Australian Government

RTA

Hume Highway Duplication

PROJECT APPLICATION REPORT AND PRELIMINARY ENVIRONMENTAL ASSESSMENT

SEPTEMBER 2006

AUSLINK

RTA/Pub. 06.235

Document Controls

Business Unit	Planning and Assessment Section, Environment Branch		
Project No	405348		
Document Description	Hume Highway Duplication – Project Application Report and Preliminary Environmental Assessment		
	Name	**Signed**	**Date**
Reviewing Manager	Joy Duncan		11.09.06

Person(s) managing this document	**Person(s) writing this document**
Andrew Cook	Andrew Cook , Peter Ryan, Alison Nash

Location	**File No.**
G:\Ops\Environ\Assessments_Section\Projects\0506\Hume Highway projects\Project Application\FINAL 110906 Hume Hwy Major_Project_Application.doc	TBA

Document Status	**Date**
Final	11 September 2006

Prepared For	**Prepared By**
Charles Blomfield Manager Hume Highway Office Wagga Wagga	Planning and Assessment Section RTA Environment Branch Level 5, Pod D, 99 Phillip Street Parramatta NSW 2150 T (02) 8837 0584 F (02) 8837 0053 E andrew_cook@rta.nsw.gov.au

Prepared by RTA Planning and Assessment, Environment Branch
Version 1

A person using RTA Planning and Assessment, Environment Branch documents or data accepts the risk of:

- *Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version; and*
- *Using the documents or data for any purpose not agreed to in writing by RTA Planning and Assessment, Environment Branch.*

Executive Summary

Introduction and Overview

The NSW Roads and Traffic Authority (RTA) is proposing to upgrade sections of the Hume Highway south of its intersection with the Sturt Highway. The Australian Government has provided $800 million to achieve dual carriageways in the sections listed below by 2009 except for the immediate town bypasses of Tarcutta, Holbrook and Woomargama.

The scope of works, the subject of this Project Application Report, comprises construction of five sections of dual carriageway in the following areas:

- Sturt Highway to Tarcutta – from approximately 37km south of Gundagai to approximately 43km south of Gundagai, totalling approximately 6km in length.
- Kyeamba Hill – from approximately 67km south of Gundagai to approximately 76km south of Gundagai, totalling approximately 9km in length.
- Little Billabong – from approximately 85km south of Gundagai to approximately 93km south of Gundagai, totalling approximately 8km in length.
- Yarra Yarra to Holbrook – from approximately 98km south of Gundagai to approximately 110km south of Gundagai, totalling approximately 12km in length.
- Woomargama to Mullengandra – from approximately 131km south of Gundagai to approximately 141km south of Gundagai, totalling approximately 10km in length.

Planning and Assessment Process

Section 75B (2) of the *EP&A Act* provides that:

> *"The following kind of development may be declared to be a project to which this Part applies:*
>
> … (a) *major infrastructure or other development that, in the opinion of the Minister, is of State or regional environmental planning significance*"

In accordance with this provision, by Order published in the NSW Government Gazette (No. 114) the Minister for Planning has declared that the Hume Highway Duplication is a project to which Part 3A applies.

Need for the Project

There have been long standing community expectations for the completion of duplication of the Hume Highway to provide a continuous high standard dual carriageway highway between Sydney and Melbourne. Dual carriageways were completed in Victoria in December 2005 increasing the focus on the remaining single carriageway sections in NSW.

The completion of dual carriageways would provide consistent conditions for road users, improving the level of service, road safety and freight efficiency.

Proposed Scope of the Environmental Assessment

Environmental issues identified by the RTA during the preliminary environmental assessment are identified in this Project Application report. The key environmental issues the RTA proposes to assess in detail within the Environmental Assessment include:

- Biodiversity;
- Aboriginal heritage; and
- Non-Aboriginal heritage.

These key environmental issues are likely to have unique project-specific issues that may require the application of project specific mitigation measures. Further assessments and studies have been identified within Section 6.2 to 6.4 of this report which would support the development and implementation of procedures, practices and protocols for identifying and managing the environmental impacts of the Project. These procedures, practices and protocols would be included in the Statement of Commitments for the Project.

Other potential environmental impacts (eg. soil and water quality, air quality, hazards and risks) associated with the Project that are common to major road works construction activity would be managed using standard industry best practice management techniques. These other potential environmental issues are considered to be of predominantly minor and transient nature and are unlikely to require unique or project-specific solutions. With application of appropriate standard management measures their impacts are considered to be of minor significance only. Table 6.1 outlines these other environmental issues and proposed mitigation measures.

Contents

Attachments

Attachment A: Route Map
Attachment B: Community Update
Attachment C: Topographic Maps
Attachment D: Salinity Maps
Attachment E: Biodiversity and Waterways Maps
Attachment F: Species List
Attachment G: Non-Aboriginal Heritage Maps

Abbreviations

Acronym	Definition
AHIMS	Aboriginal Heritage Information Management System
AQMP	Air Quality Management Plan
BMP	Blast Management Plan
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
DEC	Department of Environment and Conservation
DEH	Department of Environment and Heritage
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERM	Environmental Resources Management
FM Act	*Fisheries Management Act 1994*
HRMP	Hazards and Risk Management Plan
IDO	Interim Development Order
LGA	Local Government Area
LoS	Level of Service
NVMP	Noise and Vibration Management Plan
RTA	Roads and Traffic Authority
SEPP	State Environmental Planning Policy
SIS	State Infrastructure Strategy
SWMP	Soil and Water Management Plan
TMP	Traffic Management Plan
TSC Act	*Threatened Species Conservation Act 1995*
TSRs	Travelling Stock Routes
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
WMP	Waste Management Plan

1 Introduction and Methodology

1.1 Background

The Hume Highway consists of a continuous dual carriageway from Sydney to the Sturt Highway junction (371km) except for the Coolac Bypass (12km) and Sheahan Bridge, Gundagai (2km). Over the 146km between the Sturt Highway junction and the Victorian Border, 51km of dual carriageway has been completed, leaving approximately 95km of single carriageway remaining to be upgraded to dual carriageway. With the completion of the Albury Wodonga Freeway project in mid 2007 there will remain some 87km of single carriageway over a total 126km length between the Sturt Highway and Table Top, north of Albury.

The NSW Roads and Traffic Authority (RTA) is proposing to duplicate five sections of single carriageway on the Hume Highway south of its intersection with the Sturt Highway, to north of Albury.

The scope of works, the subject of this Project Application Report, includes five sections of duplication (approximately 45km) as described below and shown in **Attachment A**:

- Sturt Highway to Tarcutta – from approximately 37km south of Gundagai to approximately 43km south of Gundagai, totalling approximately 6km in length.
- Kyeamba Hill – from approximately 67km south of Gundagai to approximately 76km south of Gundagai, totalling approximately 9km in length.
- Little Billabong – from approximately 85km south of Gundagai to approximately 93km south of Gundagai, totalling approximately 8km in length.
- Yarra Yarra to Holbrook – from approximately 98km south of Gundagai to approximately 110km south of Gundagai, totalling approximately 12km in length.
- Woomargama to Mullengandra – from approximately 131km south of Gundagai to approximately 141km south of Gundagai, totalling approximately 10km in length.

For the purposes of this Project Application Report the scope of works is referred to as 'the Project' hereafter.

The community consultation has commenced. A Community Update was released in July 2006 providing the community with details of the proposed Hume Highway duplication project (refer to **Attachment B**).

1.2 Project development history

There have been long standing community expectations for the completion of duplication of the Hume Highway to provide a continuous high standard dual carriageway highway between Sydney and Melbourne. Dual carriageways were completed in Victoria in December 2005 increasing the focus on the remaining single carriageway sections in NSW.

In 2004, the RTA completed a *Hume Highway Strategic Planning Study* to assess the long-term improvement strategy for the Highway between the Sturt Highway and Table Top. This study identified the need to complete the duplication of the Hume Highway in NSW.

As a result of the announcement of the Federal budget in May 2006, funding has been made available for duplicating the remaining single carriageway sections of the Hume Highway south of its intersection with the Sturt Highway, except for the town bypasses of Tarcutta, Holbrook and Woomargama. The areas of proposed duplication begin approximately 37km south of Gundagai and end approximately 41km north of Albury.

Each of the areas proposed for duplication as part of this Project will require environmental assessment and approval under Part 3A of the *Environmental Panning and Assessment Act 1979* (EP&A Act).

1.3 Purpose and structure of this document

This Project Application Report and Preliminary Environmental Assessment has been prepared for the Director-General of the Department of Planning (DoP) under Section 75E of the EP&A Act. The Report focuses on the following key issues:

- Describes the Project.
- Outlines the findings of a preliminary environmental assessment and outlines the environmental management measures proposed to be adopted.
- Identifies the proposed scope of the subsequent Environmental Assessment for the Project.
- Aims to assist the formulation of environmental assessment requirements by the Director-General under Section 75F (3).

The structure of the remaining sections of this document is as follows:

- Section 2 – Planning and assessment process
- Section 3 – Strategic context and need for the Project
- Section 4 – Description of the Project
- Section 5 – Existing environment
- Section 6 – Preliminary environmental assessment
- Section 7 – Proposed scope of the Environmental Assessment

2 Planning and Assessment Process

2.1 Approval Process under Part 3A of the EP&A Act

Section 75B (2) of the *EP&A Act* provides that:

> *"The following kind of development may be declared to be a project to which this Part applies:*
>
> … (a) *major infrastructure or other development that, in the opinion of the Minister, is of State or regional environmental planning significance*"

In accordance with this provision, by Order published in the NSW Government Gazette (No. 114) the Minister for Planning has declared that the Hume Highway Duplication is a project to which Part 3A applies.

2.2 Statutory Planning

2.2.1 Local Environmental Plans

The Project is located within the Greater Hume Shire Council and Wagga Wagga City Council Local Government Areas (LGAs). The Greater Hume LGA was recently formed by the amalgamation of three council areas - Holbrook, Culcairn and Hume and includes the areas of Mullengandra, Holbrook and Little Billabong. The planning instruments for each of the former Councils in force prior to the amalgamation continue to regulate land use in their respective areas.

The planning instruments applicable to the project area are: the *Holbrook Interim Development Order, 1970 (IDO)* for Holbrook, Little Billabong, and Woomargama; *Hume Local Environmental Plan 2001* for Mullengandra; and *Wagga Wagga Rural Local Environmental Plan 1991* for Kyeamba and Tarcutta.

The Project passes through Rural (Agricultural) and Rural (Environment) land use zones in the Greater Hume Shire. In the former Holbrook LGA, the Rural (non-Urban) land zone is applicable to lands within 400m of the Hume Highway including the Holbrook and Little Billabong sections. In the Wagga Wagga LGA the Project passes through one land use zone: 1(Rural) with sub-zones 1(f) Arterial Road Frontage (RLA), 6(c) Recreation and 7(b) Hillscape. Development for the purposes of roads is permissible in the above land use zones.

Development consent from Greater Hume Shire Council and Wagga Wagga City Council would not be required, as the Project is being assessed under Part 3A of the EP&A Act.

2.3 Other State Legislation

The following NSW legislation (but not limited to) may have relevance to the Project, and will be considered in the environmental assessment:

- *Contaminated Land Management Act 1997*
- *Fisheries Management Act 1994*
- *Heritage Act 1977*
- *National Parks and Wildlife Act 1974*

- *Native Title (New South Wales) Act 1994*
- *Native Vegetation Act 2003*
- *Occupational Health and Safety Act 2000*
- *Protection of the Environment Operations Act 1997*
- *Rivers and Foreshores Improvement Act 1948*
- *Roads Act 1993*
- *Threatened Species Conservation Act 1995*
- *Waste Avoidance and Resource Recovery Act 2001*
- *Water Act 1912*
- *Water Management Act 2000*

The following environmental planning instruments (but not limited to) may have relevance to the Project, and will be considered in the environmental assessment:

- *State Environmental Planning Policy No. 44 - Koala Habitat Protection*
- *State Environmental Planning Policy No. 52 - Farm Dams and Other Works in Land and Water Management Plan Areas*
- *State Environmental Planning Policy No. 55 - Remediation of Land*
- *State Environmental Planning Policy No. 64 - Advertising and Signage*

2.4 Commonwealth Legislation

The following Commonwealth legislation (but not limited to) may have relevance to the Project, and will be addressed in the environmental assessment:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- *Environmental Protection and Biodiversity Conservation Act 1999*
- *Protection of Movable Cultural Heritage Act 1986*

2.5 Other Project Approvals

Commonwealth Legislation

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*), a project that is likely to result in a significant impact on a matter of National Environmental Significance must be referred to the Department of Environment and Heritage (DEH). If the Project is subsequently determined to be a 'Controlled Action', then approval from the Commonwealth Environment Minister is required. Matters of National Environmental Significance that are potentially relevant to the Hume Highway Duplication Project include:

- Nationally threatened species and ecological communities; and
- Migratory species protected under international agreements

Based on investigations completed by the RTA to date, the most likely trigger for a referral to DEH would be a significant impact on nationally threatened species or ecological communities, or migratory species (refer to sections 5.4 and 6.2 for further information). If it is determined that a significant impact is likely, the Project will be referred to the DEH.

3 Strategic Context and Need for the Project

3.1 Strategic Context

The Hume Highway, Sydney-Melbourne corridor is the major interstate freight corridor in Australia carrying over 20 million tonnes of road freight every year. In addition, the corridor is an important part of the NSW state and regional road network. The total length of the Sydney-Melbourne corridor is 807km, 517km in NSW and 290km in Victoria. Within Victoria 100% is now dual carriageway, mostly of freeway standard. Within NSW 408km (79%) is dual carriageway.

Of the 109km in NSW yet to be duplicated, the Albury Wodonga Freeway is currently under construction and due for completion in mid 2007, tenders have closed for the Coolac bypass duplication with work due to commence in late 2006 and planning is progressing on Sheahan Bridge duplication at Gundagai with tenders expected to be invited in late 2006. Completion of these projects will leave 87km of single carriageway on the Hume Highway, all sections of remaining single carriageway being located between the Sturt Highway junction and Table Top, north of Albury.

3.1.1 State Infrastructure Strategy

The *State Infrastructure Strategy - New South Wales 2006-07 to 2015-16* (SIS) provided strategic direction for planning and delivery of infrastructure in NSW. Projects identified for inland New South Wales included projects to complete the duplication of the Hume Highway. Delivery of some of the major roadworks initiatives acknowledged the need for Federal government funding. The SIS identified that investment priorities for transport included major improvements to the Hume Highway.

Duplication of the Hume Highway will contribute to previously announced Government transport infrastructure objectives for:

- Improving access for our rural communities; and
- Making freight more competitive.

3.1.2 AusLink White Paper

The *AusLink White Paper: Building Our National Transport Future* is the Australian Government's formal policy statement on land transport. It identifies national objectives for the AusLink investment programme.

The AusLink investment programme will promote sustainable national and regional economic growth, development and connectivity by contributing to the development of an integrated national land transport network (National Network) which:

- Improves national and interregional connectivity for people, communities, regions and industry;
- Improves national, interregional and international logistics;
- Enhances national, interregional and international trade;
- Enhances health, safety and security;

- Is consistent with the obligations to current and future generations to sustain the environment;
- Is consistent with viable, long-term economic and social outcomes; and
- Is linked effectively to the broader transport network.

Under AusLink the Australian Government has established a National Land Transport Plan and a defined National Network, which includes the Hume Highway.

The National Land Transport Plan has eight strategic directions, which include improving the capacity and performance of the vitally important eastern seaboard north-south interstate corridors by upgrading critical road links. The White Paper identified these corridors as the most heavily trafficked in Australia and will have to deal with continuing strong growth in freight and passenger traffic, fuelled by economic growth and population expansion. It further recognised that these corridors are critical to Australia's international competitiveness and include the three most significant container ports – in Sydney Melbourne and Brisbane – and the three most significant airports, which are also in the three capital cities.

The AusLink strategic priorities for the Hume Highway are to improve performance, capacity and safety with an objective to complete the full duplication of the Hume Highway to dual carriageways by 2012. The AusLink investment of $800 million announced in the 2006 Federal budget accelerates the Hume Highway upgrading programme to complete a further 67km of duplication by 2009. This will leave only 20km of additional duplication remaining, being the bypasses of Tarcutta, Holbrook and Woomargama to be completed by 2012. These bypasses are not included in the project application and will be the subject of a separate assessment and project approval process.

3.2 Need and Justification

With the completion of the Albury Wodonga Freeway project in mid 2007 there will remain some 87km of single carriageway over a total 126km length between the Sturt Highway junction and Table Top, north of Albury. The $800 million AusLink investment announced by the Australian Government in the 2006 Federal Budget is for a package of works to complete duplication of 67km in six sections:

	Approximate length:
• Sturt Highway to Tarcutta	6km
• Kyeamba Hill	9km
• Little Billabong	8km
• Yarra Yarra to Holbrook	12km
• Woomargama to Mullengandra	10km
Sub-total = 45km	
• Mullengandra to Table Top*	22km
Total = 67km	

*The Mullengandra to Table Top (22km) section has an existing project approval as part of the approved Albury National Highway Project, and does not form part of this Project application.

When these sections are completed the only remaining single carriageway lengths will be located at the township areas of Tarcutta (5km), Holbrook (7km) and Woomargama (8km).

In 2004, the RTA has completed a *Hume Highway Strategic Planning Study* to assess the long term improvement strategies for the Highway between the Sturt Highway and Table Top. Recognising that the general Sydney-Melbourne corridor contained both road and rail freight and passenger movements the study included an analysis of a potential shift of freight from road

to rail and the impact of such a shift on both the need and timing of road improvements.

The study concluded that even with significant investment, the potential freight shift from road to rail would have little impact on the total road freight transport task and would not obviate the need for highway improvements.

3.2.1 Level of Service

Level of Service (LoS) is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists or passengers. A LoS definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre (eg overtaking), traffic interruptions, comfort and convenience, and safety. In general there are six levels of service ranging from A (the best operating conditions – free flow) to F (the worst operating conditions – forced or break-down flow).

As part of the *Hume Highway Strategic Planning Study*, LoS calculations were undertaken based on 2001 traffic volumes and projected to 2006, 2016 and 2021 to reflect current and future performance. The dual carriageway sections of the Hume Highway are currently operating at LoS A with significant capacity for traffic growth at this level.

In 2006 the single carriageway sections of the Highway are operating as high as LoS B for eight hours per day (2am to 10am) and as low as LoS D for up to five hours per day (8pm to 1am). The average is LoS C. The reduction to LoS D corresponds to the peak period for heavy vehicles and reflects the high night-time percentage of truck traffic on the Hume Highway.

Adopting a threshold for upgrading from single carriageway to dual carriageway as the point at which LoS deteriorates from C to D for a significant period justifies immediate upgrading of the Highway. Without upgrading, in 2016 the single carriageway sections would deteriorate to LoS E during the period 9pm to 1am with an average weekday LoS D. In 2021 this would further deteriorate to LoS E over a longer period 7pm to 2am with an average LoS D.

As an alternative analysis measure the fiftieth highest hour of traffic demand in a year (H_{50}) is commonly used as the design volume for rural roads. Using this measure the H_{50} capacity analysis for 2006 shows the single carriageways are operating at LoS D falling to LoS E in 2016. The alternative analysis using H_{50} further supports the above conclusion that the immediate upgrading of the Highway to dual carriageway is justified.

3.2.2 Road Safety

The crash rates (in terms of travel per 100 million vehicle kilometres travel) on the single carriageway sections of the Hume Highway between the Sturt Highway and Table Top are higher in all categories (fatal, injury and total) than the adjacent dual carriageway sections as shown in the Table 3.1.

Table 3.1: Crash rates for the Hume Highway, Sturt Highway to Table Top

Road Section	Crash Rate (per 100Mvkt)		
	Fatal	Injury	Total
Divided carriageway sections Sturt Highway to Table Top	1.09	7.9	24.6
Single carriageway sections Sturt Highway to Table Top	2.01	11.1	28.2
Combined Sturt Highway to Table Top	1.71	10.6	27.0

Of note:

- The fatal crash rate on the single carriageway is approximately 85% higher than the divided carriageway.
- The injury crash rate on the single carriageway is approximately 40% higher than the divided carriageway.

Within the overall averages for the single carriageway between Sturt Highway and Table Top there is a marked variation in individual sections. Refer to Table 3.2 below.

Table 3.2: Crash rates for single carriageway between Sturt Highway and Table Top

Section	Crash Rate (per 100Mvkt)		
	Fatal	Injury	Total
Sturt Highway to Tarcutta	2.3	20	55
Kyeamba Hill	1.3	18	49
Little Billabong	4.7	11	36
Yarra Yarra to Holbrook	0.6	10	25
Woomargama to Table Top	2.5	8	18

Road safety is a significant community concern. By these measures some sections have significantly higher crash rates than the total Hume Highway as a route and improvements are justified on the grounds of road safety.

3.2.3 Freight Efficiency

Road freight on the Hume Highway can currently move between Sydney and Melbourne overnight. Thus the dominant period for freight movement on this section of the Hume Highway is at night. There is a desire to reduce travel times and provide door to door delivery. This is severely impacted by the reduced level of service on the single carriageway resulting from:

- Reduced speed limits;
- Traffic congestion; and
- Lack of overtaking opportunities.

There is a general industry desire to adopt use of higher efficiency freight vehicles. Further consideration and acceptance of such vehicles on the Hume Highway is dependent, amongst other matters, on the completion of high standard dual carriageway conditions.

4 Description of the Project

4.1 General

The Hume Highway is the main freight route between Sydney and Melbourne and it is also a vital transport link for communities and industries in southern NSW. Between its intersection with the Sturt Highway to north of Albury the Hume Highway passes through a number of towns and localities. The largest towns are Holbrook (population approximately 4000), Tarcutta (population approximately 850) and Woomargama (population approximately 150). Other localities include Kyeamba, Mullengandra, Bowna and Tabletop.

Excluding the three townships of Tarcutta, Holbrook and Woomargama, five sections of the Hume Highway remain as single carriageways.

4.2 The Project

The RTA is proposing to duplicate the remaining single carriageway sections of the Hume Highway south of its intersection with the Sturt Highway (approximately 37km south of Gundagai) to Mullengandra (approximately 41km north of Albury). Immediate funding has been received to duplicate those areas that remain as single carriageways by 2009.

The Project is therefore described as the duplication of the Hume Highway at the following locations (refer to **Attachment A**):

- Sturt Highway to Tarcutta – from approximately 37km south of Gundagai to approximately 43km south of Gundagai, totalling approximately 6km in length.
- Kyeamba Hill – from approximately 67km south of Gundagai to approximately 76km south of Gundagai, totalling approximately 9km in length.
- Little Billabong – from approximately 85km south of Gundagai to approximately 93km south of Gundagai, totalling approximately 8km in length.
- Yarra Yarra to Holbrook – from approximately 98km south of Gundagai to approximately 110km south of Gundagai, totalling approximately 12km in length.
- Woomargama to Mullengandra – from approximately 131km south of Gundagai to approximately 141km south of Gundagai, totalling approximately 10km in length.

The project description and design criteria are subject to alterations which would be identified during the detailed design of the Project. Any alterations that are required will aim to minimise impacts. Preliminary designs are advanced for the Sturt Highway to Tarcutta, Kyeamba Hill and Little Billabong sections and as such proposed alignments have been progressed. For the Yarra Yarra to Holbrook and Woomargama to Mullengandra sections, designs are not as advanced and proposed design corridors will be assessed.

The duplication of the Highway in most cases would primarily involve construction of a second carriageway to provide dual carriageway conditions consistent with the existing duplicated sections. In general, and to the maximum extent possible, the existing Highway is to be retained as one carriageway of the ultimate dual carriageway.

In some sections the existing Highway has geometric deficiencies in horizontal and vertical alignment to the extent that over short sections two new carriageways would be constructed to provide a suitable standard for dual carriageway. In either event, the new construction is likely to be undertaken on or adjacent to the existing road corridor using standard road construction methods. Grade separation of some regional roads would be considered to

improve road safety and transport efficiency. The new highway carriageway would generally be designed to the criteria described in Table 4.1 below.

Table 4.1: Design criteria for the Project

Design Element	Recommended Criteria
Design Speed	• 130 km/h Horizontal Alignment • 100 km/h Vertical Alignment
Sight Distance	• 110 km/h Stopping Sight Distance – Desirable (2.5 second reaction time) • 100 km/h Stopping Sight Distance – Minimum (2.5 second reaction time)
Horizontal Alignment	• 130 km/h Horizontal Alignment Stopping Sight Distance (2.5 second reaction time)
Grade	• Desirable maximum 4.5% • Maximum 6%
Cross Section	Basic configuration of dual carriageways, with new carriageways providing two travel lanes. Traffic Lane Width: • 3.5 metre Outside Shoulder Width: • 2.5 metre (may include gutter as required) • 3.0 metre adjacent to safety barrier (may include gutter as required) Inside (median) Shoulder Width: • 1.0 metre Median Width: • Generally provide a 12 metre depressed median with landscaping. Consideration to be given to the provision of safety barrier at critical locations. • Consider a 5 metre median with safety barrier and landscaping at locations where design provides a major cost saving (eg deep cuts). • All median breaks and cross overs with at grade intersections should accommodate turning of an articulated vehicle of up to 25 metres.
Corridor Widths	Nominally, to provide 6 metre width from tops of cuts and toes of fills to Controlled Access Road boundary.
Property Access	Access control would apply on all sections of work when new boundaries are being established. On these sections, the number of access points would be kept to a minimum.
Environmental Management	The Project shall be designed and constructed in such a way that it has the minimum impact that is practicable on both the natural and the built environment.
Bridges	Width – as per the *RTA Road Design Guide* Load – as per *Austroads Bridge Design Guide* (SM1600).

Design Element	Recommended Criteria
Pavement	Design Life: • New flexible pavement – 30 years. • Concrete and asphalt/lean-mix pavements – 40 years.
Signposting	Signposting to follow the format given in the RTA Guide Signs and Tourist Signs Manuals.

4.3 Ongoing Refinement of the Concept Design

The preparation of the concept design for the Project is ongoing at the time of preparing this Project Application. Detailed ground surveys and geotechnical investigations are currently being undertaken. Data provided by these surveys and geotechnical investigations will be used to refine the concept design for the Project during the preparation of the Environmental Assessment. Matters to be addressed during the refinement of the concept design include:

- Refinement of vertical and horizontal alignments;
- Refinement of intersection layouts;
- Refinement of property access arrangements;
- Adjustment of property boundaries;
- Completion of flood impact studies for the Sturt Highway to Tarcutta and Little Billabong project areas which may influence the provision of, siting, layout and sizing of temporary and permanent drainage, water retention and water quality control basins/ponds;
- Refinement of the road design to integrate a variety of environmental mitigation and improvement features. This may include acoustic attenuation measures, revegetation and landscaping and features that respond to local ecological conditions such as protection of key habitat and specific provisions for fauna movement across the road corridor; and
- Finalisation of proposed land acquisition boundaries based on the detailed concept design.

5 Existing Environment

For the purposes of describing the existing environment, the 'project area' is considered to be the area of each of the five sections of duplication with a buffer of approximately 500m either side of the existing Hume Highway.

5.1 Landform and Topography

The project area is located in the South Western Slopes Bioregion which occupies 10% of NSW landforms (DEC 2004). This bioregion encompasses foothills and isolated ranges along the lower western slopes of the southern area of the Great Dividing Range. The topography within the project area is characterised by north-south running valleys and ridges (refer to Attachment C). The Hume Highway generally traverses areas of low relief, including level floodplains and alluvial terraces. Other landform types present include major creek lines and granite outcrops. There are a number of existing cuttings and batters along the Hume Highway where the terrain is undulating or steep.

5.2 Geology

The project area is located within the Lachlan Fold Belt geological province of NSW (Branagan and Packham 2000). The geology in the northern part of the project area consists primarily of a metamorphic unit of quartzite, slate, phyllite, greywacke, hornfels and schist which was laid down in the Upper Ordovician. This unit has subsequently been overlain by younger tertiary and quaternary alluvium consisting of gravel, sand, silt and clay. The geology in the middle and southern project areas is comprised of early Palaeozoic granite and Upper Ordovician quartzite overlain by Tertiary alluvium. Tertiary and quaternary alluvium is particularly noticeable along Billabong Creek and also in a large accumulation surrounding the town of Holbrook (Doughty, 2003). Granite outcrops are found at Kyeamba, Holbrook, Woomargama Creek and Mullengandra. Between these outcrops 'folded Ordivician' rocks occur (Branagan and Packham 2000).

5.3 Soils

There are a variety of soil landscape types present including alluvial, erosional, transferral and residual, which generally represent areas of low relief along creek lines, foot slopes and low hills. Soils tend to be shallow and stony on hill tops and mid slopes are commonly comprised of subsoils derived from the parent rock and overlain by coarse colluvial deposits from upslope. In the valleys and alluvial plains, soils are generally >1.5m deep and are comprised of riverine deposits (Doughty 2003). Overall, soils in the project area are generally susceptible to localised occurrences of:

- Waterlogging;
- Sodicity;
- Acidity;
- Salinity; and
- Flood hazard.

Erosion hazard is generally moderate to high. Gully erosion is evident near stream banks, exacerbated by grazing of livestock, and sheet erosion is common on upper slopes, particularly

where cleared. Occurrences of acid soils and salinity in the region are caused by rising groundwater and agricultural practices. Waterlogging is particularly evident at discharge areas which are generally found at the break of slopes and may also be associated with areas where normal drainage is restricted. Refer to Section 5.4 below for further discussion on waterlogging within the project area.

A draft Soil Landscape Group called Big Springs Variant *a* (*bsa*) is described in the *Tarcutta 1:100 000 map sheet* (Wild unpublished data). This soil landscape group is associated with areas of seasonal waterlogging. It is known to occur on the western footslopes of Mount Batler in the Kyeamba duplication section where waterlogging is prevalent (Summerell et *al.* 2004). Waterlogging associated with the draft *bsa* soil landscape group may also occur in other sections of the project area located further north.

5.4 Water

There are no major rivers or wetlands within the project area however a number of named and unnamed creeks are present as are farm dams. Springs are common and may or may not be associated with drainage lines and many of the dams and creeks are spring fed. Creeks in the project area are under hydrological stress due to recent drought conditions and extractions for the purposes of stock, domestic and irrigation. Surface and groundwater typically flow east to west, following the topography.

Whilst the majority of creeks in the project area were dry during the site inspection in August 2006, they are known to have episodic flood events. The sections within the project area which would be potentially susceptible to flooding based on historical data and the proximity to creek lines are:

- Tarcutta;
- Kyeamba;
- Little Billabong; and
- Woomargama to Mullengandra.

Water quality in the project area is primarily impacted by agricultural practices and salinity with some impact from run off from the Hume Highway. Contributions from agricultural practices include nutrients from grazing of stock, fertiliser use and herbicide and pesticide use. Due to the low to moderate traffic loads on the Hume Highway, contaminated run off from the road surface is not considered to present a substantial impact.

Groundwater and surface water is utilised throughout the project area for domestic and agricultural purposes. A number of existing licensed groundwater bores are located adjacent to the Hume Highway throughout the project area, except at Kyeamba Hill where the nearest bore is located approximately 3km west.

Salinity is the primary impact on water quality in the region and can reach water courses by surface run off from areas affected by dryland salinity or by saline base flow of groundwater. Dryland salinity and saline groundwater flows are generally a result of rising groundwater. High groundwater levels are mainly found where there are lowlands surrounded by elevated areas with higher discharge due to geological conditions and land use practices (Kulatunga & Lucas 2000) including clearing of vegetation for grazing and cropping. Dryland salinity is an environmental issue in the region and management practices are currently implemented through local Landcare Groups, (Oberne-Tarcutta, Kyeamba Valley, Holbrook and Mullengandra) Catchment Management Authorities (CMA's) (Murray and Murrumbidgee) and involvement of private landholders. Salinity has been mapped within the project area at Mullengandra (refer to

Attachment D).

Waterlogging can be caused by soils with poor drainage, restriction of groundwater movement and can be associated with springs, which are common throughout the project area. An area of localised waterlogging has been identified in the southern end of the Kyeamba section and is associated with the draft *bsa* Soil Landscape Group. Waterlogging has also been identified immediately south of the Little Billabong section, and is found to be associated with restriction of groundwater movement caused by the existing Hume Highway.

Where associated with poor drainage or restriction of groundwater movement, waterlogging is likely to be caused by shallow lateral flows rather than due to rising saline groundwater. Waterlogged soil can have an impact on water quality and on land productivity by causing saline outbreaks due to evapo-transpiration from the waterlogged area (Bake et *al.* 2001)

5.5 Biodiversity

The RTA commissioned Environmental Resources Management Australia Pty Ltd (ERM) to undertake preliminary ecological investigations associated with the Project. The findings of this investigation are summarised below. Refer to Attachment E for biodiversity characteristics of the project area.

The existing environment consists of wooded and cleared areas. In wooded areas there is predominantly a mix of native and exotic grasses and native tree species. Many of the wooded areas have canopy species representative of the ecological community White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (hereafter referred to as Box-Gum Grassy Woodland). This community is listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) and endangered under the *Threatened Species Conservation Act, 1995* (TSC Act). Other wooded sections are dominated by Ironbarks, Apple Box (*Eucalyptus bridgesiana*), Red Box (*E. polyanthemos* subsp. *vestita*), Southern Blue Gum (*E. bicostata*) and River Red Gums (*E. camaldulensis*) and these areas are unlikely to be representative of Box-Gum Grassy Woodland. White Box (*E. albens*) and River Red Gum are listed as koala feed tree species on the Schedules of State Environmental Planning Policy No. 44.

A number of threatened bird species that potentially occur in the area may utilise resources (including hollows, nectar, pollen and insects) associated with Box Gum Grassy Woodland, Ironbark and eucalypt woodlands. These include the Swift Parrot (*Lathamus discolour*), which is listed as endangered under the TSC Act and EPBC Act, the Australian Painted Snipe (*Rostratula australis*), which is listed as endangered under the TSC Act and vulnerable under the EPBC Act), the Regent Honeyeater (*Xanthomyza phygia*), which is listed as endangered under the TSC Act and endangered under the EPBC Act, the Superb Parrot (*Polytelis swainsonii*) which is listed as vulnerable under the TSC Act and the EPBC Act and the Brown Tree Creeper (*Climacteris picummus*), Black-chinned Honeyeater (*Melithreptus gularis* gularis), Gang Gang Cockatoo (*Callocephalon fimbriatum*), Grey-crowned Babbler (eastern sub-species), Major Mitchell's Cockatoo (*Cacatua leadbeateri*), Barking Owl (*Ninox connivens*), (*Pomatostomus temporalis*) and the Speckled Warbler (*Pyrrholaemus sagittatus*) which are all listed as vulnerable under the TSC Act. The threatened bird species, Hooded Robin (*Melanodryas cucullata*) which is listed as vulnerable under the TSC Act may utilise habitat in the project area consisting of eucalypt woodland near cleared farmland.

Many of the larger trees have hollows of various sizes which may provide habitat for potentially occurring threatened and protected fauna species such as microbats, e.g. the Eastern Long-eared Bat (South-eastern form) (*Nyctophilus timoriensis*) which is listed as vulnerable under the TSC Act and the EPBC Act and the Squirrel Glider (*Petarus norfolcensis*) which is listed as vulnerable under the TSC Act and hollow-nesting birds such as the Turquoise Parrot

(*Neophema pulchella*) which is listed as vulnerable under the TSC Act.

The Squirrel Glider may utilise roadside vegetation, particularly where it is contiguous with larger vegetation remnants. A Squirrel Glider population in the Wagga Wagga LGA (which is listed as an endangered population under the TSC Act) potentially occurs in the project area. Mistletoes (potentially *Amyema sp.*) are present in large numbers and may represent an important food resource for native fauna. This may include threatened native mammals and birds that feed on invertebrates and fruits, including the threatened bird species, the Painted Honeyeater (*Grantiella picta*) which is a specialist feeder on the fruits of mistletoes and is listed as vulnerable under the TSC Act.

Rocky hills provide potential habitat for the threatened reptile species, Pink-tailed Worm Lizard (*Aprasia parapulchella*) which is listed as vulnerable under the EPBC Act and the TSC Act. This species is known at four sites in eastern NSW including in farmland at Tarcutta where it has been found beneath large fragments of granodiorite (DEC, 2006). The Pink-tailed Worm Lizard may also be found where rocky habitats are present in other parts of the project area.

Riparian areas are present throughout the project area and represent potential zones of higher biodiversity. The potentially occurring threatened bird species Diamond Firetail, (*Stagonopleura guttata*) which is listed as vulnerable under the TSC Act, is often found in riparian areas and sometimes in lightly wooded farmland (DEC 2005) and the Black Bittern (*Ixobrychua flavicollis*) which is listed as vulnerable under the TSC Act may also be found in riparian woodland. The project area is located within the Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment which is listed as an endangered ecological community (EEC) under the *Fisheries Management Act, 1994* (FM Act). All native fish and aquatic vertebrates within the natural waterways of this EEC are therefore regarded as endangered.

Waterways in the project area potentially support aquatic flora and fauna including frogs and fish species. The threatened flora species River Swamp Wallaby Grass (*Amphibromus fluitans*) which is listed as vulnerable under the TSC Act and the EPBC Act may occur in creeks or farm dams in the area. The Purple Spotted Gudgeon (*Mogurnda aspersa*) is listed as an endangered fish population (western population) under the FM Act and potentially occurs in slow moving or still waters often amongst weeds, rocks or snags (NSW Fisheries 2002). The Southern Bell Frog (*Litoria raniformis*) which is listed as endangered under the TSC Act and vulnerable under the EPBC Act, may utilise ephemeral pools and has the potential to occur within the Woomargama to Mullengandra duplication section (DEH 2006). During the site visit many of the creeks were dry however frogs were heard calling in Kyeamba Creek and Sweetwater Creek.

Travelling Stock Routes (TSRs) are often important areas for biodiversity. Routes identified in the project area are TSR 74 (Halfway) in the Kyeamba section, TSR 16 (Blue Metal) in the Woomargama to Mullengandra section and TSR 155 (Dalys) in the Woomargama to Mullengandra section. TSR 74 has been found to be a location of high biodiversity (Webster 2000) and TSR 16 is a well known location for bird watching and biodiversity.

Riparian areas and ridgelines also provide some connectivity of vegetation across the landscape. This potentially represents corridor value for movement of fauna across the landscape and between larger areas of remnant vegetation and for dispersal of seed.

Refer to **Attachment F** for the full list of threatened species, populations and ecological communities that are considered to have a moderate to high potential to occur in the project area.

5.6 Aboriginal Heritage

The RTA commissioned Cultural Heritage Connections to undertake preliminary Aboriginal heritage investigations associated with the Project. The findings of this investigation are presented below.

There is a lack of previous Aboriginal cultural heritage investigations in the project area and there are no previously identified items on the Department of Environment and Conservation Aboriginal Heritage Information Management System (AHIMS) database within the project area. This result should however not be considered evidence that Aboriginal objects, sites and places are not present within the project area.

Wooded areas found throughout the project area represent a high potential that scar trees may be present. Particular landscape characteristics may indicate potential presence of Aboriginal objects and places. Flats and terraces associated with creek landforms present high potential for sites including artefact scatters and camp sites. There are a number of creek crossings throughout the project area and burials may occur where soft alluvial deposits are found. Lower slope landforms present potential for artefact sites, particularly in areas of well drained elevated ground.

5.7 Non-Aboriginal Heritage

The RTA commissioned Godden Mackay Logan to undertake preliminary non-Aboriginal heritage investigations associated with the Project. The findings of this investigation are summarised below. Refer to **Attachment G** for a map of identified items.

The Hume Highway was previously known as the Great Southern Road, until 1928 when the then Main Roads Board re-named the road. In the project area, the road was initially a track servicing various holdings and provided a route for travelling stock. The south-west route of the original track is substantially the same as that of the Hume Highway today, though some realignment has occurred. Travelling stock routes remain along the route throughout the project area and could potentially have historically significance.

Within the pastoral landscapes of the project area there are also a number of historic buildings and residences are present including station structures, homesteads, hotels/inns, a church and a school. There are also potential archaeological relics including ruins and a Surveyor's tree. Other items of potential historic significance within the project area include a number of concrete bridges and remnants of early phases of the Great Southern Road / Hume Highway.

5.8 Noise and Vibration

Noise and vibration receivers within the project area are in low numbers (approximately 50) and densities. Receivers are generally farm houses with frontage to the Hume Highway ranging from 20 to 600m from the edge of the Highway however most residences are set back from the road. Sensitive receivers are present at Mullengandra, including a church, an existing school and an outdoor playground. These sensitive receivers are located 20m and 160m respectively from the Highway.

Due to the low traffic volumes and the rural land use the existing ambient noise levels for the project area and surrounds would be considered low to moderate. Sources of noise within the project area would be associated with road traffic using the Hume Highway and with agricultural machinery and equipment used on private landholdings.

The existing vibration levels within the project area would be considered negligible as there are no existing sources of vibration within and surrounding the project area.

5.9 Air Quality

The Project is located within a rural environment and air quality would generally be expected to be high. The primary use of surrounding properties appears to be stock production. Natural short-term or seasonal variations in air quality may occur and would be influenced by the variable topography and seasonal climatic conditions. Existing sources of air pollution within the project area would be due to ploughing and harvesting activities, natural pollination and wind blown dust events.

5.10 Visual Amenity

The main visual feature is the infrastructure of the existing Hume Highway. In this region, the Hume Highway is a gently curving route through a rural area offering views across cleared undulating land with scattered trees and dams and a low density of buildings and structures. Remnant native vegetation is present within uncleared parts of the roadside corridor and Travelling Stock Routes. An exotic tree plantation is also present adjacent to the Kyeamba Hill section within the project area. Riparian areas and associated waterways are common near to the Hume Highway and there are a number of creek crossings serviced by concrete bridges. The visual features of the project area are not considered to be unique as they tend to be common to other areas in the district and region, including further north and south along the Hume Highway. The project area is therefore considered to have a moderate visual amenity.

There are two principle viewing groups, being motorists and residents. Motorists using the Hume Highway, as well as those on several nearby or intersecting roads, would be the primary viewers of the proposed project works. While limited potential views would exist from adjacent and nearby residences due to factors including proximity to the Highway corridor, local landform, and elevation of the residence.

5.11 Socio-economic Considerations

The Hume Highway is the principle road transport corridor connecting Sydney and Melbourne providing for interstate, local and regional traffic. A number of local roads form intersections with the Hume Highway in the project area. The main intersections with the Highway within and/or nearby the project area include the Sturt Highway, Tumbarumba Road, Little Billabong Road and Holbrook Wagga Road. These connecting roads are important as they provide transport routes for local communities and businesses, including plantations and farms. The existing land use is dominated by agricultural pursuits (predominantly cereal farming and grazing) and road infrastructure. There are numerous accesses to rural properties on both sides of the Hume Highway. These accesses service homesteads, stockyards and paddocks.

Travelling Stock Routes (TSRs) located within the project area potentially provide a location for camping and grazing for travelling stock. However, due to the high travelling speed of traffic using the Hume Highway, movement of stock between the TSRs is unlikely to occur within the project area. Stock underpasses are also present where landowners have property on both sides of the Hume Highway.

The Hume Highway passes through a number of towns being Holbrook (population

approximately 4000), Tarcutta (population approximately 800-900) and Woomargama (population approximately 150). Localities in the project area include Kyeamba and Mullengandra, which is serviced by a school and church.

The majority of the project area is serviced by rural bus services including school buses and the Upper Murray regional mobile library servicing Woomargama, Little Billabong and Mullengandra, and the Holbrook Meals on Wheels servicing Holbrook, Woomargama and surrounding areas.

6 Preliminary Environmental Assessment

6.1 Overview

In accordance with requirements of Part 3A of the EP&A Act, the following key environmental issues associated with the proposed project development are described below:

- Biodiversity;
- Aboriginal heritage; and
- Non-Aboriginal heritage.

Preliminary environmental assessment indicates that these key environmental issues will require further detailed assessment and are likely to require project specific impact mitigation measures.

A number of other environmental issues have also been identified in the preliminary environmental assessment. These issues are outlined in Section 6.5 and are generally considered to be common issues frequently encountered in road construction projects. The potential impact of these additional environmental issues will be mitigated during construction and/or operation, largely through the application of best practice impact mitigation and management measures. They are unlikely to require unique or project specific impact mitigation measures.

6.2 Biodiversity

The duplication of the Hume Highway would have a range of biodiversity impacts, including impacts on species, populations or ecological communities listed as threatened under the NSW *Threatened Species Conservation Act 1995* (TSC Act), the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the NSW *Fisheries Management Act 1974* (FM Act) and the presence of other significant environmental features including regionally significant species or habitats of conservation significance. The results of the preliminary environmental assessment are summarised below and additional detail is attached.

6.2.1 Summary of Potential Issues Identified

The following potential biodiversity issues have been identified for the Project:

- The presence of canopy species representative of Box-Gum Grassy Woodland which indicates that this endangered community may be present.
- Potential habitat for a number of threatened bird, reptile, and mammal species recorded on the DEC Wildlife Atlas and the Birds Australia database as having occurred in the area.
- The presence of mature hollow-bearing trees that may provide nesting and refuge habitat for protected and threatened native fauna.
- The presence of mistletoe that may provide important food resources for protected and threatened native fauna (e.g. Painted Honeyeater).
- The aquatic ecosystems of local creeks, which may be sensitive to further disturbance.
- Potential presence of the vulnerable flora species, River Swamp Wallaby Grass in riparian areas and dams.
- Potential habitat for the endangered fish population (the Western Population) of the Purple Spotted Gudgeon.

- Potential impact to areas of high biodiversity including remnant vegetation found in Travelling Stock Routes.
- Potential impact to the EEC Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment.
- Potential impact to the endangered Squirrel Glider population in the Wagga Wagga LGA.

The following additional specific biodiversity issues have been identified for each of the Project duplication sections:

Sturt Highway to Tarcutta

- Potential occurrence of the Pink-tailed Worm Lizard, which inhabits rocky hills and has been recorded in the Tarcutta area.
- Potential foraging and nesting habitat for the threatened bird species Brown Tree-creeper, Regent Honeyeater, Swift Parrot, Gang Gang Cockatoo and Diamond Firetail in the form of Box-Gum Grassy Woodland, Box-Ironbark associations, eucalyptus woodland, cleared farmland, mistletoe and hollows.

Kyeamba Hill

- Potential habitat for the Pink-tailed Worm Lizard in the form of rocky outcrops, hills and knolls.
- Potential foraging, refuge and nesting habitat for the threatened bird species Diamond Firetail, Hooded Robin, Gang Gang Cockatoo, Turquoise Parrot, Speckled Warbler, Brown Tree Creeper and the Black-chinned Honeyeater in the form of Box-Gum Grassy Woodland, Box-Ironbark associations, eucalyptus woodland, cleared farmland, mistletoe, riparian vegetation and hollows.
- Potential that the existing connectivity of canopy species across the Hume Highway would facilitate movement of fauna through the landscape.
- The presence of TSR 74 in close proximity to the Hume Highway which represents an area of high biodiversity.

Little Billabong

- Potential foraging, refuge and nesting habitat for the threatened bird species, Hooded Robin, Gang Gang Cockatoo, Speckled Warbler, Diamond Firetail and Brown Tree-creeper in the form of Box-Gum Grassy Woodland, derived native grassland, Box-Ironbark associations, eucalyptus woodland, cleared farmland, mistletoe, hollows and riparian vegetation.
- Potential foraging and nesting habitat in the form of native woodland remnants for the Squirrel Glider.

Yarra Yarra to Holbrook

- Potential habitat for the Pink-tailed Worm Lizard in the form of rocky outcrops, hills and knolls.
- Potential foraging, refuge and nesting habitat for the threatened bird species Speckled Warbler, Brown Tree-creeper, Regent Honeyeater, Black Bittern, Superb Parrot, Grey-crowned Babbler, Hooded Robin, Barking Owl, Gang Gang Cockatoo, Black-chinned Honeyeater and Diamond Firetail in the form of Box-Gum Grassy Woodland, Box-Ironbark associations, eucalyptus woodland, cleared farmland, mistletoe, riparian vegetation and hollows.
- Potential foraging and nesting habitat in the form of native woodland remnants for the Squirrel Glider.

Woomargama to Mullengandra

- Potential habitat for the Pink-tailed Worm Lizard in the form of rocky outcrops, hills and knolls.
- Potential foraging, refuge and nesting habitat for the threatened bird species Gang Gang Cockatoo, Brown Tree-creeper, Turquoise Parrot, Diamond Firetail, Painted Honeyeater, Regent Honeyeater, Superb Parrot, Swift Parrot, Major Mitchell's Cockatoo, Black Bittern, Grey-crowned Honeyeater, Speckled Warbler, Hooded Robin, in the form of Box-Gum Grassy Woodland, Box-Ironbark associations, eucalyptus woodland, cleared farmland, mistletoe, riparian vegetation and hollows.
- Potential foraging and nesting habitat in the form of native woodland remnants for the Squirrel Glider.
- Potential habitat in the riparian areas of Mullengandra Creek and Sweetwater Creek for the Southern Bell Frog.

6.2.2 Conclusion and Further Assessments

The following further assessment will be undertaken in the project area to assess the potential impacts of the Project on native fauna and flora, and to identify appropriate impact minimisation and mitigation measures:

- Detailed floristic surveys to determine the presence of Box-Gum Grassy Woodland.
- Targeted surveys of potentially occurring threatened species.
- Assessment of the significance of any impact on potentially occurring threatened species or communities as defined by the Part 3A process.
- Assessment of the potential for a significant impact on any matter of national environmental significance or Commonwealth land and the need to make a referral to the Commonwealth Environment and Heritage Minister in accordance with the EPBC Act.
- Further assessment of local creeks to determine their capacity to provide habitat for fish species and threatened aquatic flora and fauna species.
- Assessment of potential impact on vegetation corridors within the locality.
- Assessment of potential impact on areas of high biodiversity.

Assessments will include preliminary identification of areas in the vicinity of the project area which may be suitable for protection, enhancement or revegetation (including recharge and discharge areas to address salinity) for provision of compensatory habitat to address biodiversity impacts if required.

6.3 Aboriginal heritage

The proposed duplication of the Hume Highway may impact on Aboriginal objects, sites and places in regard to the provisions of the *National Parks and Wildlife Act, 1974.* The results of the preliminary environmental assessment are summarised below.

6.3.1 Summary of Potential Issues Identified

The following potential Aboriginal heritage issues have been identified for the Hume Highway duplication:

- Artefact scatter sites are most likely to be located in flat, well-drained areas near water sources.

- Creek lines and terraces may be particularly sensitive and may contain high-density occupation deposits.
- Mound sites may be located on the margins of wetlands and in flood channels.
- Scarred trees can occur anywhere where old growth trees are present - all old growth trees in the project area will need to be inspected.
- Burials are difficult to predict and may occur in areas of soft alluvial deposit (such as creek landforms.
- Isolated artefacts can occur anywhere across the landscape.

6.3.2 Conclusion and Further Assessments

The following further assessment will be undertaken in the project area to assess the potential impacts of the Project on Aboriginal cultural heritage and archaeology:

- Archaeological heritage assessment, including archaeological survey to determine the extent of Aboriginal occupation and land use.
- Preliminary cultural heritage assessment to identify the cultural value of the area to Aboriginal people in the present and historically.

Note: Consultation with the Aboriginal community in accordance with the DEC's *Interim Community Consultation Requirements for Applicants* (January 2005) and *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (July 2005) and the RTA's *Aboriginal Liaison Protocol*.

6.4 Non-Aboriginal heritage

The proposed duplication of the Hume Highway may impact on heritage places and items listed on relevant local, regional and State statutory planning instruments and registers or unlisted archaeological sites. The sections below summarise the results of the preliminary environmental assessment.

6.4.1 Summary of Potential Issues Identified

The following potential non-Aboriginal heritage issues have been identified for each of the Project duplication sections:

Sturt Highway to Tarcutta

- Location of clusters of sheds and woolsheds.
- Chinese Clearing site.

Kyeamba Hill

- Kyeamba Station structures.
- Historic Travellers Joy Inn.
- 'Komolo' ruins and potential archaeological relics.
- Remains of the old service station, truck depot and associated facilities near Main Road 384 (west).
- Surveyor's tree.

Little Billabong

No specific issues identified to date.

Yarra Yarra to Holbrook

- Property of 'Jannali'.
- Property of 'Beenly'.
- The ruins located north of Racecourse road.
- Property of 'Wongalee'(Cobb & Co site within the eastern corridor).
- Property of 'Dalriada'.
- At least three farms date back five generations to the one family (Ross), and substantial advanced native trees planted by the forebears abound along sections of the Highway.
- Three Travelling Stock Routes (TSRs) are present along the Highway corridor.

Woomargama to Mullengandra

- The presence of Woomargama town, including Woomargama Public School, St. Marks Church.
- The properties of Wyola, Montrose, Old Lumeah, The Hermitage, Lumeah, 'Mullengandra' homestead and outbuildings.
- The former Royal Oak Hotel.
- St Luke's Church and Mullengandra School buildings.

6.4.2 Conclusion and Further Assessments

The following further assessment will be undertaken to determine the potential impacts of the Project on non-Aboriginal heritage:

- Historic and map research to provide a historical background and framework for determining the significance of the area and to identify any potential archaeological sites not visible on the surface.
- Assessment of potential impact on Travelling Stock Routes and pastoral landscapes.
- Further investigation and assessment to determine the heritage significance of the items identified in Section 6.4.1 above.

In addition, the following further assessment along each section of the Hume Highway duplication will be undertaken to determine potential impacts if these heritage items cannot be avoided in the project design:

6.5 Other environmental issues

Other environmental issues listed in Table 6.1 are considered to be of lesser consequence taking into account the scope of the project, the existing environment and the implementation of standard and best practice management and mitigation measures.

The potential environmental issues and the proposed management and mitigation measures identified in Table 6.1 will be reviewed further during the preparation of the detailed Environmental Assessment. Any additional environmental safeguards required to minimise and mitigate impacts will be documented in a 'Statement of Commitments' in accordance with section 75F (6) of the EP&A Act as part of the Environmental Assessment.

Table 6.1: Other environmental issues

Issue	Potential impacts	Management and mitigation measures
Air Quality		
The project is located within a rural environment and air quality is expected to be high. Local air quality would be influenced by the variable topography throughout the project area and climatic conditions. Within the project area there a limited number of air sensitive receptors (eg. residences).	During construction, activities such as earthworks, stockpiling and vegetation removal would expose soils that have the potential to be eroded by wind, resulting in dust. Emissions from heavy vehicles and construction machinery would also occur. The extent of the impact will vary depending on the level of construction activity being undertaken at the site and the prevailing weather conditions. However, potential construction air quality effects would be short-term and would be unlikely to result in significant adverse impacts due to their short-term nature and the fact that there are limited air sensitive receptors within the project area and that the existing air quality for the region is considered high. During operation, the traffic capacity and mix would not be altered materially from the existing situation. As such, the potential operational impacts to air quality are likely to be limited to vehicle emissions that will potentially increase in line with future traffic volumes. No project specific operational mitigation measures are identified as vehicle emission impacts on air quality are effectively managed at the source via vehicle fuel standards and vehicle maintenance and emissions testing.	Impacts expected during construction will be subject to the application of standard mitigation and best practice construction measures, including for suppression of dust, minimisation of land clearing and management of emissions from construction plants. In addition, no burning of vegetation or other materials will be undertaken. These measures will be identified in the Statement of Commitments and included in an Air Quality Management Plan (AQMP) to be prepared prior to the commencement of works.
Noise and Vibration		
The existing ambient noise levels for the project area and surrounds are considered low to moderate. Sources of noise within and surrounding the project area include road traffic using the Hume Highway and accessing rural properties and	During construction, it is anticipated that noise and vibration levels would be increased in the short-term as a result of construction activities and associated heavy vehicle movements. There is the potential for levels to exceed the relevant NSW Government criteria particularly if blasting is undertaken. The perception of the relative noise level increase may also be an issue as a result of the existing low to moderate ambient noise	Impacts expected during construction will be managed through the adoption of best management practices consistent with the NSW Government's *Environmental Noise Control Manual (Chapter 171)* which sets out noise criteria applicable to construction site noise for the purpose of defining intrusive noise impacts. Such practices include respite periods and scheduling noisy activities to limit their impact.

Issue	Potential impacts	Management and mitigation measures
farming activities. There is a low number of noise and vibration sensitive receivers scattered throughout the project area. Approximately 50 receivers, mostly residences, located between 20 and 600m from the Highway. A church and Mullengandra School are located within 20 and 160m respectively of the Highway in the Woomargama to Mullengandra duplication section. These receivers are classed as sensitive land uses.	levels experienced within the project area. Residences, the church and Mullengandra School located within close proximity to the Highway may be impacted by increased noise and vibration levels during construction. Potential impacts are likely to be experienced where receivers are within 50m of construction works. However, as a result of the low number of sensitive receivers and the construction impacts being of short-term duration only, it is anticipated that the implementation of best practice noise mitigation and communication strategies would ensure that the construction noise and vibration impacts would be managed to acceptable levels. Operational noise levels for the Project may be increased at receivers if the duplication alignment brings the Hume Highway closer to those premises. Avoidance of this potential impact would be considered during the selection of the preferred option and will continue throughout the design phase.	The standard construction hours for the Project will be as follows: Monday to Friday – 7am to 7pm; and Saturday – 7am to 4pm. There will be no works on Sunday or Public Holidays. Where work is required outside of these hours, best management practices will be followed, such practices include reduced equipment power and consultation with the local residents potentially affected by the out-of-hours noise and vibration. These measures and procedures will be identified in the Statement of Commitments and included in a Noise and Vibration Management Plan (NVMP) to be prepared prior to the commencement of works in accordance with RTA's *Environmental Noise Management Manual 2001*. Additionally, if blasting is required, a Blast Management Plan (BMP) will be prepared as part of the NVMP and will be implemented in consultation with DEC. Impacts associated with construction vibration will also be minimised through the adoption of best management practices and the application of relevant standards such as the *German Standard DIN 4150 (1999)* and *British Standard BS6472*. Prior to construction, dilapidation surveys will be undertaken on buildings that will be potentially impacted (generally buildings located within 20m of works). Vibration management strategies to minimise impacts associated with increased vibration levels will be developed and included in the Statement of Commitments for the Project and will be detailed in the NVMP. As there are few residences within the project area, any operational noise impacts will be managed on an individual basis, and standard noise mitigation measures will be applied as

Issue	Potential impacts	Management and mitigation measures
		described in Practice Note IV of the RTA's *Environmental Noise Management Manual*. Operational mitigation measures will be detailed in the Statement of Commitments for the Project.
Soils and Water		
Soils within the project area are considered to be moderate to highly erodible and are susceptible to sheet erosion and moderate to severe gully erosion. A number of named and unnamed creeks and farm dams are present in the project area. The Hume Highway is crossed by creeks at seven locations within the project area. There are also numerous minor crossings of unnamed drainage lines by the Hume Highway. Water quality within the study area is generally influenced by vegetation, farming practices and runoff from the Highway. Based on historical data and the proximity to creek lines the project area would be potentially susceptible to flooding. Salinity is an environmental issue in the region and management practices are currently implemented through local Landcare Groups, Catchment	Soils exposed during excavation and vegetation removal have a high potential to result in erosion as the soils are considered to be moderate to highly erodible. As such, waterways within the project area may be impacted through an increase in sediment loads during rainfall events which would lower existing water quality. Other pollutants could potentially be introduced to waterways during construction through chemical spills and construction waste. However, with the implementation of standard erosion and sedimentation control measures and risk analysis of all aspects of the Project that have the potential to pollute waterways, the impacts and risk of occurrence would be minimised. During operation, water quality may be affected by surface runoff which could contain pollutants or accidental spills. The Project would increase the existing pavement surface area and therefore increase the volume of runoff which drains to waterways within the project area. Most of the runoff flowing from the road surface would have the potential to contain gross pollutants, sediment, fuels and other chemicals however the quantity of pollutants deposited at the road surface is expected to remain consistent as traffic volumes are not expected to increase as a direct result of construction. During construction and operation there is also the potential for impacts to occur from flooding. During construction, flooding has the potential to exacerbate sedimentation and increase the risk of pollutants entering waterways. Where as	Impacts on water quality during construction through sedimentation and pollutants will be minimised though the implementation of best practice control measures. These measures will focus on watercourse crossings, areas susceptible to flooding, vehicle set down and repair areas, fuel storage and waste disposal. In addition, a soil conservation specialist will be engaged to determine soil attributes, inform detailed project design, including the erosion and sediment control measures to be implemented. The soil conservation specialist will be engaged during construction to ensure appropriate design of erosion and sediment control measures. Inspection of potentially affected waterways will be undertaken during construction to ensure management measures developed are effective. Regular inspection will also be undertaken post-construction until soils disturbed by the Project have been stabilised via revegetation/restoration works The measures to be implemented during construction of the Project will be detailed in the Statement of Commitments and will be in accordance with RTA's *Water Policy* and *Code of Practice for Water Management (1999)* and *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) (the 'Blue Book'). These measures will be included in the Soil and Water Management Plan (SWMP) and implemented prior to the commencement of works. The potential for accidental spills and polluted runoff during the

Issue	Potential impacts	Management and mitigation measures
Management Authorities and involvement of private landholders. Areas of localised waterlogging have been identified at the southern end of the Kyeamba section and immediately south of the Little Billabong section.	during operation, flooding has the potential to impact on road user safety and adjacent properties. As a result of the known issues of salinity and waterlogging within the project area, the construction and operation of the Project could potentially exacerbate the situation. The new carriageway could present a direct obstruction to overland flow and redirecting natural surface flow paths, as well as obstructing shallow groundwater flows. Surface drainage problems could also occur in areas of susceptible to waterlogging. Such problems could include blocked culverts and drains, prolonged inundation along roadsides and a loss of roadside vegetation through salinisation of roadside soils. The impacts could also extend into adjacent rural properties with extended inundation and salinity and waterlogging of soils resulting in a loss of agricultural productivity.	operational phase of the Project will be addressed during detailed design. Pollution reduction measures will include detention structures, contingency plans or a combination of both. Hydrological studies will be undertaken for the sections identified as being susceptible to flooding prior to construction to determine the relevant design criteria for the Project to minimise / avoid the potential impacts associated with flooding during construction and operation of the Project. The results of these studies will be considered during the development of the detailed project design. Identifying adjacent landuses that are currently impacted by salinity or will be potentially impacted by changes to groundwater conditions as a result of the Project will be undertaken during detailed design. This will also include investigations to determine groundwater depths and groundwater salinity where there is potential that the watertable may be intersected. An assessment to determine the potential for initiating or exacerbating waterlogging will also be undertaken. Identification of areas adjacent to the project area that may be suitable for revegetation of recharge and discharge areas if required to provide integrated solutions to offset potential salinity impacts will be included in the assessments. Mitigation measures to prevent identified impacts of the Project will be incorporated into detail design.

Issue	Potential impacts	Management and mitigation measures
Socio-economic considerations		
The project area is located within a rural environment where the dominant land use is agriculture. Predominant agriculture practices include grazing and crops. A number of local roads form intersections with the Hume Highway and provide access for the local community to and from the Hume Highway and local districts and towns. Access to rural properties located along both sides of the Hume Highway is usually direct on / off the Highway. The majority of the project area is serviced by rural bus services including school buses and the Upper Murray regional mobile library. There is a school with an outdoor playground and church at Mullengandra.	Accesses which could potentially be disrupted during construction include property access, access to local roads and access to community services eg. Mullengandra School and bus stops. However, due to the low number of accesses that exist within the project area, it is anticipated that alternative access routes will be easily established to minimise disruption. Any disruption to accesses would be temporary short-term only and the local community would be consulted regarding duration of disruptions and alternative routes. Access to properties, local roads and businesses will be maintained during construction. Potential impacts to the general amenity of residences in close proximity to the Hume Highway include increased noise and lowering of the visual amenity during construction. Impacts associated with noise are considered minimal and will be managed with the implementation of standard and site specific mitigation measures. Visual impacts will include the loss of some existing roadside vegetation, presence of construction plant and equipment and exposed earth. Visual impacts are expected to be most obvious during construction and early in the operation phase until mitigating measures, such as plantings, are established to visual screening. Property that may be acquired consists of agricultural land primarily used for grazing. Despite the potential for property acquisition, minimal land severance would occur as the Project would generally only require strip acquisition to increase the existing road reserve and it would only amount to a small loss of land which fronts the Hume Highway. The Project is expected to have a number of positive socio-	Community and socio-economic impacts arising during construction will be managed through on-going consultation with the affected community. The Statement of Commitments for the Project will include a commitment to ensure that prior to the commencement of works, the residents and the local community would be notified regarding the project schedule, construction works and if necessary temporary access arrangements during the construction period. A contact name and number will also be provided. Consultation protocols described in *RTA Community Involvement: Practice Notes and Resource Manual* (1998) will be followed. Access control will apply on all sections of work when new boundaries are being established. On these sections, the number of access points will be kept to a minimum. All property acquisitions will be conducted in accordance with the RTA's *Land Acquisition Policy*, and compensation in accordance with the *Land Acquisition (Just Terms Compensation) Act, 1991*. Negotiations for property acquisition will include consultation on property adjustments where required to maintain farm management practices.

Issue	Potential impacts	Management and mitigation measures
	economic impacts which would benefit the local and regional community. Positive impacts include those associated with local provision of support services during construction and input to the local economy by construction personnel. During operation, the local and regional community would benefit from the increase in the existing Level of Service and road safety conditions for the Hume Highway between the Sturt Highway and Tabletop.	
Traffic and Transport		
The Hume Highway is a principle transport corridor connecting Sydney and Melbourne and provides for interstate traffic and also local and regional traffic. Approximate traffic volumes for the project area very between 7,000 and 9,000 AADT with 35-40% being heavy vehicles. The peak period for heavy vehicles is between 8pm to 1am and reflects the high night-time percentage of truck traffic on the Hume Highway.	The Project has the potential to cause traffic disruptions on the Hume Highway and local connecting roads during construction. However, it is anticipated that impacts on motorists would be minor and limited to short time delays and a reduced travelling speed. The existing carriageway of the Hume Highway would remain under traffic while the new carriageway(s) is constructed. Minor short-term impacts would occur while the new carriageway(s) is joined to the existing carriageway(s) but these are expected to be manageable. Similarly, where cross overs are required it is anticipated that minor short-term impacts would occur when traffic is diverted to the new carriageway(s). Impacts to freight movements is expected to be minor as the majority of heavy vehicles using the Hume Highway in the project area occurs at night (8pm to 1am) and it is anticipated that the majority of works would be undertaken outside this period. During operation the Project would provide an increase in the Level of Service, road safety conditions and freight efficiency for the Hume Highway between the Sturt Highway and Table Top.	Standard traffic management measures will be employed during construction to minimise traffic disruptions on the Highway and local connecting roads. These measures will be identified in the Statement of Commitments and included in a Traffic Management Plan (TMP) to be prepared in accordance with RTA QA Specifications and the RTA's *Traffic Control at Work Sites Manual 2003*. The TMP will be approved by the RTA prior to implementation and will include the notification of any traffic alterations or closures, and construction vehicle movement plans. Works required outside of standard construction hours for the Project will only be undertaken where the works are essential to be completed in this period and after appropriate consultation with local sensitive receivers, the DEC, local council and will be planned to minimise disruption to freight traffic.

Issue	Potential impacts	Management and mitigation measures
Visual amenity		
The project sections of the Hume Highway consists of a is a gently curving single carriageway through a rural area, largely offering views across cleared undulating land with scattered trees and dams. Stands of remnant native vegetation are associated with the majority of the roadside area and represents remnants of historically contiguous vegetation. The visual features of the project area are not considered to be unique and tend to be common to other areas in the district and region. The project area is therefore considered to have a moderate visual amenity Motorists and residents would be the two principle viewing groups in the project area.	The majority of the Project would involve construction of a new carriageway adjacent to the existing Highway and the completed road would be consistent with the existing duplicated areas of the Hume Highway. Impacts to the visual amenity and viewing groups would include removal of visually prominent remnant and regrowth native vegetation located in the road reserve which provides a visual buffer between the Hume Highway and residential properties and the creation of cuttings and batters.	Mitigation of potential visual amenity impacts resulting from the proposed duplication works will be carried out through the formation of new earthworks and comprehensive revegetation of project area with local native species in accordance with urban design and landscape management plans developed for the Project. The urban design and landscape management plans will be prepared with consideration to the RTA's *Beyond the Pavement: Urban and Regional Design Practice Notes*, the RTA's *Bridge Aesthetics Design Guidelines*, and other urban and landscape design guidelines as required. The plans will be developed and incorporated into the project design, with an overall objective to achieve an outcome which is well integrated with the landscape, the topography of the region and the existing dual carriageway sections of the Hume Highway.
Waste minimisation and management		
The Project would generate a number of waste streams and utilise a variety of materials during the construction phase.	Wastes generated during construction would potentially include excess unsuitable spoil material, material from the removal of sections of existing road, concrete and road base, steel, waste oils and liquids from maintenance of construction plant and equipment, waste water and general garbage and sewage. Cleared vegetation would also be generated.	To minimise the impacts associated with waste the resource management hierarchy principles of the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) will be adopted as follows: 1. Avoid unnecessary resource consumption as a priority;

Issue	Potential impacts	Management and mitigation measures
	During operation, waste products would minimal and be limited to those associated with road maintenance and repair requirements and litter discarded from passing vehicles.	2. Avoidance is followed by resource recovery (including reuse of materials, reprocessing recycling, and energy recovery; and 3. Disposal is undertaken as a last resort. These principles will be used in developing strategies to minimise impacts associated with waste. The strategies will be included in the Statement of Commitments and in the Waste Management Plan (WMP) to be prepared in accordance with the RTA's QA Specifications.
Utilities A number of utilities are present within or adjacent the project area. The utilities are predominantly related to communications and are located above and below ground.	Excavations associated with the construction of the Project could result in damage to existing services and utilities, causing disruptions to services, inconvenience, or potentially hazardous situations. The Sydney to Melbourne Fibre Optic Cable may require relocation or protection where it is located within the proposed location of the new carriageway.	The need for relocation of utilities will be determined following consultation with the affected utility owners. Prior to the commencement of works, standard procedures, such as identifying the location of infrastructure will be undertaken in consultation with utility owners.
Demand on resources Construction of the Project will require the use of a number of resources including select and fill material, concrete cement aggregates, steel, fuel, asphalt and water.	The Project would not require the use of any resources that are currently in short supply. The quantity of aggregate and sand/coarse sand required by the Project is estimated to be: *Duplication Section* — *Aggregate (tonnes)* — *Sand(s) (tonnes)* Tarcutta — 45,000 — 35,000 Kyeamba — 75,000 — 60,000 Little Billabong — 65,000 — 55,000 Yarra Yarra to Holbrook — 95,000 — 75,000 Mullengandra to Woomargama — 80,000 — 65,000 TOTAL — 360,000 — 290,000	Management of potential direct and indirect environmental impacts of extraction of materials outside of the project area, including transport of those materials will be addressed in the NVMP, TMP and the AQMP. Standard measures will include construction vehicle movement plans, dust suppression and the use of low-noise plant and equipment. These measures will be included in the Statement of Commitments for the Project. Detailed design and construction planning considerations will include minimising the quantities of materials required and the distance of transport of materials. The design will be developed to maximise the use of materials from within the project area

Issue	Potential impacts	Management and mitigation measures
	Balanced cut and fill design is proposed for the Tarcutta, Kyeamba, Little Billabong and Mullengandra to Woomargama sections. General fill and select material will be extracted from or nearby to the project area.. Where balanced cut and fill design cannot be achieved, additional import of general fill and select material may be required. It is anticipated that additional select material would be required to be sourced and imported from outside of the project corridor for the Yarra Yarra to Holbrook section due to the local geology and topography. This material may be sourced from nearby, other project sections or licensed quarries. Hydrocarbon-based fuels would be required for construction plant, equipment and vehicles. Fuels would be predominantly sourced from local suppliers. Where feasible water will be sourced from groundwater and/or surface water. If this is not feasible due to quality or availability or is likely to create unacceptable impacts, water may need to be imported.	and the recycled content of materials. Existing licensed sources (eg. quarries) will be used to supply any required additional material, or alternative locations suitable for sourcing additional fill or select material would be identified and separate assessment and approvals would be sought. The detailed design and construction planning considerations will include minimising energy use and reducing fuel consumption. In design development and construction planning consideration will be given to optimising mass haul efficiency and minimising truck movements. Further investigation into the availability of water from existing groundwater and surface allocations and / or installing new bores in accordance with the *Water Act 1912* and the *Water Management Act 2000* will be undertaken prior to commencing construction in consultation with Department of Natural Resources.
Site contamination		
A former petrol station is located on the western side of the Hume Highway south of the intersection with Tumbarumba Road and the underground petrol tanks are potentially still in-situ. The rural nature of the project area presents the potential that discrete sources of contamination could	If earthworks are required at the former petrol station at Kyeamba, there is potential to encounter contaminated land as there is a possibility that underground petrol tanks are potentially still in-situ. In addition, there is potential to encounter other areas of contamination within the project area associated with past farming activities, such as drenching and dipping of stock, mixing of herbicides and maintenance of farming vehicles / equipment. Uncovering contaminated land could result in impacts to water quality and the health and safety of the public and construction personnel.	A risk assessment will be undertaken prior to the commencement of works to determine the likelihood of encountering contaminated land. Should it be required the presence and extent of contamination will be determined at potentially contaminated sites, and where required, remediation will be planned and undertaken in consultation with DEC. This will be undertaken in accordance with the *RTA Contaminated Land Management Guide, 2005*, *State Environmental Planning Policy 55 – Remediation of Land* (SEPP 55) and the *Contaminated Land Management Act, 1997.*

Issue	Potential impacts	Management and mitigation measures
occur due to past farming practices.		
Hazards and risks		
During construction and operation the Project will encounter a number of hazards and risk generally associated with road construction projects.	Potential hazards and risks associated with construction of the Project include hazards of working adjacent to the existing Hume Highway, storage of hazardous materials, use of heavy machinery, earthworks and blasting. However, it is anticipated that with the adoption of best management practices and procedures outlined in the RTA's *QA Specifications*, the potential hazards and risks associated with construction of the Project would be minimised. Likely hazards and risks associated with the operation of the Project would be associated with potential design and occupational health and safety risks including the transportation of dangerous goods and the spills of hazardous chemicals. However, once operational the Project would support the increase in the existing Level of Service, road safety conditions and freight efficiency for the Hume Highway between the Sturt Highway and Table Top. It is therefore anticipated that the potential hazards and risks of the Project during operation would be minimised.	Specific construction hazards will be addressed through best practice industry occupational health and safety measures including training, accreditation, adherence to WorkCover requirements, backed up by inspections, audits and site management planning for occupational health and safety. These measures will be included in the Statement of Commitments and detailed in a Hazards and Risk Management Plan (HRMP). The HRMP will be prepared prior to the commencement of works and will include contingency measures to deal with accidents and major incidents resulting from the works. Operational spill containment measures/facilities for incidents near sensitive environments will be incorporated into the project design. Pollution reduction measures will also be included and will be in the form of detention structures or contingency plans or a combination of both.

7 Proposed Scope of Environmental Assessment

Table 7.1 outlines the proposed scope of the Environmental Assessment for the Project. The scope of the Environmental Assessment is based on the preliminary assessment of key issues discussed in Sections 6.2 to 6.4. All other issues are able to be managed through the detailed design stage and with the application of best practice measures and site-specific safeguards as described in Table 6.1.

Table 7.1: Scope of the Environmental Assessment

Issue	Scope of studies for the Environmental Assessment
General	• Consideration of planning and statutory requirements. • Description of the Project. • Outline of construction activity. • Consideration of the principles of Ecological Sustainable Development with regard to the Project.
Stakeholder Consultation	• Description of consultation activities conducted to date and issues identified. • Outline of proposed stakeholder consultation and communications strategy.
Biodiversity	• Detailed floristic surveys to determine the presence of Box-Gum Grassy Woodland. • Targeted surveys of potentially occurring threatened species. • Assessment of the significance of any impact on potentially occurring threatened species or communities as defined by the Part 3A process. • Assessment of the potential for a significant impact on any matter of national environmental significance or Commonwealth land and the need to make a referral to the Commonwealth Environment and Heritage Minister in accordance with the EPBC Act. • Further assessment of local creeks to determine their capacity to provide habitat for fish species and threatened aquatic flora and fauna species. • Assessment of potential impact on vegetation corridors within the locality. • Assessment of potential impact on areas of high biodiversity. • Assessments will include preliminary identification of areas in the vicinity of the project area which may be suitable for protection, enhancement or revegetation (including recharge and discharge areas to address salinity) for provision of compensatory habitat to address biodiversity impacts if required.
Aboriginal Heritage	• Archaeological heritage assessment, including archaeological survey to determine the extent of Aboriginal occupation and land use. • Preliminary cultural heritage assessment to identify the cultural value of the area to Aboriginal people in the present and historically. Note: Consultation with the Aboriginal community will be undertaken in accordance with the DEC's *Interim Community Consultation Requirements for Applicants* (January 2005) and *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (July 2005) and the RTA's *Aboriginal Liaison Protocol*.

Issue	Scope of studies for the Environmental Assessment
Non-Aboriginal Heritage	• Historic and map research to provide a historical background and framework for determining the significance of the area and to identify any potential archaeological sites not visible on the surface. • Assessment of potential impact on Travelling Stock Routes and pastoral landscapes. In addition, the following specific assessments will be undertaken: • Sturt Highway to Tarcutta: Further investigation and research to determine heritage significance of the Chinese clearing site and significance of the cluster of sheds and woolsheds. • Kyeamba Hill: Further investigation and research to determine the heritage significance of Kyeamba Station entrance gates, remnants of the service station and depot, 'Komolo' ruins and potential archaeological relics and Surveyor's tree. • Yarra Yarra to Holbrook: Further assessment to determine the heritage significance of 'Jannali', 'Beenly', 'Dalriada', the Cobb & Co ruins on 'Wongalee', the well advanced roadside planting undertaken by the Ross family around the turn of the 20th century and the ruins located north of Racecourse road. • Woomargama to Mullengandra: Further assessment to determine the heritage significance of Woomargama town, Woomargama Public School, St. Marks Church, Wyola, Montrose, Old Lumeah, The Hermitage, Lumeah, 'Mullengandra' homestead and outbuildings, the former Royal Oak Hotel, St Lukes Church, and Mullengandra School buildings.
Cumulative Impacts	• Detail the Project in its relationship with existing and proposed transport infrastructure and systems and to other developments occurring or proposed. • Identify potential cumulative impacts.
Statement of Commitments	• A full list of environmental mitigation and management measures to be applied to the project works. Including identification of procedures, practices and protocols.

8 References

Baker, P., Please, P., Coram, J., Dawes, W., Bond, W., Stauffacher, M., Gilfedder, M., Probert, M., Huth, N., Gaydon, D., Keating, B., Moore, A., Simpson, R., Salmon, L., Stefanski, A. (2001) *Assessment of Salinity Management options for Upper Billabong Creek Catchment, NSW: Groundwater and Farming Systems Water Balance Modelling*. Bureau of Rural Sciences, CSIRO Land and Water, Canberra.

Branagan, D. and Packham, G (2000) *Field Geology of New South Wales*. Third Edition ed. New South Wales Department of Mineral Resources.

Cresswell, R.G., Dawes, W.R., Summerell, G.K. and Walker, G.R. (2003) *Assessment of salinity management options for Kyeamba Creek, New South Wales: Data Analysis and Groundwater Monitoring.* Murray Darling Basin Commission, Canberra ACT.

Cultural Heritage Connections (2006) *Proposed Hume Highway Duplication Preliminary Aboriginal Archaeology Assessment*. Dulwich Hill NSW. Report prepared for the NSW Roads and Traffic Authority

Department of Environment and Conservation (2005). *Diamond Firetail Profile* NSW Threatened Species Website. Department of Conservation NSW

Department of Environment and Conservation (2004) http://www.nationalparks.nsw.gov.au/npws.nsf/Content/NSW+South+Western+Slopes+Bioregion Last updated 20/12/2004. Date of access 04/08/2006

Department of the Environment and Heritage (2006a). *Aprasia parapulchella* in Species Profile and Threats Database, Department of the Environment and Heritage, Canberra.

Department of the Environment and Heritage (2006b). *Litoria raniformis* in Species Profile and Threats Database, Department of the Environment and Heritage, Canberra.

Environmental Resources Management Australia (2006) *Hume Highway Upgrade. Preliminary Ecological Assessment*. Pyrmont NSW. Report prepared for the NSW Roads and Traffic Authority.

Godden Mackay Logan Heritage Consultants (2006) *Hume Highway (Tarcutta to Albury) Road Duplications Heritage Advice*. Redfern, Sydney Report prepared for the NSW Roads and Traffic Authority.

Doughty, D (2003) *Soil Landscapes of the Hobrook – Tallangatta 1:100,000 Sheet*. Department of Infrastructure, Planning and Natural Resources, Sydney.

Kulatunga, N., Lucas, S. (2000) *Eastern Murray Groundwater Study.* Funded and resourced by the Department of Land and Water Conservation, Salt Action, Eastern Murray landholders, Landcare Co-ordinators and the Murray Catchment Management Committee.

NSW Fisheries (2002) *Fishnote NSWF1089 NSW Threatened Species Purple Spotted Gudgeon (Western Population) (Mogurnda aspersa).* NSW Fisheries, Port Stephens.

Summerell, G.K., Dowling, T.I., Wild, J.A. and Beale, G. (2004) FLAG UPNESS and its application for mapping seasonally wet to waterlogged soils. *Australian Journal of Soil Research.* 42:

155-162.

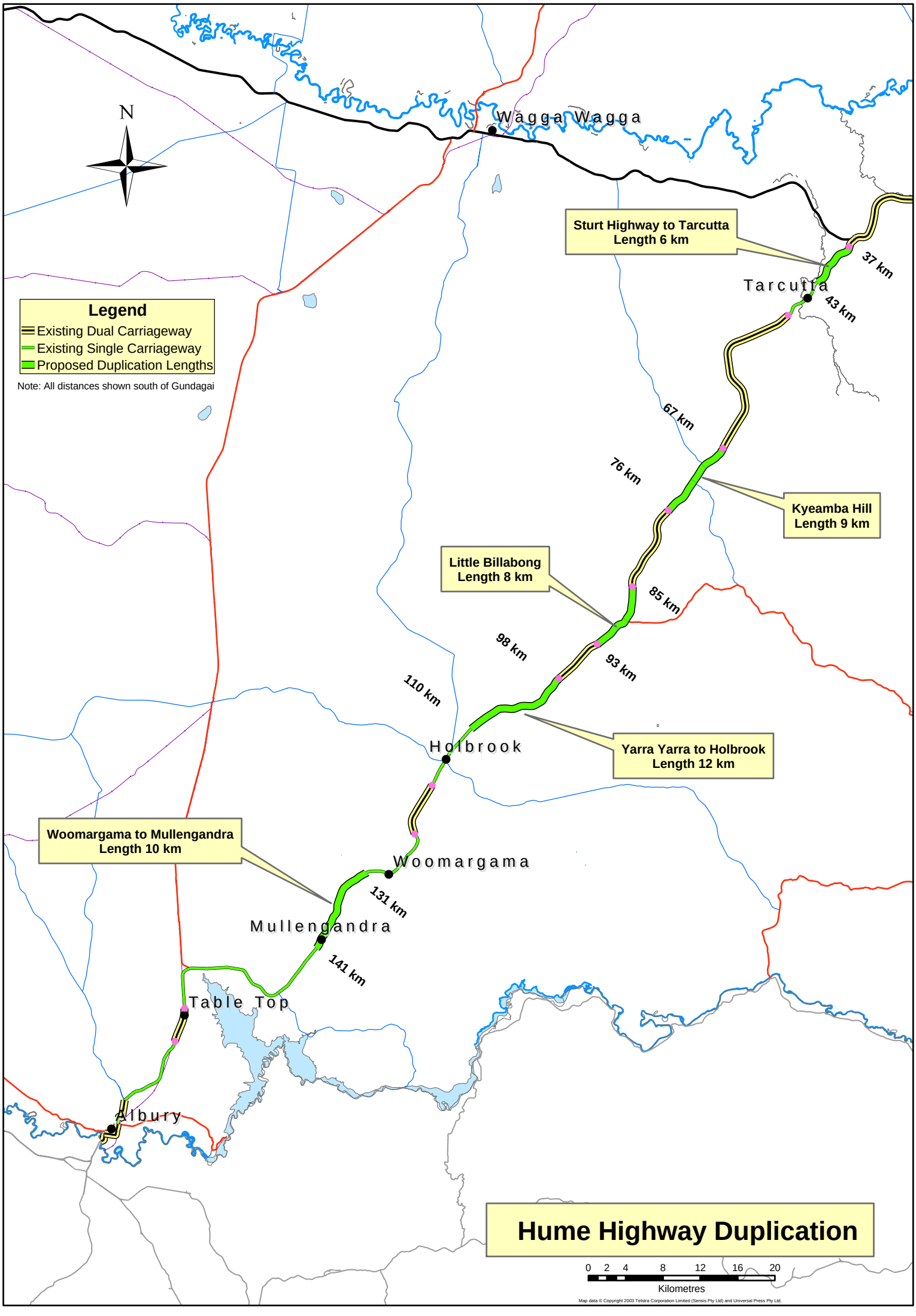
Wild, J.A. (unpublished data) *Soil Landscapes of the Tarcutta 1:100 000 map sheet*. Department of Natural Resources, Sydney.

Neave, I. (2004) *Wagga Wagga City Council State of the Environment Report* Wagga Wagga City Council, Wagga Wagga

Webster (2000) *Flora and Fauna Habitat Assessment of Travelling Stock Routes and Reserves in the Wagga Rural Lands Protection Board*. Prepared for Wagga Rural Lands Protection Board by Ecosurveys Pty Ltd

Attachment A

Route Map


N
Wagga Wagga
Sturt Highway to Tarcutta
Length 6 km
Tarcutta
37 km
43 km
67 km
76 km
Kyeamba Hill
Length 9 km
Little Billabong
Length 8 km
85 km
98 km
93 km
110 km
Holbrook
Yarra Yarra to Holbrook
Length 12 km
Woomargama to Mullengandra
Length 10 km
Woomargama
131 km
Mullengandra
141 km
Table Top
Albury
Legend
Existing Dual Carriageway
Existing Single Carriageway
Proposed Duplication Lengths
Note: All distances shown south of Gundagai
Hume Highway Duplication
0 2 4 8 12 16 20
Kilometres
Map data © Copyright 2003 Telstra Corporation Limited (Sensis Pty Ltd) and Universal Press Pty Ltd.

Attachment B

Community Update

Australian Government

RTA

Hume Highway duplication package

Sturt Highway to Table Top

COMMUNITY UPDATE
JULY 2006

Albury Wodonga Hume Freeway construction:
works near Seven Mile Creek, March 2006.

The Hume Highway is the main freight route between Sydney and Melbourne. It is also a vital transport link for communities and industries in southern New South Wales. Approximately 108 kilometres of the route is currently single carriageway.

The Australian and New South Wales governments are committed to upgrading the entire length of the Hume Highway to a four lane divided carriageway by 2012. The New South Wales Roads and Traffic Authority will manage this package of works.

Projects under construction or already planned

A number of projects on the Hume Highway are already being constructed or in planning under AusLink, the Australian Government's National Land Transport Plan. These projects include:

- **Coolac bypass.**
  Currently scheduled to commence in late 2006.
- **West Street interchange at Gundagai.**
  Currently scheduled to open in December 2006.
- **Sheahan Bridge duplication at Gundagai**.
  Currently scheduled to commence in 2007.
- **Tarcutta truck and trailer interchange facility.**
  Currently scheduled to open in late 2006.
- **Albury Wodonga Hume Freeway.**
  Currently scheduled to open in mid 2007.

Albury Wodonga Hume Freeway construction: Bridge Street rail bridge, March 2006.

Projects to be constructed by the end of 2009

The Australian Government has allocated $800 million to construct the following Hume Highway projects between the Sturt Highway and Table Top by the end of 2009:

- **Sturt Highway to Tarcutta.** Six kilometre duplication project from the Sturt Highway intersection to north of Tarcutta.
- **Kyeamba Hill.** Nine kilometre duplication project between two existing dual carriageway sections south of Tarcutta.
- **Little Billabong.** Eight kilometre duplication project between Tarcutta and Holbrook.
- **Yarra Yarra to Holbrook.** Twelve kilometre duplication project from Yarra Yarra to north of Holbrook.
- **Woomargama to Table Top.** Thirty two kilometre duplication project from south of Woomargama to Table Top (including a major deviation south of Mullengandra).

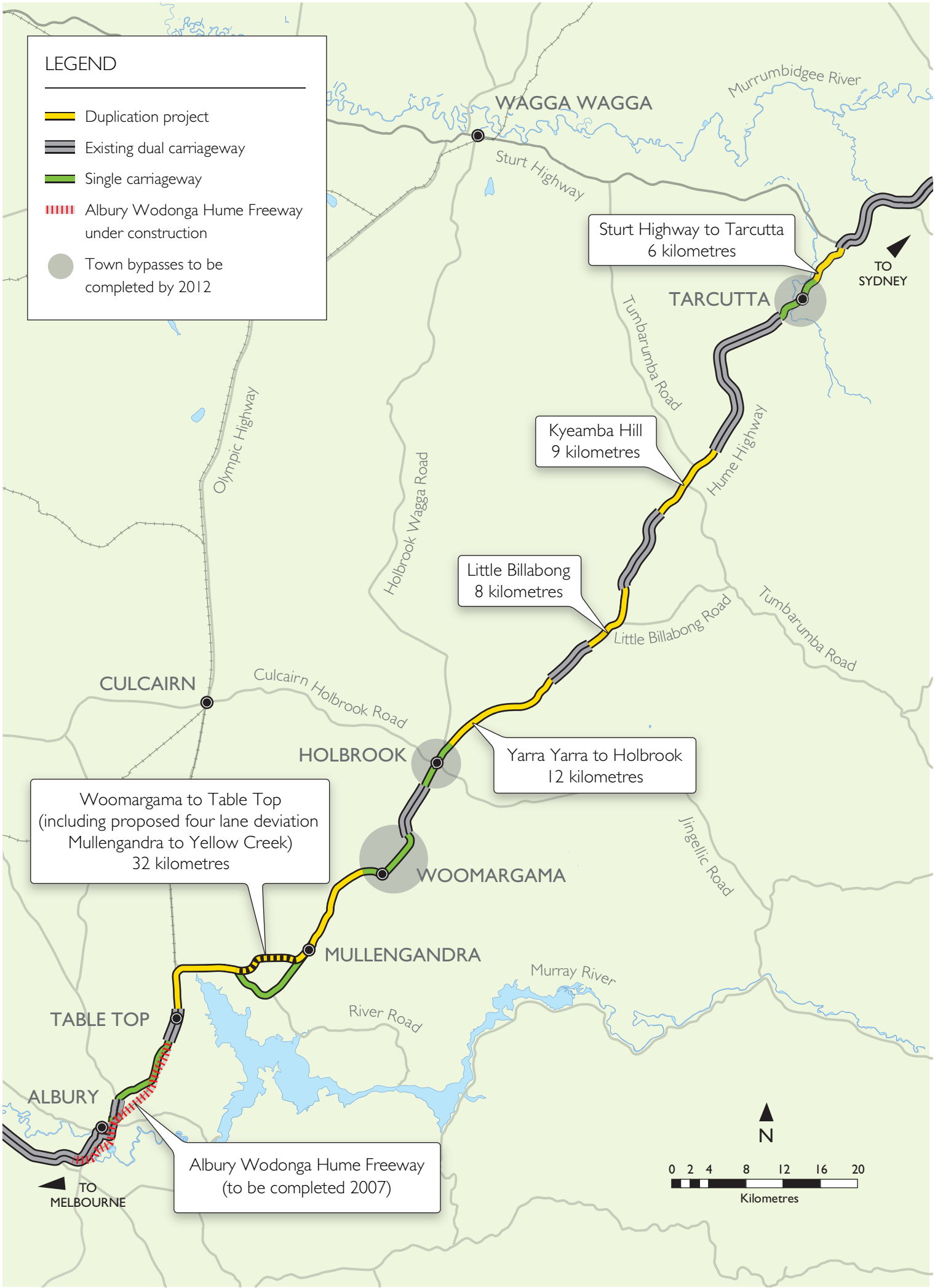
Planning is already underway for these projects. It is anticipated much of the duplication work will occur within or adjacent to the road corridor beside the existing lanes of the highway.

This package of works is scheduled to duplicate 67 kilometres of the Hume Highway in southern New South Wales by 2009, leaving only 20 kilometres of highway as single carriageway.

Bypasses scheduled to be constructed by 2012

Bypasses at Tarcutta, Holbrook and Woomargama will require more complex planning, community consultation and environmental assessment. Planning for the bypasses will start soon so that the AusLink objective of a completed four-lane Hume Highway can be met by the end of 2012.

Hume Highway duplication package



What happens next?

The RTA has commenced detailed investigations. These dot points show the next steps.

- Detailed investigations of the sections of highway to be duplicated.
- Consult with affected property owners.
- Consult with stakeholders for the various projects such as councils, residents, businesses and community groups.
- Assess environmental impacts.
- Obtain construction approval.
- Award construction contract.
- Commence construction.
- Plan the bypasses of Tarcutta, Holbrook and Woomargama.

For further information contact the RTA's Hume Highway office:

131 782

(02) 6938 1157

PO Box 484, Wagga Wagga NSW 2650

Hume_Highway_Office@rta.nsw.gov.au

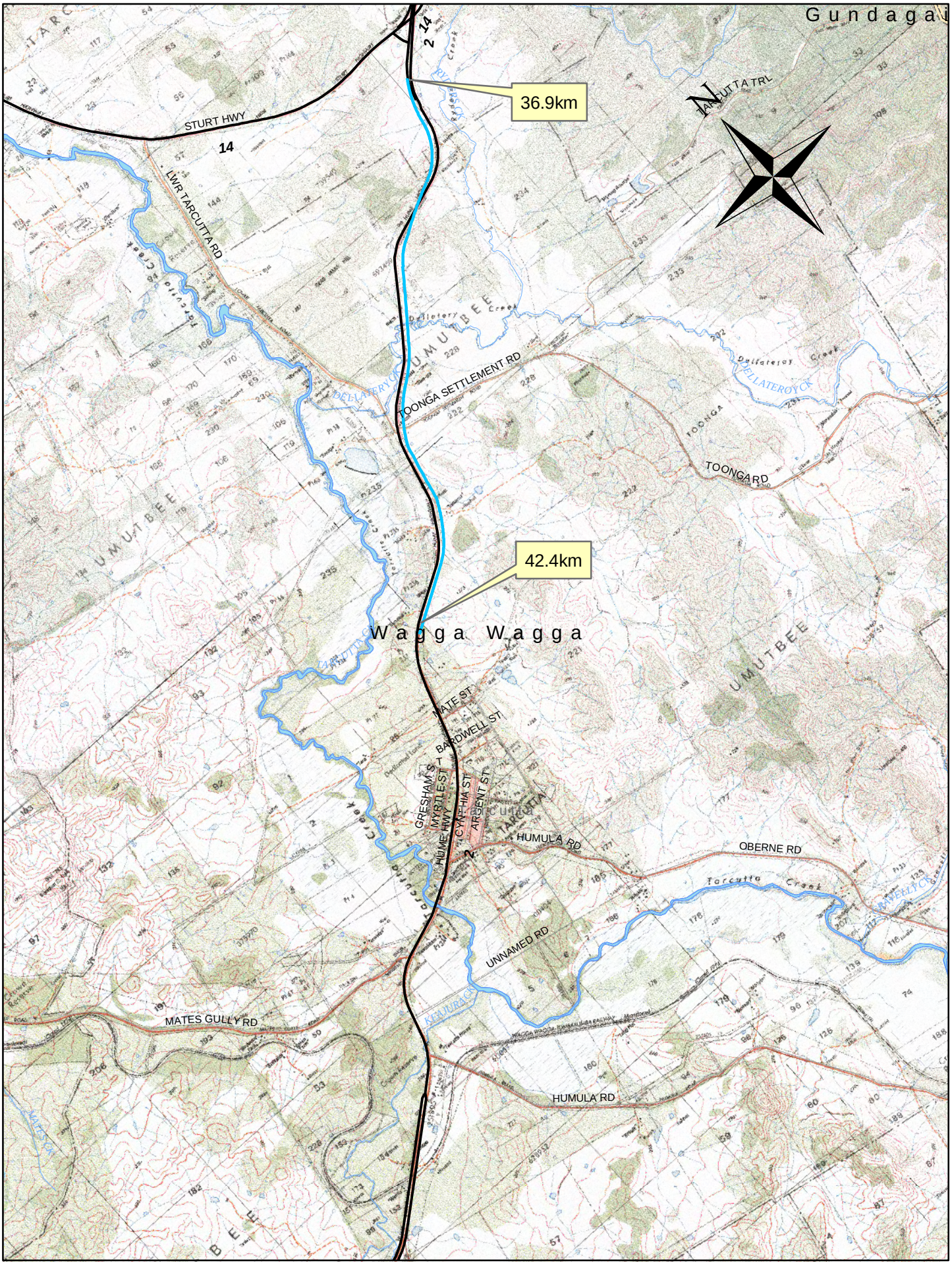
www.rta.nsw.gov.au
www.auslink.gov.au

AUSLINK
Building our National Transport Future

RTA/Pub. 06.147

Attachment C

Topographic Maps



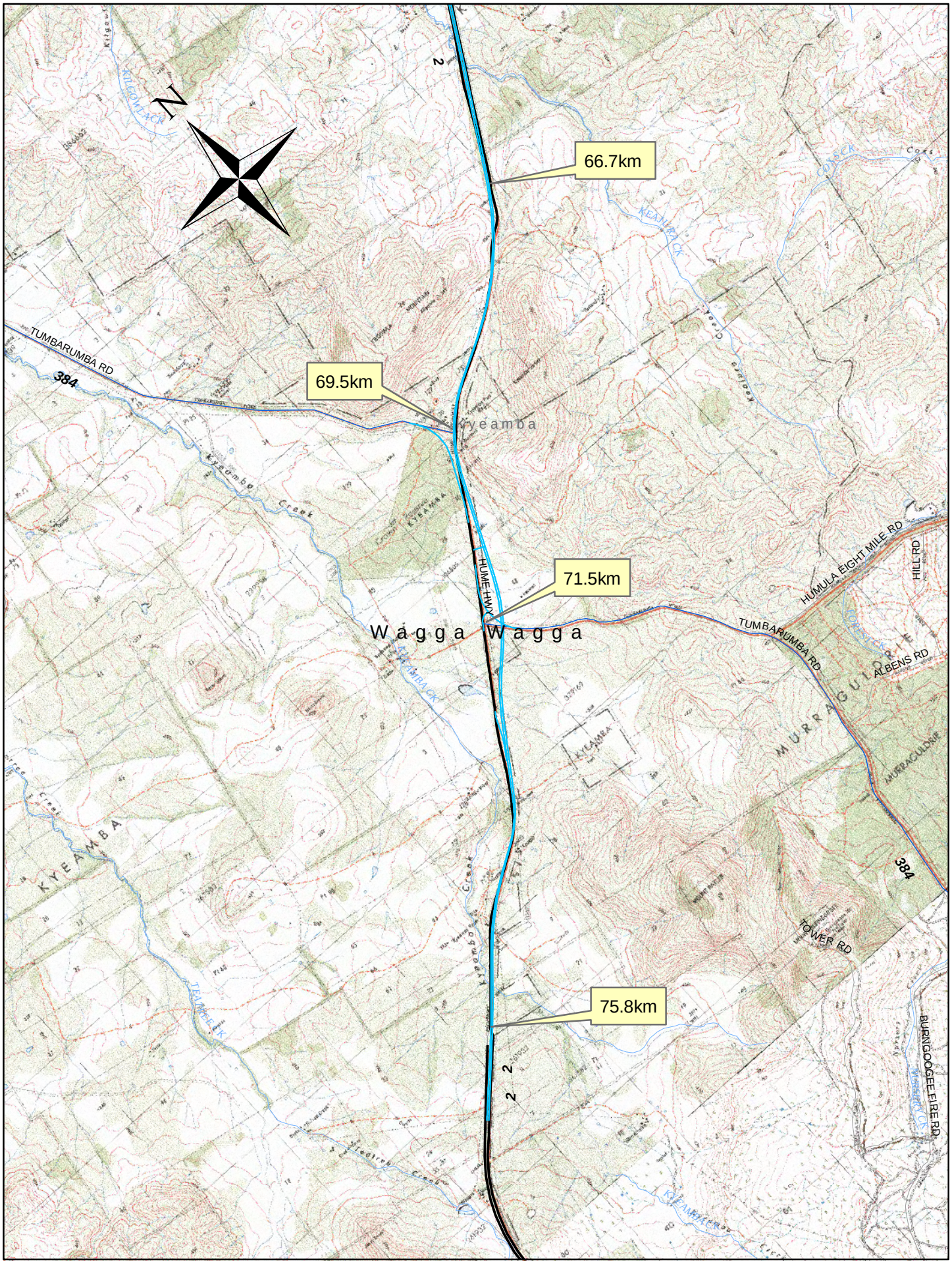
Hume Highway Duplication Project
Sturt Highway to Tarcutta
Topographic Map

0 0.5 1 2 3 4

Kilometres

Legend

Tarcutta Duplication



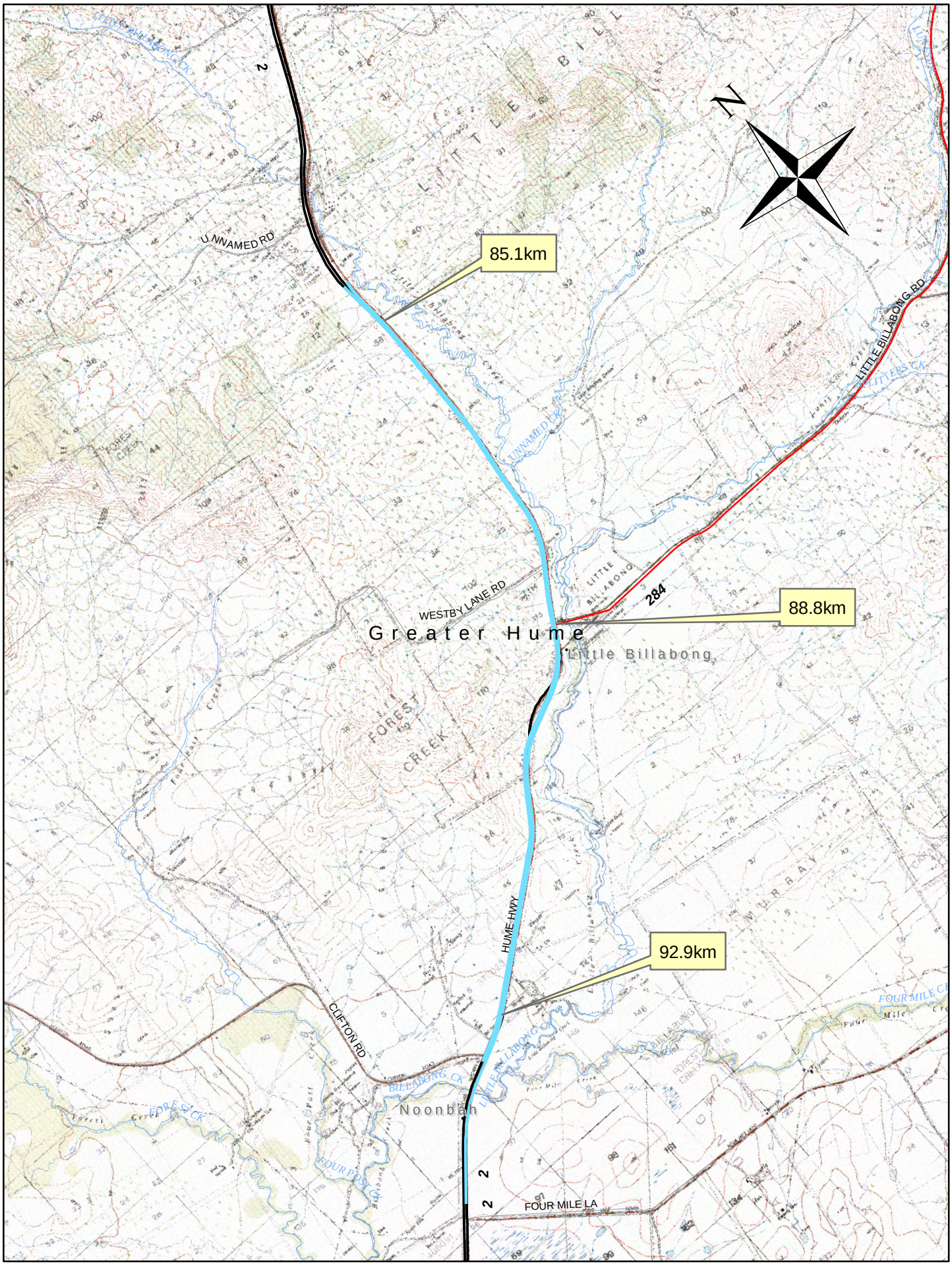
Hume Highway Duplication Project
Kyeamba Hill
Topographic Map

0 0.5 1 2 3 4

Kilometres

Legend

Kyeamba Hill Duplication



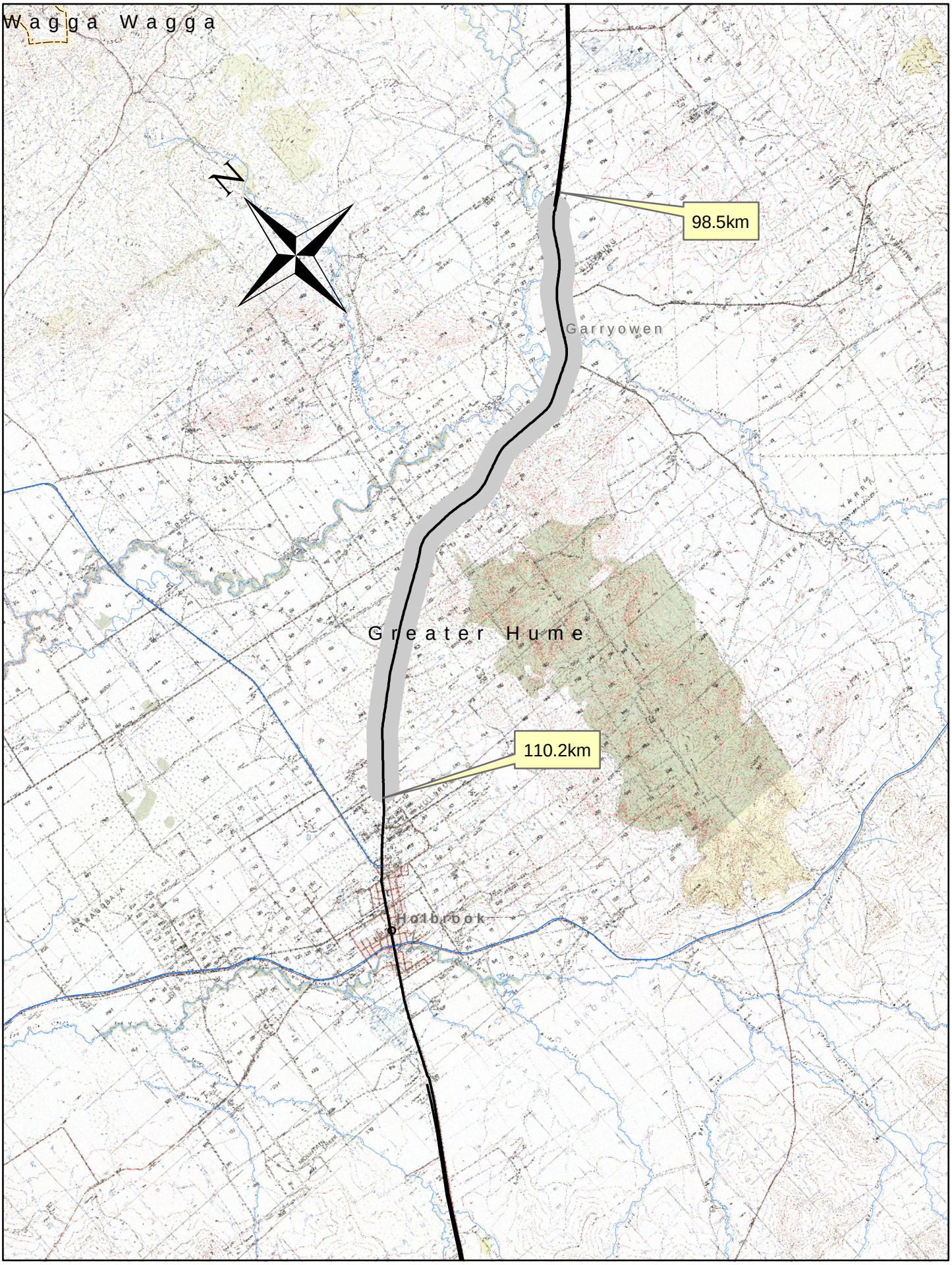
Hume Highway Duplication Project
Little Billabong
Topographic Map

0 0.5 1 2 3 4

Kilometres

Legend

Little Billabong Duplication



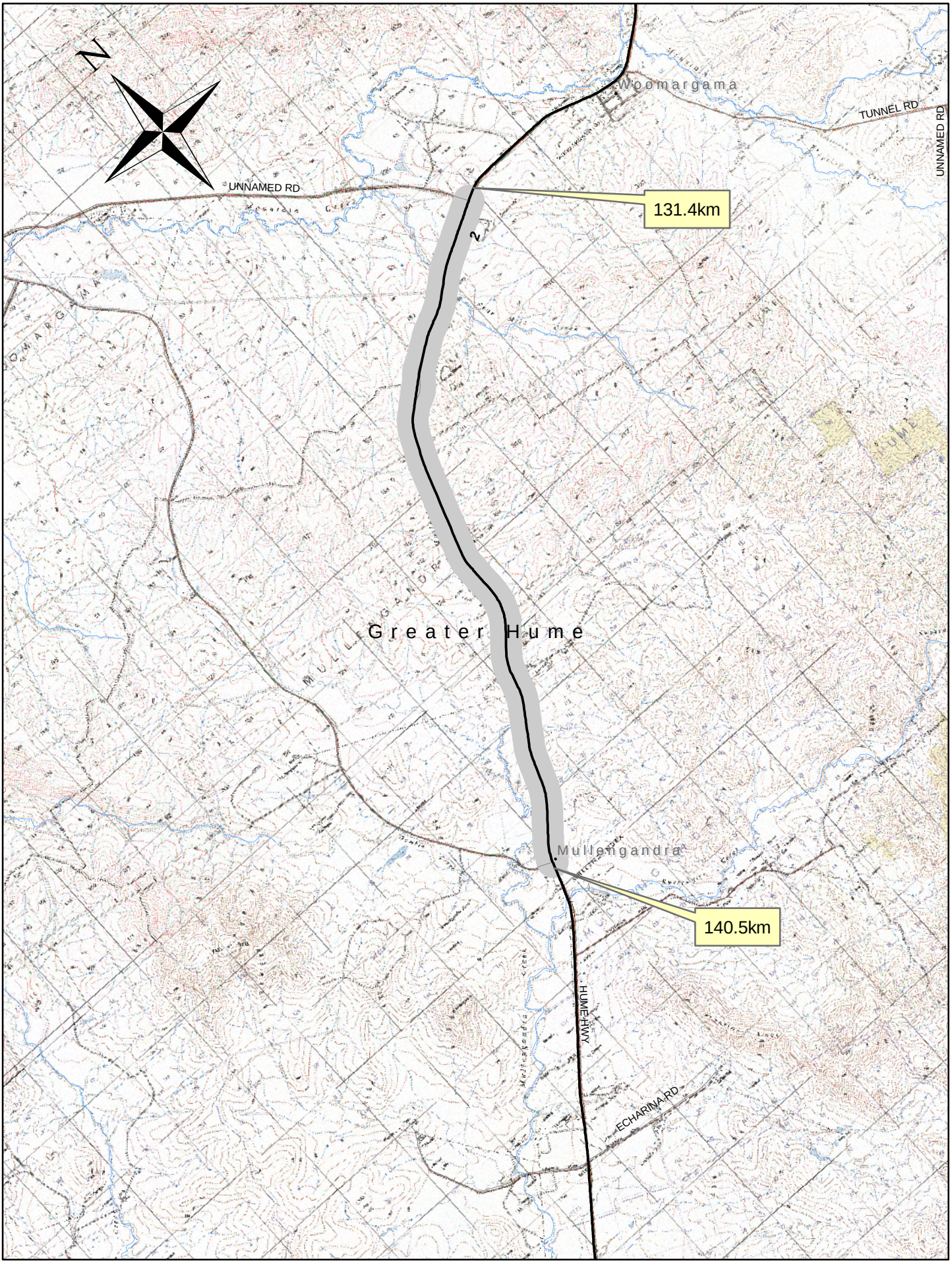
Hume Highway Duplication Project
Yarra Yarra To Holbrook
Topographic Map

0 1 2 4 6 8

Kilometres

Legend

Yarra Yarra to Holbrook



Hume Highway Duplication Project
Woomargama to Mullengandra
Topographic Map

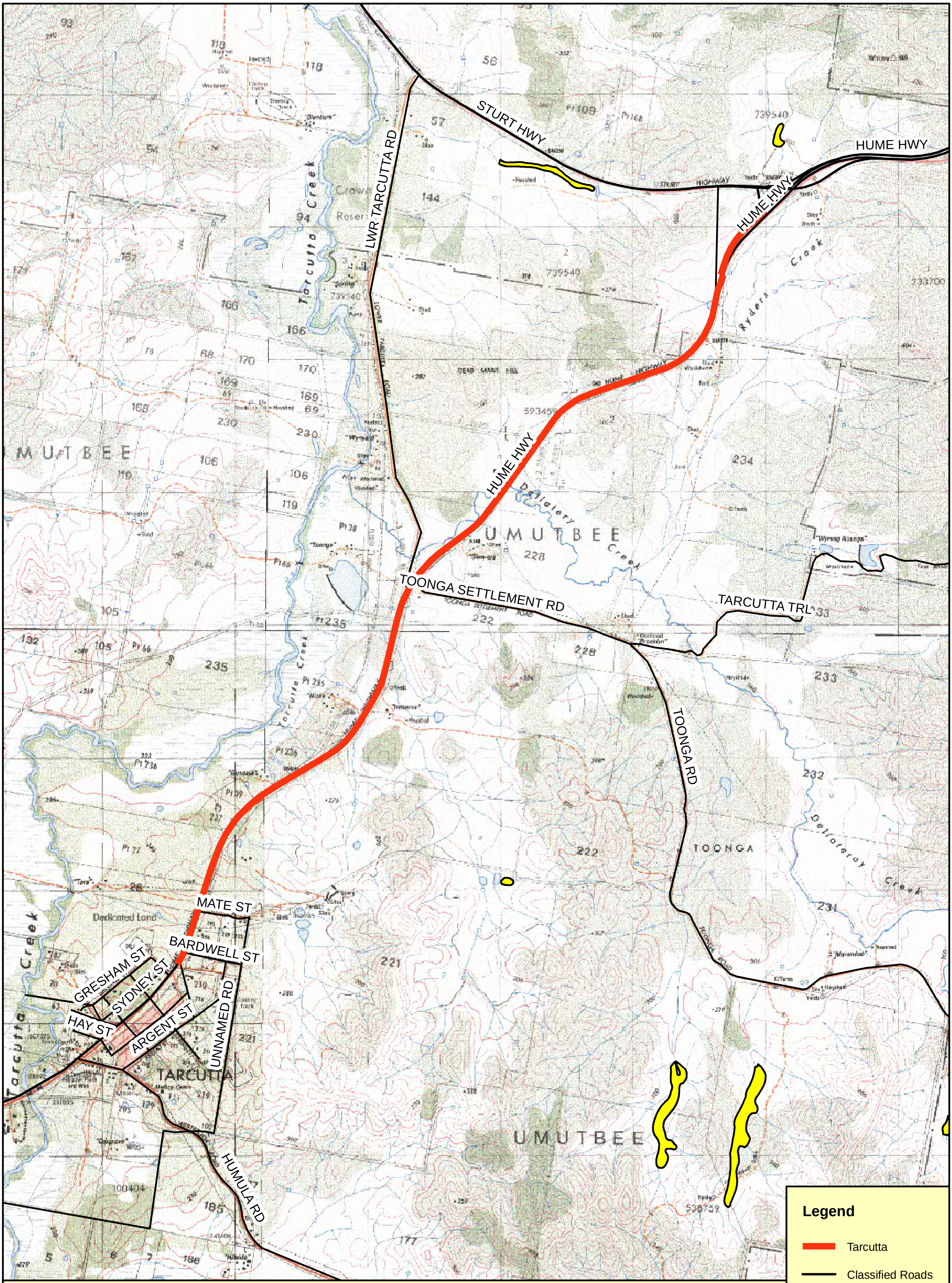
0 0.5 1 2 3 4
Kilometres

Legend

Woomargama to Mullengandra

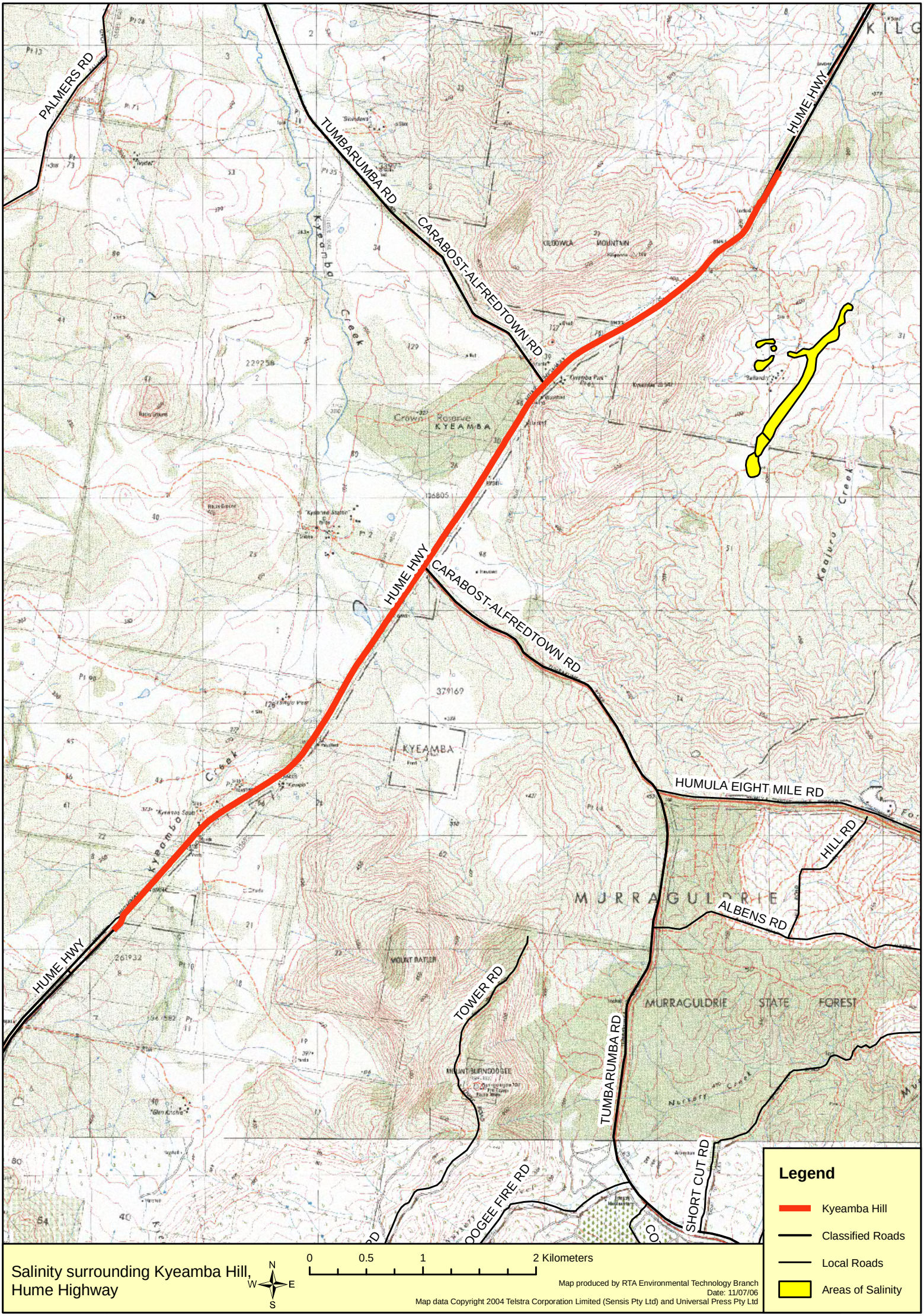
Attachment D

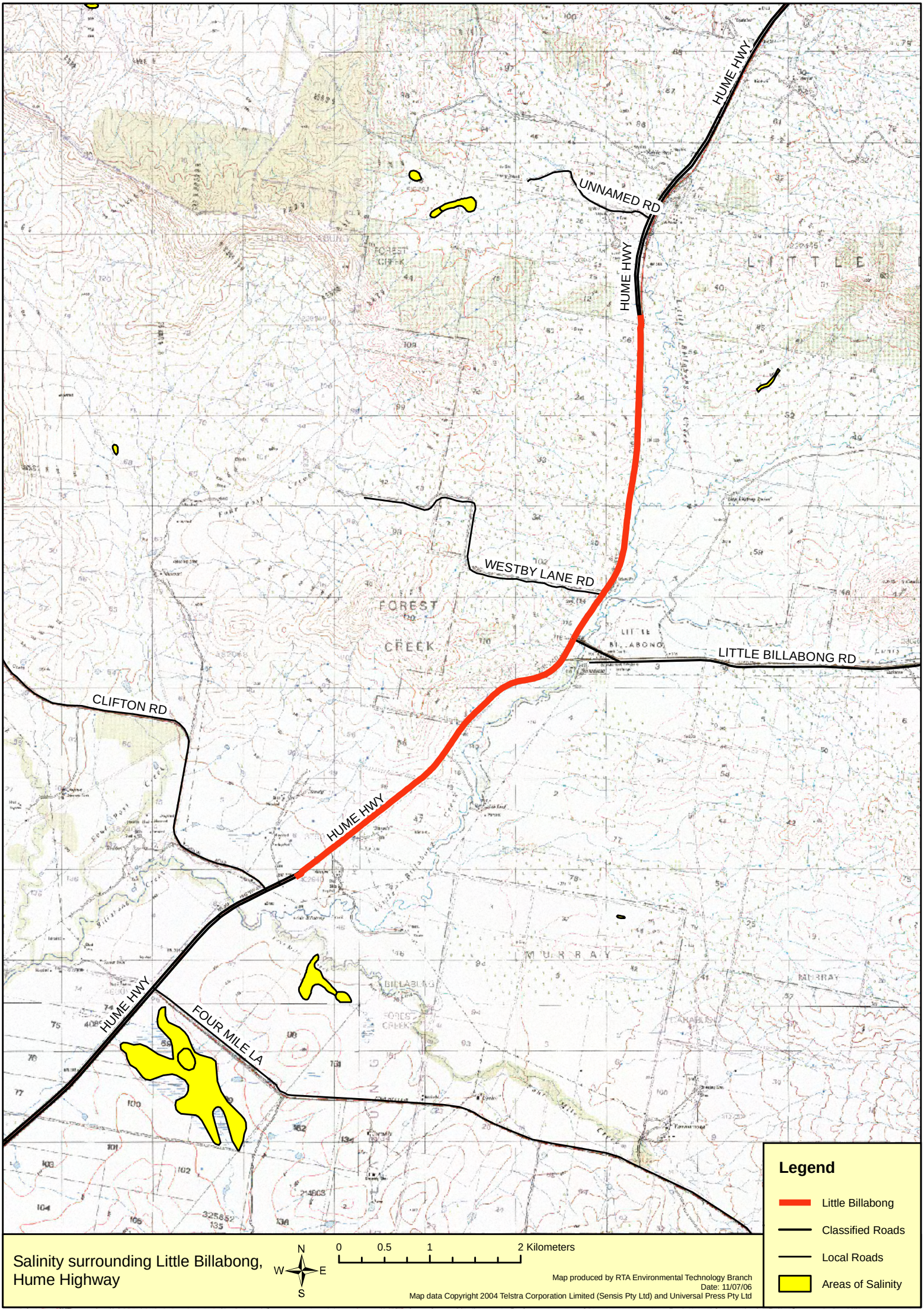
Salinity Maps



Salinity surrounding Tarcutta, Hume Highway

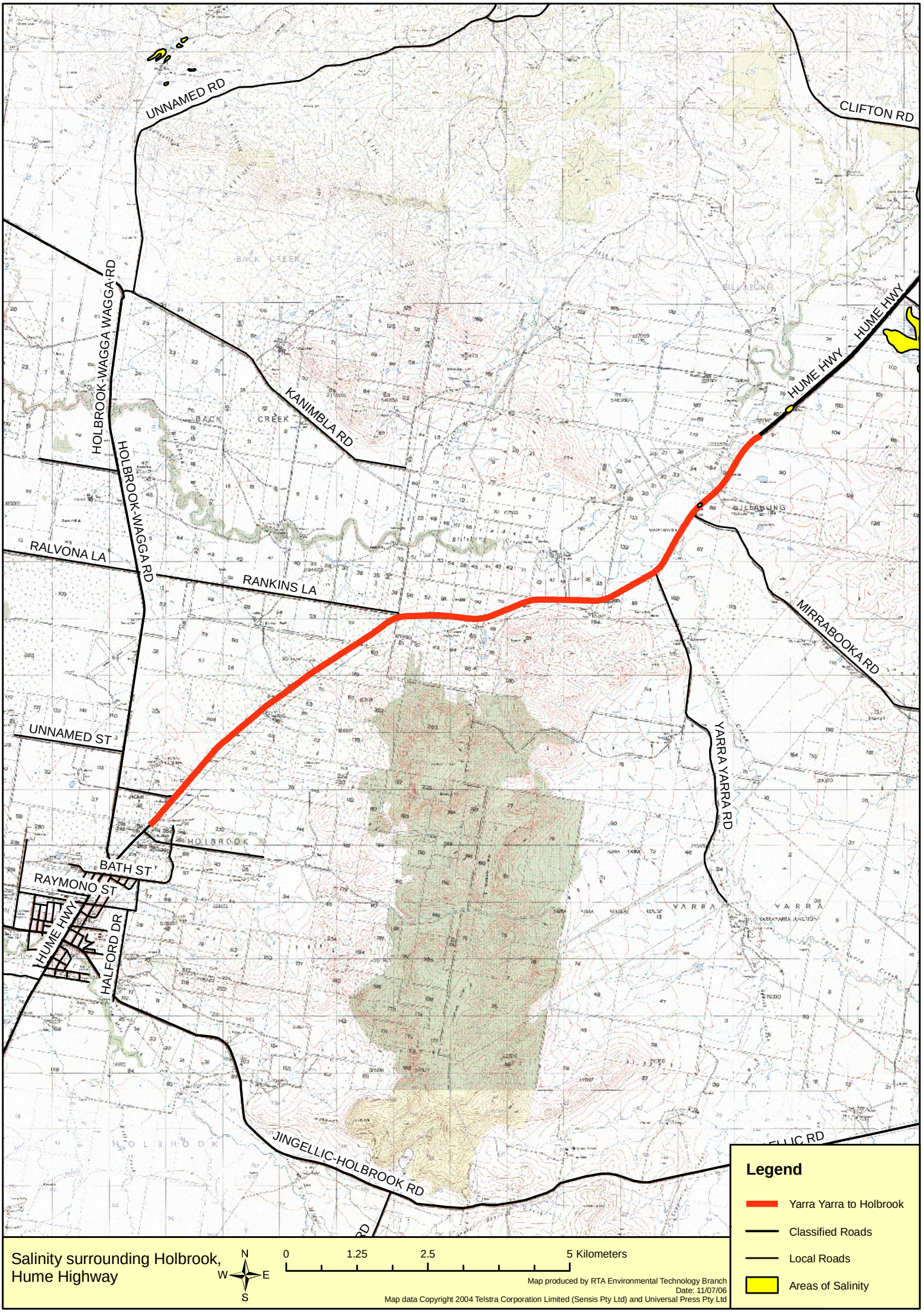
Map produced by RTA Environmental Technology Branch
Date: 11/07/06
Map data Copyright 2004 Telstra Corporation Limited (Sensis Pty Ltd) and Universal Press Pty Ltd

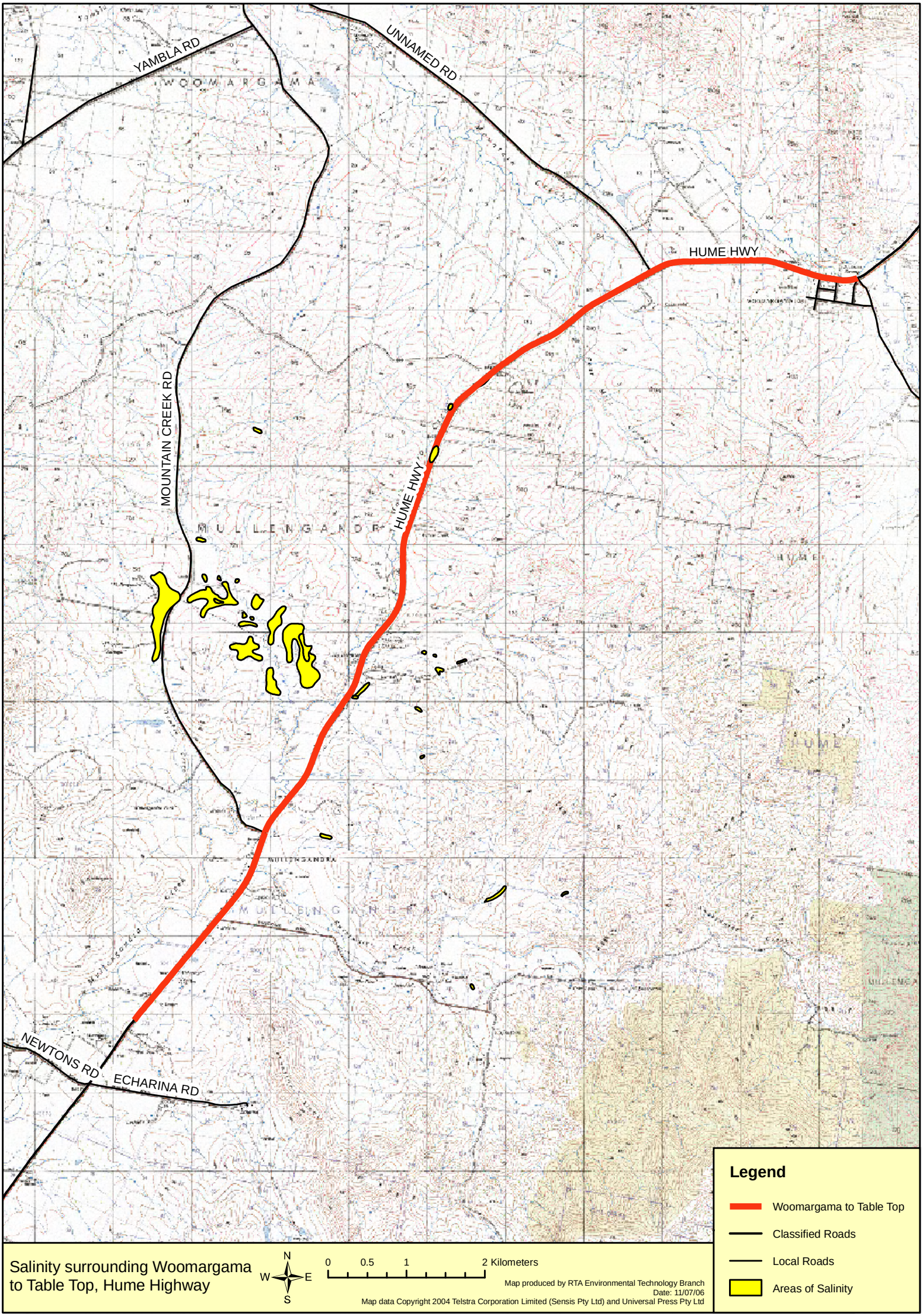

PALMERS RD
TUMBARUMBA RD
CARABOST-ALFREDTOWN RD
HUME HWY
Kyeamba Creek
KILGOWLA MOUNTAIN
Crown Reserve KYEAMBA
KYEAMBA
HUMULA EIGHT MILE RD
HILL RD
MURRAGULDRIE
ALBENS RD
TOWER RD
MOUNT BATTER
MOUNT BURINDOOGEE
MURRAGULDRIE STATE FOREST
TUMBARUMBA RD
SHORT CUT RD
BURINDOOGEE FIRE RD
Keajura Creek
Nursery Creek
Legend
Kyeamba Hill
Classified Roads
Local Roads
Areas of Salinity
Salinity surrounding Kyeamba Hill, Hume Highway
N
W
E
S
0
0.5
1
2 Kilometers
Map produced by RTA Environmental Technology Branch
Date: 11/07/06
Map data Copyright 2004 Telstra Corporation Limited (Sensis Pty Ltd) and Universal Press Pty Ltd



Salinity surrounding Little Billabong, Hume Highway

Map produced by RTA Environmental Technology Branch
Date: 11/07/06


UNNAMED RD
CLIFTON RD
HOLBROOK-WAGGA WAGGA RD
KANIMBLA RD
HUME HWY
HUME HWY
BACK CREEK
BILBUNG
RALVONA LA
RANKINS LA
HOLBROOK-WAGGA RD
MIRRABOOKA RD
UNNAMED ST
YARRA YARRA RD
HOLBROOK
BATH ST
RAYMONO ST
HUME HWY
HALFORD DR
YARRA
JINGELLIC-HOLBROOK RD
Legend
Yarra Yarra to Holbrook
Classified Roads
Local Roads
Areas of Salinity
Salinity surrounding Holbrook, Hume Highway
N
W
E
S
0
1.25
2.5
5 Kilometers
Map produced by RTA Environmental Technology Branch
Date: 11/07/06
Map data Copyright 2004 Telstra Corporation Limited (Sensis Pty Ltd) and Universal Press Pty Ltd


YAMBLA RD
UNNAMED RD
WOOMARGAMA
HUME HWY
MOUNTAIN CREEK RD
HUME HWY
MULLENGANDRA
NEWTONS RD
ECHARINA RD
Legend
Woomargama to Table Top
Classified Roads
Local Roads
Areas of Salinity
Salinity surrounding Woomargama to Table Top, Hume Highway
N
W
E
S
0
0.5
1
2 Kilometers
Map produced by RTA Environmental Technology Branch
Date: 11/07/06
Map data Copyright 2004 Telstra Corporation Limited (Sensis Pty Ltd) and Universal Press Pty Ltd

Attachment E

Biodiversity and Waterways Maps

K:\Design\H2_Hume_Hwy_Project\Constraints\Tarcutta\Vol_1\001_Sheet.dgn MontgoshXM 8/9/2006

SCALES

0 200 400 600 800 1000
SCALE 1:20000m @ A3

A3 original | This sheet may be prepared using colour and may be incomplete if copied

Aerial Photography flown January - March 2006

These maps are compiled by the Site Locations Unit of Survey Services and Road Design Engineering from information supplied by Environmental Technology. Any enquiries regarding locations should be directed to the RTA's Site Locations Coordinator on 8837 0455.

Co-ordinate System: MGA Zone 56

Height Datum: A.H.D.

RTA

PREPARED BY
PROJECT DESIGN & SURVEY SERVICES
(RTA SITE LOCATIONS UNIT)
ENGINEERING TECHNOLOGY BRANCH
OPERATIONS & SERVICES

DRAWN Sheila Montgomery

REVIEWED

ROADS AND TRAFFIC AUTHORITY OF NSW

Hume Highway Duplication Project
Sturt Highway to Tarcutta
Project Study Area for the Tarcutta Duplication
Biodiversity and Waterways

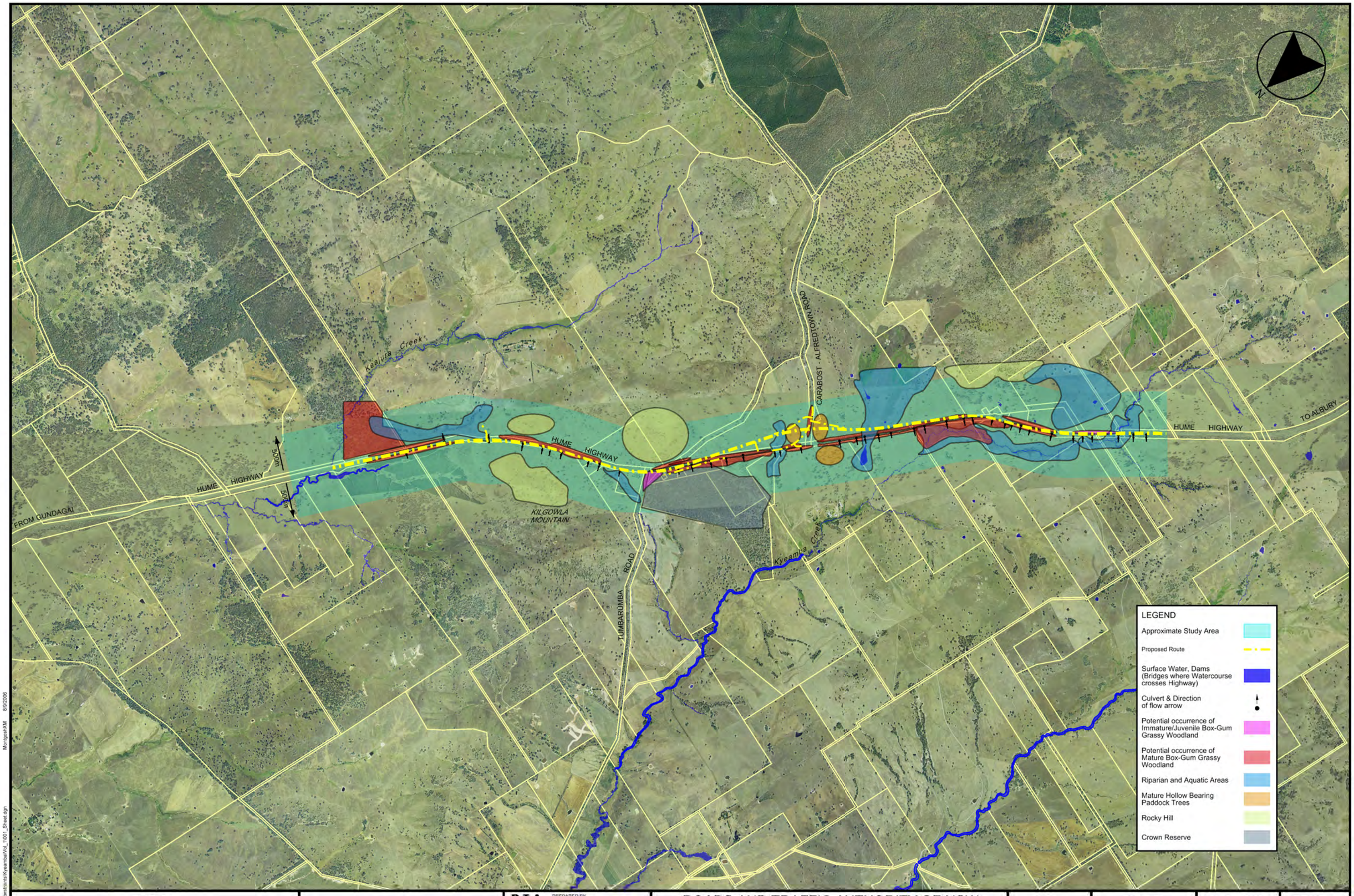
FILE No.

DRAWING
001_Sheet.dgn

PRINTED DATE
8/9/2006

REGISTRATION NUMBER
0002.468.EP.0764

SHEET No.
001



SCALES

0 500 1000 1500 2000

SCALE 1:40000m @ A3

A3 original | This sheet may be prepared using colour and may be incomplete if copied

Aerial Photography flown January - March 2006

These maps are compiled by the Site Locations Unit of Survey Services and Road Design Engineering from information supplied by Environmental Technology. Any enquiries regarding locations should be directed to the RTA's Site Locations Coordinator on 8837 0455.

Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

RTA

PREPARED BY
PROJECT DESIGN & SURVEY SERVICES
(RTA SITE LOCATIONS UNIT)
ENGINEERING TECHNOLOGY BRANCH
OPERATIONS & SERVICES

DRAWN Sheila Montgomery

REVIEWED

ROADS AND TRAFFIC AUTHORITY OF NSW

Hume Highway Duplication Project
Kyeamba Hill
Project Study Area for the Kyeamba Hill Duplication
Biodiversity and Waterways

FILE No.	DRAWING	PRINTED DATE	SHEET No.
	001_Sheet.dgn	8/9/2006	001

REGISTRATION NUMBER
0002.468.EP.0763

K:\Design\H2_Hume_Hwy_Project\Corridors\Kyeamba\Vol_1\001_Sheet.dgn 8/9/2006 MontgomeXM

LITTLE BILLABONG

LITTLE BILLABONG ROAD

Lunis Creek

Unamed Creek

Little Billabong Creek

HUME HIGHWAY

WESTBY LANE ROAD

Four Mile Creek

FOUR MILE LANE

TO ALBURY

ALBURY & DISTRICT ABORIGINAL LAND COUNCIL AREA

WAGGA WAGGA ABORIGINAL LAND COUNCIL AREA

CLIFTON ROAD

Four Post Creek

FROM GUNDAGAI

580m

590m

N

LEGEND

- Approximate Study Area
- Proposed Route
- Surface Water, Dams (Bridges where Watercourse crosses Highway)
- Culvert & Direction of flow arrow
- Potential occurrence of Mature Box-Gum Grassy Woodland
- Riparian and Aquatic Areas

SCALES

0 500 1000 1500 2000

SCALE 1:40000m @ A3

A3 original

This sheet may be prepared using colour and may be incomplete if copied

Aerial Photography flown January - March 2006

These maps are compiled by the Site Locations Unit of Survey Services and Road Design Engineering from information supplied by Environmental Technology. Any enquiries regarding locations should be directed to the RTA's Site Locations Coordinator on 8837 0455.

Co-ordinate System: MGA Zone 56

Height Datum: A.H.D.

RTA

PREPARED BY
PROJECT DESIGN & SURVEY SERVICES
(RTA SITE LOCATIONS UNIT)
ENGINEERING TECHNOLOGY BRANCH
OPERATIONS & SERVICES

DRAWN Sheila Montgomery

REVIEWED

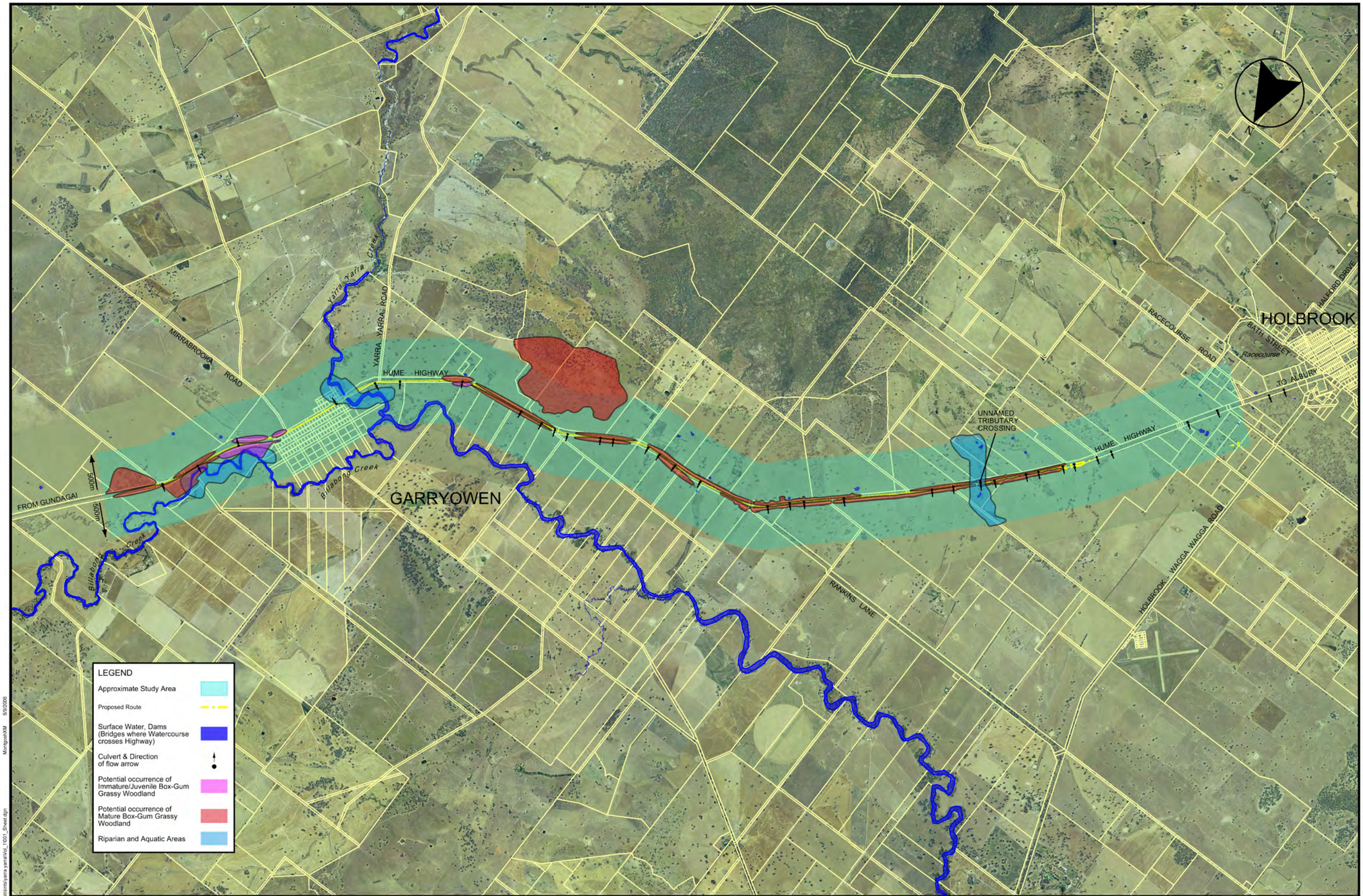
ROADS AND TRAFFIC AUTHORITY OF NSW

Hume Highway Duplication Project
Little Billabong
Project Study Area for the Little Billabong Duplication
Biodiversity and Waterways

FILE No.	DRAWING	PRINTED DATE	SHEET No.
	001_Sheet.dgn	8/9/2006	001

REGISTRATION NUMBER
0002.186.EP.0505

K:\Design\H2_Hume_Hwy_Proj\Corridors\Little Billabong\Vol_1\001_Sheet.dgn MontgoshXM 8/9/2006



K:\Design\H2_Hume_Hwy_Project\Constructs\yarra yarra\Vol_1\001_Sheet.dgn MontgoshKM 8/9/2006

SCALES

0 500 1000 1500 2000

SCALE 1:40000m @ A3

A3 original | This sheet may be prepared using colour and may be incomplete if copied

Aerial Photography flown January - March 2006

These maps are compiled by the Site Locations Unit of Survey Services and Road Design Engineering from information supplied by Environmental Technology. Any enquiries regarding locations should be directed to the RTA's Site Locations Coordinator on 8837 0455

Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

RTA

PREPARED BY
PROJECT DESIGN & SURVEY SERVICES
(RTA SITE LOCATIONS UNIT)
ENGINEERING TECHNOLOGY BRANCH
OPERATIONS & SERVICES

DRAWN Sheila Montgomery

REVIEWED

ROADS AND TRAFFIC AUTHORITY OF NSW

Hume Highway Duplication Project
Yarra Yarra to Holbrook
Project Study Area for the Yarra Yarra to Holbrook Duplication
Biodiversity and Waterways

FILE No.	DRAWING	PRINTED DATE	SHEET No.
	001_Sheet.dgn	8/9/2006	001

REGISTRATION NUMBER
0002.186.EP.0504

WOOMARGAMA

MULLENGANDRA

FROM GUNDAGAI

TO ALBURY

HUME HIGHWAY

TUNNEL ROAD

SWEETWATER ROAD

MOUNTAIN CREEK ROAD

Woomargama Cemetary

Wilson Creek

500m

St Mark's Church

Four Mile Creek

UNNAMED TRIBUTARY CROSSING

Mullengandra Creek

Sweetwater Creek

Mullengandra Cemetary

N

LEGEND

- Approximate Study Area
- Proposed Route
- Surface Water, Dams (Bridges where Watercourse crosses Highway)
- Culvert & Direction of flow arrow
- Potential occurrence of Immature/Juvenile Box-Gum Grassy Woodland
- Potential occurrence of Mature Box-Gum Grassy Woodland
- Riparian and Aquatic Areas

SCALES

0 500 1000 1500 2000

SCALE 1:40000m @ A3

A3 original

This sheet may be prepared using colour and may be incomplete if copied

Aerial Photography flown January - March 2006

These maps are compiled by the Site Locations Unit of Survey Services and Road Design Engineering from information supplied by Environmental Technology. Any enquiries regarding locations should be directed to the RTA's Site Locations Coordinator on 8837 0455.

Co-ordinate System: MGA Zone 56

Height Datum: A.H.D.

RTA

PREPARED BY
PROJECT DESIGN & SURVEY SERVICES
(RTA SITE LOCATIONS UNIT)
ENGINEERING TECHNOLOGY BRANCH
OPERATIONS & SERVICES

DRAWN Sheila Montgomery

REVIEWED

ROADS AND TRAFFIC AUTHORITY OF NSW

Hume Highway Duplication Project
Woomargama to Mullengandra
Project Study Area for the Woomargama Duplication
Biodiversity and Waterways

FILE No.	DRAWING	PRINTED DATE	SHEET No.
	001_Sheet.dgn	8/9/2006	001

REGISTRATION NUMBER
0002.186.EP.0503

K:\Design\H2_Hume_Hwy_Project\Creations\Woomargama\Vis_1\001_Sheet.dgn 8/9/2006 MontgomXM

Attachment F

Species List

Potentially occurring threatened fauna species

Bird Species

Scientific Name	Common Name	Conservation Status			Likelihood of Occurrence
		FM Act	TSC Act	EPBC Act	
Lathamus discolor	Swift Parrot	-	E	E, M, Ma	High
Stagonopleura guttata	Diamond Firetail	-	V	-	High
Xanthomyza phygia	Regent Honeyeater	-	E	E, M	High
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subsp.)	-	V	-	High
Grantiella picta	Painted Honeyeater	-	V	-	High
Climacteris picumnus	Brown Treecreeper	-	V	-	High
Melanodryas cucullata	Hooded Robin	-	V	-	High
Ixobrychus flavicollis	Black Bittern	-	V	-	Moderate
Rostratula benghalensis australis	Painted Snipe (Australian subsp.)	-	E	V, M, Ma	Moderate
Pomatostomus temporalis	Grey-crowned Babbler (eastern subsp.)	-	V	-	High
Callocephalon fimbriatum	Gang-Gang Cockatoo	-	V	-	High
Cacutua leadbeateri	Major Mitchell's Cockatoo	-	V	-	Moderate
Neophema pulchella	Turquoise Parrot	-	V	-	High
Pyrrholaemus sagittatus	Speckled Warbler	-	V	-	Moderate
Ninox connivens	Barking Owl	-	V	-	Moderate
Polytelis swainsonii	Superb Parrot	-	V	V	Moderate

Mammal Species					
Scientific Name	Common Name	Conservation Status			Likelihood of Occurrence
		FM Act	TSC Act	EPBC Act	
Petaurus norfolcensis	Squirrel Glider	-	V	-	Moderate
Phascolarctos cinereus	Koala	-	V	V	High

Reptile Species					
Scientific Name	Common Name	Conservation Status			
		FM Act	TSC Act	EPBC Act	
Apasia parapulchella	Pink-tailed Worm-lizard	-	V	V	High

Fish Species					
Scientific Name	Common Name	Conservation Status			Likelihood of Occurrence
		FM Act	TSC Act	EPBC Act	
Mogurnda aspersa	Purple Spotted Gudgeon (Western Population)	E	-	-	High

Amphibian Species					
Scientific Name	Common Name	Conservation Status			Likelihood of Occurrence
		FM Act	TSC Act	EPBC Act	
Litoria raniformis	Southern Bell Frog	-	E	V	Moderate

Marine Species

Scientific Name	Common Name	Conservation Status			Likelihood of Occurrence
		FM Act	TSC Act	EPBC Act	
Ardea alba	White Egret	-	-	Ma	High
Ardea ibis	Cattle Egret	-	-	Ma	High
Merops ornatus	Rainbow Bee-eater	-	-	Ma	Moderate

Potentially occurring threatened flora species

Flora Species

Scientific Name	Common Name	Conservation Status			Likelihood of Occurrence
		FM Act	TSC Act	EPBC Act	
Senecio galandii	Woolly Ragwort	-	V	V	Moderate
Amphibromus fluitans	River Swamp Wallaby Grass	-	V	V	High

Listed Threatened Ecologically Endangered Communities

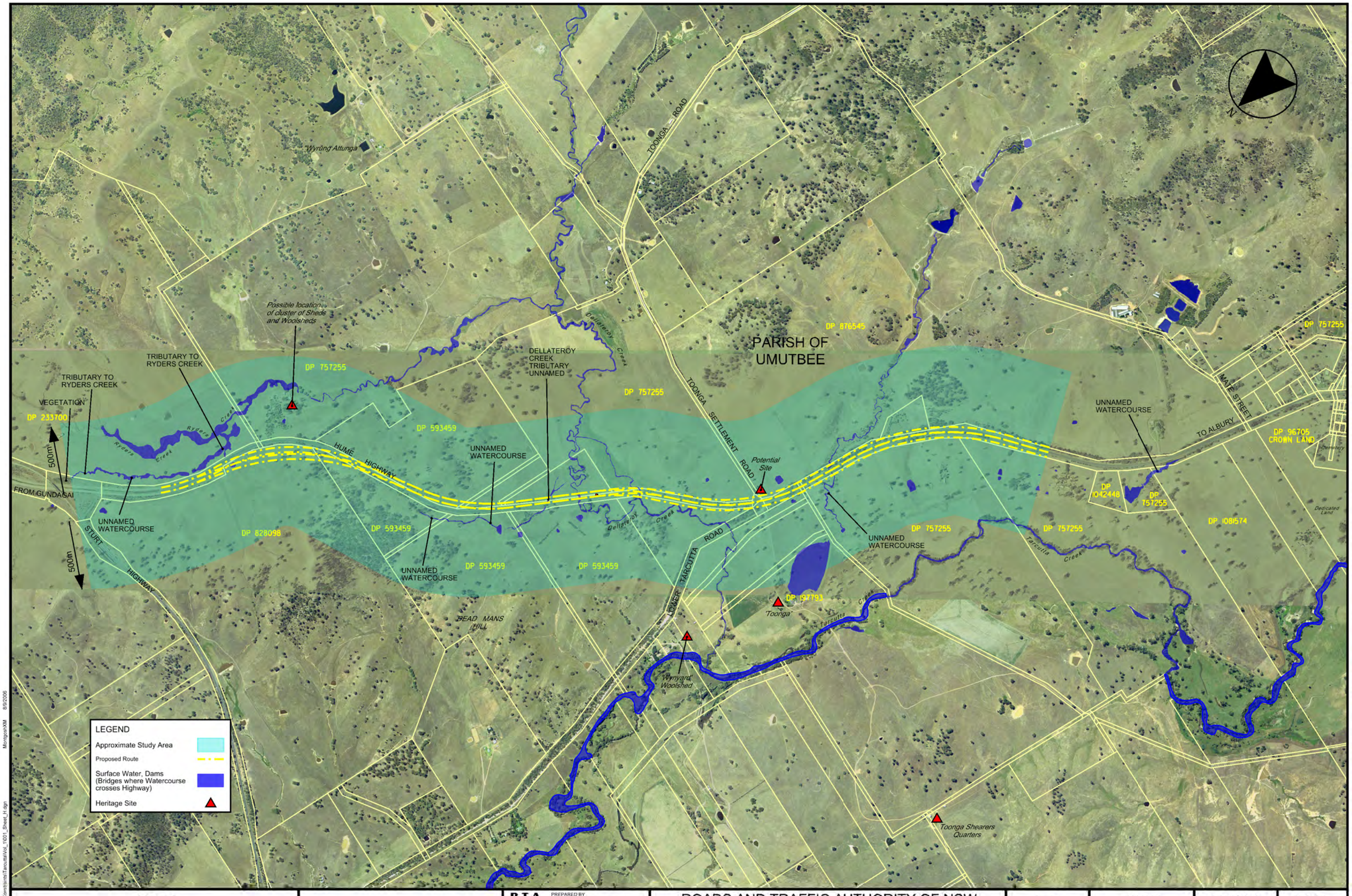
Ecologically Endangered Communities
Potentially occurring threatened populations/ecological communities

Name	Conservation Status			Likelihood of Occurrence
	FM Act	TSC Act	EPBC Act	
Aquatic ecological community in the natural drainage system of the lower Murray River catchment	E		-	Occurs
White Box Yellow Box Blakely's Red Gum Woodland		E	CE	High
Squirrel glider population in the Wagga Wagga LGA		E	-	Moderate
Purple Spotted Gudgeon (Western Population)	E		-	High

List of Abbreviations
V- Vulnerable
E- Endangered
M- Migratory
Ma - Marine
CE- Critically Endangered

Attachment G

Non-Aboriginal Heritage Maps



SCALES

0 200 400 600 800 1000

SCALE 1:20000m @ A3

A3 original | This sheet may be prepared using colour and may be incomplete if copied

Aerial Photography flown January - March 2006

These maps are compiled by the Site Locations Unit of Survey Services and Road Design Engineering from information supplied by Environmental Technology. Any enquiries regarding locations should be directed to the RTA's Site Locations Coordinator on 8837 0455.

Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

RTA

PREPARED BY
PROJECT DESIGN & SURVEY SERVICES
(RTA SITE LOCATIONS UNIT)
ENGINEERING TECHNOLOGY BRANCH
OPERATIONS & SERVICES

DRAWN Sheila Montgomery

REVIEWED

ROADS AND TRAFFIC AUTHORITY OF NSW

Hume Highway Duplication Project
Sturt Highway to Tarcutta
Project Study Area for the Tarcutta Duplication
Heritage

FILE No.	DRAWING	PRINTED DATE	SHEET No.
	001_Sheet_H.dgn	8/9/2006	001

REGISTRATION NUMBER
0002.468.EP.0765

K:\Design\HS_Hume_Hwy_Projects\Corridors\Tarcutta\Vol_1\001_Sheet_H.dgn 8/9/2006 MontgomXM

N

Keajura Creek

CARABOST - ALFREDTOWN ROAD

'Komolo' Stone Chimney' Archaeology likely location

HUME HIGHWAY

TO ALBURY

'Kyeamba South'

HUME HIGHWAY

SOUTH

HUME HIGHWAY

FROM GUNDAGAI

KILGOWLA MOUNTAIN

'Kyeamba'

Kyeamba Creek

TUMBARUMBA ROAD

LEGEND

- Approximate Study Area
- Proposed Route
- Surface Water, Dams (Bridges where Watercourse crosses Highway)
- Heritage Site

SCALES

0 500 1000 1500 2000

SCALE 1:40000m @ A3

A3 original

This sheet may be prepared using colour and may be incomplete if copied

Aerial Photography flown January - March 2006

These maps are compiled by the Site Locations Unit of Survey Services and Road Design Engineering from information supplied by Environmental Technology. Any enquiries regarding locations should be directed to the RTA's Site Locations Coordinator on 8837 0455.

Co-ordinate System: MGA Zone 56

Height Datum: A.H.D.

RTA

PREPARED BY
PROJECT DESIGN & SURVEY SERVICES
(RTA SITE LOCATIONS UNIT)
ENGINEERING TECHNOLOGY BRANCH
OPERATIONS & SERVICES

DRAWN Sheila Montgomery

REVIEWED

ROADS AND TRAFFIC AUTHORITY OF NSW

Hume Highway Duplication Project
Kyeamba Hill
Project Study Area for the Kyeamba Hill Duplication
Heritage

FILE No.	DRAWING	PRINTED DATE	SHEET No.
	001_Sheet_H.dgn	8/9/2006	001

REGISTRATION NUMBER
0002.468.EP.0766

K:\Design\H2_Hume_Hwy_Project\Constructs\Kyeamba\Vol_1\001_Sheet_H.dgn 8/9/2006 MontgoshXM

LITTLE BILLABONG

LITTLE BILLABONG ROAD

Lunns Creek

Unamed Creek

Little Billabong Creek

HUME HIGHWAY

WESTBY LANE ROAD

Four Mile Creek

FOUR MILE LANE

TO ALBURY

ALBURY & DISTRICT ABORIGINAL LAND COUNCIL AREA

WAGGA WAGGA ABORIGINAL LAND COUNCIL AREA

CLIFTON ROAD

Four Post Creek

500m

500m

FROM GUNDAGAI

Lunts Vale Cemetary

N

LEGEND

- Approximate Study Area
- Proposed Route
- Surface Water, Dams (Bridges where Watercourse crosses Highway)
- Heritage Site

SCALES

0 500 1000 1500 2000

SCALE 1:40000m @ A3

A3 original

This sheet may be prepared using colour and may be incomplete if copied

Aerial Photography flown January - March 2006

These maps are compiled by the Site Locations Unit of Survey Services and Road Design Engineering from information supplied by Environmental Technology. Any enquiries regarding locations should be directed to the RTA's Site Locations Coordinator on 8837 0455.

Co-ordinate System: MGA Zone 56

Height Datum: A.H.D.

RTA

PREPARED BY
PROJECT DESIGN & SURVEY SERVICES
(RTA SITE LOCATIONS UNIT)
ENGINEERING TECHNOLOGY BRANCH
OPERATIONS & SERVICES

DRAWN Sheila Montgomery

REVIEWED

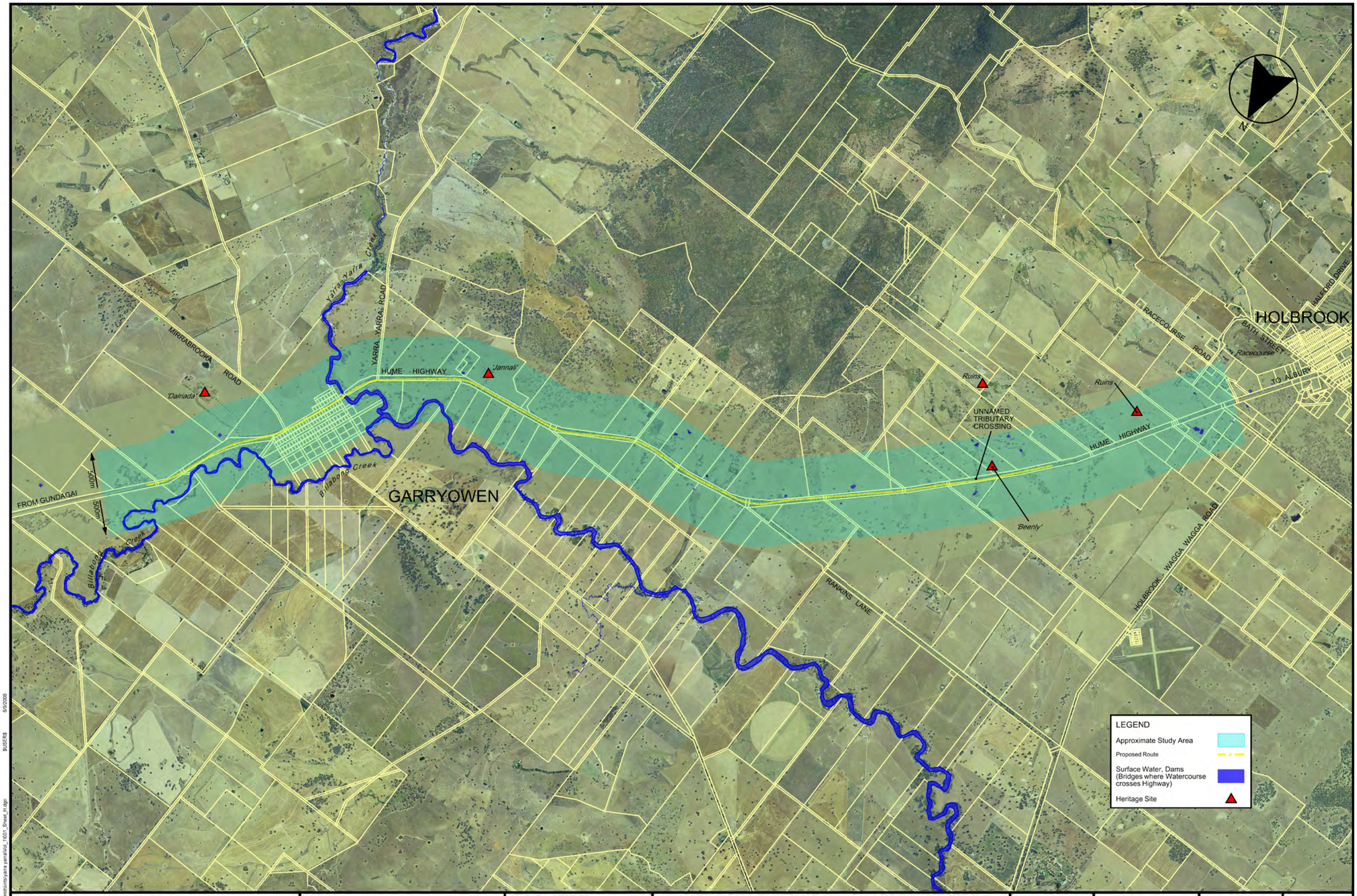
ROADS AND TRAFFIC AUTHORITY OF NSW

Hume Highway Duplication Project
Little Billabong
Project Study Area for the Little Billabong Duplication
Heritage

FILE No.	DRAWING	PRINTED DATE	SHEET No.
	001_Sheet_H.dgn	8/9/2006	001

REGISTRATION NUMBER
0002.186.EP.0506

K:\Design\H2_Hume_Hwy_Project\Constraints\Little Billabong\Vol_1\001_Sheet_H.dgn $USER$ 8/9/2006



SCALES

0 500 1000 1500 2000

SCALE 1:40000m @ A3

A3 original | This sheet may be prepared using colour and may be incomplete if copied

Aerial Photography flown January - March 2006

These maps are compiled by the Site Locations Unit of Survey Services and Road Design Engineering from information supplied by Environmental Technology. Any enquiries regarding locations should be directed to the RTA's Site Locations Coordinator on 8837 0455

Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

RTA

PREPARED BY
PROJECT DESIGN & SURVEY SERVICES
(RTA SITE LOCATIONS UNIT)
ENGINEERING TECHNOLOGY BRANCH
OPERATIONS & SERVICES

DRAWN Sheila Montgomery

REVIEWED

ROADS AND TRAFFIC AUTHORITY OF NSW

Hume Highway Duplication Project
Yarra Yarra to Holbrook
Project Study Area for the Yarra Yarra to Holbrook Duplication
Heritage

FILE No.	DRAWING	PRINTED DATE	SHEET No.
	001_Sheet_H.dgn	8/9/2006	001

REGISTRATION NUMBER
0002.186.EP.0507

K:\Design\H2_Hume_Hwy_Project\Constructs\yarra yarra\Vol_1\001_Sheet_H.dgn $USERS 8/9/2006