *Eucalyptus praecox* [Brittle Gum], some *Eucalyptus rubida* [Ribbon Gum] and *Pinus* sp.* [Pines]. Scattered trees of *Eucalyptus ?cannonii hybrids* occur mainly on the area within and immediately adjacent to the existing highway reserve. A single tree determined to be *Eucalyptus cannonii* occurs along the existing road reserve.

Shrub species present include *Acacia decurrens* [Black Wattle], *Cassinia arcuata* [Chinese Shrub], *Rosa rubiginosa** [Briar Rose], *Rubus* spp.* [Blackberry], *Olearia elliptica* [Sticky Daisy Bush], *Leptospermum continentale* [Tea Tree], *Bursaria spinosa* [Native Blackthorn], *Astroloma humifusum* [Native Cranberry], *Bossiaea buxifolia, Pultenaea microphylla*, *Cassinia leavis* [Cough Bush], *Acacia dawsonii* [Poverty Wattle], *Acacia implexa* [Hickory Wattle], *Daviesia latifolia* and *Ozothamnus diosmifolius* [Pill Flower].

Ground cover species include *Anthoxanthum odoratum** [Sweet Vernal Grass], *Aristida jerichoensis* var. *jerichoensis* [Jericho Wiregrass], *Senecio quadridentatus* [Cotton Fireweed], *Poranthera microphylla*, *Austrodanthonia caespitosa* [White-top], *Pterostylis bicolor*, [*Calotis cuneifolia* [Purple Burr-daisy], *Dianella revoluta* [Spreading Flax-lily], *Triptilodiscus pygmaeus* [Common Sunray], *Holcus lanatus** [Yorkshire Fog], *Hypericum gramineum* [Small St. John's Wort], *Leucochrysum albicans* ssp. *albicans* var. *albicans* [Hoary Sunray], *Lomandra confertifolia* ssp. *pallida*, *Poa sieberiana* var. *sieberiana* [Fine-leaf Tussock Grass], *Stackhousia viminea* [Slender Stackhousia], *Diuris sulphurea* [Tiger Orchid], *Caladenia gracilis* [Musky Caladenia], *Brachycome heterodonta* var. *heterodonta* [Lobe-seed Daisy] and *Wurmbea dioica* [Early Nancy].

A complete list of ground cover species recorded from this community is contained in **Table 3.**

5.3.3 Community 3 - Narrow-leaf Stringybark [Eucalyptus *sparsifolia*] - Scribbly Gum [*Eucalyptus rossii*] - Grey Gum [*Eucalyptus punctata*] Community

This community extends from the northern extremity of Community 2 [approximate chainage 650 - 700] to the northern point of the study area where the proposed deviation meets the existing Highway.

This community is generally uncleared although some trees may have been removed in the past. The Telstra corridor turns to north-west at the southern extremity of this community

Tree species include *Eucalyptus punctata* [Grey Gum], *Eucalyptus rossii* [Scribbly Gum], *Eucalyptus sparsifolia* [Narrow-leaf Stringybark], *Eucalyptus dives* [Broad-leaved Peppermint]. *Eucalyptus praecox* [Ribbon Gum] and occasional *Eucalyptus macrorhyncha* [Red Stringybark] near southern end in the community intergrade area.

Shrub species include *Astroloma humifusum* [Cranberry Heath], *Cassinia laevis* [Cough Bush], *Hardenbergia violacea* [False Sarsaparilla], *Acacia terminalis* [Sunshine Wattle], *Ozothamnus diosmifolius* [Pill Flower], *Persoonia linearis, Pultenaea microphylla, Acacia dawsonii* [Poverty Wattle], *Billardiera scandens* [Apple Berry], *Bossiaea buxifolia*, *Brachyloma daphnoides* [Daphne Heath], *Cassytha pubescens* [Common Devil's-twine], *Hibbertia obtusifolia* [Hoary Guinea-flower], *Hovea heterophylla, Leptomeria acida* [Native Currant], *Persoonia linearis* [Narrow-leaved Geebung] and *Podolobium ilicifolium* [Native Holly].

Ground cover species include *Themeda australis* [Kangaroo Grass], *Calotis cuneifolia* [Purple Burr-daisy], *Chrysocephalum apiculatum* [Yellow Buttons], *Diuris sulphurea* [Tiger Orchid], *Dianella revoluta* [Spreading Flax-lily], *Echinopogon ovatus* [Forest Hedgehog Grass], *Caladenia gracilis* [Musky Caladenia], *Thelymitra megacalyptra*, *Goodenia hederacea* var. *hederacea* [Forest Goodenia], *Poa sieberiana* var. *sieberiana* [Fine-leaf Tussock Grass], *Stackhousia viminea* [Slender Stackhousia], *Leucochrysum albicans* ssp. *albicans* var. *albicans* [Hoary Sunray] and *Lomandra confertifolia* ssp. *pallida.*

A complete list of ground cover species recorded from this community is contained in **Table 3.**

Table 2

Tree and Shrub Occurrence in Sampled Sections

SECTION	SAMPLED SECTION	EASTING / NORTHING	TREE AND SHRUB LAYER DESCRIPTION
1	between ST94 and Church gate	777927E / 6328649S to 777898 / 6328716	Treeless; *Eucalyptus bridgesiana* [Apple Box] nearby; scattered *Rubus* sp * [Blackberry] and *Rosa rubiginosa** [Briar Rose]
2	Church yard [paddock] [Church gate post to survey chainage 200	777898 / 6328716 to 777853 / 6328867	Scattered *Pinus* sp. [Pine], Eucalypts on roadside include *Eucalyptus macrorhyncha* [Red Stringybark], Apple Box, *Eucalyptus cannonii* [Capertee Stringybark] hybrids and *Eucalyptus praecox* [Brittle Gum]. Shrubs include Blackberry*, *Acacia decurrens* [Black Wattle], *Dillwynia phylicoides, Gompholobium grandiflorum, Bossiaea buxifolia*
3	chainage 200 to chainage 250	777853 / 6328867 to 777838 / 6328917	Red Stringybark, *Eucalyptus rossii* [Scribbly Gum], Apple Box. Shrubs include Black Wattle and *Bursaria spinosa* [Native Blackthorn]

Note: all chainages relate to centre line pegs

Table 2 [cont]

Tree and Shrub Occurrence in Sampled Sections

SECTION	SAMPLED SECTION	EASTING / NORTHING	TREE AND SHRUB LAYER DESCRIPTION
4	chainage 250 to chainage 300	777838 / 6328917 to 777817 / 6328961	Mainly previously cleared; many eucalypt trees and saplings including Brittle Gum, Red Stringybark, Capertee Stringybark and hybrids, Apple Box on margins; Black Wattle, Pine*, Scribbly Gum. Shrubs include *Acacia dawsonii* [Poverty Wattle], *Olearia elliptica* [Sticky Daisy Bush], *Ozothamnus diosmifolius* [Pill Flower], *Brachyloma daphnoides* [Daphne Heath], *Hovea heterophylla, Hardenbergia violacea* [False Sarsaparilla], Briar Rose, Blackberry
5	chainage 300 to chainage 350	777817 / 6328961 to 777798 / 6329008	*Eucalyptus rubida* [Ribbon Gum], Red Stringybark, Brittle Gum, many eucalypt saplings *Eucalyptus dives* [Broad-leaf Peppermint]. Shrubs Blackberry, Native Blackthorn, Briar Rose
6	chainage 350 to chainage 450	777798 / 6329008 to 777750 / 6329086	Capertee Stringybark hybrid, Ribbon Gum, Broad-leaf Peppermint, many eucalypt saplings Shrubs Black Wattle, Briar Rose
7	chainage 450 to chainage 500	777750 / 6329086 to 777716 / 6329135	Ribbon Gum, Brittle Gum, Capertee Stringybark hybrids, eucalypt saplings Shrubs *Leptospermum continentale* [Tea Tree], Blackberry
8	chainage 500 to chainage 550 and private rd	777716 / 6329135 to 777686 / 6329170	Red Stringybark, Ribbon Gum, Capertee Stringybark hybrids, eucalypt saplings Shrubs, Black Wattle, Tea Tree, Blackberry
9	PRIVATE ROAD and sides	777647E / 6329189S	Red Stringybark, Capertee Stringybark hybrid, Ribbon Gum, Broad-leaf Peppermint, Brittle Gum, Shrubs Blackberry, *Daviesia latifolia, Cassinia laevis* [Cough Bush]
10	private road to chainage 650	777647 / 6329189 to 777615 / 6329250	Red Stringybark, Brittle Gum, Broad-leaf Peppermint Shrubs Blackberry, *Bossiaea buxifolia*
11	chainage 650 to chainage 700	777615 / 6329250 to 777572 / 6329272	*Eucalyptus sparsifolia* [Narrow-leaf Stringybark], Brittle Gum, Red Stringybark, Broad-leaf Peppermint, *Daviesia latifolia,* Cough Bush
12	chainage 700 to chainage 760	777572 / 6329272 to 777527 / 6329315	Scribbly Gum, *Eucalyptus punctata* [Grey Gum], Narrow-leaf Stringybark, *Hibbertia obtusifolia* [Hoary Guinea-flower], *Podolobium ilicifolium* [Native Holly], *Billardiera scandens* [Apple Berry], *Persoonia linearis* [Narrow-leaved Geebung], Black Wattle, *Astroloma humifusum* [Cranberry Heath]

Table 2 [cont]

Tree and Shrub Occurrence in Sampled Sections

SECTION	SAMPLED SECTION	EASTING / NORTHING	TREE AND SHRUB LAYER DESCRIPTION
13	Chainage 760 to chainage 801.5	777527 / 6329315 to 777501 / 6329341	Grey Gum, Small-fruited Stringybark, Shrubs Cough Bush, Native Holly, Apple Berry, Narrow-leaved Geebung
14	chainage 801.5 to chainage 850	777501 / 6329341 to 777452 / 6329361	Grey Gum, Small-fruited Stringybark, Brittle Gum. Shrubs Cough Bush, Native Holly, Apple Berry, Narrow-leaved Geebung, Pill Flower, *Leptomeria acida*
15 and 16	chainage 850 to ST 97	777452 / 6329361 to 777246 / 6329567	Grey Gum, Small-fruited Stringybark, Scribbly Gum. Shrubs *Cassytha pubescens.* [Devil's Twine], False Sarsaparilla, Native Holly, Narrow-leaved Geebung, *Acacia terminalis* [Sunshine Wattle], Poverty Wattle, *Pultenaea microphylla*, *Xanthorrhoea* sp.

Note: all chainages relate to centre line pegs

Table 3

Ground Cover Species Recorded from the 16 Sections [S] Within the Study Area

NOTE: 'P' denotes *present*; 'A' denotes *not recorded*

SPECIES	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
*Aira elegantissima** [Delicate Hairgrass]	P	P	P	P	A	A	A	A	P	A	A	A	A	A	A	A
*Anagallis arvensis** [Scarlet Pimpernel]	A	P	P	A	A	P	A	A	A	A	A	A	A	A	A	A
*Anthoxanthum odoratum** [Sweet Vernal Grass]	A	A	A	P	P	P	P	P	P	A	A	A	A	A	A	A
Aristida jerichoensis var. *jerichoensis* [No. 9 Wiregrass]	P	P	A	P	A	A	A	A	A	A	A	A	A	P	A	A
Asperula conferta [Common Woodruff]	P	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Austrodanthonia caespitosa [Whitetop]	P	P	P	A	A	A	A	A	A	A	A	A	A	A	A	A
Avena spp.* [Wild Oats]	P	A	A	A	A	A	A	A	A	A	A	A	A	A	P	A
*Briza maxima** [Quaking Grass]	P	A	A	A	A	A	A	A	P	A	A	A	A	A	P	P
*Briza minor** [Shivery Grass]	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A
*Bromus molliformis** [Silky Brome]	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Caladenia gracilis [Musky Caladenia]	A	A	P	A	A	A	A	A	P	P	P	P	P	P	A	A
Calotis cuneifolia [Yellow Burr-daisy]	A	P	P	A	P	P	A	A	P	A	A	A	A	P	A	A
Carduus tenuiflorus [Winged Slender Thistle]	A	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
Hydrocotyle laxiflora [Stinking Pennywort]	A	P	A	A	A	A	A	A	A	P	A	A	A	A	A	A
Cerastium glomeratum* [Mouse-ear Chickweed]	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Chamaesyce drummondii [Caustic Weed]	A	A	A	A	A	A	A	A	A	P	A	A	A	A	A	A
Chionochloa pallida [Silvertop Wallaby Grass]	A	A	A	A	A	A	A	A	A	A	A	A	A	P	P	A
Chrysocephalum apiculatum [Yellow Buttons]	A	P	A	A	A	A	A	A	A	A	P	A	A	P	A	P
*Cynodon dactylon** [Couch Grass]	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
*Dactylis glomerata** [Cocksfoot]	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	P
Brachycome heterodonta var. *heterodonta* [Lobed-seed Daisy]	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Dianella revoluta [Spreading Flax-lily]	A	A	P	A	A	A	A	A	P	P	A	A	P	P	A	P
Dichelachne rara	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Dichondra repens [Kidney Weed]	A	A	A	A	A	A	A	A	A	P	A	A	A	A	A	A

Table 3

Ground Cover Species Recorded from the 16 Sections [S] Within the Study Area

NOTE: 'P' denotes *present*; 'A' denotes *not recorded*

SPECIES	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
Dichopogon strictus [Nodding Chocolate Lily]	A	A	A	A	A	A	A	A	P	A	A	A	A	A	A	A
Diuris sulphurea [Tiger Orchid]	A	A	P	A	A	A	A	A	P	P	A	A	P	A	P	P
Echinopogon ovatus [Forest Hedgehog Grass]	A	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
*Echium plantagineum** [Paterson's Curse]	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	P
Elymus scaber [Common Wheatgrass]	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Geranium homeanum	P	P	P	A	A	P	A	A	A	P	A	A	A	A	A	A
Goodenia sp.	A	P	A	P	A	A	A	A	A	A	A	A	P	A	P	P
Goodenia hederacea var. *hederacea* [Forest Goodenia]	A	A	A	A	A	A	A	A	A	A	A	A	A	P	A	A
Heilchrysum scorpioides [Button Everlasting]	A	A	A	A	A	A	A	A	A	A	P	A	A	A	A	A
Triptilodiscus pygmaeus [Common Sunray] 1,	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
*Holcus lanatus** [Yorkshire Fog]	A	A	P	A	A	P	A	A	A	A	A	A	A	A	A	A
Hypericum gramineum [Small St. John's Wort]	A	P	A	P	A	A	A	A	A	P	A	A	A	P	A	A
*Hypericum perforatum** [St. John's Wort]	P	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
*Hypochaeris glabra** [Smooth Cat'sear]	A	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
*Hypochaeris radicata** [Flatweed]	P	A	P	A	A	P	P	A	A	A	A	A	A	A	A	A
Leucochrysum albicans ssp. *albicans* var. *albicans* [Hoary Sunray]	A	P	P	A	A	A	A	A	P	P	P	P	P	P	P	P
Lomandra confertifolia ssp. *pallida* [Matrush]	A	P	A	P	P	A	A	A	A	A	A	A	P	A	A	A
Lomandra longifolia [Spiny-headed Matrush]	A	P	A	A	P	P	A	A	A	A	A	A	A	A	A	P
Luzula flaccida [Grass-leaved Sedge]	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Oxalis sp. [Wood Sorrel]	A	A	A	A	A	A	A	A	P	A	A	A	A	A	A	A
*Paspalum dilatatum** [Paspalum]	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
*Plantago lanceolata** [Ribwort]	P	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
Plantago sp. [native]	A	A	A	A	A	P	A	A	A	A	A	A	A	A	P	P
Poa sieberiana var. *sieberiana* [Tussock Grass]	A	P	P	A	A	A	P	P	P	P	P	P	A	A	P	P
Poranthera microphylla	A	A	A	P	A	A	A	A	P	A	P	A	P	A	A	A
Pterostrylis bicolor	A	P	A	P	A	A	A	A	A	A	A	A	A	A	A	A

Table 3

Ground Cover Species Recorded from the 16 Sections [S] Within the Study Area

NOTE: 'P' denotes *present*; 'A' denotes *not recorded*

SPECIES	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
Rumex brownii [Slender Dock] 3,	A	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
Sanguisorba minor ssp. *muricata** [Salad Burnet]	P	P	A	P	A	A	A	A	A	A	A	A	A	A	A	A
Senecio quadridentatus [Cotton Firerweed]	A	A	A	A	P	A	A	A	A	A	A	A	A	A	A	A
*Sherardia arvensis** [Field Madder]	A	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
*Sonchus asper** [Prickly Sowthistle]	P	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
*Sonchus oleraceus** [Common Sowthistle]	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Stackhousia viminea [Slender Stackhousia]	A	P	A	A	A	A	A	A	A	P	P	A	P	A	A	
Stylidium graminifolium [Trigger Plant]	A	A	A	A	A	A	A	A	P	A	A	A	A	A	A	
Thelymitra megacalyptra	A	A	A	A	A	A	A	A	A	A	A	A	A	A	P	P
Themeda australis [Kangaroo Grass]	P	P	P	A	A	A	A	A	A	A	A	A	A	A	P	A
*Tragopogon porrifolius** [Salsify]	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
*Trifolium arvense** [Haresfoot Clover]	A	A	A	P	A	A	A	A	A	A	A	A	A	A	A	A
*Trifolium campestre** [Hop Clover]	P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
*Trifolium dubium** [Yellow Suckling Clover]	P	P	A	A	P	A	A	A	A	A	A	A	A	A	A	A
*Verbena bonariiensis** [Wild Stattice]	A	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
Veronica gracilis	A	A	A	A	A	P	A	A	A	A	A	A	A	A	A	A
Wahlenbergia communis [Tufted Bluebell]	A	A	P	A	A	A	A	A	A	A	A	A	A	A	A	A
Wahlenbergia stricta [Tall Bluebell]	A	P	A	A	A	A	A	A	A	P	A	P	A	A	P	
Wurmbea dioica [Early Nancy]	A	P	P	A	A	P	A	A	A	A	A	A	A	A	A	A

6.0 THREATENED AND PROTECTED SPECIES ISSUES

6.1 NSW Threatened Species Conservation Act [TSC Act]

A listing of threatened flora species, Endangered Ecological Communities, Endangered Populations and Critical Habitat obtained from the Department of Environment and Conservation [National Parks and Wildlife Service] 'Atlas of NSW Wildlife ' indicates that a number of Threatened flora species and communities have been recorded, or are predicted to occur, in the region surrounding the study area

6.1.1 Threatened Species Recorded from a 20km x 20km Square Centred on the Study Area

Four threatened flora species are recorded as occurring in this area. These species are:

- *Eucalyptus cannonii* [Capertee Stringybark] -21 records from 14 localities [including Capertee Village; 2.5km south Capertee; 8km south of Capertee; 4km north-west of Capertee; 5km north of Capertee; 6km and 8km east of Capertee; 5km north-east of Capertee; 3km and 5km south-east of Ben Bullen; 6km and 6.5km south-east of Capertee; 6km east north-east of Capertee; 5km north-east of Capertee;]

- *Persoonia marginata* - one record from approx. 1.5km south-east of Capertee.

- *Prostanthera stricta* - 14 records from four locations [including 2km south of Genowlan Point; near Genowlan Mountain; 1km south-east of Airly Turret; Airly Turret]

- *Pultenaea* sp. 'Genowlan Point' - two records from Genowlan Point

These species are discussed in **Table 4.**

6.1.2 Species Predicted to Occur Using the BIOCLIM Model

The following threatened flora species are predicted to occur within the area of the Bathurst [8831] 1: 100 000 scale map sheet area using the Department of Environment and Conservation [National Parks and Wildlife Service] BIOCLIM model and so are assessed in this report. [data not available for Wallerawang sheet]

Calotis glandulosa
Dichanthium setosum
Eucalyptus cannonii
Eucalyptus pulverulenta
Eucalyptus robertsonii ssp. hemishpaerica
Goodenia macbarronii
Homoranthus darwinioides
Pilularia novae-hollandiae
Swainsona recta
Thesium australe

These species are discussed in **Table 4**.

6.1.3 Endangered Ecological Communities

The following Endangered Ecological Communities are predicted to occur within the Bathurst [8831] and Wallerawang [8931] 1: 100 000 scale map sheet areas.

- Warkworth Sands Woodland in the Sydney Basin Bioregion
- Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions
- Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion
- Quorrobolong Scribbly Gum Woodland in the Sydney Basin Bioregion
- Melaleuca armillaris Tall Shrubland in the Sydney Basin Bioregion
- Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion
- Shale/Sandstone Transition Forest in the Sydney Basin Bioregion
- Sydney Coastal River-Flat Forest
- Cumberland Plain Woodland
- Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion
- Genowlan Point *Allocasuarina nana* Heathland
- Kurri Sand Swamp Woodland in the Sydney Basin Bioregion
- Mount Gibraltar Forest in the Sydney Basin Bioregion
- Robertson Basalt Tall Open-forest in the Sydney Basin Bioregion
- Robertson Rainforest in the Sydney Basin Bioregion
- Southern Highlands Shale Woodlands in the Sydney Basin Bioregion
- Sydney Coastal Estuary Swamp Forest in the Sydney Basin Bioregion
- Sydney Freshwater Wetlands in the Sydney Basin Bioregion
- Western Sydney Dry Rainforest in the Sydney Basin Bioregion
- Castlereagh Swamp Woodland Community
- Sun Valley Cabbage Gum Forest in the Sydney Basin Bioregion
- Shale gravel Transition Forest in the Sydney Basin Bioregion
- Moist Shale Woodland in the Sydney Basin Bioregion
- White Box Yellow Box Blakely's Red Gum Woodland
- Duffys Forest Ecological Community in the Sydney Basin Bioregion
- Illawarra Subtropical Rainforest in the Sydney Basin Bioregion
- Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion

6.1.4 Endangered Populations

- *Pultenaea villifera* in the Blue Mountains LGA
- *Keraudrenia corrolata* var. *denticulata* in the Hawkesbury Local Government Area

6.1.5 Critical Habitat

Nil.

6.2 Commonwealth Environment Protection and Biodiversity Conservation Act [EPBC Act]

A listing of Threatened flora species and Threatened Ecological Communities likely to occur within a 20km radius of the site was obtained from the Environment Australia Database in an EPBC Act Protected Matters Report.

In addition, details of any World Heritage Properties or Wetlands of International Significance with the vicinity were obtained.

The Protected Matters Report indicates that the following Threatened Species and Threatened Ecological Communities have been recorded in the region around the study area or are predicted to occur there.

6.2.1 Threatened Species

Acacia flocktoniae
Eucalyptus cannonii
Grevillea obtusiflora
Microtis angusii
Philotheca ericifolia
Pomaderris brunnea
Prostanthera stricta
Pultenaea campbellii
Pultenaea glabra
Thesium australe

These species are discussed in **Table 4.**

6.2.2 Threatened Ecological Communities

- Grassy White Box Woodlands

6.2.3 Nearby World Heritage Properties

The Protected Matters Report indicated proximity to the Greater Blue Mountains Area NSW World Heritage Site.

6.2. Associated Wetlands of International Significance

The Protected Matters Report indicates that the Macquarie Marshes Nature Reserve is within the same catchment as the delineated 20km radius serch area around the study area.

7.0 RESULTS OF THE PRESENT SURVEY

7.1 Threatened Species

Of the species listed under the TSC Act or the EPBC Act as being recorded from the region surrounding the proposed access track site [or predicted to occur there] only *Eucalyptus cannonii* [Capertee Stringybark] was recorded during the survey.

As previously discussed, there are a number of trees present within the study area that superficially appear to resemble *Eucalyptus cannonii* but on closer examination were determined not to be that species but hybrids.

7.2 Endangered / Threatened Ecological Communities

None of the Endangered / Threatened Ecological Communities listed under the TSC Act or the EPBC Act as likely to occur in the region surrounding the study area were recorded during the survey.

7.3 Endangered Populations

None of the Endangered Populations listed under the TSC Act as likely to occur in the region surrounding the study area were recorded during the survey.

7.4 Nearby World Heritage Properties

The work proposed for the study area will not impact on the Greater Blue Mountains Area NSW World Heritage Site.

7.4 Associated Wetlands of International Significance

The proposed Castlereagh Highway deviation is located within the same catchment as the Macquarie Marshes Nature Reserve [RAMSAR Site]. Provided the works are carried out in a manner that minimises sediment and other pollutant loss from the site during the construction and rehabilitation periods there will be no significant impact on this distant RAMSAR site.

7.5 Critical Habitat

There is no Critical Habitat present at the study area.

TABLE 4
Assessment of the Likelihood of Occurrence of Threatened Flora Species Within the Study Area

SPECIES	ASSESSMENT
Acacia flocktoniae	Erect or spreading shrub, 2 - 3 m high. Harden 2002] notes that it flowers usually June - August and grows in dry sclerophyll forest on sandstone, in the Blue Mountains from Mount Wilson south to the Picton district. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Calotis glandullosa	This species grows in grasslands and sclerophyll forest at higher altitudes, from Eden to the Dubbo area [Harden, 1992]. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Dichanthium setosum	Occurs chiefly in woodlands and grasslands on the Northern Tablelands and more rarely on the North-western Slopes and Plains and Central Western Slopes [Vickery, 1981; Harden, 1993]. Recorded from the Mudgee area. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Eucalyptus cannonii	Recorded from the Central Tablelands. Locally frequent but apparently restricted in its distribution. Occurs in sclerophyll woodland on shallow soils on rises in the Rylstone to upper Wolgan Valley areas. Recorded occurrences some kilometres to the north of the study area near Ben Bullen, Cullen Bullen and Capertee. Similar in appearance to Red Stringybark [*Eucalyptus macrorhyncha*]. The species was recorded during field inspection of the study area. **IT IS CONCLUDED THAT THIS SPECIES IS PRESENT WITHIN THE STUDY AREA.**
Eucalyptus pulverulenta	Tree or mallee to 10m high, bark smooth, grey or bronze, shedding in long ribbons. A rare species that occurs in scattered small stands in the understorey of grassy woodland on relatively poor soil, from Bathurst to Bombala. [Harden, 1993]. AN UNLIKELY OCCURRENCE given its normal range of occurrence. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**

TABLE 4 [cont]
Assessment of the Likelihood of Occurrence of Threatened Flora Species Within the Study Area

SPECIES	ASSESSMENT
Eucalyptus robertsonii ssp. haemispherica	A tree to 30m high, bark persistent on trunk and larger branches or throughout, grey to grey-brown, shortly fibrous ["peppermint"], smooth above, grey, shedding in long strips. Locally frequent; in grassy or dry sclerophyll woodland or forest on lighter soils, often on granite; to the east and south-east of Orange and Bathurst [Harden 1991]. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Goodenia macbarronii	Harden [1992] notes that this species is recorded from the Central Tablelands Botanical Subdivision. It grows in damp sandy soils south from the Guyra and Inverell districts. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Grevillea obtusiflora	A rhizomatous shrub 20-100cm high, rarely 2m; found as localised populations in the Kandos area [Harden, 2002]. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Homoranthus darwinioides	This species grows in dry sclerophyll forest or woodland; usually on sandstone outcrops or ridges, from the Putty district to Dubbo and is recorded from Goonoo State Forest north-east of Dubbo. AN UNLIKELY OCCURRENCE.. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Microtis angusii	Ground orchid to 25-60cm high, flowers May to October, originally known from a site at Ingleside in Sydney; discussions with Dr David Jones of the Centre for Biodiversity Research in Canberra indicates that other populations though to be this species are not and that it is very unlikely that many other populations will be found. An UNLIKELY OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Persoonia marginata	A spreading to decumbent shrub that grows in dry sclerophyll forest on sandstone; restricted to the area between Kandos and Portland [Harden, 2002]. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Philotheca ericifolia	A shrub that grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies, in the upper Hunter Valley and Pilliga to Peak Hill district [Harden, 1991] also on rocky hilltops [Cunningham pers.comm.] A POSSIBLE OCCURRENCE. The species was not recorded during field inspection, suitable habitat is absent and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Pilularia novae-hollandiae	A widespread but not common herb found in seasonally dry depressions and margins of marshes; may grow submerged [Harden, 1990] Recorded from swampy areas in the Urana, Rand, Bulgandry, Howlong, Lake Urana, Balldale, Henty, Albury, Walbundrie and Urangeline areas.; also recorded from the Central Tablelands. An UNLIKELY OCCURRENCE due to the lack of swampy areas within the study area. The species was not recorded during the field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Pomaderris brunnea	Shrub to 2-3m high; occurs in open forest, confined to the Colo River area and upper Nepean River [Harden, 2000]. AN UNLIKELY OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Prostanthera stricta	A more or less erect shrub to 2m high and 3m diameter; flowers winter - spring; grows in sclerophyll forest, in sandy alluvium near watercourses; Widdin Valley district; populations are often clonal [Harden, 1992]. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection, suitable habitat is absent and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Pultenaea campbellii	A shrub that grows in dry sclerophyll forest on light gravelly soil in the New England district from Glen Innes to Nundle [Harden, 1991]. Harden [2002] notes that the species is now included within *Pultenaea setulosa* which is widespread and occurs in coastal, tablelands and western slopes botanical subdivisions as far west as Gilgandra. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**

TABLE 4 [cont]
Assessment of the Likelihood of Occurrence of Threatened Flora Species Within the Study Area

SPECIES	ASSESSMENT
Pultenaea glabra	An erect shrub that is currently subject to further research; appears to be a complex of a number of species or forms; *Pultenaea glabra* in the strictest sense may be restricted to the upper Blue Mountains [Harden, 2001]; grows in dry sclerophyll forest on sandstone; higher Blue Mountains and Glen Davis area [Harden 1992]. A POSSIBLE OCCURRENCE. The species was not recorded during field inspection, suitable habitat is absent and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Swainsona recta	This species occurs on grassland and open woodland sites and often on stony hillsides. It has been recorded from Mount Arthur near Wellington [Cunningham, pers. comm.]. Harden [1991] notes its occurrence in the South-west Slopes, Central-west Slopes and Southern Tablelands Botanical Subdivisions. A POSSIBLE OCCURRENCE. The species was not recorded during the field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**
Thesium australe	Recorded from the Central-west Slopes Botanical Subdivision [Harden, 1992]. It flowers spring - summer and grows in grassland or woodland, often in damp sites. A POSSIBLE OCCURRENCE. The species was not recorded during the field inspection and there are no records of its presence within the study area in the past. **IT IS CONCLUDED THAT THIS SPECIES IS NOT PRESENT WITHIN THE STUDY AREA.**

8.0 EIGHT PART TEST

The likelihood of the occurrence of Threatened flora species within the study area has been assessed in **Table 4.** These assessments have been supplemented with field observations.

Some of the study area has been highly modified from its original condition as a consequence of its use as a corridor for telephone lines and cables and as a road reserve. The remainder has been probably little modified except for possible timber cutting in the past.

Field observations recorded one tree of the Threatened flora species - *Eucalyptus cannonii* - although there were no past records of any Threatened flora species being recorded from the study area.

There are no remnants of Endangered [TSC Act] or Threatened [EPBC Act] Ecological Communities and no Threatened Flora Populations or areas of Critical Habitat present within the study area.

The outcome of the assessments and field survey *observations has been the conclusion that* ***only one*** *of the Threatened flora species recorded or predicted to occur in the wider region around the study area occurs at the site.*

For the purposes of the Environmental Planning and Assessment Act the following factors must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

[a] in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable population of the species is likely to be placed at risk of extinction,

One tree of *Eucalyptus cannonii*, a listed Threatened flora species [NSW Threatened Species Conservation Act, 1995; Commonwealth EPBC Act, 1999] was recorded

during the field survey although there were no previous records of collections of this species from the study area.

There is a population of undoubted hybrids of this species and other eucalypts [probably with *Eucalyptus macrorhyncha* and / or *Eucalyptus sparsifolia*] - both of which are present in the study area. These hybrids are not legally regarded as having protection under the Threatened Species Conservation Act, 1995.

The proposed work may require the removal of the single *Eucalyptus cannonii* tree that is located on the existing Castlereagh Highway road reserve. However, given the number of trees of this species that are conserved in nearby conservation reserves [Hunter and White, 1990] its removal will **not significantly** disrupt the life cycle of the local or regional population of this species to the extent that a viable population of the species is likely to be placed at risk of extinction,

[b] in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,

No Endangered Flora Populations have been listed in the Schedules of the NSW Threatened Species Conservation Act for the study area. As a consequence, the proposed work will not disrupt / compromise the life cycle of any local endangered plant populations.

[c] in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,

The study area provides habitat for the Threatened plant species, *Eucalyptus cannonii.* One tree of this species occurs at one site within the study area - within the existing Castlereagh Highway road reserve. The habitat of this species has already been modified by the construction of the Castlereagh Highway to the east and the Telstra line / cable corridor to the west.

The proposed work will not modify or remove a significant area of known habitat for this species because only a single tree occurs there. There are large areas of habitat for this species conserved in conservation reserves and other sites in the district.

The study area does not provide significant habitat for any Endangered Plant Population. No Endangered Populations of flora are listed for the study area, and none were recorded during field survey, and so there will not be any significant modification or removal of such habitat.

No Endangered Ecological Communities are present within the study area.

[d] whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community,

The subject area constitutes a known habitat for the threatened plant species, *Eucalyptus cannonii.* It does not constitute a known habitat for any Endangered Plant Population or Endangered Ecological Community.

The proposed work, while it may result in the removal of a single *Eucalyptus cannonii* tree, will not result in any more significant isolation of habitat for Threatened flora species than currently exists in view of the tree's location in a road corridor between the existing road and a previously cleared Telstra corridor.

[e] whether critical habitat will be affected,

No Critical Habitat exists within the study area. Therefore the proposed work will not affect critical habitat.

[f] whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves [or similar protected areas] in the regional environment of the species, population or community,

Hunter and White [1999] provide a discussion of the habitat and distribution of *Eucalyptus cannonii*. They note that there are populations of this species reserved in Wollemi and Gardens of Stone National Parks and in Winburndale Nature Reserve. It is estimated that at least 6000 individuals exist in Winburndale Nature Reserve and that, in all, well in excess of 10, 000 individuals occur across its range.

Hunter and White [1999] note that it is likely that *Eucalyptus cannonii* was rare prior to European settlement and that it is presently adequately conserved as most of the situations in which it occurs are unlikely to be cleared for agricultural purposes. They recommend that the classification of 'vulnerable' [Schedule 2] under the *Threatened Species Conservation Act,* 1995 is no longer appropriate.

[g] whether the development or activity is of a class of development or activity that is recognised as a threatening process,

'Clearing of Native Vegetation' has been listed as a Key Threatening Process on Schedule 3 to the Threatened Species Conservation Act.

'Land Clearance' is also listed as a Key Threatening Process under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999.

The proposed work will involve clearing of the minimal amount of vegetation necessary to meet road construction and highway safety standards.

A single tree of *Eucalyptus cannonii* will probably be cleared, depending on its location in relation to the final road alignment and associated work areas. The impact of this clearing will not have a significant impact on the overall population of *Eucalyptus cannonii* in the Capertee area.

[h] whether any threatened species, population or ecological community is at the limit of its known distribution,

No. The study area is well within the area in which *Eucalyptus cannonii* is recorded - as can be seen from the Atlas of NSW Wildlife records. Hunter and White [1999] note that the species has a range of distribution from east of Mudgee to east of Bathurst - a distance of 100km. The study area is located at about the centre of this range.

9.0 EPBC ACT ANALYSIS

One tree of *Eucalyptus cannonii* has been recorded within the study area.

The following analysis of impact takes into account the criteria to be considered in relation to actions affecting flora species listed as vulnerable under the EPBC Act.

The action:

[a] **is not likely to lead to a long-term decrease in the size of an important population of a species** as only one tree is proposed to be cleared. The species is well represented in surrounding areas and in nearby conservation reserves, or

[b] **is not likely to reduce the area of occupancy of an important population** as the current population in the vicinity of the proposed works will only marginally impinge in the area occupied by this species, or

[c] **is not likely to fragment an existing important population into two or more populations** as the occurrences of this species are disjunct through the surrounding community and the population is not regarded as an important one, or

[d] **is not likely to adversely affect habitat critical to the survival of a species** [*Eucalyptus cannonii*] as this site is not habitat critical to the survival of this community in a local, regional or national sense. The overall condition of the community in which this tree occurs is poor and the trees are scattered in their occurrence. There are many conserved trees of this species in conservation areas within the region. The numbers of these species in such areas have prompted Hunter and White [1999] to recommend the removal of this species from the NSW Threatened Species Conservation Act schedules, or

[e] **is not likely to disrupt the breeding cycle of an important population** as the single tree affected here is not part of an important population, or

[f] **is not likely to modify, destroy, remove or isolate or decrease the availability or quantity of habitat to the extent that the species is likely to decline** as the modification / destruction of habitat will be very minimal and much of the area where this tree occurs has already been heavily modified by past road and telephone line construction and cable laying. The number of this species present in the area around Capertee are very high and most occur in conservation reserves, or

[g] **is not likely to result in invasive species that are harmful to a vulnerable species becoming established vulnerable species' habitat** because exotic ground cover species are already established as prominent components of ground cover throughout the habitat. Similar species will be present on rehabilitated areas after construction, or

[h] **is not likely to interfere substantially with the recovery of the species** as the species in a local and regional sense is well represented in conservation reserves and other private lands where it is unlikely to be affected by human activity [Hunter and White, 1999]

10.0 THREATENED SPECIES OVERVIEW

[i] There are no records of threatened plant species contained in the 'Atlas of NSW Wildlife' database for the study area.

[ii] One Threatened [NSW Threatened Species Conservation Act or Commonwealth EPBC Act] plant species [*Eucalyptus cannonii*] was recorded from the study area during field survey,

[iii] Despite predictions and records that indicated that a number of **other** Threatened flora species might be likely to occur at the site, none of these were recorded. The likelihood of occurrence of these species has been assessed in **Table 4.**

[iv] Part of the study area has been cleared for construction of telephone lines and later for cable laying. The existing Castlereagh Highway and associated road reserve is present to the east. It is in this area that the single tree of *Eucalyptus cannonii* occurs.

[v] There are no occurrences within the study area of Endangered Plant Populations or Endangered Ecological Communities listed in the Schedules of the NSW Threatened Species Conservation Act or in the Schedules of the Commonwealth EPBC Act

[vi] There is no critical habitat listed for the study area or its environs.

[vii] It is concluded that there will be no significant impact on threatened flora species [NSW TSC Act and Commonwealth EPBC Act], Endangered Ecological Communities, Endangered Populations of flora or Critical Habitat as a consequence of the proposed work within the study area.

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Managing Director and Principal Ecologist
27th January, 2004

Appendix D

Ecological Assessment (Fauna)

FAUNA STUDY AND ASSESSMENT FOR A RE-ALIGNMENT OF A SECTION OF THE CASTLEREAGH HIGHWAY AT CAPERTEE, NSW

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January, 2004

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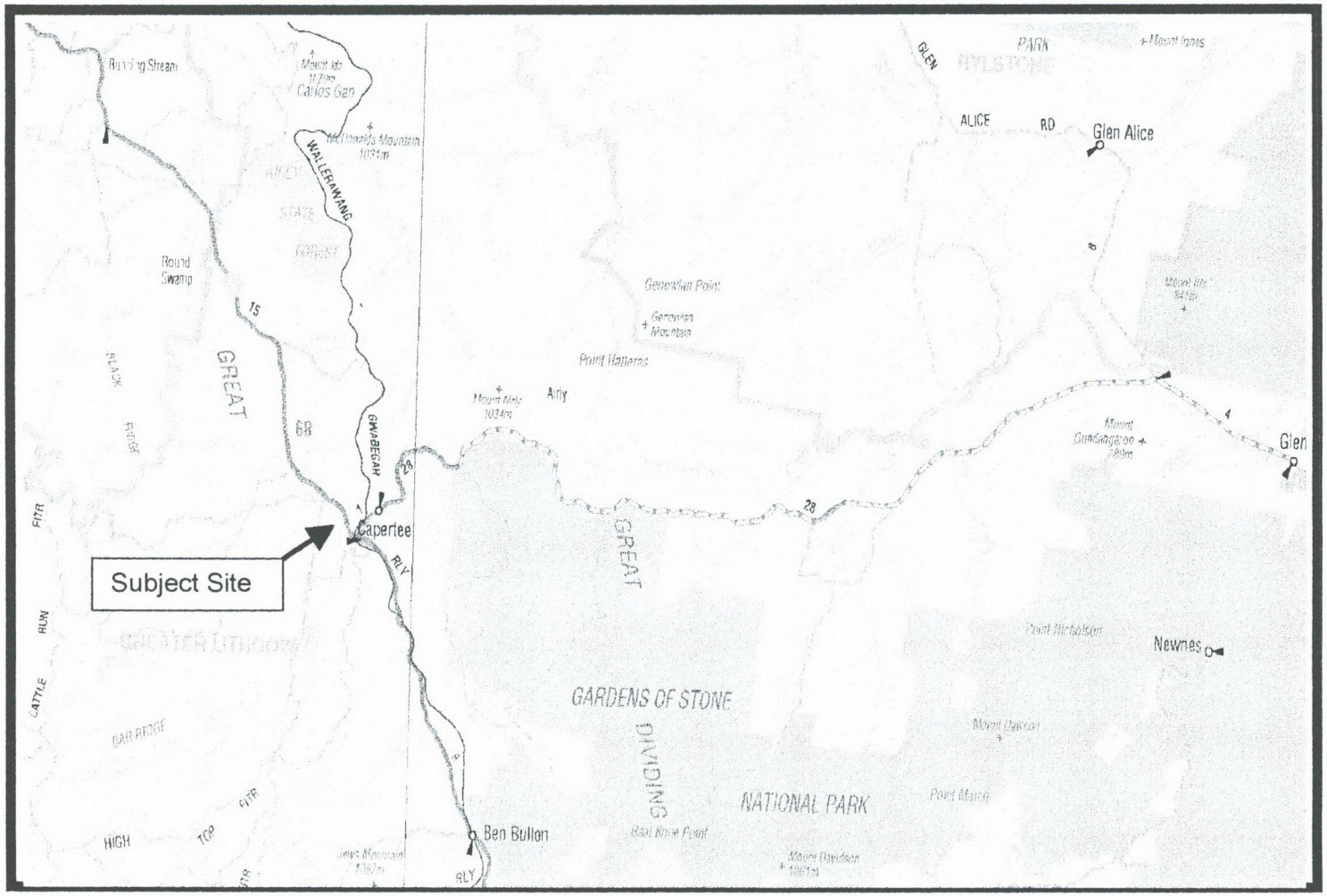
FIGURE 1 LOCATION OF STUDY AREA



1.0 INTRODUCTION

This fauna study and assessment was carried out for a Review of Environmental Factors (REF) on behalf of the NSW Roads and Traffic Authority of NSW, Parramatta Office, (hence the RTA). As detailed in the RTA's brief as follows:

"[The] RTA proposes to realign the Castlereagh Highway (SH18) (Mudgee Road) at Capertee Crest approximately 41km north of Lithgow. (see **Figure 1**). The Proposal would improve the safety of this section of road by leveling (*sic*) the crest and straightening the road to the National Highway standard."

The Highway realignment would be approximately 1km in length with a footprint of 20m either side of the centre line. See **Figure 2**.

The road section would be an average total formation width of 14m, where possible, comprised of two 3.5m travel lanes with 2m sealed shoulders and a table drain of approximately 1.5m. Drainage culverts would also be constructed where necessary. The new alignment would create a Proposal footprint of approximately 5 ha in total.

The area to be impacted by the Proposal comprises native woodland and grassy roadside vegetation. The Proposal would involve the removal of all of the vegetation within the areas defined above.

An REF is required for the Proposal to fulfil the requirements of Section 111 (Part V) of the Environmental Planning and Assessment Act 1979, and to take into account all matters affecting or likely to affect the environment as a result of the Proposal."

This report assesses the likely adverse impact this Proposal may have on all protected fauna, especially the threatened species listed under the *Threatened Species Conservation Act 1995 (NSW)* (hence the TSC Act) and the listed species under the *Environmental Protection and Biodiversity Conservation Act 1999 (C'wth)* (hence the EPBC Act). It also assesses the likely impact of the proposed activity on listed endangered populations and threatened communities as well as key threatening processes under these pieces of legislation.

Figure 2 Fauna Habitat in Survey Area.

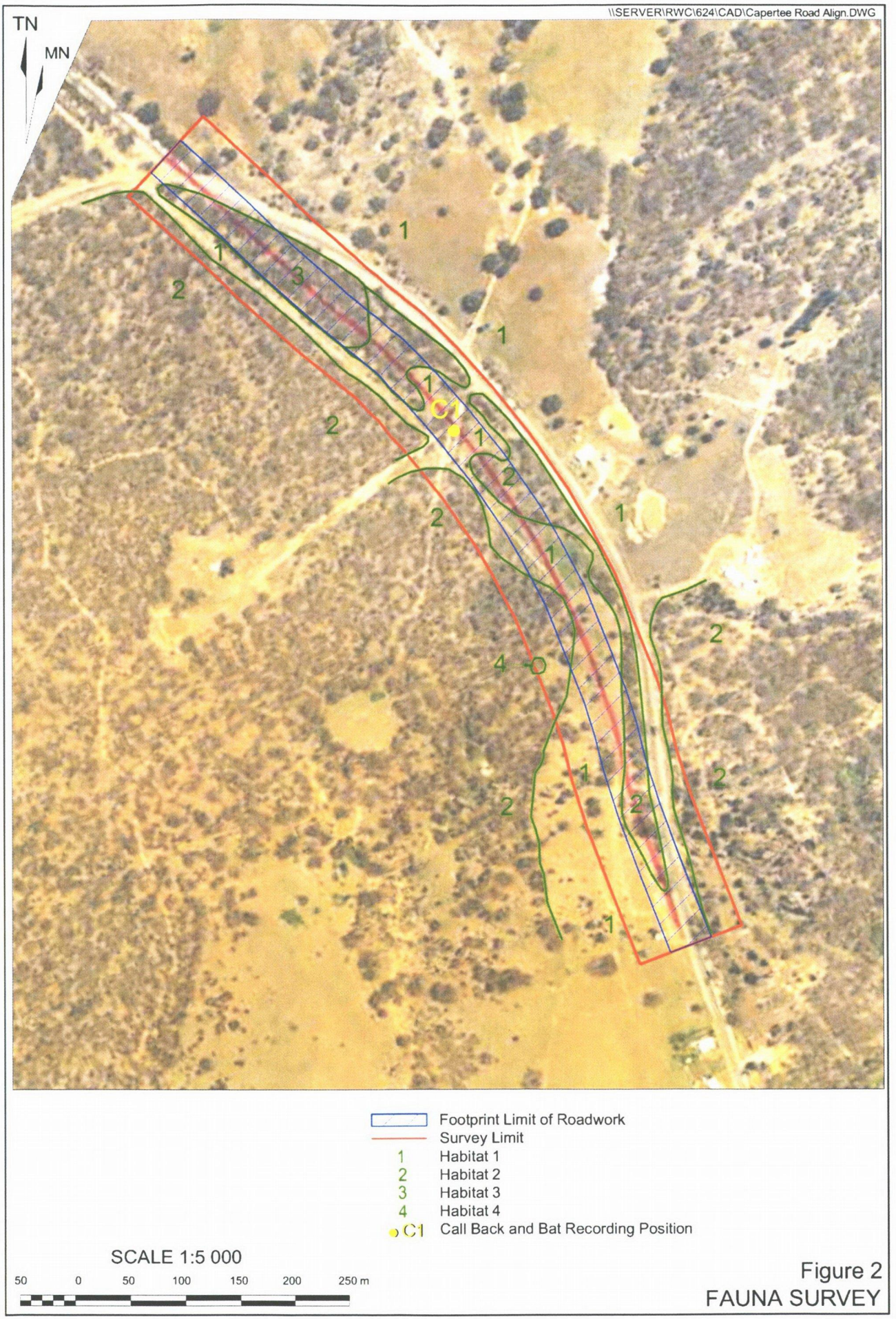


Figure 2
FAUNA SURVEY

From the review of the data available and a field survey, this report discusses the need for a Species Impact Statement (SIS) pursuant to section 5A of the *Environmental Planning and Assessment Act 1976 (NSW)* (hence EP&A Act) and whether the proposed activity constitutes a "Controlled Action" under the EPBC Act.

State Environmental Planning Policy No.44 Koala Habitat Protection (hence SEPP 44) applies to this section of the Castlereagh Highway in the Greater Lithgow Shire Council. This LGA being listed under Schedule 1 of this planning instrument.

This report also considers the consequences of the proposed activity on native vegetation clearing under the *Native Vegetation Conservation Act 1997 (NSW)* (hence, NVC Act), only in relation to cumulative loss and fragmentation of fauna habitat locally in terms of connectivity and conductivity with special reference to wildlife corridors.

2.0 EXISTING ENVIRONMENT OF THE STUDY AREA

The Study Area extends 50 m on either side of the pegged centerline of the proposed realignment (**Figure 2**) north from the outskirts of the township of Capertee. The proposed road realignment is located within a 5.0 ha footprint between a cleared 15m wide underground communication cable easement and the existing road.

This area in the western slopes of the Central Tableland of NSW lies in proximity to the northeastern edge of the Southern Eastern Highlands Bioregion (Tackway and Cassell 1995 and also see NPWS 1996) but is located at the western edge of the Kanangra Sub-Bioregion. Morgan (2001) describes this Sub-Bioregion as having:

> "Devonian sandstones with small areas of granite and fine-grained Silurian and Ordovician sediments at the edge of the Sydney Basin. Ridges and small plateaus to 1200 m, deep valleys, swampy upper tributary floors, outcrops and tors on granite hills. Red and yellow earths and structured loams. Well drained slopes, moderate fertility. Grey gum, Blaxland's stringybark on lower areas, and brown barrel, mountain gum, narrow-leaved peppermint and ribbon gum on

higher areas. Patches of snow gum. High diversity swamps on Boyd Plateau with carex and tea tree, sphagnum bogs in streams."

The site is saddled between the Capertee Valley and the Turon Valley, and draining westwards into the Turon River which flows westwards to form part of the Macquarie River Catchment.

Capertee is within the 1800 and 2400mm uniformly seasonal annual rainfall zone and experiences an average of 120 rainy days with up to 200 frost days a year. It experiences average daily relative humidity down to 40% in summer and up to 80%, and lies in the 1200 and 1600mm evaporation zone (Bureau of Meteorology, Canberra).

GCNRC (2004) described the vegetation in the Study Area as comprising of 3 vegetation communities:

"**Community 1** - Open Grassland - Highly Invaded By Introduced Species

Community 2 - Capertee Stringybark [*Eucalyptus cannonii*] - Red Stringybark [*Eucalyptus macrorhyncha*] - Broad-leaved Peppermint [*Eucalyptus dives*] - Apple Box [*E. bridgesiana*] - Brittle Gum [*Eucalyptus praecox*]

Community 3 - Narrow-leaf Stringybark [Eucalyptus *sparsifolia*] - Scribbly Gum [*Eucalyptus rossii*] - Grey Gum [*Eucalyptus punctata*] Community."

The locations of the 3 communities are shown in **Figure 2** (also refer to GCNRC 2004).

Four discernable fauna habitat types can be found in the study area. The first 3 roughly corresponding to Vegetation Communities 1 to 3.

- Habitat 1 Open Grassland Areas (Photo 1: Community 1)

This habitat lacks upper and middle structures. The understorey is dominated by Introduced grasses and herbs. The native herbivores and grass eating birds can be expected to use this habitat.

- Habitat 2 Open Woodland (Mixed Eucalypts)(Photo 2: Community 2),

This habitat has sparse upper storey canopy cover with mostly limited middle storey structure (dominated by *Acacia* spp) other than patches of Blackberry (*Rubus* sp) shrubs. Some of the mature trees over 20m in height are starting to develop small hollows.

- Habitat 3 Open Woodland (Dominated by Capertee Stringybark) on a rocky rise (Photo 3: Community 3).

This habitat patch is a largely disturbed tree stand with a well-established 15-20m canopy height and an abundance of logs and native grasses on the ground. There are a few hollowed out old stumps in this habitat patch.

- Habitat 4 Wetland area (Photo 4: a small dam located on the western side of the proposed realignment).

This is a small dam no more than 20m in diameter. Although it was full at the time of the survey, from its location in a very limited drainage area and its size, it can only be expected to be an ephemeral pond.

GCNRC (2004) described the structural plant composition of these habitats as follows:

- **Community 1 - Open Grassland - Highly Invaded By Introduced Species**

This community occurs between the deviation commencement point and the Capertee Catholic Church. It is mainly cleared farmland with scattered Apple Box [*Eucalyptus bridgesiana*].

Shrubs are basically absent.

Ground cover species include *Paspalum dilatatum** [Paspalum], *Bromus molliformis** [Silky Brome], *Cynodon dactylon** [Couch Grass], *Echium plantagineum** [Paterson's

Curse], *Geranium homeanum, Triptilodiscus pygmaeus* [Common n Sunray], *Hypochaeris radicata** [Flatweed], *Sanguisorba minor* ssp. *muricata** [Salad Buurnet], *Sonchus oleraceus** [Sowthistle], *Sonchus asper** [Prickly Sowthistle], *Tragopogon porrifolius** [Salsify], *Trifolium campestre** [Hop Clover] and *Trifolium dubium** [Yellow Suckling Clover]. Introduced species are marked with '*' symbol.

- **Community 2 - Capertee Stringybark [*Eucalyptus cannonii*] - Red Stringybark [*Eucalyptus macrorhyncha*] - Broad-leaved Peppermint [*Eucalyptus dives*] - Apple Box [*E. bridgesiana*] - Brittle Gum [*Eucalyptus praecox*] Community**

This community extends from the Capertee Catholic Church to North of a private road at about chainage 650 - 700. It is partly cleared along the Telstra corridor and not cleared closer to the to the Castlereagh Highway.

Trees include *Eucalyptus bridgesiana* [Apple Box], *Eucalyptus rossii* [Scribbly Gum], *Eucalyptus dives* [Broad-leaved Peppermint], *Eucalyptus punctata* [Grey Gum], *Eucalyptus praecox* [Brittle Gum] and some *Pinus* sp.* [Pines]. Scattered trees of *Eucalyptus macrorhyncha / cannonii intergrades* occur mainly on the area within and immediately adjacent to the existing highway reserve.

Shrub species present include *Acacia decurrens* [Black Wattle], *Cassinia arcuata* [Chinese Shrub], *Rosa rubiginosa** [Briar Rose], *Rubus* spp.* [Blackberry], *Olearia elliptica* [Sticky Daisy Bush], *Leptospermum continentale* [Tea Tree], *Bursaria spinosa* [Native Blackthorn], *Astroloma humifusum* [Native Cranberry], *Bossiaea buxifolia, Pultenaea microphylla*, *Cassinia leavis* [Cough Bush], *Acacia dawsonii* [Poverty Wattle], *Acacia implexa* [Hickory Wattle], *Daviesia latifolia* and *Ozothamnus diosmifolius* [Pill Flower].

Ground cover species include *Anthoxanthum odoratum** [Sweet Vernal Grass], *Aristida jerichoensis* var. *jerichoensis* [Jericho Wiregrass], *Austrodanthonia caespitosa* [White-top], *Calotis cuneifolia* [Purple Burr-daisy], *Dianella revoluta* [Spreading Flax-lily], *Triptilodiscus pygmaeus* [Common Sunray], *Holcus lanatus** [Yorkshire Fog], *Hypericum gramineum* [Small St. John's Wort], *Leucochrysum*

albicans ssp. *albicans* var. *albicans* [Hoary Sunray], *Lomandra confertifolia* ssp. *pallida*, *Poa sieberiana* var. *sieberiana* [Fine-leaf Tussock Grass], *Stackhousia viminea* [Slender Stackhousia], *Brachycome heterodonta* var. *heterodonta* [Lobe-seed Daisy] and *Wurmbea dioica* [Early Nancy]

- **Community 3 - Narrow-leaf Stringybark [Eucalyptus *sparsifolia*] - Scribbly Gum [*Eucalyptus rossii*] - Grey Gum [*Eucalyptus punctata*] Community**

This community extends from the northern extremity of Community 2 [approximate chainage 650 - 700] to the northern point of the study area where the proposed deviation meets the existing Highway.

This community is generally uncleared although some trees may have been removed in the past. Tree species include *Eucalyptus punctata* [Grey Gum], *Eucalyptus rossii* [Scribbly Gum], *Eucalyptus sparsifolia* [Narrow-leaf Stringybark], *Eucalyptus dives* [Broad-leaved Peppermint] and occasional *Eucalyptus macrorhyncha* [Red Stringybark] near the southern end in the community intergrade area.

Shrub species include *Astroloma humifusum* [Cranberry Heath], *Cassinia laevis* [Cough Bush], *Hardenbergia violacea* [False Sarsaparilla], *Acacia terminalis* [Sunshine Wattle], *Ozothamnus diosmifolius* [Pill Flower], *Persoonia linearis, Pultenaea microphylla, Acacia dawsonii* [Poverty Wattle], *Billardiera scandens* [Apple Berry], *Bossiaea buxifolia*, *Brachyloma daphnoides* [Daphne Heath], *Cassytha pubescens* [Common Devil's-twine], *Hibbertia obtusifolia* [Hoary Guinea-flower], *Hovea heterophylla, Leptomeria acida* [Native Currant], *Persoonia linearis* [Narrow-leafed Geebung] and *Podolobium ilicifolium* [Native Holly].

Ground cover species include *Themeda australis* [Kangaroo Grass], *Calotis cuneifolia* [Purple Burr-daisy], *Chrysocephalum apiculatum* [Yellow Buttons], *Diuris sulphurea* [Tiger Orchid], *Dianella revoluta* [Spreading Flax-lily], *Echinopogon ovatus* [Forest Hedgehog Grass], *Caladenia* sp, *Goodenia hederacea* var. *hederacea* [Forest Goodenia], *Poa sieberiana* var. *sieberiana* [Fine-leaf Tussock Grass], *Stackhousia viminea* [Slender Stackhousia], *Leucochrysum albicans* ssp. *albicans* var. *albicans* [Hoary Sunray] and *Lomandra confertifolia* ssp. *pallida.*"

3.0 REGIONAL FAUNA CHECKLIST

A checklist of the regional fauna was compiled from the NPWS Atlas of NSW Wildlife (hence the Atlas) database (NPWS 2003). The fauna community recorded on the Wallerawang 1:100 000 Map Sheet 8931 was considered to be indicative of the local fauna likely to be found around Capertee.

The Atlas database was supplemented with a number of published and other unpublished sources viz. Chisholm (1923), Cogger (2000), Strahan (1995), Blakers *et al* (1981), SN (1992), Novacoal (1991), IEC (1997), CES (1995), CES (1997), CES (1999) NPWS (1999) and French *et al* (2003).

The nomenclature used in this report follows that of Christidis and Boles (1994) for birds, Cogger (2000) for reptiles and amphibians, Churchill (1998) for bats and Strahan (1995) for other mammals. Common names used in this report follow the field guides by Wilson & Swan (2003) for reptiles, Menkhorst & Knight (2001) for mammals, Simpson *et al* (1999) for birds and Barker *et al* (1995) for amphibians.

3.1 Regional Fauna Community

The regional checklist suggests that there could be up to 16 species of frogs, 123 birds, 52 mammals, 38 reptiles and 1 listed invertebrate can be expected to occur in the Region.

3.1.1 Amphibians

Of the 16 amphibians expected in the Region, 4 species are listed as threatened. These are the listed Endangered Green and Golden Bell Frog, *Litoria aurea* and the New England Bell Frog, *Litoria castanea* and the listed Vulnerable Red-crowned Toadlet, *Pseudophryne australis* and the Booroolong Frog, *Litoria booroolongensis*.

3.1.2 Birds

The bird species list for the region contains 123 species represented in 38 families.

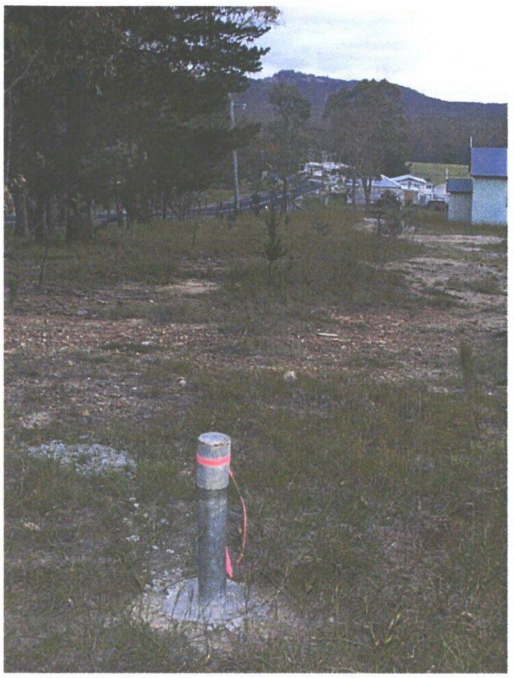


Photo 1 Open Grassland (dominated by Introduced species)

Photo 2 Open Woodland

Photo 3 Open Woodland (dominated by Stringybark on a rocky rise)

Photo 4 Dam – Wetland Habitat (small dam)

Among the bird species in the region there are 2 endangered, 10 vulnerable, and 3 introduced species, namely, the House Sparrow, *Passer domesticus,* the European Goldfinch, *Carduelis carduelis,* and the Common Starling, *Sturnus vulgaris.*

The Regent Honeyeater, *Xanthomyza phrygia* and Swift Parrot, *Lathamus discolor* are listed as endangered, while the following are the listed vulnerable species that has been recorded in the Region:

COMMON NAME		SCIENTIFIC NAME
1.	Square-tailed Kite	*Lophoictinia isura*
2.	Glossy Black Cockatoo	*Calyptorhynchus. lathami*
3.	Turquoise Parrot	*Neophema pulchella*
4.	Powerful Owl	*Ninox strenua*
5.	Barking Owl	*Ninox connivens*
6.	Painted Honeyeater	*Grantiella picta.*
7.	Brown Treecreeper	*Climacteris picumnus*
8.	Black-chinned Honeyeater	*Melithreptus gularis*
9.	Diamond Firetail	*Stagonopleura guttata*
10.	Speckled Warbler	*Pyrrholaemus sagittatus*

3.1.3 Mammals

Some 40 native mammal species have been known to occur in the Region. Of these, 19 species are terrestrial or arboreal and 21 are bats. There are also 11 introduced terrestrial species bringing the mammal community to a total of 51 species. No mammal in the Region has been listed as endangered but the following 12 species are listed as vulnerable:

COMMON NAME		SCIENTIFIC NAME
1.	Tiger Quoll	*Dasyurus maculatus*
2.	Koala	*Phascolarctos cinereus*
3.	Yellow-bellied Glider	*Petaurus australis*
4.	Brush-tailed Rock-wallaby	*Petrogale penicillata*
5.	Large-eared Pied Bat	*Chalinolobus dwyeri*
6.	Common Bentwing Bat	*Miniopterus schreibersii*
7.	Large-footed Myotis	*Myotis adversus*
8.	Greater Broad-nosed Bat	*Scoteanax rueppellii*
9.	Great (Eastern False) Pipistrelle	*Falsistrellus tasmaniensis*
10.	Eastern Freetail-bat	*Mormopterus norfolkensis*
11.	Yellow-bellied Sheathtailed-bat	*Saccolaimus flaviventris*
12.	Squirrel Glider	*Petaurus norfolkensis*

The only record of the listed Vulnerable Little Bentwing Bat, *Miniopterus australis*, in the region is around Capertee (see **Figure 3**). Although there are a few records of this small bat on the western side of the Great Dividing Range, this 1997 record in the Atlas database may have been a result of misidentification. This area is not within the normal distribution range of this small bat that usually occurs on the eastern side of the range where it occurs near relatively large areas of dense vegetation.

3.1.4 Reptiles

There are almost 40 species of reptiles in the region, which includes 7 families. Two species, the Broad-headed Snake, *Hoplocephalus bungaroides,* and the Blue Mountain Water Skink, *Eulamprus leuraensis,* are listed as Endangered.

The Grassland Earless Dragon, *Tympanocryptis pinguicolla,* Rosenberg's Goanna, *Varanus rosenbergi,* and the Pink-tailed Worm-lizard, *Aprasia parapulchella,* are listed as vulnerable.

Figure 3 Threatened Species Locations around Survey Area, near Capertee

3.1.4 Invertebrate

The Bathurst Copper Butterfly, *Paralucia spinifera,* is a listed Endangered species that is known to occur in the Region, especially around Lithgow. Its distribution is related to the occurrence of its food plant native Blackthorn bush, *Bursaria spinosa* and mutualistic almost exclusively with an ant, Anonychomyra *itierans*.

The Bathurst Copper Butterfly, *Paralucia spinifera,* favors clear areas with sunny slopes and a northerly or westerly aspect. The Bathurst Copper Butterfly appears to require all-day sun exposure to the lower habitat structure in cold exposed areas.

3.1.5 Fish

No listed fish species listed under the FM Act occurs in the upper river catchments that are relevant to this Subject Site. The survey area is within the Macquarie Marshes Catchment but is not within the distribution range of the listed Endangered Macquarie Perch, *Macquaria australasica*, where its eastern population is in the Hawkesbury and Shoalhaven River Catchment and its western population extends to the upper reaches of the Murray River. The Trout Cod, *Maccullochella macquariensis*, is another listed Endangered fish that has its isolated northern population confined to the upper parts of the Macquarie River between Dubbo and Bathurst. It is a species that is associated with deep water and is not known to occur in the upper reaches of the Macquarie River Catchment in the Central Tablelands. (see NSWF 2001).

3.2 Consideration of EPBC Act Matters.

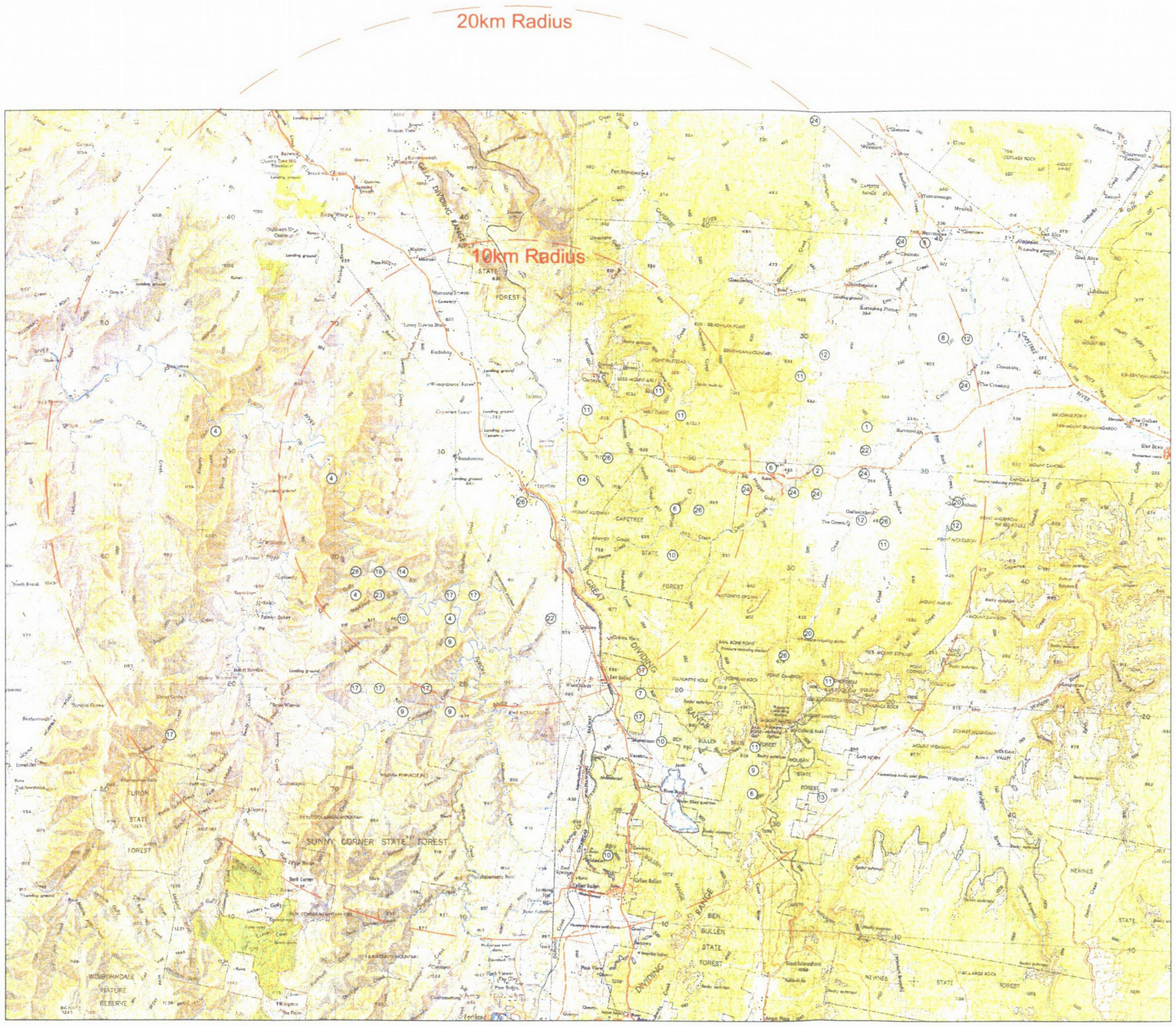
An online query was made of the Environment Australia website at point location co-ordinates S 33° 09.1', E 149° 59.0' with a 20.0 km buffer. The report generated by this query 20 January 2004 included the following relevant matters:

i) World Heritage Properties:

The Greater Blue Mountain Area, NSW

\\SERVER\RWC\624\CAD\Species.DWG

TN
MN



1 Barking Owl
2 Black-chinned Honeyeater (eastern subsp.)
3 Blue Mountains Water skink
4 Booroolong Frog
5 Broad-headed Snake
6 Brown Treecreeper
7 Brush-tailed Rock-wallaby
8 Diamond Firetail
9 Eastern Bent-wing Bat
10 Eastern False Pipistrelle
11 Glossy Black-Cockatoo
12 Hooded Robin
13 Koala
14 Large-eared Pied Bat
15 Little Bentwing-bat
16 Little Pied Bat
17 Powerful Owl
19 Rosenberg's Goanna
20 Speckled Warbler
21 Spotted-tailed Quoll
22 Square-tailed Kite
23 Squirrel Glider
24 Swift Parrot
25 The Bathurst Copper Butterfly
26 Turquoise Parrot
27 Yellow-bellied Glider
28 Yellow-bellied Sheathtail-bat

SCALE 1:200 000

2 0 2 4 6 8 10 km

Base Map Source: Bathurst 8831 & Wallerawang 8931 1:100 000 Topographic Maps

Figure 3
THREATENED SPECIES LOCATIONS

ii) Ramsar Sites

Macquarie Marshes Nature Reserve

iii) Threatened species listed under the provisions of the EP&PB Act.

Scientific Name	Common Name	Status
Aves		
Lathamus discolor	Swift Parrot	Endangered
Rostratula australis	Australian Painted Snipe	Vulnerable
Xanthomyza phrygia	Regent Honeyeater	Endangered
Mammalia		
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable
Dasyurus maculatus	Spotted-tail Quoll	Vulnerable
Nyctophilus timoriensis	Eastern Long-eared Bat	Vulnerable
Petrogale penicillata	Brush-tailed Rock-wallaby	Vulnerable
Osteichthyes		
Macquaria australasica	Macquarie Perch	Endangered
Maccullochella peelii	Murray Cod	Endangered

iv) Terrestrial species covered by the migratory birds provisions of the EPBC Act, 1999

Scientific Name	Common Name
Haliaeetus leucogaster	White-bellied Sea-Eagle
Hirundapus caudacutus	White-throated Needletail
Xanthomyza phrygia	Regent Honeyeater
Rhipidura rufifrons	Rufous Fantail
Myiagra cyanoleuca	Satin Flycatcher

v) Wetland species covered by the migratory birds provisions of the EPBC Act, 1999

Scientific Name	Common Name
Gallinago hardwickii	Latham's Japanese Snipe
Rostratula benghalensis	Australian Painted Snipe

vi) Conservation Reserves

- Winburndale Nature Reserve
- Garden of Stones National Park
- Wollemi National Park

4.0 FIELD SURVEY

Field sampling of the study area was carried out on the afternoon and evening of the 17 and the morning of 18 November 2003. The limited period of sampling is considered adequate for assessing the likely impact of the proposal along the 5.0ha road realignment corridor on the local fauna in the area. The timing of this survey in Spring precluded the observation of any species that only occurs in the area in Winter. The only listed threatened species that are affected by this limitation is the Swift Parrot and the Black-chinned Honeyeater (see Section 5.1.2 for further considerations).

The sampling methods used for sampling the relevant fauna, in particular the listed threatened species, were as followings:

4.1 Call Backs

Call broadcasts were conducted for the following listed threatened species at location "C1" in **Figure 2**.

Common Name	Scientific Name
1. Powerful Owl	*Ninox strenua*
2. Masked Owl	*Tyto novaehollandiae*
3. Sooty Owl	*Tyto tenebricosa*
4. Barking Owl	*Ninox connivens*
5. Koala	*Phascolarctos cinereus*
6. Squirrel Glider	*Petaurus norfolcensis*
7. Yellow-bellied Glider	*Petaurus australis*

No response was obtained from any of these mammals or owls.

4.2 Diurnal Bird Sampling

A 2-hr search was conducted to record the birds over the whole Study Area on the afternoon of the 17 November 2003. This was conducted on foot along the centre line of the proposed realignment and this was repeated the next morning. In addition, all other incidental observations made of the birds using the Survey Area were also noted. The listed threatened species known to occur within 20 km of Capertee, including the Endangered Regent Honeyeater (see **Figure 3**) were especially targeted during this sampling. The following species were recorded during the study:

COMMON NAME	SCIENTIFIC NAME	17/11	18/11
1. Galah	*Cacatua roseicapilla*	*	
2. Eastern Rosella	*Platycercus eximius*		*
3. Brush Cuckoo	*Cacomantis variolosus*		*
4. Laughing Kookaburra	*Dacelo novaeguineae*	*	*
5. Spotted Pardalote	*Pardalotus punctatus*	*	*
6. Striated Thornbill	*Acanthiza lineata*		*
7. Red Wattlebird	*Anthochaera carunculata*		*
8. Little Friarbird	*Philemon citreogularis*		*
9. Lewin's Honeyeater	*Meliphaga lewinii*		*
10. Tawny-crowned Honeyeater	*Phylidonyris melanops*		*

11. Grey Fantail	*Rhipidura fuliginosa*	*	*
12. Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	*	
13. Australian Magpie	*Gymnorhina tibicen*	*	*
14. Pied Currawong	*Strepera graculina*		*
15. Australian Raven	*Corvus coronoides*	*	*

All the native birds recorded are common protected species. The absence of any Introduced bird is noteworthy.

4.3 Spotlight Searches

On 17 November 2003 a 2-hour spotlight search was conducted on foot immediately after last light in the Study Area. This was conducted along the centre line over the entire length of the Study Area.

During this survey, no fauna species were observed during the spotlighting other than a Brush-tailed Possum, *Trichosurus vulpecula* in the Stringy Bark. A dead Eastern Grey Kangaroo, *Macropus giganteus*, was observed by the roadside. It was on the eastern side of the road near the northern end of the proposed realignment.

Farm dogs, *Canis lupus familiaris*, were heard in the nearby properties.

4.4 Ground Searches and Tree Inspections

Ground searches and inspection of trees was carried out during daylight hours of the entire Study Area, with the listed threatened species including the Bathurst Copper Butterfly, especially targeted.

These searches included looking for the following signs of animals:

- Body remains including skeletal and other tissue (hairs, beaks, nails, sloughs, scales, etc)
- Faecal material, including bird "whitewash" under roosting perches and near nests.

- Footprints and scratches on tree trunks
- Foraging signs, including diggings and partially consumed plant material, including seedpods.
- Nests, tunnels and occupied tree hollows.
- Eggs and egg masses

The searches in the survey area revealed the following:

- No tadpoles or egg mass was observed in any of the water within and adjoining the Study Area.

- A few inactive bird nests were observed in the Study Area.

- Only small and insignificant tree hollows occur in the area 20m on either side of the proposed realignment.

- There was no sign of "white wash" that would suggest the existence of roosting sites of owls and raptors.

- A mob of Eastern Grey Kangaroos was observed in the study area and there were signs of use of the habitat by the Echidna as well as horses and rabbits.

- Some Possum scratch marks were observed on the larger smooth-barked trees in the Study Area.

- No reptile was observed in the Survey Area, although the common species of skinks, dragons and monitor lizards can be expected to occur here from time to time.

- No Bathurst Copper Butterfly or its host ants was found although some *Bursaria spinosa* bushes to 3.0m were located in the study area (see GCNRC 2004). However, these occurred in the cleared disturbed areas as dispersed bushes and not in clumps.

- No other fauna habitat of special significance (eg caves, boulder piles, stand of trees that has potential to develop large hollows, etc) occurred or is expected to occur in the area 20m on either side of the proposed realignment.

4.5 Bat Sampling

An Anabat-CF ultra-sonic recorder mounted on vehicle was used to record the batcalls in the Survey Area. The following bats were identified from the 1.75-hr recording at C1:

Common Name	Scientific Name	Status
1. Large Forest Bat	*Vespadelus darlingtoni*	P
2. Great Pipistrelle	*Falsistrellus tasmaniensis*	V
3. Little Forest Bat	*Vespadelus vulturnus*	P
4. White-striped Freetail bat	*Tadarida australis*	P
5. Little Broad nosed Bat	*Scotorepens greyii*	P
6. Long-eared Bat	*Nyctophilus sp*	P

Notes: P – Protected V - Vulnerable

5.0 DISCUSSION

The proposed activity would only involve the removal of a number of trees within the 5.0 ha realignment corridor area. The significance of this habitat for this REF needs to be considered with its proximity to Capertee and the fact that it is surrounded by rural residential properties with dogs and cats in mind. These domestic pets have considerable impact on the native fauna and the latter is listed as a Key Threatening Process. The high proportion of presumed extinct ground dwelling mammal and bird species in the Region is a reflection of the long history of European settlement of this area of NSW. This is a relevant factor when assessing the conservation value of the habitat on the subject site and considered in proportion with its relatively small area compared to the State Forest to the north and extensive areas of reserves to the east of the subject site (see **Figure 1**). The other relevant fauna matters in assessing the likely significant impact of this Proposal are discussed in detail below as follows.

5.1 Threatened Species Considerations

No listed threatened species was recorded in this section of the road reserve along the Castlereagh Highway proposed road realignment, except the Great Pipistrelle, *Falsistrellus tasmaniensis*. A search of the Atlas database for threatened species that have been recorded within 20km of Capertee is presented in **Figure 3**. The likely occurrences of these species, and other listed threatened species that may potentially occur on or near this location, are considered below according to their habitat requirements.

5.1.1 Amphibians

No frog habitat by way of swamps or streams exists in the study area, except for the small dam (see Photo 4) and no frog was recorded in this dam. The habitat in the survey area is unsuitable for both of these listed Endangered Bell Frogs. There is no record of them ever occurred, and they are not expected to occur, in the Capertee area. The listed vulnerable Red-crowned Toadlet, *Pseudophryne australis,* is confined to the Hawkesbury Sandstone areas in pools on elevated benches. The Booroolong Frog, *Litoria booroolongensis*. Is only found in clear water near the headwaters of west flowing streams. This species has been recorded in the Turon River to the west of Capertee but the proposal is unlikely to affect the waters of this river. These last 2 frogs are not expected to occur around Capertee and the survey area.

5.1.2 Birds

The Swift Parrot, *Lathamus discolor,* is a migratory species from Tasmania that only occurs on the Australian mainland during winter. It is thus unlikely to be observed in a survey carried out outside winter. The nearest record of this parrot is over 10km away to the east of Capertee in the Gardens of Stone National Park (see **Figure 3**) and in Yellow and White Box Community (Dick Turner, pers comm.). It is unlikely that this road realignment involving the removal of less than 5.0 ha of non-Box Eucalypts would significantly adversely affect this bird which is a winter transient in this part of its range on the Australian mainland.

The Powerful Owl, *Ninox strenua,* and the Barking Owl, *Ninox connivens,* has not been recorded around Capertee but the Powerful Owl occurs in the Capertee Valley within 10km of the Survey Area and the Barking Owl is also recorded in the Gardens of Stone National Park. Similarly, the Square-tailed Kite, *Lophoictinia isura*, has not been recorded near Survey Area but is known to occur in the Capertee Valley.

The Proposal is on a hillcrest and is unlikely to significantly affect species like the Square-tailed Kite the Powerful Owl and the Barking Owl that have large home ranges in excess of 800ha. This kite nests only on tall large trees and the last 2 owl species require large hollows to nest. These habitat characteristics are not present in the Survey Area.

The Turquoise Parrot, *Neophema pulchella,* is partly nomadic and is often found feeding at the edge of clearing. It nests in tree hollows as well as stags (dead standing trees) and in fallen logs and fence posts. This species appears to have recovered in recent years by utilising the seeds from introduced plant species. Although this species was not recorded during this survey, it may occur in the Survey Area from time to time. This grass parrot has been recorded in the Gardens of Stone National Park and within a few kilometers from Capertee. However, the impact of the Proposal on this species is unlikely to be significant unless it impacts upon nesting site(s). There are only a few trees with hollows in the Survey Area. Carrying out a prestart survey when the final alignment is established and, if necessary, relocating the nest hollow(s) before removing the trees can ameliorate any adverse impact on this species.

The Glossy Black Cockatoo, *Calyptorhynchus lathami,* on the other hand is a large tree hollow nester that feeds almost exclusively on *Allocasuarine* spp. These habitat requirements are unavailable in the Survey Area. There is no record of this cockatoo in proximity to Capertee and the nearest known records are over 10km to the east around Mt Airly and the Gardens of Stone National Park. It is unlikely that the Proposal would affect this species.

The Painted Honeyeater, *Grantiella picta,* is an irregularly seen and nomadic species in NSW. More likely seen in the north during winter and south during summer. It is partial to

mistletoe berries and is found where heavy mistletoe infestations occur. Mistletoe is uncommon in this Survey Area and the impact on this habitat from this proposed activity is thus unlikely to significantly affect this honeyeater. Similarly, there is no record of this honeyeater in proximity to Capertee and the nearest known records are over 10km to the east around Mt Airly and the Gardens of Stone National Park. It is also unlikely that the Proposal would affect this species.

The eastern population of the Brown Treecreeper, *Climacteris picummus*, is now distributed through central NSW on the western side of the Great Dividing Range where it intergrades with arid zone "sub-species" along its western limits of its range. It is a sedentary medium size insectivorous bird that inhabits eucalypt open woodland with sparse understorey. It is a tree hollow nester and usually occurs in pairs or small groups foraging on tree trunks and on the ground amongst the leaf litter and on fallen logs for ants, beetles and insect larvae. There is no record of this treecreeper in proximity to Capertee and the nearest known records are over 10km to the east around Mt Airly and the Gardens of Stone National Park. The preferred habitat of this treecreeper does not occur in the Survey Area and this proposed activity is unlikely to impact upon this species.

The Black-chinned Honeyeater, *Melithreptus gularis*, is distributed throughout northern and eastern Australia. In this part of this range in NSW it occurs mainly on the western slopes and plains where in winter it is found in association with habitat where Box-Ironbark association or River Red Gum is present (see French *et al* 2003). There is also no record of this honeyeater in proximity to Capertee and the nearest known records are also over 10km to the east around Mt Airly and the Gardens of Stone National Park. The preferred habitat of this honeyeater does not occur in the Survey Area and this proposed activity is unlikely to impact upon this species.

The Diamond Firetail, *Stagonopleura guttata*, is a widespread species in eastern Australia, occurring predominantly west of the Great Dividing Range. This finch can be found in open woodland, forest and mallee where there is a grassy understorey. It feeds on grass seeds, other plant material and insects on the ground. They appear to be unable to persist in habitat remnants less than 200ha. There is no record of this species

around Capertee and the only records of this species are over 10km to the east in the Gardens of Stone National Park and around Mt Airly.

The Hooded Robin, *Melanodaras cucullata*, is another widespread species that occurs in small family groups in Open Woodland with abundant dead timber. However, it keeps a relatively large home range and occupies only unfragmented vegetation remnants larger than 100ha. The records of this species are also all over 10km east of this Subject Site in and around the Gardens of Stone National Park. No record of this species occurs around Capertee and in view of the fragmented nature of the Survey Area and it is unlikely to be affect by this proposed activity.

The Speckled Warbler, *Pyrrholaemus sagittata*, is also a widespread species inhabiting Eucalypt Woodland where it prefers foraging for insects in open grassy, leaf litter and shrub cover. This warbler usually occurs as resident pairs nesting on the ground over a home range of up to12 ha. It also appears to require large vegetation remnants of more than 100 ha in which to survive. It is a ground nesting species that is prone to predation by Introduced predators. The records of this species are also all over 10km east of this Subject Site in and around the Gardens of Stone National Park. No recorded of this species occurs around Capertee and in view of the fragmented nature of the Survey Area and its proximity to the township and rural residential dwellings, the proposed activity is likely to affect this species

5.1.3 Mammals

It is unlikely that the Survey Area would support a Tiger Quoll, *Dasyurus maculatus,* as its sparse understorey does not provide sufficient cover for this species to persist. This species have obvious latrine sites within its home range. None was observed during this survey and the nearest record of this species is some 20km approximately southeast of Capertee (see **Figure 3**).

The Yellow-bellied Glider, *Petaurus australis* is also not expected to occur in the Survey Area. Although it is known to have occurred in the Region, it is a species that is dependent on tall forest in relatively fertile soils with mixed varieties of Eucalypts. The nearest record of this species is less than 5 km to the southwest of Capertee and it has

been recorded along the upper reaches of the Capertee River tributaries in the Garden of Stones National Park. The Survey Area is sub-optimal for this glider and would be at the western limits of its distribution and the proposed activity is unlikely to significantly impact upon this species.

There is no suitable habitat for the Brush-tailed Rock-wallaby, *Petrogale penicillata* in Survey Area. This rock-wallaby requires extensive rocky outcrops and feeding terraces on cliffs to persist. This species has been recorded near Ben Bullen but its habitat type does not occur around Capertee. The Proposal is unlikely to affect this macropod.

The Squirrel Glider, *Petaurus norfolkensis,* has not been recorded around Capertee. It is a species that requires habitat with an abundance of large mature hollow bearing mixed *Eucalyptus* spp (especially smooth-barked species) with an *Acacia* spp and *Banksia* spp. understorey. The nearest record of this species from Capertee is less than 10km away to the southwest in the Turon Valley and it is known to occur in the Gardens of Stone National Park. The habitat requirements of this glider are not present in the Survey Area so its is unlikely to be affected by this Proposal.

The Survey Area is unsuitable for the Large-footed Myotis, *Myotis adversus,* which is a species that is confined to the riparian zone. This is no record of this bat within 20km of Capertee.

The Common Bentwing Bat, *Miniopterus schreibersii,* is a cave dweller that forages over large areas of open woodland such as those present in the Survey Area. It regularly forages over several kilometers from its roosting site. This bat has been recorded within 10km to the east and west of Capertee. It was listed as a Vulnerable species because of its special breeding behaviour and is highly vulnerable in and around its maternal caves. No maternal cave is known to exist within 20km of Capertee and the proposed activity involving 5.0 ha is unlikely to significantly affect the availability of foraging habitat for this bat in the area.

The nearest record of the Large-eared Pied Bat, *Chalinolobus dwyeri,* is almost 20km to the southeast of the Survey Area. The distribution and ecology of this bat is poorly known but it has an apparent association with cliffs and rocky outcrops although it has

been known to roost in disused mines. These habitats do not occur in the Survey Area and the Proposal is thus unlikely to affect this bat.

The only records of the Greater Broad-nosed Bat, *Scoteanax rueppellii,* and the Eastern Freetail-bat, *Mormopterus norfolkensis* are around Blackman's Flat more than 20 km away. Neither of this species was recorded during this survey. Both are known to roost in tree hollows but because the Proposal involves a relatively small area unless it impacts upon roosting site(s) of these bats, it is unlikely to significantly affect these bats.

The nearest record of the Yellow-bellied Sheathtail-bat, *Saccolaimus flaviventris,* is less than 10km away approximately to the southwest of Capertee. This is a fast flying bat that forages above the canopy for insects and it occurs throughout NSW in a wide range of habitat. It also uses a wide range of roosting sites, including tree hollows (sometimes with Sugar Gliders), cracks in dry clay and under rock slabs. It is unlikely that this bat would be affect by the Proposal that involves only about 5.0ha.

In summary, because the Proposal involves only a relatively small area of 5.0 ha, it is unlikely to significantly affect these bats unless they are roosting in the trees that have to be removed. Carrying out a prestart survey and relocating the roost hollows can ameliorate this, if necessary.

5.1.4 Reptiles

No listed Endangered reptiles have been recorded from the immediate area around Capertee. The Broad-headed Snake, *Hoplocephalus bungaroides* has been recorded further north in the Capertee region, and also occurs to the east and south of the Survey Area. The nearest record of this species is less than 5 km to the southwest of Capertee (see **Figure 3**). It is however, a sandstone escarpment dweller and this habitat type is not present on the Survey Area or the immediate around Capertee and is thus unlikely to be affect by this Proposal.

Similarly, the Blue Mountain Water Skink, *Eulamprus leuraensis*, is confined only to areas of hanging swamps on the Newne's Plateau and is unlikely to be found around Capertee as this species is specific to those swamps and this Proposal is unlikely to

affect this skink. The nearest record of this species is over 20km to the southeast of Capertee.

The Grassland Earless Dragon, *Tympanocryptis pinguicolla,* is known from the ACT, Bathurst and Armidale regions, so the site is within its known distribution. It is an inhabitant of treeless native grasslands, which do not occur on the site. None were found during intensive searching in the Survey Area. Given the habitat modification from grazing, mining and quarrying activities in the region it is highly improbable that it occurs in the area around Capertee. This species is thus unlikely to be affected by the Proposal.

Goldney & Bowie (1987) include this area in their "predicted distribution" for the Pale-headed Snake, *Hoplocephalus bitorquatus,* although they offer no reason as to why. This snake has a widespread but extremely patchy distribution and there is no record of any specimens found in the region (Swan, G pers comm.). It is thus unlikely to be affected by this Proposal.

The Pink-tailed Worm-lizard, *Aprasia parapulchella,* is known from the ACT and Tarcutta regions of southern NSW and from the Bathurst area. It is generally found under relatively small rocks on soil in open woodland with an understorey of native grasslands. Systematic searching of possibly suitable areas on the Survey Area and, in particular, rocky area east of the existing road failed to locate this species. Its occurrence can often be determined by the presence of discarded skin (slough) under rocks, however none were found on the site. This species is also not expected to be affected by the Proposal.

5.1.5 Invertebrates

Although *Bursaria spinosa* occurs in the Survey Area, none of the area within the footprint of the proposed road realignment can be considered potential Bathurst Copper Butterfly habitat. These plants are occurring as isolated shrubs under a canopy layer. This butterfly is not known to occur around Capertee or north of Cullen Bullen (see NPWS 2001). This butterfly is unlikely to be affected by this Proposal.

5.1.6 The 8-part Test for Impact Significance (s 5A EP&A Act)

The limited scale of this Proposal notwithstanding, the 8-Part Tests of likely significant adverse effects of the proposed activity on listed threatened (Endangered and Vulnerable) species, populations or ecological communities, or their habitats are considered below in accordance with Section 5A of the EP&A Act for the Great Pipistrelle, *Falsistrellus tasmaniensis,* and the Regent Honeyeater *Xanthomyza phrygia,* as follows.

i) Great Pipistrelle

This is a very poorly known rare species that is known to roosts in tree hollows. Its wing morphology suggests that it is a highly mobile and a fast flying species. It ranges from south of Fraser Island in Queensland to Tasmania and southwestern Victoria and along the western slopes in NSW (see Phillip 1995). This species has also been recorded within 10 km to the east and southwest of Capertee (see **Figure 3**).

In its southern range, this bat is known to forage up to 13km from its daytime tree hollow roost. It roosts mainly in the main trunks of large eucalypts and feeds mainly on larger beetles.

(a) Whether the life cycle of a threatened species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

The record of this species within the survey area is from only one single call on the entire recordings. This suggests a rare and/or transient individual rather than the existence of a local viable population.

The Survey Area is obviously part of its foraging habitat but the lack of large eucalypts in this area suggests that it is unlikely to be roosting in the vicinity. It is therefore unlikely that the Proposal would affect the survival of the local population of this bat.

(b) Whether the life cycle of an endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

No endangered fauna population has been listed in this area of the Bioregion near Capertee, therefore none is likely to be affected by this proposed road realignment.

(c) Whether a significant area of known habitat of a threatened species, population or ecological community in the region is to be modified or removed.

The modification and removal of open woodland habitat for this proposed realignment of the road is only over a 5.0 ha 40m-wide corridor through a habitat patch of open woodland of more than 300 ha in the immediate area (see **Figure 2**). Similar foraging habitat can be found in Airly State Forest less than 10km to the north and extensive areas in the Garden of Stones National Park and the Mt Airly area to the east of the Survey Area (see **Figure 1**).

This 5.0 ha of foraging habitat cannot be considered a significant area of known habitat for a bat that is known to forage up to at least 13km from its roost(s).

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

As this bat is highly mobile and is known to forage up to 13 km from its roost, it is unlikely that the habitat would be isolated as a result of the proposed road realignment. Thus, no area of known habitat of this bat is likely to become any more isolated from any interconnecting or proximal areas of habitat as a result of the proposed activity (See **Figure 2** and also refer to 5.3 below).

(e) Whether critical habitat will be affected.

No fauna critical habitat has yet been listed in this Bioregion.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas in the region).

There are several records of the Great Pipistrelle in the Gardens of Stone National Park to the east. The habitat for this bat would be represented in this and other extensive reserve areas to the east of Capertee.

(g) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

Some native vegetation in Habitat 2 and Habitat 3 would be cleared along this proposed realignment corridor but the area that would be cleared is much less than 5.0 ha (see **Figure 2**).

This proposed activity, a minor road realignment, is unlikely to augment or contribute to any listed Key Threatening Processes, including those listed under the EPBC Act if the recommendations of this report are adopted.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

Capertee is probably close to the western edge of the distribution for the Greater Pipistrelle although there is no data to suggest that the local population have any biological special significance.

ii) Regent Honeyeater

This listed Endangered Regent Honeyeater, *Xanthomyza phrygia,* is described as a semi-nomadic species that occurs in temperate eucalypt woodland and open forest in SE Australia. It is a sporadic breeder that feeds on nectar from a variety of eucalypts.

The survey area is located at the western ridge of the Capertee Valley; an area identified as being where one of the last 2 known substantial populations of this honeyeater is

located. In this valley, it is often feeding in White Box, *Eucalyptus albens*, Yellow Box, *Eucalyptus melliodora*, and Mugger Ironbark, *Eucalyptus sideroxylon* (French *et al* 2003) and nesting mainly in River Oak, *Casuarina cunninghamiana* and Rough-barked Apple, *Angophora floribunda*, as well as several *Eucalyptus* species (Geering and French 1998). Numerous records of this honeyeater are known throughout this valley and it also occurs further west within 20 km of the Survey Area (see **Figure 4**). There is also a record of this bird near Capertee.

. .

(a) Whether the life cycle of a threatened species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Trees that the Regent Honeyeater prefers are not found in the survey area and it is not considered a preferred feeding or nesting habitat for this bird. This honeyeater has not been recorded nesting close to Capertee (Dick Turner, pers comm.).

The area where trees would be removed in Habitat 2 and Habitat 3 along this proposed realignment corridor is much less than 5.0 ha and this is unlikely to adversely affect the local population of this semi-nomadic bird.

(b) Whether the life cycle of an endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

No endangered fauna population has been listed in this area of the Bioregion near Capertee, therefore none is likely to be affected by this proposed road realignment.

(c) Whether a significant area of known habitat of a threatened species, population or ecological community in the region is to be modified or removed.

This honeyeater would probably be observed in the Survey Area from time to time. However, the removal of native vegetation in Habitat 2 and Habitat 3 along this proposed realignment corridor representing much less than 5.0 ha (see **Figure 2**) can hardly be seen to represent a significant area of known habitat for this honeyeater.

Figure 4 Locations of Regent Honeyeater around the Survey Area, near Capertee

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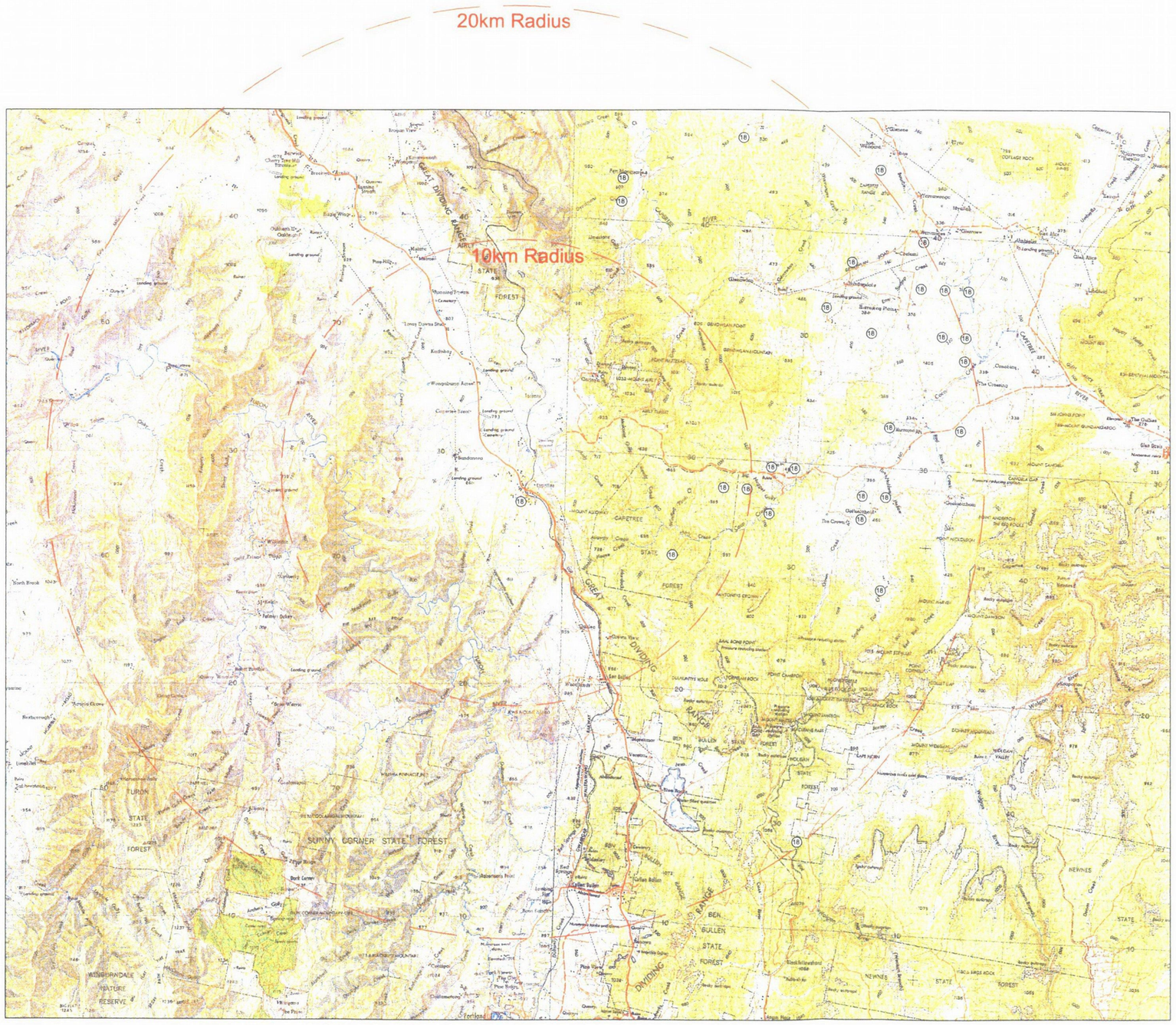

18 Regent Honeyeater

SCALE 1:200 000

2 0 2 4 6 8 10 km

Base Map Source: Bathurst 8831 & Wallerawang 8931 1:100 000 Topographic Maps

Figure 4
REGENT HONEYEATER LOCATIONS

(d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

This bird is known to be semi-nomadic. It is unlikely that it would be isolated from any interconnecting or proximal areas of habitat by this proposal.

(e) Whether critical habitat will be affected.

No fauna critical habitat has yet been listed in this Bioregion.

(f) Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas in the region).

This honeyeater is known to occur in no less than 20 national parks and 1 nature reserve, including the Gardens of Stones National Park to the east of Capertee.

(g) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

Some native vegetation in Habitat 2 and Habitat 3 would be cleared along this proposed realignment corridor but the area that would be cleared is much less than 5.0 ha (see **Figure 2**).

This proposed activity, a minor road realignment, is unlikely to augment or contribute to any listed Key Threatening Processes, including those listed under the EPBC Act if the recommendations of this report are adopted.

(h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The Survey Area is not the limit of distribution for the Regent Honeyeater.

Thus, in summary, the proposed realignment of this section of the Castlereagh Highway is unlikely to significantly affect any listed threatened fauna species, population or community. Thus no SIS is warranted.

5.2 Controlled Action Considerations (EPBC Act)

Relevant matters that might constitute a Controlled Action from the Proposal are considered below:

5.2.1 World Heritage Site

The Subject Area being only small, approximately 5.0 ha, is more than 10km away from the Greater Blue Mountain World Heritage Site and is unlikely to impact upon the environmental quality of the area.

5.2.2 Ramsar Wetland

Although the subject site is also located within the catchment of a Ramsar Wetland (the Macquarie Marshes) the proposed activity is not expected to cause any significant impact to this wetland. The Proposal is unlikely to have an impact on this Ramsar site due to its distance from the Survey Area and if adequate local sediment runoff controls are adequate.

5.2.3 Listed Threatened Species

Below are considerations of a listed species that has not been dealt with in conjunction with the Section 5.1 considerations of the TSC Act.

The Australian Painted Snipe, *Rostratula australis*, is a species that forages in mudflats and nests in shallow water. There is no record of this species within 20km of Capertee. The Proposal is not likely to affect this snipe as these habitats are not present in the Survey Area.

5.2.4 Migratory Species

The White-breasted Sea Eagle, *Haliaeetus leucogaster*, is predominantly a coastal and estuarine species but also occurs in inland waterways where there are sufficient fish in the lakes and rivers for it to persist. There is no record of this species within 20km of Capertee and the Proposal does not involve or have any direct or indirect impact on any wetland thus it would have no impact on the White-breasted Sea Eagle.

The White-throated Needletail, *Hirundapus caudacutus*, is a migratory species that spends almost all of its time in the air. There is no record of this species within 20km of Capertee and the Proposal is unlikely to have any direct or indirect impact on this aerial species.

The Rufous Fantail, *Rhipidura rufifrons*, is a summer migrant in Southeastern Australia. Although it is found in the Sydney Basin Bioregion and, occasionally further west, in this bioregion, it is associated with structurally diverse eucalypt forests in the Central Tablelands and Central Coast. Although this fantail has been recorded in the region it has not been recorded near Capertee. The Survey Area on the edge of the drier western slope, is marginal non-breeding habitat to this fantail as it does not have the structural diversity of some habitat patches in some of the gullies in the region to the east. The Proposal is thus unlikely to significantly impact upon this species.

The Satin Flycatcher, *Myiagra cyanoleuca*, is a species that inhabits eucalypt woodland and migrates north in winter. It breeds in the wetter areas with dense vegetation and moves to drier habitats once the young are out of the nest. There is no record of this species within 20 km of Capertee and none has been recorded in the region. The Proposal is thus also unlikely to significantly impact upon this species.

In summary, no EPBC Act listed threatened species and key threatening processes, Ramsar wetland or any CAMBA or JAMBA listed species would be affected by this proposed activity. No other matter that would trigger this proposed activity to be a controlled action is relevant in this case; thus no further consideration is warranted pursuant to the EPBC Act.

Environment Protection and Biodiversity Conservation Act (1999)

Significance Guidelines

Under the *EPBC Act*, if the proposed development has the potential to have an adverse impact on a threatened species, population or ecological community listed on the *Act*, the proposal must be referred to the Federal Minister for the Environment for further consideration. In order to determine if an action is likely to have a significant effect on the environment, the action must be considered under the Environment Australia Guidelines Assessment of Significance.

Regent Honeyeater, *Xanthomyza phrygia*

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

No. See Section 5.1.6 (ii) and Points d), g) and h) below.

b) Will the action reduce the area of occupancy of an important population?

No. See Section 5.1.6 (ii) and Points d), g) and h) below.

c) Will the action adversely affect habitat critical to the survival of a species?

No critical habitat of the Regent Honeyeater has been listed.

d) Will the action fragment an existing important population into two or more populations?

No. The site of the proposal is not part of the major Regent Honeyeater breeding populations in the Capertee Valley and the Bundara – Baraba District. Some breeding also occurs in the Warrumbungles and Mudge areas (NPWS 1999). The species is semi-nomadic elsewhere in it distribution range.

e) Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for any species in the Capertee area.

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

No. See Section 5.1.6 (ii) and Point d) above as well as Points g) and h) below.

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

No. The area involved in this proposal is between an existing road and a strip of cleared Telstra easement and the access provided by the road realignment to existing native and exotic predators would be unlikely to be augmented by the proposed activity.

h) Will the action interfere substantially with the recovery of the species?

No. The proposed action does not involve the loss of feed or nesting trees preferred by the Regent Honeyeater, viz. Mugga Ironbark, White Box or Yellow Box, or any *Casuarina* or loss of Mistletoe (see Geering & French 1997 and French *et al* 2003).

Conclusion

The proposed development of the study area is unlikely to cause a significant impact on *X. phrygia* and as such a referral of this action to Environment Australia is not recommended.

5.3 Native Vegetation Clearing (NVC Act) and Wildlife Corridor

The proposed activity would involve some clearing of native vegetation, including some trees with hollows and shrubs up to 20m from the centre line of the proposed road realignment. This Proposal would further dissect the area of habitat that now lies between the Telstra easement and the existing road (see **Figure 2**). This further adverse impact is however unlikely to significantly alter the status of the connectivity and conductivity of the habitat on either side of the existing road.

The above notwithstanding, on the basis of a "no long-term nett loss" principle, the cleared area (Habitat 1) along this proposed road realignment should be revegetated. This would compensate for the loss in the connectivity and conductivity from the removal of habitat in Habitat 2 and Habitat 3 between the existing habitat areas to the east and west of the current highway.

The impact of the Proposal on fauna habitat could also be mitigated if the realignment can be relocated slightly to the west at its northern end to avoid as much of the uncleared native vegetation as possible in Habitat 3 (see **Figure 2**).

The impact on the fauna and its habitat could be further ameliorated by lowering the speed limit along this stretch of the highway leading into the town of Capertee to an 80km/h zone. This would further reduce the amount of clearing from the proposed centerline needed to meet the relevant road design standards.

Further consideration may also be warranted to minimise the clearing of threatened native vegetation (see GCNRC 2004).

5.4 SEPP 44 Koala Habitat Protection

The Greater Lithgow City Council is listed under Schedule 1 of SEPP 44. There is however no potential or core Koala habitat in the area proposed for the road realignment. Of the Koala feed trees listed in Schedule 2 of SEPP 44, only the Grey Gum, *E. punctata* was found in the Survey Area. It did not make up more than 15% of

the upper or lower canopy. There is also no historical record of Koala near Capertee (NPWS 2003), thus no further consideration for a Koala Habitat Management Plan is warranted (also see GCNRC 2004).

5.5 ESD Considerations

No additional loss of biodiversity is expected from this proposed activity. The issue of intergeneration equity and value adding considerations regarding the use of the fauna is not relevant in this instance. No issue of any matter relating to the Precautionary Principle is relevant in this case.

The proposed activity, in these respects, is thus consistent with ESD principles.

5.6 Cumulative Impacts and Road Kills

The proposed activity is to be carried out on a section of the Castlereagh Highway and would result in some loss and/or modification of the local fauna habitat from the clearing of native vegetation. The cumulative impact on fauna habitat from the clearing of native vegetation in this proposed road realignment could not be assessed, as the extent of other roadwork planned in this Bioregion is not available to the authors.

Although native fauna, including some of the listed vulnerable species, are expected to feed along the shoulder of the road on this section of the highway from time to time, no significant cumulative impact on the fauna from roadkills is expected to result from this Proposal. The realigned road would simply have supplanted the current impact of the existing road. Should the speed limit be reduced from the current 100 km/hr to 80 km/hr speed limit as it is on an approach to a township, the frequency of road kills in the realigned section can be expected to decrease from the current level.

6.0 RECOMMENDATIONS

The above summary of findings notwithstanding, the following safeguards are recommended to generally minimise or ameliorate any adverse impact on the fauna for the realignment of this stretch of the Castlereagh Highway.

1. Where possible all native vegetation should be retained, especially trees with hollows or that may have potential to form hollows.
2. Where possible trees should be lopped to reduce safety concerns where their removal can be avoided.
3. The removal of trees should be confined to late summer or early autumn, where possible, to avoid any impact on spring nesting birds and winter hibernating bats.
4. All fallen timber, including stags (dead standing trees) should be left within the roadside corridor beyond the 13m zone on either side of the road.
5. No burning or removal for firewood of any fallen timber should be carried out.
6. Consideration should be given to encouraging habitat regeneration along the roadside corridor along this strip of the highway, especially the southern third of the realignment to improve the connectivity of the bushland on either side of the highway.
7. Consideration be given to reducing the speed limit to 80km/h along this proposed realignment and reducing the necessity meet the 100km/h guideline road shoulder clearing condition(s).
8. The turn-around areas should be located in cleared area to avoid any further necessity for any additional clearing of native vegetation.
9. A pre-start survey should be carried out when the actual realignment is established to relocate any hollow branches that may be occupied by threatened bats or birds.

7.0 CONCLUSIONS

Having given consideration to the above and the nature of the proposed realignment of the road, it would appear that the proposed activity is:

i) unlikely to significantly affect any of the listed threatened species, fauna populations or communities.

ii) unlikely to augment or significantly contribute to any listed key threatening processes.

iii) unlikely to significantly affect any Ramsar wetland or any CAMBA or JAMBA listed species.

iv) unlikely to significantly affect the water quality of any waterway if adequate safeguards are adopted.

v) consistent with ESD principles with regards to fauna and would not adversely affect the local biodiversity.

Thus, the proposed activity should not be considered to constitute a Controlled Action and no SIS is warranted.

In reaching this conclusion, we are assuming that the RTA will have the usual sediment controls in place and the turn-around areas will be confined to cleared areas and that these ancillary activities will not further affect any fauna habitat in any significant way.

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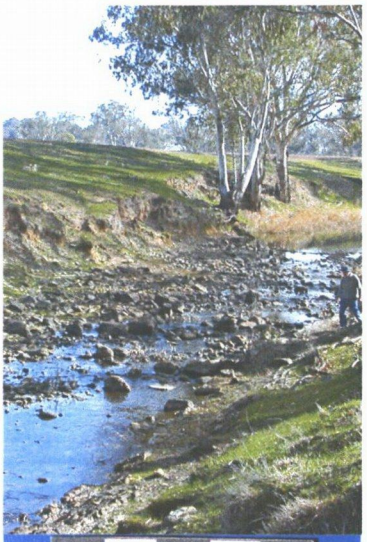
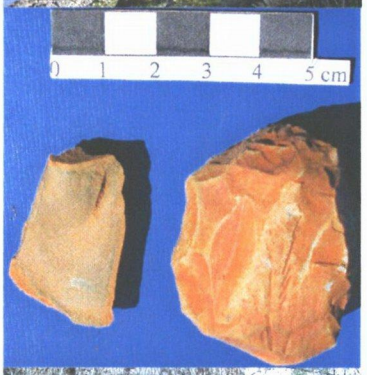
Appendix E

Indigenous Heritage Assessment





OzArk

Cultural Heritage Management P/L

INDIGENOUS HERITAGE SURVEY:

CASTLEREAGH HIGHWAY REALIGNMENT

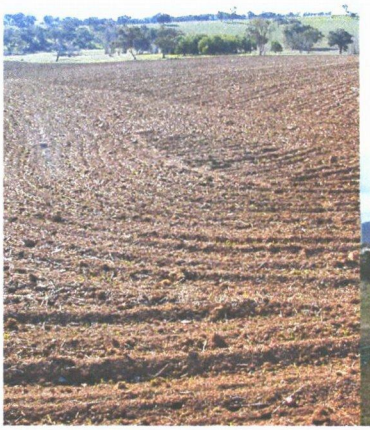
CAPERTEE, NSW

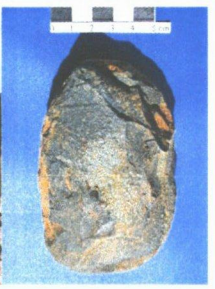
DECEMBER 2003

REPORT PREPARED BY
OZARK CULTURAL HERITAGE MANAGEMENT P/L

FOR

RTA ENVIRONMENTAL TECHNOLOGY





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Executive Summary

The current study identified one Aboriginal site within the study area. This scarred tree is located c. 50 m from the centerline, on the western border of the study area (Figure 3). This tree would not be directly impacted by the proposed road realignment, as it is 25 m outside the edge of the proposed impact corridor. This site may, however, be indirectly or incidentally damaged during construction works and thus poses a constraint by the requirement to implement mitigative measures. These measures are based on the use of a physical curtilage around the tree and a fence line erected along the edge of the impact zone. Workplace induction leading to increased staff awareness is also recommended (see Recommendations – Section 8 for details).

No other Indigenous sites were identified during the survey and there are no other constraints to the project on the grounds of cultural heritage.

Three sites of possible Historic heritage significance were also noted as a result of this study. The horizontal extent of these areas requires determination in the field to ensure they are outside the zone of impact. Recommendations (Section 8) provide some guidelines to ensure these sites are protected.

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Appendices

1. INTRODUCTION

This report was commissioned by the Roads and Traffic Authority, Environmental Technology (RTA). It details the results of a survey for Aboriginal sites along a 1.2 km road corridor adjacent to the Castlereagh Highway (SH 18) at Capertee, 41 - 43 kms north of Lithgow.

This study comprises part of a Review of Environmental Factors.

1.1 Project Scope

The consultant was briefed to undertake survey and assessment of Indigenous heritage issues arising from a proposed road deviation project along a c. 1.2 km stretch of the Castlereagh Highway, Capertee.

This investigation included the following aspects:

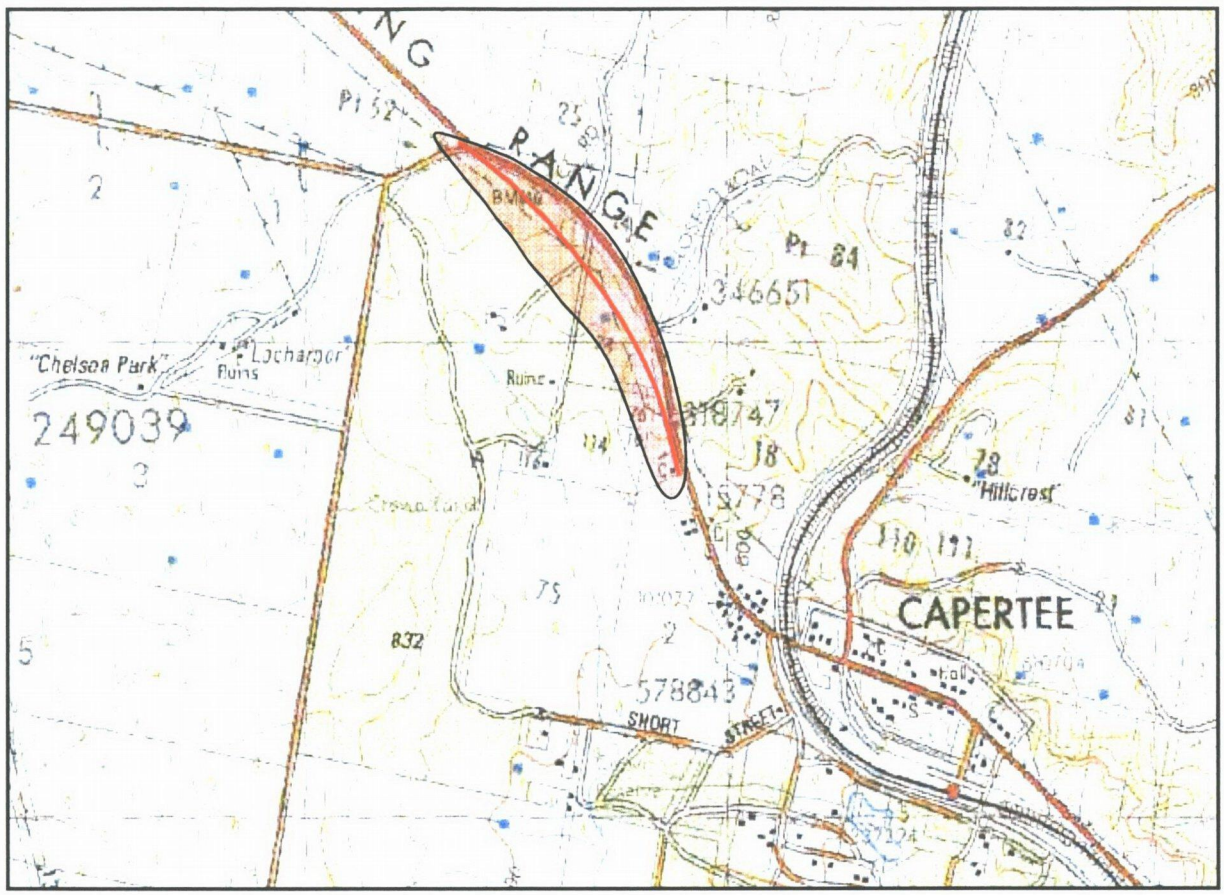
- A search of the NSW Department of Environment and Conservation (DEC) Aboriginal Heritage Information Management System (AHIMS) for any previously recorded sites;
- A review of relevant literature including previous consulting reports, academic theses and articles and available works on the history and ethnography of the Capertee - Lithgow area;
- Consultation with the Bathurst Local Aboriginal Land Council (BLALC);
- Pedestrian field survey to identify and record all cultural heritage sites and relics within a c. 1.2 km stretch of the Castlereagh Highway, from 41 - 43 kms north of Lithgow, for a distance of 50 m either side of the proposed centreline;
- Assessments of the significance of any recorded sites and the formulation of appropriate management strategies; and,
- Completion of documentary evidence (e.g. DEC Site Cards) for any sites/relics located during the survey for the notification of the relevant authorities.

1.2 Proposed Works

The RTA proposes to realign the Castlereagh Highway c. 1 km north of Capertee (Figure 2). These works are required to upgrade the Highway formation in line with current design guidelines of a 100 km / h alignment and 13 m width. It is proposed that impacts will only occur within c. 25 m from the pegged centerline.

Figure 1: Locality Map.

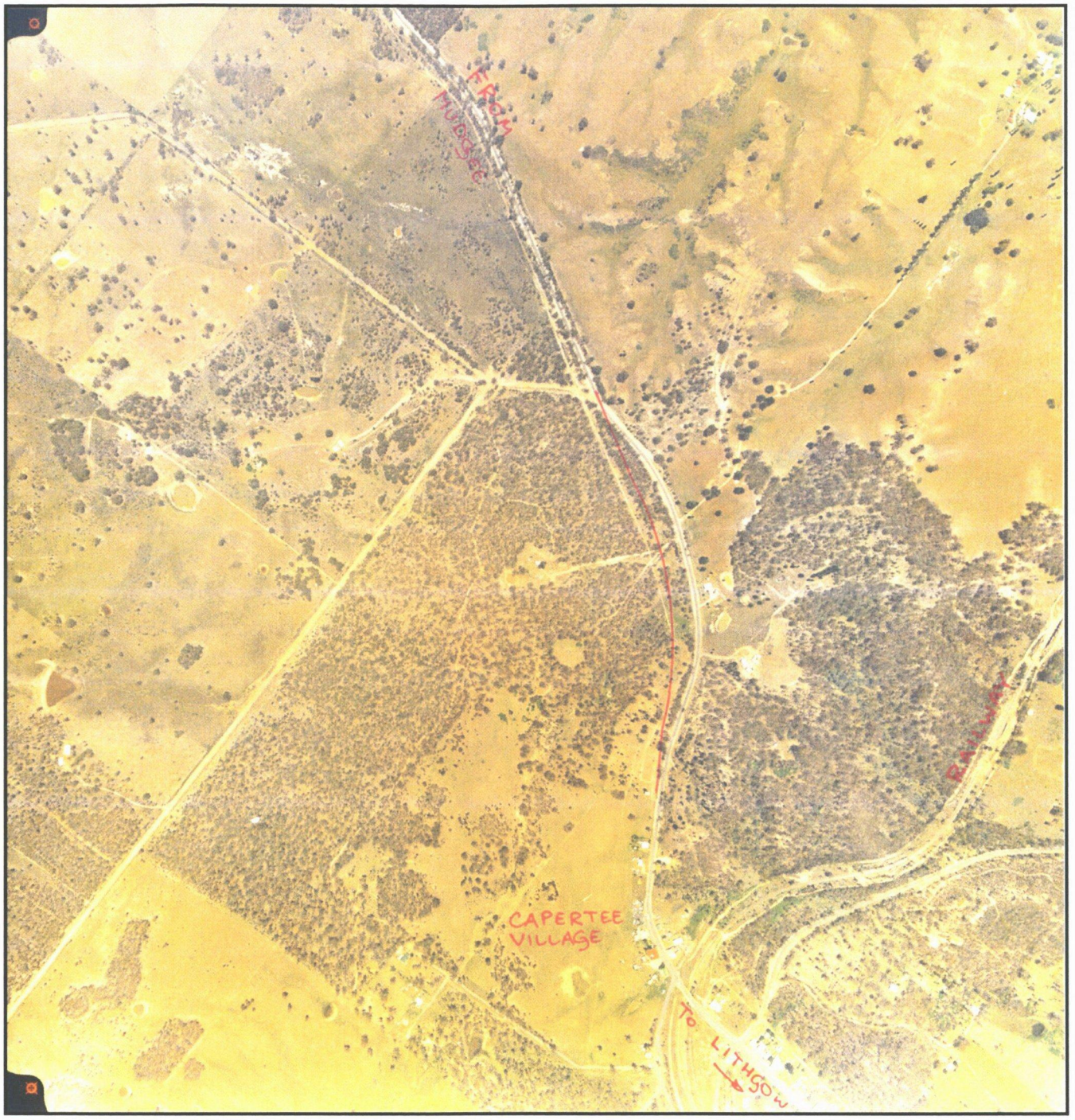
Figure 2: Map showing the study area. Capertee 1:25k Topographic map series 8831-1-s.



Approximate boundaries of study area

Approximate location of new road alignment

Figure 3: Aerial photograph showing the location of the proposed Castlereagh Highway realignment in relation to the current Highway alignment and surrounding landscape. Taken from aerial photo 9726-9739 – 1993.



1.3 Project Constraints and Limitations

Survey was limited to the area delineated in Figure 2, being 1.2 kms in length and comprised of land 50 m either side of the proposed realignment of the Castlereagh Highway. All boundaries of the study area were marked in the field with white survey posts with chainages and delineated on a map by sent by the client (Christopher Havelock – RTA Environmental Technology).

1.4 Report authorship

This investigation was undertaken by Richard Peters representing the Bathurst Local Aboriginal Land Council, Mark Arrow representing the RTA Western Region and Jodie Benton - OzArk Cultural Heritage Management P/L. This report was written by Jodie Benton and Phillip Cameron.

2. ABORIGINAL COMMUNITY INVOLVEMENT

The study areas fall within the boundaries of the Bathurst Local Aboriginal Land Council (BLALC). Richard Peters representing the BLALC participated in the survey that took place on Thursday the 20 November 2003.

Discussions were held on-site regarding the findings of the field survey and the topics covered included cultural significance, management options and recommendations.

Letters of correspondence from BLALC regarding the survey and its results can be found in Appendix 2.

A record of all consultation with the BLALC was kept during the course of the project and is presented in Appendix 3.

3. THE STUDY AREA

The study area for the current project is land owned by six separate tenants, two of which are crown land. All are a timbered and located 1 km north of Capertee, on the western side of the existing Castlereagh Highway (Figure 1). This is within the Greater Lithgow Shire, County of Roxborough and the parish of Bandamora.

The subject land is comprised of a 1.2 km stretch of land to the east of the existing Castlereagh Highway, from 41 - 43 kms north of Lithgow.

The boundaries of the site were well defined in the field, with white survey pegs defining the proposed centreline with chainages, and a 25 m boundary of impact line also delineated. Approximately 50 m either side of the centre line was surveyed, creating a study area of c. 12 ha.

3.1 Topography and Hydrology

The Capertee area is situated in the western foothills of the Great Dividing Range. More specifically, the landscape of the current study area is comprised of slightly sloping land, declining to the southwest at a slope of c. 3°. Elevations within the area do not vary

greatly from 820 - 860 m Australian Height Datum (AHD).

The creeks in this landscape drain generally in a southwesterly direction, away from the mountains and foothills flowing into the Turon, Bandamora and Lochobe Creeks and hence into the Turon River valley.

No creek lines actually traverse the study area, although at the southern end of the study area are the headwaters of an ephemeral drainage line that flows into Turon Creek c. 600 m to the southwest of the study area.

3.2 Geology

Capertee lies within an area of Palaeozoic undifferentiated Shoalhaven Group claystone comprised of light brown to grey, fine-grained clayey sandstone, which dates to the Permian period. To the east are pockets of Illawarra coal measures, and less than 4 kms to the west are areas of Ordovician Sofala Volcanics which include volcanic sandstone, conglomerate, breccia, siltstone, minor basaltic andesite, chert and limestone.

3.3 Vegetation

Prior to European occupation the study area would have exhibited an open stringy bark (*Eucalyptus macrorhyncha*) woodland, grassy understory with a mixed sparse shrub layer. Today bush tracks and timber cutting are the major disturbances in evidence, and the impacts of these are generally minimal. The cutting of railway sleepers in the past has, however, eliminated many of the very mature trees. The understory comprises occasional dense clumps of native bushes and blackberry but more generally appropriate conditions have predominated for a healthy native grass community to thrive.

3.4 Existing levels of disturbance

North and east of the current study area sees the existing Castlereagh Highway and its associated disturbances. South and west of the current highway, however, has seen only minor disturbance which is thought to be associated with early twentieth century logging and more recent vehicle and stock movement (Plates 1 and 2). Property access tracks bisect the study area through the centre. Disturbance surrounding these driveways constitutes minor tree clearing, loss of ground cover and sheet erosion from soil compaction.

The remainder of the study area sees generally low levels of ground surface disturbance with occasional signs of vehicle tracks and stock movement. Beyond this open woodland predominates with sporadic invasion of native shrubs and the introduced blackberry bush. A single dam is present on the western boundary of the study area (Figure 2).

3.5 Effective survey coverage

Ground surface visibility across the majority of the study area was low (see Table 1), hence, effective survey coverage was also low (c. 4%). The areas of undisturbed woodland offered very little ground surface visibility due to the moderately dense grass and leaf litter layer. The only areas of good visibility were disturbed, predominantly consisting of the various trails or tracks associated with stock or vehicle movement and small areas of sheet erosion.

All older trees were inspected for scarring and a photographic record of these was kept despite the fact that only one was assessed as being of cultural origin.

Table 1: Estimated effective survey coverage across the Castlereagh Highway study area.

Land form	Dimensions	Exposure %	Visibility within exposure	Estimated effective coverage	Sites
Woodland	12 ha	Occasional sheet erosion, access tracks, around dam 5%	80%	4800 m^2	1
Totals	*12 ha*			*4800 m^2*	*1*

4. PREVIOUS ARCHAEOLOGICAL STUDIES

4.1 Regional Context

No recent systematic, regional based archaeological studies had been undertaken in the Capertee area. In 1985 a general overview of the archaeology of Evans Shire was undertaken but this document has not been accessible during research for the current study. Several development driven investigations have been undertaken in the Capertee region, including work in the Gardens of Stone and Wollemi National Parks and studies relating to agricultural impacts. These will be described in more detail in the following section.

The Blue Mountains have been the birthplace to a number of published models for pre-historic occupation of upland or mountainous areas (McIntyre-Tamwoy 2002: 11-14). Models proposed by McCarthy (1964) Stockton (1970) and Johnson (1979) all suggest that occupation of the mountains was restricted to the major valley floors and lower slopes and that occupation of the sandstone plateau was either highly unlikely (McCarthy 1964) or at least restricted to restricted sporadic short term hunting trips during the warmer months or religious / ceremonial activities (Stockton 1970).

Johnson (1979) concurred with previous models proposed by Stockton and McCarthy, stating:

a) permanent and intensive occupation occurs in the valleys where sites are rich in lithic material and poor in art;

b) the sandstone plateau was subject to only sporadic, short term occupation because the area is poor in resources;

c) large rock shelters on the margin of the plateau are rich in parietal art and poor in lithic material. Such sites are ascribed by Johnson to ceremonial purposes.

Working further to the west of the Blue Mountains, Pearson (1981)[1], determined that archaeological sites could be divided into two main categories, occupation sites and non-occupation sites (which included grinding grooves, scarred or carved trees, ceremonial and burial sites etc.). An analysis of the location of these sites led him to build a model for site prediction which saw occupation sites occurring in places that had access to water, good drainage, level ground, adequate fuel and appropriate localised weather patterns for summer or winter occupation. Such places were most frequently found on low ridge tops, creek banks, gently undulating hills and river flats and usually in open woodland vegetation (Pearson 1981: 101 as quoted in Koettig 1985: 47). He notes that this pattern may differ somewhat as you head west into the drier plains where there was a greater dependence on the larger, more permanent water supplies.

The location of non-occupation sites was dependent on various factors relating to site function. For example, grinding grooves only occur where there is appropriate outcropping sandstone, but as close to the occupation site as possible. Scarred trees were variably located with no obvious patterning, other than proximity to watercourses, where camps were more frequently located, hence these provided a focus of human activity.

As a result of her work in the Dubbo area, Koettig (1985: 81-82) made several broadly applicable statements regarding site location:

- The location of sites and their relative size were determined by various factors, predominantly environmental and social. Although social factors cannot be explained through archaeological research, some of the environmental issues may be. These are:
    a) *Proximity to water*: the largest campsites were located close to permanent water, nonetheless, sites were found all over the landscape including hills and ridges away from obvious water.
    b) *Geological formation:* Certain sites require specific conditions, e.g. grinding grooves occur where appropriate sandstone outcrops, quarries are found where suitable stone resources are accessible, burials tend to be found in sandy sediments such as alluvial flats etc.
    c) *Availability of food resources:* The widest range of potential foods was found along the main watercourses due to the supply of permanent water. Some foods would have been seasonal and required foraging away from watercourses.
- In predicting intensity of occupation, Koettig suggests that larger and more constantly occupied sites are likely to occur along permanent watercourses, while less intense and sporadic occupation evidence is seen along ridge tops or temporary water sources e.g. creek headwaters.

The predictive model for site location developed as a result of this study can be summarised as follows:

- All site types can be found along watercourses;
- stone arrangements occur most frequently on knolls or prominent landscape

[1] M. Pearson's 1981 study is an unpublished PhD thesis from the ANU. I have been unable to directly access this work and rely heavily on summaries presented in Koettig (1985) and to a lesser extent Kelton (1996).

features;

- larger campsites are most frequent along permanent watercourses, near springs or wetlands, although small campsites may be found anywhere. Because occupation was more intensive along major watercourses, more site complexes will be found there;
- scarred trees may be found anywhere, but especially where there are remnant stands of native trees;
- campsites would become smaller and more sporadic near the headwaters of creeks;
- grinding grooves are most frequent in association with appropriate sandstone;
- quarries may be found wherever there is a reliable sources of suitable stone; and
- Shell lenses (midden material[2]) would only be found along Rivers that support shellfish.

The North-Central Rivers study undertaken by Balme (1986), contributed to our knowledge of the archaeology of the region by looking at site location with reference to preservation, both in the face of natural and incursive processes. Findings concluded that apart from the effect of historic impacts on sites, the greatest influence on the distribution of sites is that of geomorphic processes affecting site preservation and subsequent processes leading to site exposure (Balme 1986: 182 as quoted in Jo McDonald CHM: 1998: 17). Balme also found there was little scope for the assessment of the chronology of prehistoric sites as so few datable contexts have been located. Finally, and relevant to the current study, was Balme's finding that a number of sites recorded on the ASR register from ethnographic accounts (e.g. Etheridge 1918) are no longer likely to be found.

4.2 Local Context

Between 1971 and 1990, nine studies have been undertaken in the Capertee region.

In 1971 Brayshaw undertook survey in the face of operations at the Airly Authorisation (mining purposes). This study recorded two rock shelters, one with art the other with PAD, an open camp site and an isolated find. Further work at the same site in 1990 (Brayshaw) recorded a further open camp site and another rock shelter with PAD.

Johnson (1977) recorded 24 rock shelters as a result of his work in the Blue Mountains / Capertee area. Later that year and in the following year, Johnson undertook excavations of at least two of these sites.

A search of the NPWS AHIMS register revealed two (2) previously recorded Aboriginal sites located within a 10 x 10 km square area centered on the Castlereagh Highway study area (Search date: 11.11.03). Both these sites have the same eastings / northings despite being described as very different site types. The first (44-3-0029) is described as a shelter with art and deposit, while the second (44-3-0056) is labeled as a bora / ceremonial ground and carved tree site. The former site is described as paintings in a cave at Heffernan's Hole, near Capertee, and was apparently originally recorded in 1900. The latter site was most recently described by Bell in his 1980 report, where it is said to be

[2] Midden: A prehistoric refuse heap usually comprised of shells.

located near the Capertee – Mudgee Rd, although is also noted as possible destroyed.

Whilst in the field for the current survey an attempt was made to find these sites, as they plotted out to being only c. 150 m east of the current study area. No manifestations of either side could be found, and is presumed that they have been either destroyed or their eastings and northings are incorrect. Further, no suitable rocky outcrops were present close to the grid references provided.

It is also important to remember that the distribution of recorded sites across this landscape reflects more the pattern of development, the ad-hoc nature of incidental recordings and factors of visibility, rather than providing a true picture of Aboriginal site distribution.

4.3 Predictive Model for Site Location

Proximity to a permanent water supply is the primary factor appearing to determine the location of Aboriginal campsites. In the Sydney region, stream ordering has been used to predict the potential for site occurrence, and further to indicate the possible nature of these sites in terms of their complexity. Results of an integrated series of studies including a serious excavation component (Jo McDonald CHM 1997), suggests a high correlation between the permanence of a water source and the permanence and / or complexity of the areas' Aboriginal occupation. This was further reflected in the lithic assemblages from sites close to permanent water, which suggested that a greater range of activities were represented (e.g. tool use, manufacture and maintenance, food processing and quarrying). Sites near ephemeral water sources had evidence for one-off occupation (e.g. isolated knapping floors or tool discard), and creek junctions were also proven to be foci for site activity.

Using the concept of stream ordering, the results of the predictive models outlined in Section 4.1, and the limited knowledge gained from a review of the local context in Section 4.2, the following general predictions can be made regarding the nature of sites and their location in the current study area:

- In the vicinity of second order creeks (such as Turon Creek to the south-southwest of the study area), archaeological evidence may be sparse, but may indicate focused activity (one-off camp sites and knapping events);

- On the flat plains over 200 m from water, archaeological evidence is likely to be sporadic if present at all.

From the known sites outlined previously in Section 4.2, it is possible to say that the most likely sites to be encountered in the Castlereagh Highway study area are:

- Scarred trees (not frequently found in the local area but more generally located close to creeks and rivers but also found further a field).
- Isolated finds may occur anywhere, especially in disturbed locations near water sources or in areas close to ephemeral water – i.e. headwaters;
- Open camp sites (unlikely due to distance from permanent water);
- Carved trees (possible but usually destroyed)

- Bora or initiation grounds (unlikely to remain extant)

For the purposes of the current study, the following site type definitions have been used:

Scarred Trees

This site type results from the deliberate removal of bark (and sometimes wood) from trees, for the purpose of obtaining raw material for the manufacture of various items of material culture – i.e. shields, coolamons, shelters, canoes, and cradles. They may also result from foraging and hunting - for instance, toe holes cut in trees to allow access to upper branches and hollows, and axe marks around natural hollows for the extraction of small tree-living fauna (such as possums or birds) or honey.

The identification and interpretation of a scar as being Aboriginal in origin can often be difficult, as bark can be removed from trees by a variety of means e.g. animal foraging, the natural breaking off tree limbs, the result of machinery damage to trunks and the removal of bark by Europeans to define land boundaries. To assist archaeologists in the accurate identification of Aboriginal scarred trees, the NPWS Western region provides a set of criteria against which each scar must be assessed.

These diagnostic criteria are as follows:

1. *The scar must not touch the ground*[3] - (scars resulting from fire, fungal attack or lightning nearly always reach the ground). Such a termination does not necessarily preclude an Aboriginal origin. Ethno-historic accounts of canoe manufacture occasionally demonstrate scarring to ground level. If the scar does run to the ground, the sides must be relatively parallel (i.e. not triangular);

2. *The ends of the scar should be squared off or evenly tapered* - Different shapes at the top and bottom (e.g. pointed at top, squared at bottom; round at top, flaring at bottom) are suggestive of natural processes (e.g. branch loss);

3. *The sides of the scar should be parallel or symmetrical* - Few natural scars are likely to have these properties, with the possible exception of fire scars, which may be symmetrical but are usually wider at their base. Modern surveyors' marks are typically triangular, and often adzed. These also (regardless of shape) usually have a number carved in the wood, within the scar;

4. *The length of the scar must be on the same axis as the tree and not oblique or slanting across the tree or the branch* - Scars that are natural in origin tend to have irregular outlines, sometimes have irregular regrowth and may occur against the axis of the tree.

5. *The tree should be reasonably old – i.e. over 100 years* - The tree upon which the scar is found should be old enough (i.e. of sufficient age) to have been used by

[3] Discussion with Will Burns (WDD) suggests that scars may indeed extend to the ground, especially when the bark is planned for use in a shelter. This information is derived from oral histories recorded by the WDD.

Aboriginal people in (at least) a semi-traditional manner. This means the tree should be at least c. 100 years old. The age of the scar should also be reflected in the thickness of the regrowth. Young scars (e.g. some natural scars caused by branches falling or birds or horses gnawing, have characteristically thin regrowth);

6. *There must be no obvious natural or other artificial cause* such as a branch rip, lightening strike, cockatoo chewed bark or healed bark tears from machinery damage or car impact – Any signs that the scar may not be Aboriginal should be carefully assessed; and,

7. *The tree must not be an introduced species* – For obvious reasons, the tree upon which the scar is found should be endemic to the region, i.e. this excludes historic (exotic) plantings.

Also helpful, but not within the NPWS criteria are the following points:

8. *Axe or adze marks* - A scar with cut marks on the original wood is likely to be anthropogenic in nature (i.e. as a result of human actions). The location and shape/size may lend support to the scar's origin. For example stone axe marks would indicate an Aboriginal origin, while steel axe marks post-date the arrival of Europeans. These of course could still have been made by an Aboriginal person in the post-contact era; and,

9. *The presence of epicormal growth* – Many scars of Aboriginal origin tend to have an epicormal shoot originating at the base of the scar. This is a new branch shooting from the point of damage and is part of the tree's self-preservation mechanism.

As noted in the NPWS criteria, any tree that does not fit these rules cannot be accepted as likely to be of Aboriginal origin. This may mean that a few authentic scars are omitted from the Aboriginal Sites register, but it is the only means to establish consistency in identification.

However, even when applied, the above criteria cannot always provide a definitive classification, and a natural origin for the scar cannot be ruled out. For this reason interpretations of Aboriginal origin are qualified by the recorders degree of certainty. The following categories are used:

- DEFINITE ABORIGINAL SCAR

This is a scar which conforms to all of the criteria stated above and/or has in addition a feature or characteristic that provides definitive identification, such as diagnostic axe or adze marks, or a historical identification. All conceivably natural causes of the scar can be reliably discounted.

- ABORIGINAL SCAR

This is a scar where Aboriginal origin is considered the most likely. The scar conforms to all of the criteria and a natural origin is considered unlikely and improbable.

- PROBABLE ABORIGINAL SCAR

This is a scar that conforms to most of the criteria, and where an Aboriginal origin is considered to be the most likely. Despite this, a natural origin cannot be completely ruled out.

- POSSIBLE ABORIGINAL SCAR

This is a scar that conforms to most of the criteria but where an Aboriginal origin would appear unlikely[4].

For the purposes of the current study, on the advice of Allan Hutchins (NPWS Western Region), only scars of the first two categories have been recorded as sites to be entered into the NPWS ASR. As a general rule, the "Aboriginal scar" and "Probable Aboriginal scar" categories have been collapsed into one, called "Aboriginal scar". Other scars have been photographed and their locations recorded but will not be treated at Aboriginal sites.

Isolated Finds

An artefact, usually of stone, but possibly of other materials, that is located but has no relationship to other identifiable archaeological features.

Open camp sites

Often called stone artefact scatters, these sites (for the purposes of the DEC AHIMS database) were in the past defined by the presence of two or more stone artefacts located within 50 m of one another. Current guidelines, however, delineate no hard and fast determinations on requisite artefact numbers, more loosely describing these campsites as places exhibiting evidence of past human activity. This can be, and is most frequently, in the form of stone artefacts, but may also include other evidence such as hearths or midden material. Such sites provide evidence for the range of activities that may have been undertaken at a particular place, including the production of stone tools and the preparation of food including the butchering of animals or grinding of seeds. However, the distinction between a single, isolated artefact versus a place where numerous artefacts have been recorded together, provides a necessary division in terms of the possible information that a site can reveal about past activities. Further information recorded about open sites includes assessments of the sites' integrity (how intact the site is) and subsequently whether sub-surface deposits are thought to be present.

Carved trees

According to Mulvaney and Kamminga (1999), a carved tree is of a significant size with the bark removed and cuts made on the trunk in the patterns of circles, spirals, concentric diamonds and lozenges. These trees marked ceremonial or burial grounds. While a mass

[4] Occasionally scars are encountered which have all the necessary criteria to be anthropogenic in origin, but have additional features (such as letters or numbers) which suggest that they may have been produced during historic times by non-Aboriginal people.

of 120 carved trees around one bora ground has been recorded, they frequently occur in small numbers and often singly. The antiquity of the tradition is not known as bushfires and time consume the dead or old trees. Many of those recorded were made with steel hatchets post European contact.

Bora or initiation grounds

Ceremonial rock arrangements and earthworks (bora) are found in many parts of Australia. Over 1000 are known in NSW and Queensland alone. Mulvaney and Kamminga (1999), state that they are always low constructions, usually less than a meter high, but they have various patterns. It is presumed that the function of many earthworks and stone arrangements was comparable: their owners viewed them as personifying totemic beings who participated in creation dramas. In other cases, the constructions demarcated areas where ceremonial activities occurred. Many features of earth or piled stones are identified as a bora ring because of historical accounts of 'bora' ceremonies (initiation of boys) at such sites. The simpler the construction or feature, the greater the difficulty in identifying it as an aboriginal relict. Some have no distinctive attributes and, without confirmation from informants, would be unrecognizable as aboriginal or cultural features.

5. SURVEY METHODOLOGY

The entire Castlereagh Highway study area was traversed using pedestrian transects usually no more than c. 10 m apart. Three surveyors were used, and the area to the southwest of the proposed centreline was traversed twice, with surveyors covering a 25 m spread in each pass. North and east of the proposed, one pass was made within the fenced area and a second pass along the current Castlereagh road verge outside the boundary fence. All mature, native trees were inspected for scars and all areas of ground surface visibility were examined closely.

6. SURVEY RESULTS

One (1) Aboriginal site was located during the current inspection of the Castlereagh Highway study area. This scarred tree (CHC-ST1) is located on the southwestern side of the proposed Castlereagh Highway alignment, being c. 50 m from the proposed centreline and is shown on Figure 4. It is important to note that two other scars were noted on mature native trees. These were photographed and their co-ordinates noted despite the fact that they do not appear to be cultural in origin. Summarised information pertaining to CHC-ST1 is presented below and site details (including drawings and NPWS site cards) are presented in Appendix 4.

CHC-ST1 *Capertee 1:50k* *777705E 6329080N*

This scarred tree is located southwest of the current Castlereagh Highway, c. 50 m southwest of the proposed realignment centreline and approximately 50 m south of the property access track that divides the study area (Figure 4). It is located in a relatively cleared area close to the dam. The tree is a dead stump, incorporating one major trunk, and reaching approximately 2 m in height. The surrounding soils are relatively stable and the stump is situated on very slight slope.

The scarred trunk is c. 2.2 m in circumference at breast height (ABH). The elongated, ovoid, scar is oriented south-west, 70 cm in length, 27 cm wide with regrowth of c. 10 cm depth and the base of the scar is just above ground level (Plate 5). Axe marks were noted above and at the side of the scar. The tree was a smooth barked eucalypt, possibly a scribbly gum, although a definitive determination was difficult as the tree was dead.

This scar is assessed as an Aboriginal Scar, conforming to the current NPWS criteria, outlined in Section 4.3. Its size and shape suggests the removed bark may have been used as a shield or a coolamon. No stone artefacts were noted in the vicinity of this scarred tree.

No other Aboriginal sites were recorded during the current survey.

Although the survey undertaken over the study area was aimed at assessing Indigenous sites and issues, it was impossible not to note the presence of several items/areas of possible European heritage significance. These are briefly described below and some recommendations have been included in Section 8 to ensure the RTA does not breach the 1977 Heritage Act.

Timber cutters camp

At the north end of the survey area, southwest of the 25 m impact boundary but within the 50 m of the survey area, was the remains of a camping area (Figure 4). There are many tins of various sizes and types as well as sherds of ceramic vessels and glass bottles. Slightly to one side of this camp is a tree branch (shaped like a wish bone) lying on the ground, filled with squared pieces of bark[5] (Plate 5). Nearby, in the surrounding bush are the stumps of trees cut down long ago. Saw marks on the stumps indicate use of a two-handed saw, which leaves a particular series of concentric marks as well as a slight ridge through the centre. At some stump locations, the angle of the fallen trunk could still be ascertained as the fibrous bark still lay there, pulled from the trunk after it was sawn into lengths that appear to have been that of railway sleepers.

Second, more disturbed camp

Several hundred metres southeast of the initial camp was a second camp area that appeared far less intact (Figure 4). Once again scattered tins, glass and ceramics indicated camping activities, and stumps were in the general area.

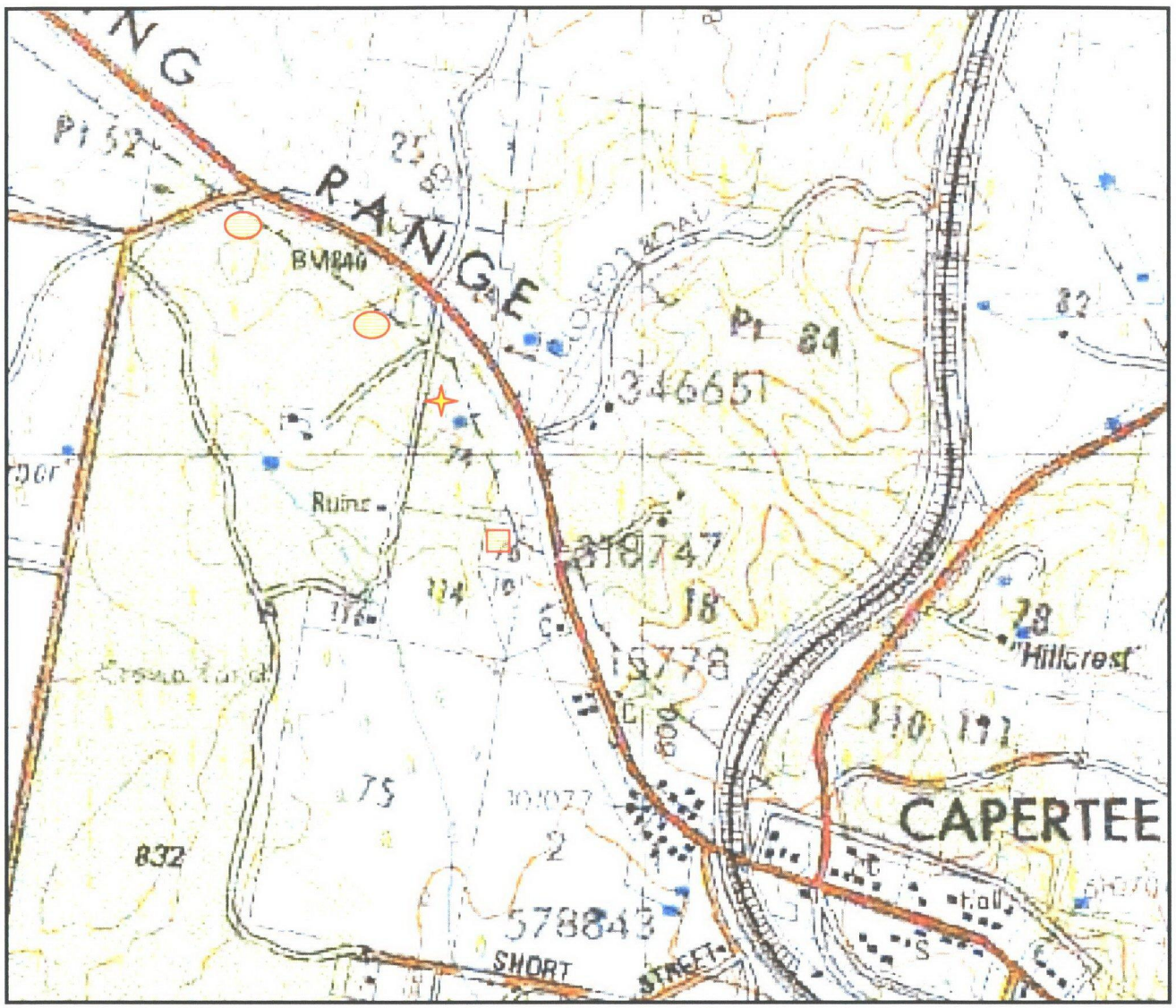
Horse Corral

At the southern end of the study area was a rough corral for horses constructed of coarsely hewn braches and tied together with wire between existing trees. Nearby are fences enclosing a paddock, and these appear to use the same gauge wire and construction techniques as the corral. The gauge of the wire was assessed as being of considerable age and subsequent research suggests that the enclosed paddock and corral date to the turn of the century (c. 1900) and were in fact the police paddock where horses were rested[6].

---

[5] Possibly an ad hoc bed?
[6] Mark Arrow (Pers. Comm.)

Figure 4: Map locating sites recorded during the current survey. Capertee 1:50 k topographic map.



Scarred tree CHC-ST1

Camp sites (European)

Horse Corral

7. DISCUSSION

7.1 Aboriginal Site Distribution

The current study area is comprised of a 100 m wide strip of land that traverses slightly sloping plains that are no closer than c. 300 m from permanent and/or temporary water sources (Turon Creek to the south). One Indigenous site, a scarred tree CHC-ST1, was recorded within this area, situated southwest of the proposed Castlereagh Highway road corridor.

In terms of the model for site prediction outlined in Section 4.3, the site recorded during the current survey (scarred tree), was found somewhat outside its expected zone of location (i.e. close to creek lines) being found on slightly sloping plains c. 300 m from a temporary water source. The absence of other recorded sites may be explained by the following factors:

- The study area did not transect any creeklines, where evidence for open camp sites may be more likely to occur:
- That previous disturbance within the study area (namely the establishment of the current Castlereagh Highway and associated infrastructure) may have disturbed / destroyed any previously extant sites; or
- That other sites exist within the study area but remain undetected due to the lack of ground surface visibility.

In general, the entire study can be assessed as being of low-moderate archaeological sensitivity, due to its distance from any water sources, and due to the slightly sloping nature of much of the land. Disturbance to the area has been sporadic but would be generally assessed as moderate to low. Overlaying the sensitivity of the area with the assessed disturbance, provides an assessment of the potential for intact, sub-surface archaeological deposits to remain undetected within the boundaries of the study area as low.

7.2 Aboriginal Site Assessment

The appropriate management of cultural heritage items is usually determined on the basis of their assessed significance as well as the likely impacts of any proposed developments. Scientific, cultural and public significance are currently identified as baseline elements of this assessment, and it is through the combination of these elements that the overall cultural heritage values of a site, place or area are resolved.

Cultural significance

This area of assessment concerns the importance of a site or feature to the relevant cultural group - in this case the Aboriginal community. Aspects of cultural significance include assessment of sites, items, and landscapes that are traditionally significant or that have contemporary importance to the Aboriginal community. This importance involves both traditional links with specific areas as well as an overall concern by Aboriginal

people for their sites generally and the continued protection of these. This type of significance may not be in accord with interpretations made by the archaeologist - a site may have low scientific significance but high Aboriginal significance (or *vice versa*).

The significance of the archaeological site located in the Castlereagh Highway, Capertee study area to the **Aboriginal communities** of the area was addressed during an on-site meeting attended by a representatives of the Bathurst LALC (see Section 2, 7.3 and Appendix 2).

Scientific significance

Assessing a site in this context involves placing it into a broader regional framework, as well as assessing the site's individual merits in view of current archaeological discourse. This type of significance relates to the ability of a site to answer current research questions and is also based on a site's condition (integrity), content and representativeness.

The overriding aim of cultural heritage management is to preserve a representative sample of the archaeological resource. This will ensure that future research within the discipline can be based on a valid sample of the past. Establishing whether or not a site can contribute to current research also involves defining 'research potential' and 'representativeness' (Bowdler 1984). Questions regularly asked when determining significance are: can this site contribute information that no other site can? Is this site representative of other sites in the region?

Scarred trees (being the only site type identified during the current study) are assessed on the basis of the known local context of this site type (i.e. are there many, some or no such features known locally). In general terms, scarred trees do not tend to increase our understanding of the area's prehistory, except in situations where past land-use practices have resulted in the total clearance of trees. In these circumstances, scarred trees become more significant due to the overall degradation of this resource (Jo McDonald CHM 1998: 50).

Public significance

Sites that have public significance do so because they can educate people about the past. By reducing ignorance about why sites are important to the Aboriginal and scientific community, important sites can be protected from ignorant or inadvertent destruction. Educating the public to understand the need for site preservation should increase the likelihood of maintaining an archaeological resource into the future. For a site to have high public significance it should contain easily identifiable and interpretable elements, and be relatively easily accessed.

Although scarred trees are easily appreciated due to their obvious visual manifestation, their general significance is reduced by their common occurrence. Unless a scarred tree is in some way outstanding (i.e. located in an area where such site types are rare, a canoe or toe hold tree or an unusual species to carry scarring), and depending on the condition of the tree, this site type is usually assessed as having moderate-low public significance.

7.3 Assessed significance of the scarred tree CHC-ST1

Cultural

Discussion regarding the significance of the recorded tree was held on site. Scarred trees are usually assessed as being of **high cultural significance**, however, it is noted that as the tree is dead and only comprised of remnant stump, this significance is compromised.

Scientific

The scientific assessment of scarred trees, as described above, revolves around the known local context of this site type (i.e. are there many, some or no such features known locally). Looking within a 10 x 10 km zone surrounding the study area, there are no scarred trees recorded on the DEC AHIMS database.

Scarred tree CHC-ST1 is assessed as being of Aboriginal origin. It is located on a slightly sloping plain southwest of the Castlereagh Highway and the likelihood of there being associated, intact sub-surface deposits is considered moderate-low. Scarred trees are a relatively rare site type in the local area, although they are more frequent on a regional level. This slight rarity must, however, be balanced with the fact that CHC-ST1 is a remnant, dead stump such that this site is assessed as being of **low scientific significance.**

Public

Scarred tree CHC-ST1 is assessed as being of **low public significance**. It is far from public access and on a dead tree stump.

7.4 Likely impacts of the proposed Castlereagh Hwy realignment at Capertee

Realignment of the Castlereagh Highway (Figures 2 and 3) will see the Highway moved to the south and west, thereby cutting off a dangerous bend in the current alignment. The works will heavily impact an area up to c. 25 m from the proposed (delineated) centreline. The landscape beyond the 25 m impact boundary will be protected by the erection of fencing that will ensure disturbance will remain to within this corridor. The scarred tree CHC-ST1 and the recorded items of historic heritage should all be protected as they lie outside the proposed zone of impact. Recommendations (Section 8) provide options to ensure the protection of all recorded sites.

7.5 Relevant legislation

Base line principles for the conservation of heritage places and relics can be found in the Burra Charter[7], which recognizes that there are places worth keeping because they can enrich our lives on many levels. The significance of such places may be embodied in fabric (physical material), environmental setting, contents, use or its meaning to people, and should be assessed through methodical data collection. Since its adoption in 1979, the

[7] The Burra Charter defines the basic principles and procedures to be followed in the conservation of all kinds of places such as monuments, buildings, Aboriginal sites, roads, archaeological sites, whole districts or even regions. It was first adopted in 1979, based on the Australian ICOMOS (International Council on Monuments and Sites) review (1977) of the 1966 Venice Charter (Australian ICOMOS Inc. 1998).

Burra Charter has become the standard of best practice in the conservation of heritage places in Australia, and heritage organisations and local government authorities have incorporated the inherent principles and logic into guidelines and other conservation planning documents. The Burra Charter generally advocates a cautious approach to changing places of heritage significance. This conservative notion embodies the basic premise behind legislation designed to protect our heritage, which operates primarily at a State level.

A number of Acts of parliament provide for the protection of Aboriginal heritage at various levels of government[8]. The three most important statutes in New South Wales are:

- The Environmental Planning and Assessment Act (EP & A Act) 1979
- The National Parks and Wildlife Act 1974
- The Heritage Act 1977

The Environmental Planning and Assessment Act 1979 requires that environmental impacts, including cultural heritage, are considered at a land-use planning and decision making level.

Under Part 5 of this Act Aboriginal heritage is protected in three different ways:

1. Through planning instruments such as Regional Environmental Plans (REP's) and Local Environmental Plans (LEP's). Such plans outline permissible land use as well as identifying potential constraints. S111 of the EP & A Act delineates that determining authorities must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.

2. S228 of the EP&A Regulation (2000) lists impacts to the environmental resource, including cultural heritage, which must be considered before development approval is granted.

3. All State Government agencies acting as determining authorities on environmental issues must consider a range of community and cultural factors, including Aboriginal heritage, in their decision-making process.

The National Parks and Wildlife Act 1974 (as amended; particularly sections 83-91A) provides statutory protection for all Aboriginal relics and places, regardless of significance, land tenure or whether they have been previously recorded in the NPWS Aboriginal Sites Register. Areas may be gazetted as Aboriginal 'places' when the Minister is satisfied that sufficient evidence exists to demonstrate that the area is or was of special significance to Aboriginal people.

Under this Act it is an offence to knowingly damage, deface or cause or permit the destruction of an Aboriginal relic or place without the prior written consent of the Director-general of the NSW NPWS. Prosecution for such offences may include the

[8] NSW Heritage Office 1998: Living with Aboriginal Culture, p. 3

imposition of financial penalties and/or imprisonment. Reporting the discovery of previously unknown Aboriginal sites to the NPWS within a reasonable time of discovery is also obligatory.

The Heritage Act 1977 (as amended) protects the State's natural and cultural heritage and contains measures to protect archaeological remains. Generally, Aboriginal sites are protected by the NP&W Act, but if certain sites are deemed as having great significance, they can be further protected by a heritage order, issued by the Minister, on the advice of the Heritage Council.

8. RECOMMENDATIONS

Under Section 91 of the NP & W Act (1974 as amended) it is mandatory that all Aboriginal sites recorded under any auspices be registered with the NSW DEC Aboriginal Heritage Information and Management System (AHIMS). As a professional in the field of cultural heritage management it is the responsibility of OzArk CHM P/L to ensure this process is undertaken.

To this end it is noted that the NPWS Site Card for the site recorded during the current survey of the Castlereagh Highway study area north of Capertee has been delivered to the NSW DEC.

The following recommendations are made on the basis of:

- Legal requirements under the terms of the National Parks and Wildlife Act of 1974 (as amended) whereby it is illegal to damage, deface or destroy an Aboriginal relic/object without the prior written consent of the Director, NPWS;
- The findings of the current investigations undertaken within the study area; and,
- The interests of the Bathurst Local Aboriginal Land Council.

It is recommended that:

1. In order to ensure the conservation of scarred tree CHC-ST1, certain mitigative measures must be adopted prior to and during the construction phase of the proposed road works. There are two possibilities, as follows:

   a) The entire vegetated corridor within which scarred tree CHC-ST1 is located may be fenced off from the possible or incidental impacts of construction works.

   OR

   b) Scarred trees CHC-ST1 must be identified in the field prior to any works being undertaken. A curtilage must be delineated around this tree using a highly visual physical barrier (i.e. 1 m high orange roadwork fencing). This will ensure the tree can be easily identified and protected.

   c) Irrespective of whether option a) or b) is favoured, **all** members of the construction team, including sub-contractors, machine operators and truck driver must undergo site induction concerning cultural heritage issues, prior to working on the site. This would preferably be undertaken by an individual who has a good working knowledge of Indigenous sites and of the legislation protecting them. This induction should inform workers/contractors of the location of the site, and of its legislative protection under Section 90 of the NSW National Parks and Wildlife Act 1974. These inductions should be recorded in a register, with all those present signing their complicity with these guidelines;

2) Should any 'relics' or other Aboriginal sites be identified during the course of

construction, work in that area should cease and the NPWS Central Division and the Bathust LALC be contacted to discuss how to proceed;

3) One copy of this report should be sent to:

Mr Warwick Peckham
Chairperson,
Bathurst LALC
PO Box 1500
Bathurst NSW 2795.

One copy of this report should be sent to:

Ms Theresa Gay
Manager, Cultural Heritage Division,
Central Region, NPWS,
PO Box 1967
Hurstville, NSW, 2221.

With regards to the recorded items of possible European heritage value, the following recommendations apply:

4) The horizontal extent of these features should be delineated in the field to determine whether they are likely to suffer any impacts as a result of the proposed Castlereagh Highway realignment. If they **are to be impacted**, the following procedures are recommended:

   a) The RTA should conduct a heritage assessment of the significance of the recorded items / relics in accordance with the "Assessing Heritage Significance Guidelines" 2001;

   b) Given that items at these locations are likely to qualify as 'relics' as defined in Section 139 of the Heritage Act 1997, the RTA is required to comply with the tenants of this Section (not to disturb or impact upon a 'relic' etc.) or seek an exemption in accordance with Section 139(4);

   c) If disturbance is unavoidable, then a Section 140 permit will be required prior to any impacts occurring.

5) If these **sites are outside the impact corridor**, the following procedures are recommended:

   a) The extent of the relics / sites be delineated in the field and then fenced off during the construction phase to ensure no incidental impacts occur;

   b) Members of the construction team should be inducted as to the location of these sites and their legislative protection under the NSW Heritage Act. These inductions should be recorded in a register and signed off by all team members.

9. REFERENCES

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Plate 1: View NW showing typical vegetation types through the study area. Note the dense vegetation and heavy leaf litter impeding visibility.

Plate 2: View W along the small dam wall. The scared tree stump is located within a short distance from this area.

Plate 3: View NW showing the handmade horse corral at the southern end of the survey area. Note the surrounding open woodland which is characteristic of the study site.

Plate 4: View W showing the remnants of a camp site (note the bark feature in the foreground) that may have been used by timber cutters of the early twentieth century. This area is located at the northern end of the study area (see Figure 4).

Plate 5: View NW showing scarred tree CRC-ST1.

Plate 6: View SE along the western road verge of the current Castlereagh Highway. It is through this area that new highway will be aligned.

Appendix 2 – Aboriginal Community Correspondence

BATHURST
LOCAL ABORIGINAL LAND COUNCIL

130 Bentinck Street
Bathurst NSW 2795

PO Box 1500
Bathurst NSW 2795

Phone: 02 6332 6835
Fax: 02 6332 3623

CASTLEREAGH HIGHWAY CAPERTEE

A survey was conducted on Thursday 20 November 2003 for the Roads and Traffic Authority for the proposed upgrade of the Castlereagh Highway at Capertee.

Bush tracks and tree lobbing has severely disturbed the whole area surveyed. Most areas were covered in heavy undergrowth, dense shrubs and Blackberry bushes also provided poor to nil visibility and prominently sandy and stony areas were also encountered.

A probable scared tree stump was located 25-30 metres outside the surveyed area and should not be impacted upon. This area can be located on the maps provided by Archaeologist Jodie Benton from Ozark reference C.H.R.C-ST1.

No other evidence of Aboriginal activity, sites, shelters or occupation was located during this survey.

Therefor the Bathurst Local Aboriginal Land Council has no objection to the commencement of this project.

Present at this survey were:

Jody Benton	Archaeologist	Ozark
Mark Arrow	Roads and Traffic Authority	
Richard Peters	Sites Office	B.L.A.L.C

Richard J. Peters

RICHARD J PETERS
SITES OFFICE
23 NOVEMBER 2003

Appendix 3 – Aboriginal Community Consultation Register

Log Of Aboriginal Community Correspondence

Date	Group contacted	Name	Discussion topics
19.11.03	Bathurst LALC	Toni Lea	Called to speak to Warwick but Toni said he was away. I arranged for the Capertee job to be done with Richard Peters. She agreed with the proposal and said she would pass my message on to Warwick.
19.11.03	Bathurst LALC	Richard Peters	Spoke in person to Richard and discussed Capertee with him. We arranged the date and a communication pathway with BLALC
20.11.03	Bathurst LALC	Richard Peters	Accompanied during the site inspection, discussed mitigative measures and reccomendations of the report
21.11.03	Bathurst LALC	Richard Peters	Received a copy of his letter report from the site inspection

Appendix 4 – NSW DEC Site Cards

New Recording ☒ Additional information ☐

SITE IDENTIFICATION					
Site name	CHC-ST1			**NPWS Site Number**	
Owner/manager	RTA Environmental Technology				
Owner Address	99 Phillip Street Pasramatta, NSW 2150				
LOCATION					
Location	Capertee				
How to get to the site	Follow the Castlereagh Highway to Capertee. The site is 1km immediately north of the town on the western side of the Highway.				
1:250,000 map name	Bathurst			**NPWS map code**	
AMG Zone	55	**AMG Easting**	777705	**AMG Northing**	6329080
Method for grid reference	Topographic map	**Map scale (if method = map)**	1:50,000	**Map name**	Capertee
NPWS District Name (see map)				**NPWS Zone (see map)**	Sydney Zone
Portion no.				**Parish**	Bandamora
SITE DESCRIPTION					
Site type(s)	Scarred Tree			**Site type code (NPWS use only)**	

Description of site and contents

CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.

DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.

ART: area of decorated surface, motifs, colours, wet/dry pigment, engraving technique, no. of figures, sizes, patination.

BURIALS: number & condition of bone, position, age, sex, associated artefacts.

TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth.

QUARRIES: rock type, debris, recognisable artefacts, percentage quarried

CHC-ST1

This scarred tree is located southwest of the current Castlereagh Highway, c. 50 m southwest of the proposed realignment centreline and approximately 50 m south of the property access track that divides the study area. It is located in a relatively cleared area close to the dam. The tree is a dead stump, incorporating one major trunk, and reaching approximately 2 m in height. The surrounding soils are relatively stable and the stump is situated on very slight slope.

The scarred trunk is c. 2.2 m in circumference at breast height (ABH). The elongated, ovoid, scar is oriented south-west, 70 cm in length, 27 cm wide with regrowth of c. 10 cm depth and the base of the scar is just above ground level. Axe marks were noted above and at the side of the scar. The tree was a smooth barked eucalypt, possibly a scribbly gum, although a definitive determination was difficult as the tree was dead.

This scar is assessed as an Aboriginal Scar, conforming to the current NPWS criteria. Its size and shape suggests the removed bark may have been used as a shield or a coolamon. No stone artefacts were noted in the vicinity of this scarred tree.

No other Aboriginal sites were recorded during the current survey.

Attach photographs and sketches, eg. plan & section of shelter.

Do NOT dig, disturb or damage site or contents.

SITE ENVIRONMENT

Land form	hillside	**Aspect**	open	**Slope**	slightly sloping

Mark position of the site

Local rock type	Palaeozoic undifferentiated Shoalhaven Group claystone	**Land use/effect**	partially cleared selectively due to historical timbercutting and since regnerated (naturally), prob. grazed, not ploughed.
Distance from drinking water	200 m	**Source**	Turon Creek
Resource zone (eg. estuarine, river, forest)	Open forest	**Vegetation**	Stringy bark, scribbly gum
Edible plants		**Faunal resources** (include shellfish)	
Other exploitable resources (eg. ochre)			

Are there other sites in the locality	Yes	**Are they in the Sites Register**	Yes	**Other site types include**	Rock shelter with PAD, Rock Art, Bora Ground and Carved Tree(s) (all not present and recorded from oral history - most likely all destroyed)

SITE MANAGEMENT

Site condition	Poor	The tree is dead, but the scar remains relatively intact
Management recommendations	physical curtilage reccomended to avoid any impact	

Have artefacts been removed from site	No	**When**	
By whom		**Deposited at**	
Consent applied for	☐	**Consent issued**	☐
Date of issue		**Consent number**	

SITE INSPECTION AND RECORDING

Reason for investigation			
Were local Aborigines contacted or present for the recording	☐ Not contacted ☒ Contacted and present	**Names and addresses**	Richard Peters Bathurst LALC 149 Russell Street, PO Box 1500

	☐ Contacted but not present		Bathurst, 2795
Is the site important to local Aborigines	Yes		
Verbal/written reference sources	OzArk CHM Indigenous Heritage Survey - Castlereagh Highway realignment, Capertee, NSW	**ASR report number(s) (or title)**	C- C-
Photographs taken	Yes	**No. of Photos attached**	2
Site recorded by	Jodie Benton (OzArk), Richard Peters (BLALC) and Mark Arrow (RTA - Western Region)	**Date of recording**	20 November, 2003
Address/institution	OzArk CHM P/L: 5 Sterling Street Dubbo 2830. ph 02 6882 0118		

Appendix F

Noise Impact Assessment

Document Controls

Business Unit	Environmental Technology Branch		
Proposal No.			
Document description	Noise Assessment: Deviation of Castlereagh Highway (SH18) - Capertee		
	Name	**Signed**	**Date**
Approving Manager	Jeff Parnell		27/2/2004
Reviewing Officer	Jeff Parnell		27/2/2004

Person managing this document	**Person(s) writing this document**
Con Tsitsos	Con Tsitsos

Location	**CARMS File**
G:\PROJECTS\MONITORING\NM CASTLEREAGH HIGHWAY CAPERTEE\R110204.DOC	4M1177

Status	**Date**
Final	27/2/2004

Prepared by RTA Operations – Environmental Technology Branch

Prepared for:	**Prepared by:**
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Glossary of Terms

AADT	Annual Average Daily Traffic
dB	This is the abbreviation used for decibel which is the measure of sound pressure level.
dB(A)	The "A" denotes that the sound pressure level has been A weighted so that the scale approximates the response of the human ear. The ear is less sensitive to high and low frequency sounds than it is to sounds in the mid-range. Most community noise is measured in "A" weighted decibels.
DEC	NSW Department of Environment and Conservation
ECRTN	Environmental Criteria for Road Traffic Noise
ENMM	Environmental Noise Management Manual
L_1 dB(A)	This is the noise level in dB(A) exceeded for 1% of a specified time period. For a 1 hour period the level would be exceeded for 36 seconds but would be less for the remaining 59 minutes 24 seconds. This is also written as L_{A1}.
L_{10} dB(A)	This is the noise level in dB(A) exceeded for 10% of a specified time period. For a 1 hour period the level would be exceeded for 6 minutes but would be less for the remaining 54 minutes. This is also written as L_{A10}.
L_{90} dB(A)	This is the noise level in dB(A) exceeded for 90% of a specified time period. For a 1 hour period the level would be exceeded for 54 minutes but would be less for the remaining 6 minutes. This is also written as L_{A90}.
L_{Aeq} (9 hr)	The logarithmic average of the hourly L_{Aeq} measurements recorded between 10 pm and 7 am (Current NSW DEC night time objective.)
L_{Aeq} (15 hr)	The logarithmic average of the hourly L_{Aeq} measurements recorded between 7am and 10pm (Current NSW DEC day time objective.)
L_{eq}	The Leq represents the average noise energy level during the measurement period. When the energy level is A weighted, it may be written as L_{Aeq}
RTA	NSW Roads and Traffic Authority

CONTENTS

1.0 INTRODUCTION

The NSW Roads and Traffic Authority (RTA) proposes to carry out the construction of a deviation to the Castlereagh Highway (SH18) at Capertee, 41km north of Lithgow ("The Proposal"). The Proposal would create a deviation to the west of the current highway for a length of 1.1km, thereby creating a straighter alignment and removing the current substandard horizontal curve and very steep vertical curve. This route is traversed by a relatively large number of heavy vehicles, accounting for approximately 11% of vehicle movements. It is anticipated that works would commence in 2004 and be completed 52 weeks after commencement given ideal working conditions.

The RTA's Environmental Technology Branch was engaged to provide an acoustic assessment of the impact of road traffic noise on residences adjacent to Castlereagh Highway, Capertee. The objective of this report is to provide a desktop noise and vibration assessment report to predict environmental impacts of construction noise and vibration, and future operational noise levels that would result from the Proposal. No data was collected specifically for this report as it was deemed sufficient to undertake a desktop assessment. At no point will changes in alignment result in any residence being located closer to Castlereagh Highway.

1.1 SCOPE AND OBJECTIVES

This report assists in the environmental assessment of the proposed carriageway duplication on SH18 by meeting the following objectives:

- Identification of the relevant assessment criteria for the scope of the proposed work;
- Determination of the existing road traffic noise levels and assessment of ambient noise conditions in the study area, and
- Prediction of the impact of the Proposal in relation to construction noise and vibration, and in regards to the contribution of operational road traffic noise to the noise catchment.

2.0 STUDY AREA & PROPOSED WORKS

The study area is the section of SH18 in the immediate vicinity of the township of Capertee. The proposed deviation begins approximately 300 metres north of the township and rejoins 1.1 km further north back onto the existing road . An aerial photograph of the study area showing the location of the new alignment is shown in Figure 2.1.

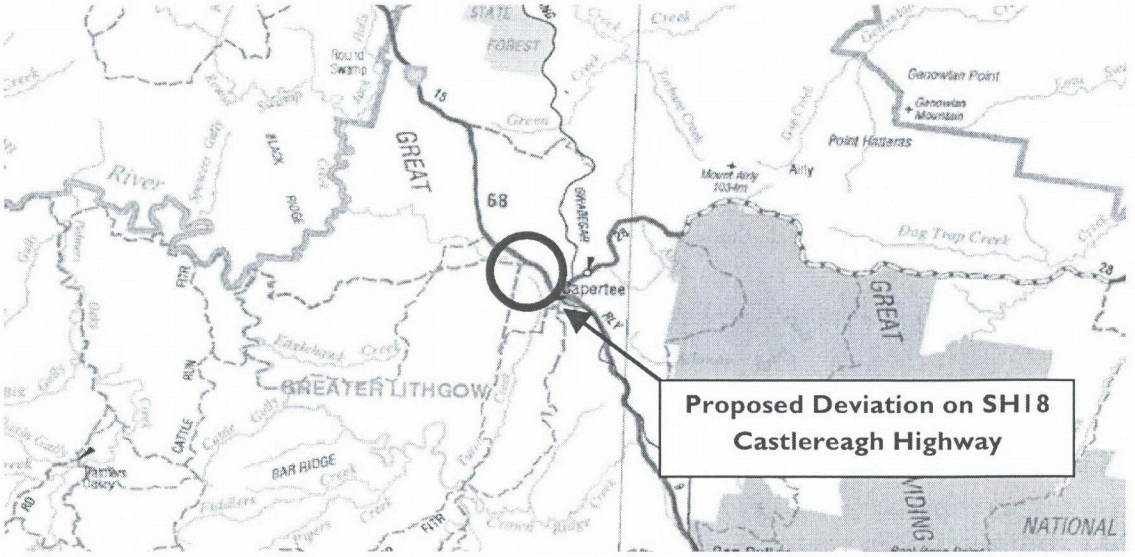

Figure 2.1 – Locality map of the location of the proposed deviation on SH18

2.2 SCOPE OF WORKS

The Proposal would result in moving the section of Castlereagh Highway at Capertee westward. Noise sensitive receivers identified in the vicinity of the Proposal are as follows:

- St Judes Catholic Church (Site A) located on the western side of Castlereagh Highway at the southern end of the Proposal approximately 40 metres from the existing road, and
- residential dwelling (Site B) located on the eastern side of Castlereagh Highway approximately 620 metres north of the church approximately 35 metres from the existing road (no house number, nor could one be provided by the resident).

The next nearest residential dwellings are 140 metres south from St Judes Catholic Church (southern extent of the Proposal) and a further 50 metres south respectively. It would not be likely that these dwellings would be impacted by the Proposal.

The Proposal would not move the traffic closer to Site A and would move the traffic approximately 50 metres further away from Site B.

It would be expected that construction equipment for the Proposal would include:

- Heavy dozer with ripper;
- Grader;
- Scraper;
- Loader;
- Vibrating roller;
- Water cart;
- Haul trucks and other heavy transport;
- Back hoe;
- Compressors;
- Light commercial vehicles; and
- Concrete delivery agitator trucks.

3.0 OPERATIONAL NOISE ASSESSMENT

3.1 CRITERIA

The classification for Castlereagh Highway is `arterial road'. The NSW Government's *"Environmental Criteria For Road Traffic Noise"* (ECRTN) provides assessment criteria under the classification of *"Redevelopment of existing freeway / arterial road"*. According to the definitions supplied, the scope of this project which does not provide for significant changes in alignment or a design increase in traffic volumes or mix is such that it is not subject to noise level targets. This interpretation is confirmed be reference to the flow chart for selecting criteria given in Practice Note 1, (page 82) of the RTA's *"Environmental Noise Management Manual"* (ENMM). ENMM also states that redevelopment of an existing arterial road does not include "minor" road works to improve safety, such as the straightening of curves, the installation of traffic control devices or "minor" realignments. The rationalisation of changing the alignment of Castlereagh Highway was a response to its high accident rate in its southern sections due to poor alignment.

3.2 METHODOLOGY

As the Proposal is not subject to operational noise level targets, it was considered sufficient to undertake a desktop assessment only, therefore, no new data was collected for this report. It is considered that there is enough relevant information to achieve the objective of this report which was to assess the Proposal against relevant criteria in accordance with the protocols and practices described in the RTAs *Environmental Noise Management Manual.*

3.3 TRAFFIC DATA

Annual Average Daily Traffic data (AADT) and percentages of heavy vehicles for Castlereagh Highway, Capertee (year 1999 and 2010) were provided by RTA Assessments Section (Parramatta). This data was used to extrapolate for the years 2005 (project opening) and 2015 (10 years after project opening). It is expected that there would not be an increase in traffic carrying capacity, traffic mix or speed and that the growth rate is 1% per annum. Table 1 is a summary of the traffic data for Castlereagh Highway, Capertee.

Table 1 Summary of Traffic Volumes for Castlereagh Highway, Capertee for the Years 2004, 2005 and 2015.

YEAR	AADT	% HEAVY VEHICLES
2004	1688	11
2005	1707	11
2015	1900	11

4.0 CONSTRUCTION NOISE ASSESSMENT

4.1 CRITERIA

The guidelines for assessment of construction noise are those established by the NSW Department of Environment and Conservation (NSW DEC) in chapter 171 of the DEC's Environmental Noise Control Manual (1994).

The DEC criteria for construction noise are as follows:

- For a construction period of 4 weeks or less, the L_{10} noise level must not exceed the background noise level (L_{90}) during the scheduled daytime hours by more than 20 dB(A).
- For a construction period of between 4 weeks and 26 weeks, the L_{10} noise level must not exceed the background noise level (L_{90}) during the scheduled daytime hours by more than 10 dB(A).
- For a construction period of greater than 26 weeks, the L_{10} noise level must not exceed the background noise level (L_{90}) during the scheduled daytime hours by more than 5 dB(A).

Normal scheduled working hours are defined as:

- 7:00 am – 6:00 pm Monday to Friday
- 7:00 am – 1:00 pm Saturday if inaudible on residential premises, otherwise 8:00 am to 1:00 pm (No construction work to take place on Sundays or Public Holidays).

The expected duration of 52 weeks for construction activities implies that the applicable criteria for construction noise is such that the L_{10} noise level must not exceed the background noise level (L_{90}) during the scheduled daytime hours by more than 5 dB(A).
In addition, the DEC also generally applies the sleep arousal goals provided in the DEC's Environmental Criteria for Road Traffic Noise (ECRTN). The DEC sleep arousal guideline requires that "the L_1 level of any noise should not exceed the ambient L_{90} by more than 15 dB(A). This goal applies to the night period (10pm to 7am).

Exceedance of the above goals is only permitted after all feasible and reasonable noise mitigation measures have been exhausted. Close consultation with the affected community is essential where construction works are proposed outside normal working hours. In addition, where noise goal exceedance is likely and all feasible and reasonable noise mitigation measures have been exhausted, the RTA's out of normal hours construction programming and consultation protocols as described in **Appendix A** must be followed.

4.2 AMBIENT BACKGROUND NOISE LEVELS

4.2.1 Methodology

Long-term noise measurements were not possible at either of the two noise sensitive receivers due to logger security difficulties and extraneous noise from pet dogs. Part 3 of AS 1055 *"Acoustic – Description and Measurement of Environmental Noise"* provides a guideline for estimated average background A-weighted sound pressure levels (LA90,T) for different areas containing residences in Australia. The table extracted from AS 1055.3 is included in **Appendix B**.

Although there is a high percentage of heavy vehicles for this section of SH18 (11%), the traffic volume is low as outlined in Section 3.2 of this report. Appendix B of AS 1055.3 describes expected average background noise levels for varying densities of transportation. These include areas with negligible transportation (R1), low density (R2), medium density (R3) and dense transportation or with some commerce or industry (R4). The high percentage of heavy vehicles dismisses the use of R1, therefore, a conservative approach would be to incorporate the background noise levels for noise area category R2 as summarised below in Table 2.

Table 2 Conservative Estimate of Ambient Background Noise Levels $L_{A90,T}$ dB(A) as per AS 1055.3.

Day L_{A90} 7am-6pm	Evening L_{A90} 6pm–10pm	Night L_{A90} 10pm– 7am
45	40	35

4.3 CALCULATIONS

Table 3 summarises the background noise level and the corresponding DEC noise goals applicable for the day, evening and night periods.

Table 3 Background Noise Levels and Noise Goals for Day, Evening and Night Time Periods for Receivers at SH18 Castlereagh Highway Capertee.

Tenth Percentile Background Noise Level dB(A)			Project Specific Construction Noise Goals dB(A)		
Day L_{A90} 7am-6pm	Evening L_{A90} 6pm–10pm	Night L_{A90} 10pm– 7am	Day L_{A10} 7am-6pm	Evening L_{A10} 6pm–10pm	Night[1] L_{A10}, L_{A1} 10pm– 7am
45	40	35	50 (45+5)	45 (40+5)	40 / 50 (35+5)/(35+15)

Note: The DEC sleep arousal guideline requires 'L_1 level of any noise should not exceed the ambient L_{90} by more than 15 dB(A).

It is often recognised that the daytime construction noise goals are very stringent and are sometimes unachievable particularly where noise sensitive receptors are located in close proximity to construction works and background noise levels are relatively low. Where daytime goals are likely to be exceeded, a performance approach should be followed that allows the implementation of best management practice in reducing construction noise levels towards the goals. Close consultation with the affected community is essential where it is expected that construction works will exceed DEC criteria, with consultation protocols (RTA Community Involvement Practice Notes and Resource Manual, 1998) being followed.

4.4 CONSTRUCTION NOISE PREDICTIONS

The plant and equipment to be used during construction is shown in Section 2.2 of this report. Table 4 lists typical sound pressure levels of the type of construction plant items likely to be employed. These levels have been selected with reference to Section 9 of the RTA's *Environmental Noise Management Manual,* AS 2436-1981 *"Guide to Noise Control on Construction, Maintenance and Demolition Sites"*, and measurements taken from other RTA construction sites.

Table 4 Typical Sound Pressure Levels of Construction Plant Items at 7m (revised according to project and latest noise level information).

Plant	Sound Pressure Level at 7m dB(A)
Back Hoe	83
Grader	84
Scraper	86
Front end loader	86
Vibratory Roller	77
Water cart	84
Dump truck	86
Compressor	81
Concrete delivery agitator trucks	86

For the purposes of calculations, a conservative assumption of equipment that would be likely adopted for the proposed works include 1 back hoe, 1 grader, 1 scraper, 1 excavator, 1 vibratory roller, 1 roller, 1 water cart, 2 dump trucks, 1 compressor and 1 agitator truck (see **Appendix C** for detailed calculations). Noise levels from Table 4 were used for a range of assumed construction equipment to predict the sound pressure level at the noise sensitive receptors. Experience shows that the L_{10} is generally between 5 and 12 dB(A) less than the sound pressure level predicted from sound power levels and this can be discounted by a further 2 dB(A) because all equipment would not normally be operated in unison.

The predicted L_{10} in Table 5 has been conservatively discounted by a total of 7 dB(A) and compares against calculated guidelines and project specific criteria for the identified receivers.

In accordance to the DEC sleep arousal goals as mentioned in Section 2, the L_1 noise level was calculated and detailed in **Appendix C**. The L_1 is the noise level in dB(A) exceeded for 1% of a specified time period and can be considered as the maximum noise level recorded. From calculations in **Appendix C**, the sound pressure level at St Judes Catholic Church with the proposed construction is predicted to be 80 dB(A). This can be interpreted as the maximum noise level and thus, the L_1 predictions for the Proposal.

Table 5 Construction Noise Level Objectives and Predicted Levels at Identified Receivers.

Site	Project Specific Construction Noise Goals dB(A)			Predicted Construction Noise	
	Day (7am - 6pm) L_{10}	Evening (6pm – 10pm) L_{10}	Night (10pm – 7am) L_{10} / L_1	L_{10} dB(A)	L_1 dB(A)
A	50	45	40 / 50	73	80
B	50	45	40 / 50	74	81

Note: Site A is St Judes Catholic Church (closest distance to road works would be 40 metres).
Site B is residential dwelling 620 metres north of the church (closest distance to road works would be 35 metres).
Due to conservative estimating, the error range is likely to be +2/-9 dB(A) for predictions of noise levels from the Construction Site for the assumed equipment use.

4.5 CONSTRUCTION NOISE IMPACT

The construction noise levels would exceed the project specific noise goals by 28 dB(A) for Site A (73 – 45), and 29 dB(A) for Site B (74 – 45) during the day/evening periods. An exceedance of 30 dB(A) for Site A (80 – 50) and 31 dB(A) for Site B (81 – 50) would be expected during the night time period although it is not anticipated that there would be any night time works. It is recommended that best practice work methods be adopted to ensure that potential impacts would be minimised. A procedure for dealing with complaints should also be developed. Section 4.6 references techniques for controlling construction noise which may be included in an Environmental Management Plan (EMP). **Appendix A** includes a list of techniques for controlling construction noise which may be included in an EMP along with a protocol for the programming of night work and other activities outside of normal working hours.

5.0 CONSTRUCTION VIBRATION ASSESSMENT

5.1 CRITERIA

There are no applicable Australian Standards for vibration. German Standard 4150 (1999) which sets safe vibration levels for structural damage at 5mm/second is generally recognised as setting the most appropriate criteria for architectural assessment. A lower level of 2mm/second is often adopted for heritage structures. These levels would rarely be exceeded by roadworks, however human perception and comfort levels are usually reached at a much lower level. In this regard the British Standard BS6472 provides the most authoritative criteria for assessment of the impacts of construction vibration on the community as given in Tables 6 and 7.

Table 6 Vertical Vibration Levels and Human Perception.

Approximate Vibration Level	Degree of Perception
0.10 mm/s	Not Felt
0.15 mm/s	Threshold of Perception
0.35 mm/s	Barely Noticeable
1.0 mm/s	Noticeable
2.2 mm/s	Easily Noticeable
6 mm/s	Strongly Noticeable
14 mm/s	Very Strongly Noticeable

Note: These approximate vibration levels (in floors of buildings) are for vibration having a frequency content in the range of 8Hz to 80Hz.

Table 7 Vibration Dose Values ($mm/s^{1.75}$) Versus Degrees of Adverse Comment Expected in Residential Buildings.

Location	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Residential buildings 16 hour day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hour night	0.13	0.26	0.51

5.2 CONSTRUCTION VIBRATION PREDICTIONS

From experience it may be expected that residences located 20 m from road construction work would experience vibration levels up to 3 mm/sec when vibratory rolling is being undertaken at the closest point to the residence. As the distance between the noise sensitive receivers and Castlereagh Highway are greater than 20 metres, it is not expected that there would be any impact.

6.0 CONCLUSION

6.1 OPERATIONAL NOISE

As explained in Section 3.1, the Proposal is not subject to noise level targets. The Proposal would not move the traffic closer to either of the two noise sensitive receivers adjacent to Castlereagh Highway at this section and it is expected that there would not be an increase in traffic carrying capacity, traffic mix or speed. Consequently, there would not be any impact regarding traffic noise and thus, no mitigation measures would be required.

6.2 CONSTRUCTION NOISE

Although it is expected that noise levels arising from construction activities would exceed the project specific noise goals, the following recommendations for construction noise management would help reduce any adverse comments from any affected residents. This list of noise management options is not exhaustive, however, it will assist in reducing impacts. These and any other available options should be considered when planning works, and should be implemented where practical and cost-effective. The RTA's Environmental Noise Management Manual should be consulted prior to the development of any noise mitigation strategies.

Source controls

- **Time constraints**
  Limit work to daylight hours.
- **Scheduling**
  Perform noisy work during less sensitive time periods.
- **Equipment restrictions**
  Select low-noise plant and equipment.
  Ensure equipment has quality mufflers installed.
- **Emission restrictions**
  Establish stringent noise emission limits for specified plant and equipment.
  Implement noise monitoring audit program to ensure equipment remains within specified limits.
- **Substitute methods**
  Use quieter and less vibration emitting construction methods where possible.
- **Limit equipment on site**
  Only have necessary equipment on site.
- **Limit activity duration**
  Where possible, concentrate noisy activities at one location and move to another as quickly as possible.
- **Site access**
  Vehicle movements outside construction hours, including loading and unloading operations, should be minimised and avoided where possible.
- **Equipment maintenance**
  Ensure equipment is well maintained and fitted with adequately maintained silencers which meet the design specifications.
- **Reduced equipment**

- **Power**
  Use only necessary size and power.
- **Quieter work practices** For example, implement work-site induction training, educating staff on noise sensitive issues and the need to make as little noise as possible.
- **Reversing alarms**
  Consider alternatives, such as manually adjustable or ambient noise sensitive types ("smart" reversing alarms). Alternative site management strategies can be developed, in accordance with the *Occupational Health and Safety Plan*, with the concurrence of the Occupational Health and Safety Officer.

Path controls

- **Noise barriers**
  Consider installing temporary construction noise barriers.
  Install any permanent noise barriers required to minimise road traffic noise as early as possible in the construction process.
  Locate equipment to take advantage of the noise barriers provided by existing site features and structures, such as embankments and storage sheds.
- **Enclosures**
  Install noise-control kits for noisy mobile equipment and shrouds around stationary plant, as necessary.
- **Increased distance**
  Locate noisy plant as far away from noise-sensitive receptors as possible.
- **Site access**
  Select and locate site access roads as far away as possible from noise-sensitive areas.

Receptor controls

- **Consultation**
  Community consultation, information, participation and complaint responses are essential aspects of all construction noise management programs.
  They typically involve:

- A community information program before construction and/or high risk activities are commenced. This usually involves a leaflet distribution and direct discussions and negotiations with affected residents, explaining the type, time and duration of expected noise emissions.
- The involvement of affected residents in the development of acceptable noise management strategies.
- A nominated community liaison officer with a contact telephone number.
- A complaints hotline.
- Timely responses to complaints, providing information on planned actions and progress towards the resolution of concerns.

It is also recommended that:

- Best management practice should be applied in development of a noise and vibration management plan (NVMP).

- Where work is conducted outside normal working hours and noise goal exceedances are predicted, all feasible and reasonable noise mitigation measures should be evaluated and included in the NVMP. If after the application of all feasible and reasonable noise mitigation measures, it is still predicted that there will be noise goals exceedances, the RTA's out of normal hours construction programming and consultation protocols should be followed.

6.3 CONSTRUCTION VIBRATION

There would not be any vibration impacts associated with construction activities for the Proposal.

7.0 REFERENCES

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Standards Australia, (1981). *AS 2436 - 1981 Guide to noise control on construction, maintenance and demolition sites.* Standards Australia, Sydney.

Appendix A: Roadworks Outside Normal Working Hours Practice Notes

Practice Note 

Roadworks outside normal working hours

An outline of procedures for construction and maintenance works outside normal working hours. This Practice Note should be read in conjunction with Sections 9 and 10.

Background

From time to time local communities raise issues regarding noise and vibrations generated by roadworks outside normal working hours, and particularly works at night. These works are often unavoidable, because of the need to maintain full traffic capacity on the network during peak demand periods.

"Normal working hours" are defined in the EPA's *Environmental Noise Control Manual* as 7 am to 6 pm Monday to Friday and 8 am to 1 pm on Saturdays (or 7 am to 1 pm on Saturdays if the noise is not audible on residential premises).

To minimise community concerns, effective community consultation is essential.

The involvement of affected communities should be sought in the selection and design of noise and vibration treatment measures, where possible.

Where practical, noise and vibration impacts should be minimised by applying stringent roadworks programming restrictions for work conducted outside normal working hours.

Minimum roadworks programming requirements

If roadworks are proposed and it is likely that sensitive receptors will be affected by noise and vibration above guideline levels, and/or receivers are within minimum distance setbacks set out in the CEMP,

- Program the work so that noise and vibration at night will not affect any single dwelling or group of dwellings, flats, units and other places of residence on more than two consecutive nights, or on more than a total of six nights over a period of one calendar month.
    - When night work is programmed in stages to comply with this requirement, the periods of work should be separated by not less than one week.

- If programmed night work is postponed for any reason, the work should be re-programmed and the programming requirements described above apply again.
- Very noisy activities should be programmed for normal working hours. If the work cannot be undertaken during the day, it should be completed before 11:00 pm.
- Where practicable, work should be scheduled to avoid major student examination periods and times when students are studying for examinations, such as before and during the Higher School Certificate and at the end of higher education semesters.

If it is not practical to apply these minimum programming requirements, extra care will need to be taken in selecting and applying alternative and effective noise and vibration management measures.

The *CEMP* must be regularly revised to account for changes in noise and vibration management strategies.

Consultation and procedural requirements

- Evaluate all available, feasible and reasonable noise and vibration management measures and include the preferred management measures in the *CEMP*.
    - RTA environmental protection quality assurance specifications outline a range of measures, including minimum noise and vibration management requirements, that should be included in a *CEMP*. *Section 5* also outlines a range of construction and maintenance noise and vibration management measures which could be adopted. Source control is generally the most effective strategy.
- Apply for a *Road Occupancy or Road Development Licence* from the RTA's Transport Management Centre (Sydney region) or the Regional Traffic Commander (remainder of NSW).
    - Road construction or maintenance works must not commence until a *Road Occupancy or Road Development Licence* has been granted.
- On the *Road Occupancy or Road Development Licence* application form, include an "after hours" contact name and telephone number for the work. This person should have the power to issue directions concerning the commencement, performance or termination of the work. The "after hours" contact person must be accessible during the course of work.
- If the work is the subject of an Environment Protection Licence, contact the EPA and advise the work proposed to be undertaken, its location, the days and dates of the work, the hours involved and the "after hours" contact name and telephone number.
- Update the *CEMP* to include any additional noise and vibration management strategies and any additional EPA requirements.

- Contact the local community potentially affected by the proposed out-of-hours noise/vibration (residents, businesses, etc) and inform them by letter of the proposed work, the location and type of work, the day(s) and date(s) of work and the hours involved.
    - This contact should be made five days before the proposed commencement of the work.
    - It is preferable to over-estimate the hours of work, rather than aggravate people by extending the work hours for longer than anticipated.
    - A standard *Letter of Advice* can be found at the end of this *Practice Note* (below).
- If the night work will also involve significant disruption to traffic, a suitable advertisement should be placed in local papers. This advertisement should include a reference to night noise/vibration.
- Notify the TMC or Regional Traffic Commander, as applicable, prior to the commencement of work and again upon completion, in accordance with traffic management procedures.
    - It may also be beneficial to notify the affected community and other organisations (e.g. Police and Council), to assist effective complaint management.
- Notify the RTA Environmental Adviser for the region before the commencement of work.
- Manage any noise and vibration complaints in accordance with *Practice Note IX*.

Sample letter of advice

Dear resident,

[***Road name, suburb/town***]
Roadworks

The Roads and Traffic Authority (RTA) will soon be carrying out urgent road works on [***road name***] between [***point A***] and [***point B***], [***suburb/town***].

These works are programmed to commence on [***date***], weather permitting. It is expected that the work will take [***number***] nights to complete.

Unfortunately, because of the high traffic volumes in the area, the work must be carried out outside normal working hours, in order to limit traffic disruptions. It is therefore planned to work between the hours of [***state hours and relevant dates***].

The work will involve activities such as [***state nature of works e.g. the removal of failed pavement and its replacement***]. The effect on you is likely to be limited to noise [***and vibration, if relevant***] associated with this activity. Every attempt will be made to minimise the effect of this work on residents.

If you have any questions, please contact [***name***] on phone [***number***], or after hours the RTA Transport Management Centre on 131 700.

Yours faithfully,

[***Name***]
[***Position***]
[***Region/organisation***]
[***Date***]

Appendix B: Background Noise Level

The table below is extracted from Appendix A of AS 1055 *"Acoustic – Description and Measurement of Environmental Noise Part 3: Acquisition of Data Pertinent to Land Use"* and provides estimated average background A-weighted sound pressure levels ($L_{A90,T}$) for different areas containing residences in Australia.

Noise area category (Notes 1 and 2)	Description of neighbourhood	Average background A-weighted sound pressure level, ($L_{A90,T}$)					
		Monday to Saturday			Sundays and public holidays		
		0700 – 1800	1800 – 2200	2200 – 0700	0900 – 1800	1800 – 2200	2200 – 0900
R1	Areas with negligible transportation	40	35	30	40	35	30
R2	Areas with low density transportation	45	40	35	45	40	35
R3	Areas with medium density transportation or some commerce or industry	50	45	40	50	45	40
R4	Areas with dense transportation or with some commerce or industry	55	50	45	55	50	45

NOTES:

1 The division into noise area categories is necessary in order to accommodate existing sound levels encountered at residential sites in predominantly commercial or industrial districts, or in areas located close to main land transport routes, i.e. road and rail.

2 The noise area category most appropriate should be selected irrespective of metropolitan or rural zoning and will vary from location to location.

3 The estimated background sound levels given in this Appendix should only be used when the existing ambient sound levels are not appropriate for planning purposes e.g. because of changes to land use.

Appendix C: Construction Noise Predictions

Acoustic Calculations

Noise Propagation from Construction Site

The calculations below follow procedures outlined in AS2436-1981.
Assumptions made in the calculations include:

- No barrier attenuation
- No ground effect attenuation
- The number of machines on construction site
- Attenuation due to hemispherical spreading

Table C1 Sound Power Noise Levels for Construction Plant to be used on SH18.

Construction Machine	Sound Pressure Level @ 7 m	Sound Power Level [dB(A)]	Number of machines	Total Power Level [dB(A)][1]	Cumulative [2]
Back Hoe	83	108	2	111	108
Grader	84	109	1	109	113
Scraper	86	111	1	111	115
Loader	86	111	1	111	117
Vibratory Roller	77	102	1	102	117
Water Cart	84	109	1	109	117
Dump Truck	86	111	2	114	119
Compressor	81	106	1	106	119
Agitator trucks	86	111	1	111	120

[1] The total power level from each machine type, calculated with reference to Table B2 of AS2436-1981
[2] Cumulative sound power levels from different types of machines, calculated with reference to Table B2 of AS2436-1981

The sound level at a receiving position distant R from the geometric centre of a machine or process if sound is radiated uniformly in all directions over flat, open ground is given by the following formula (Appendix B3 of AS2436-1981):

$SPL = PWL - 20 \log R - 8$ Where SPL = Sound Pressure Level in dB(A)
PWL = Sound Power Level in dB(A)
R = distance from source to receiver in m

The maximum PWL was found to be 120 dB(A) with the assumed number and types of construction equipment for the proposed works as shown in the above tables.

St Judes Catholic Church is located approximately 40 metres from where the nearest construction activities on SH18 are to occur.

Therefore, the sound pressure level at the church with the proposed construction is predicted to be:

$SPL = 120 - 20 \log 40 - 8$
$= \mathbf{80\ dB(A)}$

Experience shows that the L_{10} is generally between 5 and 12 dB(A) less than the sound pressure level predicted from sound power levels and this can be discounted by a further 2 dB(A) because all equipment will not be working at the same time. The L_{10} can be approximately calculated by deducting 7 dB(A) from the sound pressure level.

Therefore, the L_{10} at St Judes Catholic Church is calculated to be:

L_{10} = 80 dB(A) – 7 dB(A)
= **73 dB(A)**

In accordance to the EPA sleep arousal goals, the L_1 noise level was predicted. The L_1 is the noise level in dB(A) exceeded for 1% of a specified time period and can be interpreted as the maximum noise level recorded. The sound pressure level estimated by the formula PWL - 20 log R – 8 is assumed to predict the maximum noise level at the monitoring site located at a distant R from the proposed construction activities. Thus, it can be used to calculate the L_1 noise level for the Proposal.

Similarly, the residential dwelling is located 35 metres from where the nearest construction activities on SH18 are to occur. Therefore, the sound pressure level at the dwelling with the proposed construction is predicted to be:

SPL = 120 – 20 log 35 – 8
= **81 dB(A)**

Therefore, the L_{10} at the residential dwelling is calculated to be:

L_{10} = 81 dB(A) – 7 dB(A)
= **74 dB(A)**

Table C2 Predicted Noise Levels at the Noise Sensitive Receivers adjacent to SH18.

Site	Tenth Percentile Background Noise Level dB(A)			Project Specific Construction Noise Goals dB(A)			Predicted Construction Noise	
	Day (7am - 6pm) L_{90}	Evening (6pm – 10pm) L_{90}	Night (10pm – 7am) L_{90}	Day (7am - 6pm) L_{10}	Evening (6pm – 10pm) L_{10}	Night (10pm – 7am) L_{10} / L_1	L_{10} dB(A)	L_1 dB(A)
A	45	40	35	50 (45+5)	45 (40+5)	40 / 50 (35+5)/(35+15)	73	80
B	45	40	35	50 (45+5)	45 (40+5)	40 / 50 (35+5)/(35+15)	74	81

Note: Site A is St Judes Catholic Church Capertee
Site B is the residential dwelling 620 metres north of St Judes Catholic Church.

Appendix G

Consultation

COUNCIL OF THE CITY OF LITHGOW

180 Mort Street, Lithgow, NSW, 2790. Telephone: (02) 6352 1077

NSW – First Learning City

Your Reference:
Our Reference: 26488:GRO/MU1 GW
Contact: Environmental Services

17 November, 2003

Mr Chris Havelock
Level 5, Pod D
99 Phillip Street
PARRAMATTA 2124

Dear Sir

REALIGNMENT OF THE CASTLEREAGH HIGHWAY

I refer to your fax received 14th November 2003 concerning the realignment of the Castlereagh Highway, approximately 41km from Lithgow, near the Village of Capertee.

As requested please find attached a copy of Lithgow City Council's Local Planning Instrument indicating all listed heritage items. Additionally, also find attached a copy of all relevant items listed as part of Council's heritage study, which is currently in a draft format. Any Part 5 review should take these draft items into consideration.

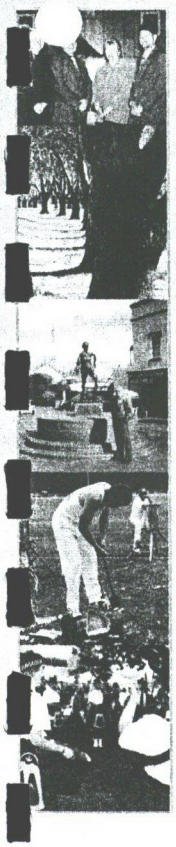
Finally, the land to the north of the Village of Capertee is zoned 1(a) General Rural for which the objectives are outlined in the attached Local Environmental Plan.

Please do not hesitate to contact Gary Wallace who is available personally on (02) 63549991 between 8.30 am and 10.30 am, Monday to Friday, in Council's Environmental and Planning Services Division should you require any additional information in relation to this matter.

Yours faithfully

Mr Ian Rufus
PLANNING AND DEVELOPMENT MANAGER

for Mr Iain Stewart
GENERAL MANAGER



Address Correspondence to: General Manager, PO Box 19, Lithgow, 2790
Fax No: (02) 6351 4259 • Email: glcc@lithgow.nsw.gov.au
Website: www.lithgow.com

Inventory No	Heritage Item	Address	Capertee
B172	Airly Homestead	Glen Davis Road	
A145	Airly Township Site	Glen Davis Road	
A146	Airly Church Site	Glen Davis Road	
A147	Airly Well and Stone House	Glen Davis Road	
A148	Airly Big Rock cave dwellings	Glen Davis Road	
A149	Airly bakery	Glen Davis Road	
A150	Airly Pott's Point dwelling Complex	Glen Davis Road	
A151	Airly Manager's House	Glen Davis Road	
A152	Airly Powder Magazine, Spring, Cave Dwelling	Glen Davis Road	
A153	Airly Fig Tree Stone House	Glen Davis Road	
A154	Airly Skipway, Stone Retaining Wall	Glen Davis Road	
A155	Airly, Groom's House	Glen Davis Road	
A156	Airly, Martins Tunnel, ventilation tunnel, chimney	Glen Davis Road	
A157	Airly Ventilation Chimney	Glen Davis Road	
A158	Airly boiler and winding house	Glen Davis Road	
A159	Airly Flying Fox Ropeway	Glen Davis Road	
A160	Airly Ventilation Shaft, Dwelling, Skipway	Glen Davis Road	
B170	"Bandamora Homestead"	4601 Upper Turon Road	
B171	"Bernina Homestead"	4428 Castlereagh Highway	
B128	Bootmaker's Cottage/Shop	Castlereagh Highway	
A063	Capertee General Cemetary		
L009	Capertee Village Locality		
L010	Capertee Valley Locality		
B173	"Carinya Homestead"	Airly Street	
B121	Cottage	Railway Street	
A104	Galagher Private Cemetary	"Bernina", 4428 Castlereagh Highway	
B130	"Glengar"	5016 Castlereagh Highway	
A060	Glengar Circular Saw	Castlereagh Highway	
B337	Goolooinboin Garden, Redrock Creek	Glen Davis Road	
B132	Greengully farm complex	Off Castlereagh Highway	
B133	Greengully Pise House	Off Castlereagh Highway	
A062	Green Gully Circular Saw	Off Castlereagh Highway	
B126	Hartigan's Store	Castlereagh Highway	
B125	Jarbour's Store	Castlereagh Highway	
A059	Kangaroo Flat Methodist Church Ruins	Castlereagh Highway	

A084	Locharbor House and Shearing Shed Ruins	19 Upper Turon Road
B123	Police Station Lock-Up	Castlereagh Highway
B129	Public School (former)	Short Street
B120	Railway Station	Railway Street
A061	Round Swamp Cemetary	5249 Castlereagh Highway
B127	Royal Hotel	Castlereagh Highway
B124	School Master's Residence	Castlereagh Highway
B122	Station Master's House	Railway Street
A058	Stone Chimney	Castlereagh Highway
A085	Torbane Oil-Shale Works	"Carinya", Glen Davis Road
A161	Torbane Tramway Cuttings and Embankments	"Carinya", Glen Davis Road

COUNCIL OF THE CITY OF LITHGOW

180 Mort Street, Lithgow, NSW, 2790. Telephone: (02) 6352 1077

NSW – First Learning City

Your Reference:
Our Reference:
Contact: 26488:GRO/MU1 GW
Environmental Services

22 December, 2003

Mr Chris Havelock
Level 5, Pod D
99 Phillip Street
PARRAMATTA 2124

Dear Sir

REALIGNMENT OF THE CASTLEREAGH HIGHWAY

I refer to your fax received 14th November 2003 and further documentation received 12th December 2003 concerning the realignment of the Castlereagh Highway, approximately 41km from Lithgow, near the Village of Capertee.

Council would like to take the opportunity to comment on the Part 5 assessment when completed by the RTA. At this stage, Council has given all information available pertaining to the development and cannot comment any further.

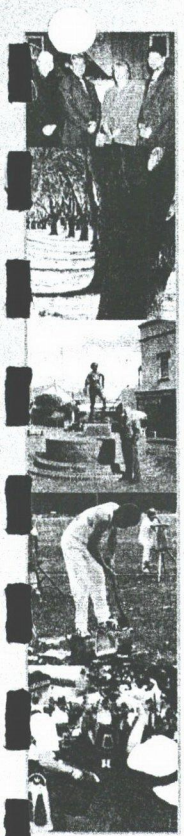
Additionally, all contaminated land sites that have been identified and registered by the Department of Environment and Conservation can be found on their website. Council has no record of any such contamination in the surrounding area of that proposed.

Please do not hesitate to contact Gary Wallace who is available personally on (02) 63549991 between 8.30 am and 10.30 am, Monday to Friday, in Council's Environmental and Planning Services Division should you require any additional information in relation to this matter.

Yours faithfully

Mr Ian Rufus
PLANNING AND DEVELOPMENT MANAGER

for Mr Iain Stewart
GENERAL MANAGER



Address Correspondence to: General Manager, PO Box 19, Lithgow, 2790
Fax No: (02) 6351 4259 • Email: glcc@lithgow.nsw.gov.au
Website: www.lithgow.com

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE
ABN 30 841 387 271

Christopher Havelock
Environmental Officer
Roads and Traffic Authority
Octagon Building
Level 5 POD D
99 Philip Street
PARRAMATTA NSW 2150

Our Ref.: SYZ 96/252

Dear Christopher

RE: PROPOSED REALIGNMENT OF CASTLEREAGH HIGHWAY (SH 18), CAPERTEE

Thank you for your letter dated 14 November 2003 in which you consulted with the National Parks and Wildlife Service (NPWS) on the above proposal.

The NPWS has a statutory responsibility for the protection and care of native flora, native fauna and Aboriginal objects and places, and for the management of NPWS estate. Accordingly the NPWS has an interest in ensuring that potential impacts to these attributes are appropriately assessed. As you may be aware, the NSW Government has recently announced the creation of the new Department of Environment and Conservation (DEC). The NPWS has been amalgamated into DEC, together with the EPA and a number of other agencies. This response relates to the former NPWS statutory responsibilities.

To assist you in this regard, it is recommended that the matters referred to in the attached guidelines titled "General Guidelines for Impact Assessment" be addressed in your assessment where appropriate. These guidelines also provide information on any approvals that may be relevant under the National Parks and Wildlife Act and a summary of the former NPWS' databases which may be of assistance to you in your assessment.

It is requested that any EIS forwarded to the DEC for comment state the reasons for the referral. The DEC typically comments on EIS's where there is a statutory concurrence or approval role for the DEC, or where there is likely to be a threat to DEC reserves or regionally significant conservation values. The attached guidelines may be used to assist in determining whether the EIS requires referral to the DEC for comment, concurrence or an approval.

The DEC requests that REF/EIS include the following:

- comprehensive assessment of flora and fauna and Aboriginal heritage attributes of the site;

43 Bridge Street
PO Box 1967
Hurstville NSW
2220 Australia
Tel: (02) 9585 6444
Fax: (02) 9585 6555
www.npws.nsw.gov.au

- full consideration of all options to ensure impacts on areas and items of conservation significance are avoided;
- measures to mitigate impacts;
- consideration of viable options for fauna crossing if relevant at this location.

Please contact, Megan Phillips, A/ Conservation Planning Officer on (02) 9585-6007 if you have any questions concerning this matter.

Yours sincerely,

Helen Mulligan 13 December '03

Helen Mulligan

A/Manager, Conservation Planning Unit
Conservation Programs & Planning
Department of Environment and Conservation

Infrastructure, Planning
and Natural Resources

Roads and Traffic Authority
99 Phillip St
PARRAMATTA NSW 2124

Attention Christopher Havelock

Realignment of the Castlereagh Highway (SH 18) 41 km north of Lithgow at Capertee.

Dear Christopher

Your advice has been received that a Review of Environmental Factors (REF) is to be prepared for the proposed realignment of the Castlereagh Highway north of Lithgow at Capertee. The Department of Infrastructure Planning and Natural Resources is grateful for the opportunity to advise on those matters that it would wish to see addressed in the REF.

Following is a list of issues the DIPNR wish to see addressed. The list of issues is generalised and is based on the requirements of the Department in relation to its Statutory and Natural Resource Management responsibilities

General

Introduction. – This should include the relevant background information on the areas involved.

The Proposal - to include the following:

- the development proposal - general description
- the reason for the proposed works
- construction method, sequencing, site preparation, any relevant pre-construction operations.
- waste soil or rock disposal, to include physical characteristics of reject material, quantities, disposal site location.
- vegetation clearance/management

Existing Environment - this section should include a description of the following:

- topography
- drainage
- geology
- vegetation

- soils
- existing land use

Particular detail is required of an Integrated Soil and Water Management Plan that should include the following:

Soil Management - description of soils present and description of any waste material to be generated on the proposed site that may be useful for rehabilitation purposes, soil stripping, stockpile management, reuse proposals.

Water Management - to include management of runoff from adjoining land, any infrastructure components such as hard stand areas or compounds used during construction, access or detour roads and other features of the sites together with water management and water quality impacts for water passing through, leaving or flowing adjacent to the sites.

Erosion and Sediment Control - to include management and control of sediment movement at all stages of the project. Temporary and permanent structures should be specified with particular attention given to opening up of new or undisturbed areas.

Rehabilitation Plan - information in relation to all aspects of site rehabilitation, which should include rehabilitation objectives, conceptual end-use landforms, revegetation procedures, abandonment plans and maintenance program for rehabilitation.

Legislative Requirements - Under the *Rivers and Foreshores Improvement Act, 1948*, on freehold land,

- any excavation
- any removal of material, or
- doing anything which obstructs or detrimentally affects the flow of water

within a stream (for road/causeway reconstruction etc) normally requires the proponent to obtain a 3A permit from the Department. Although the RTA is not bound by this legislation, the Department would expect the works to be undertaken in a manner that is not detrimental to the stability of watercourse beds or banks or flow of water.

In the case of the clearing of vegetation, under the *Native Vegetation Conservation Act, 1997*, a permit to clear would normally be required for any clearing within 20 metres of the bed or bank of any part of a river or lake. This includes any tree, whether alive or dead, standing or fallen or whether it is indigenous. It should perhaps be mentioned in the REF that, (if any clearing is required), tree removal is permissible under Section 12 (n) of the Act which exempts the clearing where the clearing is covered by Section 88 of the *Roads Act,* as it is in this case.

For any further information please contact David Pritchard, Natural Resource Planner, Bathurst, on telephone (02) 6339 4914 or fax (02) 6339 4949.

Yours sincerely

D. J. Pritchard

David Pritchard
for Don Martin
Regional Director
Central West Region

21st November 2003..

BATHURST
LOCAL ABORIGINAL LAND COUNCIL

130 Bentinck Street
Bathurst NSW 2795

PO Box 1500
Bathurst NSW 2795

Phone: 02 6332 6835
Fax: 02 6332 3623

CASTLEREAGH HIGHWAY CAPERTEE

A survey was conducted on Thursday 20 November 2003 for the Roads and Traffic Authority for the proposed upgrade of the Castlereagh Highway at Capertee.

Bush tracks and tree lobbing has severely disturbed the whole area surveyed. Most areas were covered in heavy undergrowth, dense shrubs and Blackberry bushes also provided poor to nil visibility and prominently sandy and stony areas were also encountered.

A probable scared tree stump was located 25-30 metres outside the surveyed area and should not be impacted upon. This area can be located on the maps provided by Archaeologist Jodie Benton from Ozark reference C.H.R.C-ST1.

No other evidence of Aboriginal activity, sites, shelters or occupation was located during this survey.

Therefor the Bathurst Local Aboriginal Land Council has no objection to the commencement of this project.

Present at this survey were:

Jody Benton	Archaeologist	Ozark
Mark Arrow	Roads and Traffic Authority	
Richard Peters	Sites Office	B.L.A.L.C

Richard J Peters

RICHARD J PETERS
SITES OFFICE
23 NOVEMBER 2003

Appendix H

Database Searches

Listing Heritage Items

State Heritage Inventory Search Results

Statutory Listed Items

Information and items listed in the State Heritage Inventory come from a number of sources. This mean several entries for the same heritage item in the database. For clarity, the search results have been divi

- The first section contains items listed on the State Heritage Register, covered by an Interim Herita under section 130 of the NSW Heritage Act. This information is provided by the NSW Heritage Offi
- The second section contains items listed by Local Councils & Shires and State Government Agenci also contain additional information on some of the items listed in the first section.

Section 1. Items listed under the NSW Heritage Act.

The search results can be resorted by clicking on the **(sort)** option at the top of each column.

Item Name (sort)	Address (sort)	Suburb (sort)	LGA (sort)	State Heri

There were no records in this section matching your search criteria.

Section 2. Items listed by Local Government and State agencies.

Item Name (sort)	Address (sort)	Suburb (sort)	LGA (sort)	Informatic
Capertee Railway Station Group		Capertee	Lithgow	SGOV

There was 1 record in this section matching your search criteria.

There was a total of 1 record matching your search criteria.

Key:
LGA = Local Government Area
GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government Agency.

Note: The Heritage Office seeks to keep the State Heritage Inventory (SHI) up to date, ho listings in Local and Regional Environmental Plans (LEPs and REPs) may not yet be include with the relevant Local Council or Shire for the most recent listings.

Register of the National Estate

Search Results

new search | return to main Register page | Australian Heritage Commission home

3 results found.

Coco Creek Geological Site Capertee Glen Davis Rd	Capertee, NSW	(Registered)
Private Cemetery on Bernina	Bernina via Capertee, NSW	(Indicative Place)
Round Swamp Private Cemetery Lithgow - Mudgee Rd	Round Swamp, NSW	(Indicative Place)

Report Produced: Tue Dec 9 13:28:04 2003

What is the weather usually like?

- Climate Averages for Australian Sites -

Averages for LITHGOW (BIRDWOOD ST)

Make sure you understand what the Climate Averages are all about before you make use of the following information. A comma separated text file of these averages is also available for download which can be graphed in software such as a spreadsheet

063224 LITHGOW (BIRDWOOD ST) Commenced: 1889 Last record: 2003
Latitude:-33.4901 S Longitude: 150.1498 E Elevation: 950.0 m State: NSW

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	No. Yrs	%age comp
Mean Daily Max Temp (deg C)	25.4	24.6	22.4	18.3	14.3	11.1	10.4	12.0	15.4	18.7	21.6	24.5	18.2	80.4	88
Mean no. Days, Max >= 40.0 deg C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.1	98
Mean no. Days, Max >= 35.0 deg C	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	1.3	37.1	98
Mean no. Days, Max >= 30.0 deg C	6.3	4.2	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.5	4.1	17.5	37.1	98
Highest Max Temp (deg C)	37.7	36.3	35.1	30.8	24.6	21.3	21.5	22.5	27.6	33.1	37.2	36.2	37.7	37.4	98
Mean Daily Min Temp (deg C)	11.8	12.0	10.1	6.7	3.9	1.8	0.7	1.3	3.4	5.9	8.0	10.4	6.3	80.8	88
Mean no. Days, Min =< 2.0 deg C	0.0	0.0	0.3	2.7	9.5	14.8	19.6	16.8	10.1	4.0	1.3	0.3	79.4	37.2	98
Mean no. Days, Min =< 0.0 deg C															

Highest Recorded Daily Rain (mm)														
89.9	101.9	112.0	147.3	135.4	179.0	163.8	165.4	97.5	65.0	83.6	101.6	179.0	88.6	77
Mean no. of Clear Days														
7.2	5.3	7.1	7.9	7.1	6.0	7.9	9.3	8.4	7.2	6.6	8.1	88.2	37.7	99
Mean no. of Cloudy Days														
12.2	12.8	12.7	10.3	13.6	14.1	12.5	11.0	10.4	11.6	11.6	10.4	143.2	37.7	99

Last modified 7 October 2003

EPBC Act

Protected Matters Search Tool

Australian Government
Department of the Environment and Heritage

7 November 2003 14:40

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

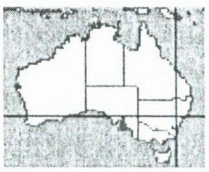
You may wish to print this report for reference before moving to other pages or websites.

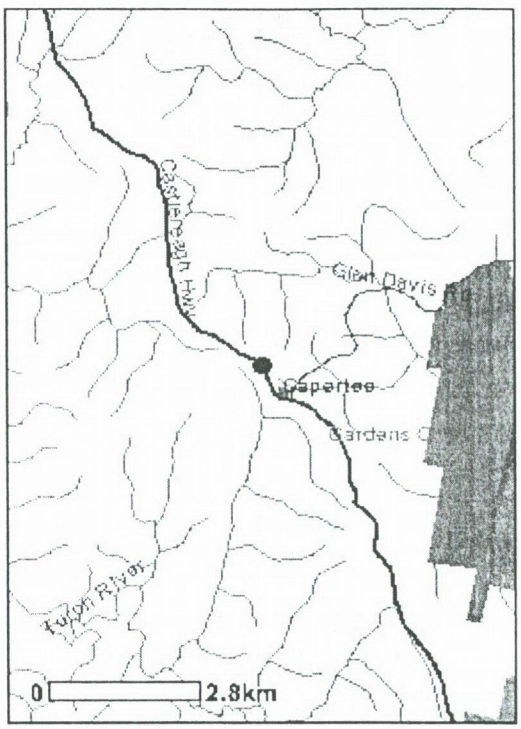
The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.ea.gov.au/epbc/assessmentsapprovals/index.html

Search Type: Point

Buffer: 5 km

Coordinates: -33.13946,149.97881





Report Contents:

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.ea.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	1
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1
Threatened Species:	17
Migratory Species:	7

Maccullochella peelii peelii Murray Cod, Cod, Goodoo	Vulnerable	Species or species habitat may occur within area
Macquaria australasica * Macquarie Perch	Endangered	Species or species habitat may occur within area
Insects		
Paralucia spinifera Bathurst Copper Butterfly, Purple Copper Butterfly, Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (s. lat.) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (south-east mainland and Tasmanian subspecies)	Vulnerable	Species or species habitat likely to occur within area
Nyctophilus timoriensis (South-eastern form) Eastern Long-eared Bat	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby	Vulnerable	Species or species habitat may occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland)	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Hoplocephalus bungaroides * Broad-headed Snake	Vulnerable	Species or species habitat likely to occur within area
Plants		
Eucalyptus cannonii Cannons Stringybark	Vulnerable	Species or species habitat likely to occur within area
Philotheca ericifolia *	Vulnerable	Species or species habitat likely to occur within area
Prostanthera stricta * Mount Vincent Mintbush	Vulnerable	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax	Vulnerable	Species or species habitat likely to occur within area

Migratory Species [Dataset Information]	**Status**	**Type of Presence**
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster * White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Breeding likely to occur within area
Rhipidura rufifrons Rufous Fantail	Migratory	Breeding may occur within area
Xanthomyza phrygia Regent Honeyeater	Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
Birds		
Gallinago hardwickii	Migratory	Species or species habitat may occur

guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are delineated. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- cetaceans which are not listed as threatened
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Acknowledgments

This database has been compiled from a range of data sources. Environment Australia acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England

Your Ref:
Our Ref: AHIMS #8668

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BY:.....

RTA Environment Technology
Po Box ~~8085~~ 3035
Parramatta NSW 2150

NSW NATIONAL PARKS AND WILDLIFE SERVICE

ABN 30 841 387 271

Wednesday, 12 November 2003

Attention: Christopher Havelock

Dear Sir or Madam:

Re: AHIMS Search for the following area at
Zone 55 Eastings: 773200-783200 Northings: 6323300-6333300

I am writing in response to your recent inquiry in respect to Aboriginal objects and Aboriginal places registered with the NSW National Parks and Wildlife Service (NPWS) at the above location.

A search of the NPWS Aboriginal Heritage Information Management System (AHIMS) has shown that 2 Aboriginal objects and Aboriginal places are recorded in or near the above location. Please refer to the attached report for details.

The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.

The following qualifications apply to an AHIMS search:

- AHIMS only includes information on Aboriginal objects and Aboriginal places that have been provided to NPWS;
- Large areas of New South Wales have not been the subject of systematic survey or recording of Aboriginal history. These areas may contain Aboriginal objects and other heritage values which are not recorded on AHIMS;
- Recordings are provided from a variety of sources and may be variable in their accuracy. When an AHIMS search identifies Aboriginal objects in or near the area it is recommended that the exact location of the Aboriginal object be determined by re-location on the ground; and
- The criteria used to search AHIMS are derived from the information provided by the client and NPWS assumes that this information is accurate.

All Aboriginal places and Aboriginal objects are protected under the *National Parks and Wildlife Act 1974* (NPW Act) and it is an offence to destroy, damage or deface them without the prior consent of the NPWS Director-General. An Aboriginal object is considered to be known if:

- It is registered on AHIMS;
- It is known to the Aboriginal community; or
- It is located during an investigation of the area conducted for a development application.

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If you are considering undertaking a development activity in the area subject to the AHIMS search, NPWS would recommend that an Aboriginal Heritage Assessment be undertaken. You should consult with the relevant consent authority to determine the necessary assessment to accompany your development application.

Yours Sincerely

Vanessa Kendall
Department of Environment & Conservation
Aboriginal Information Officer
Information Systems Unit
Cultural Heritage Division
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