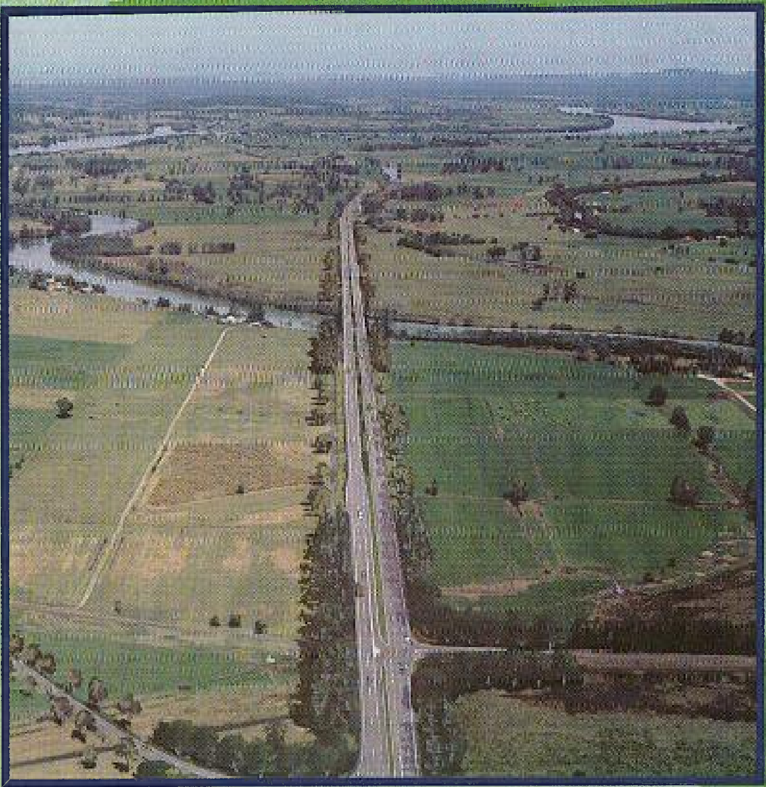
Pacific Highway Coopernook traffic relief route : environmental impact statement

RTA

ENVIRONMENTAL IMPACT STATEMENT

PACIFIC HIGHWAY COOPERNOOK TRAFFIC RELIEF ROUTE



MAIN VOLUME

Prepared by
Connell Wagner

Roads and Traffic
Authority
of NSW

Pacific Highway
Coopernook Traffic Relief Route

Environmental Impact Statement

Prepared by
©
CONNELL WAGNER PTY LTD
ACN 005 139 873
116 Military Road
NEUTRAL BAY NSW 2089
TEL: (02) 9465 5599
FAX: (02) 9465 5598

September 1997

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

PART 1

PART 2

Form 8

Submission of
Environmental Impact Statement (EIS)
prepared under the Environmental Planning and Assessment Act 1979
Section 112

EIS prepared by

name	John Brockhoff
qualifications	BSc (Hons) MEnvPlan MRAPI MEIA
address	Connell Wagner Pty Ltd 116 Military Road Neutral Bay NSW 2089
in respect of	

Part 5 activity

proponent name	Roads and Traffic Authority of NSW
proponent address	1 Mort Street Port Macquarie NSW 2444
land on which activity to be carried out:	All land required for the construction and operation of the proposed highway is shown on Figure 5.2.
proposed development:	Construction and operation of a high standard dual carriageway road between Jones Island and Two Mile Creek Road which bypasses the village of Coopernook and includes a bridge crossing of the Lansdowne River and intersections where the new road crosses Harrington Road and connects with the existing Pacific Highway.

Environmental Impact Statement

☒ an Environmental Impact Statement (EIS) is attached

Certificate

I certify that I have prepared the contents of this Statement and to the best of my knowledge

- it is in accordance with clauses 84 and 85 of the Environmental Planning and Assessment Regulation 1994, and
- it is true in all material particulars and does not, by its presentation or omission of information, materially mislead

Signature	John O. Brockhoff ....
name	John Brockhoff
date	15 / 9 / 97

Form 2	**Submission of**
	Environmental Impact Statement (EIS)
	prepared under the Environmental Planning and Assessment Act 1979
	Section 77

EIS prepared by

name	John Brockhoff
qualifications	BSc (Hons) MEnv Plan MRAPI MEIA
address	Connell Wagner Pty Ltd 116 Military Road Neutral Bay NSW 2089
in respect of	

Development Application

applicant name	Roads and Traffic Authority of NSW
applicant address	1 Mort Street Port Macquarie NSW 2444
land to be developed: address	
lot no, DPMPS, vol/fol etc	Lot 1 DP957426 and Lot 55 DP754415 Coopernook, Parish of Harrington
proposed development	The construction and operation of that portion of the proposed dual carriageway Pacific Highway Bypass of Coopernook which bridges SEPP 14 Wetland No. 545 at Coopernook Creek as shown on Figure 5.2 of the EIS.

Environmental Impact Statement	☒ an Environmental Impact Statement (EIS) is attached

Certificate

I certify that I have prepared the contents of this Statement and to the best of my knowledge

- it is in accordance with clauses 51 and 52 of the Environmental Planning and Assessment Regulation 1994, and
- it is true in all material particulars and does not, by its presentation or omission of information, materially mislead

Signature	John O. Brockhoff ....
name	John Brockhoff
date	15/9/97

G

GLOSSARY

GLOSSARY

AADT	Annual Average Daily Traffic volume representing the total traffic in both directions at each location, calculated from mechanically obtained axle counts. A recorded vehicle represents a mechanical count of two axles and adjustments are made for seasonal variations in traffic flow.
ADT	Average Daily Traffic based on survey counts and not adjusted as for AADT.
AEP	Annual Exceedence Probability refers to the probability of a flood event exceeding a nominated level in a year. A 1% AEP is the probability of an event exceeding a nominated level in 100 years.
AHD	Australian Height Datum
Acid Sulphate Soils	Naturally acid clays, mud and other sediments usually found in swamps and estuaries. They may become extremely acidic when drained and exposed to oxygen, and may produce acidic leachate and runoff which can pollute receiving waters and liberate toxins.
Air Blast Overpressure	Peak response linear (unweighted) level in frequency range 2 Hz to 20 Hz of a pressure wave propagating through air arising from blasting (Unit: dBL).
Alluvial Soil	Juvenile soils formed by deposition from still or moving water. Little pedological development beyond some accumulation of organic matter at the surface.
Ambient Noise	The background noise at a point being a composite of sounds from near and far.
ANZECC	Australian and New Zealand Environment and Conservation Council
Arboreal	To live in, or be connected with, trees.
ASS	Acid Sulphate Soils.
Atmospheric dispersion	The processes by which gaseous pollutants discharged into the atmosphere are diluted. These processes include diffusion, which involves the spreading out of the pollutant from the point of discharge, and transport by wind.
Attenuation	The reduction in sound pressure level magnitude during transmission (eg. around a barrier or over a distance outdoors). (Unit: dB, dBA).
Background Noise Level	The A-weighted ambient sound pressure level in the absence of the sound under investigation exceeded for 90% of the measurement period. Normally equated to the average minimum A-weighted sound pressure level. Symbol L_{A90}. (Unit: dBA).

Basalt	Volcanic extrusive rock type with fine grained structure and dark minerals. Usually a very hard rock which may weather to form fertile soils.
Batter	The side slope of walls, embankments and cuttings etc. or the degree of such slope, usually expressed as a ratio of horizontal distance to 1 vertical height.
Benefit Cost Ratio	The ratio of the present value of benefits to the present value of costs of a project.
Berms	A ledge formed at the top, bottom, or intermediate level of an earth slope.
Biological Diversity	The broad variety and relative abundance of plant and animal life in a nominated area; encompasses diversity at genetic, species, ecosystem and habitat level (or Biodiversity).
Bund Wall	A wall erected to prevent the escape of stored liquids into the environment.
Canopy	The uppermost layer of foliage formed by the crowns of trees.
Carriageway	That portion of a road or bridge used by vehicles (inclusive of shoulders and auxiliary lanes).
Catalytic converter	A vehicle emission control system which reduces levels of hydrocarbons, nitrogen oxides and carbon monoxide in exhaust gases.
Contour Drain	A surface drain designed to slow the rate of runoff by diverting water along a gently sloped path, from a construction site to nearby stable areas at a discharge velocity that will not cause erosion.
Culvert	One or more adjacent, enclosed channels for conveying a stream below road formation level.
Cut	The material excavated from a cutting.
Decibel	A scale unit used in the comparison of powers and levels of sound energy. The number of decibels is 10 times the logarithm to the base of 10 of the ratio of the powers. (Unit: dB).
Diversion drain	A drain leading water away from a given area.
Dual Carriageway	A highway or road with separated carriageways for traffic travelling in opposite directions.
Ecosystem	A functional unit of energy transfer and nutrient cycling in a given place such as a forest or estuary; it includes all the relationships within the biotic community and between the biotic components of the system.

RTA

ROADS & TRAFFIC AUTHORITY

GREATER TAREE CITY COUNCIL

Development Proposal and Assessment of Environmental Impact of Proposed Coopernook Traffic Relief Route Pacific Highway

PUBLIC EXHIBITION

The Roads and Traffic Authority (RTA) proposes to construct a four lane divided carriageway bypass of Coopernook. The proposal includes new bridge crossings of the Lansdowne River and Coopernook Creek and new intersection and access arrangements linking Coopernook, Harrington Road and the Pacific Highway.

Environmental assessment of the proposal has been undertaken in terms of both Part V and Part IV of the Environmental Planning and Assessment Act.

The RTA is the proponent and nominated determining authority for the Part V component of the proposal.

In the vicinity of Coopernook Creek, the proposal would involve the bridging of Wetland No. 545 as identified under State Environmental Planning Policy No. 14. This part of the proposal is designated development and the RTA, as the applicant, has lodged a development application with Greater Taree City Council as the responsible consent authority for the Part IV component. The affected wetland is located on the following properties: Lot 1, DP957426 and Lot55, DP754415

Environmental aspects of the proposal have been examined and an Environmental Impact Statement has been prepared. The EIS and an associated Appendix volume will be on public display from 15th of October until 26th of November at the following locations during the hours shown:

COOPERNOOK POST OFFICE
Macquarie St, COOPERNOOK,
NSW 2426
Monday - Friday 9.00am - 4.30pm
closed 1.00pm - 2.00pm

ROADS AND TRAFFIC AUTHORITY *
Major Projects Branch
1 Mort St,
PORT MACQUARIE,
NSW 2444
Monday - Friday, 9.00am - 4.30pm

ROADS AND TRAFFIC AUTHORITY
Motor Registry
cnr Central & Barton Rd,
PORT MACQUARIE
NSW 2444
Monday - Friday, 9.00am - 4.30pm
Saturday, 8.30am - 12.00pm

NATIONAL PARKS AND WILDLIFE SERVICE
Head Office
30 Bridge St, HURSTVILLE,
NSW 2220
Monday - Friday 9.00am - 4.30pm

DEPARTMENT OF URBAN AFFAIRS & PLANNING
Gov. Macquarie Tower
1 Farrer Pl, SYDNEY,
NSW 2000
Monday - Friday, 9am - 4.30pm

DEPARTMENT OF URBAN AFFAIRS & PLANNING
251 Wharf Rd, NEWCASTLE,
NSW 2300
Monday - Friday, 9am - 4.30pm

NSW GOVERNMENT INFORMATION CENTRE
Cnr Phillip & Hunter St, SYDNEY, NSW
2000
Monday - Friday, 9.00am - 4.30pm

ROADS AND TRAFFIC AUTHORITY *
Ground Floor, Centennial Plaza
260 Elizabeth St, SURRY HILLS,
NSW 2010
Monday - Friday, 9.00am - 4.30pm

ROADS AND TRAFFIC AUTHORITY *
Major Projects Branch
47 Darby St, NEWCASTLE,
NSW 2300
Monday - Friday, 9.00am - 4.30pm

ROADS AND TRAFFIC AUTHORITY *
Pacific Highway Development Office
21 Prince St, GRAFTON,
NSW 2460
Monday - Friday, 9.00am - 4.30pm

GREATER TAREE CITY COUNCIL
2 Pulteney St, TAREE,
NSW 2430
Monday - Friday, 9.00am - 4.30pm

ROADS AND TRAFFIC AUTHORITY
Motor Registry
7 Macquarie St, TAREE, NSW 2430
Monday - Friday, 9.00am - 4.30pm
Saturday, 8.30am - 12.00pm

NSW ENVIRONMENT CENTRE
39 George St, SYDNEY,
NSW 2000
Monday - Friday, 10.00am - 4.30pm

* During the period of exhibition, copies of the EIS will be available for purchase for $20 (EIS only) and $25 (EIS and two Appendices) only at the asterisked locations below:

Any person may, before the 26th of November 1997, make written submissions in relation to the development application. Where a submission is by way of objection, the grounds of objection are to be specified. Any person who makes a submission by way of objection and who is dissatisfied with the determination of the consent authority to approve the proposal, may appeal to the Land and Environment Court. Submissions regarding the designated development (wetlands section) should be directed to Greater Taree City Council in its capacity as consent authority for Part IV matters:

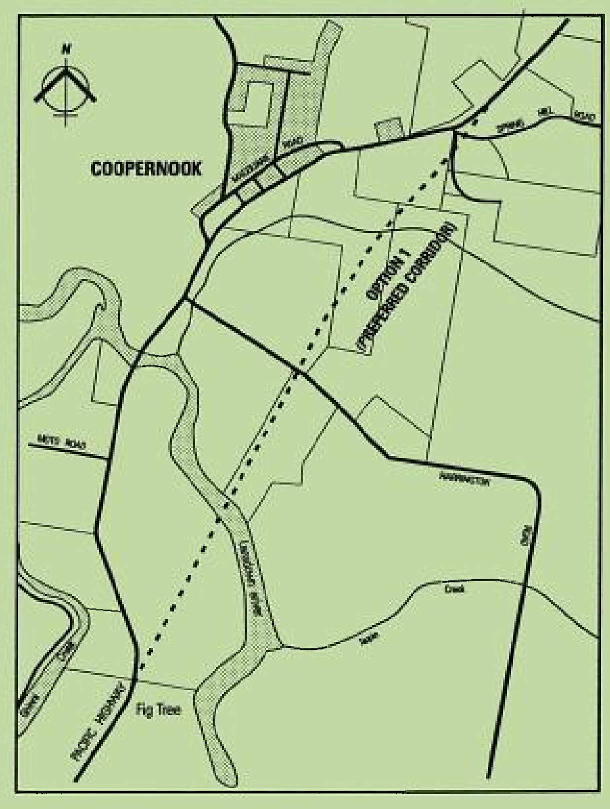
The General Manager
Greater Taree City Council
2 Pulteney St, TAREE 2430

Any person may, before the 26th of November 1997, make written submissions in relation to any aspect of the EIS to the RTA. Such submissions should be directed to:

Mr Jeff Thompson
Roads and Traffic Authority
1 Mort St, PORT MACQUARIE, NSW 2444

Copies of all submissions received by the RTA or Greater Taree City Council will be referred to the other responsible party. The name and address of any person or organisation from which a submission is received may be published in subsequent assessment reports unless clear indication is given that the information is not to be published.

Further information can be obtained from Jeff Thompson (RTA) on (065) 803418



EMP	Environmental Management Plan
Ecologically Sustainable Development (ESD)	Development that maintains and improves the total quality of life. Development both now and in the future in a way that maintains the ecological processes on which life depends. Key components of ESD are intergenerational equity, maintenance of biodiversity, improved economic evaluation of environmental costs and benefits and the precautionary principle.
EPA	Environment Protection Authority (NSW) (formerly State Pollution Control Commission).
Equivalent Continuous Sound Level	Of a fluctuating sound over an extended time interval: the constant sound level which, when operating over the same time interval, is equivalent to the same sound energy. (Symbol: L_{Aeq}), (Unit: dBA).
Erosion	The wearing away of the land and removal of soil by running water, rain, wind, ice or other geological agents, including such processes as detachment, entrainment, suspension, transportation and mass movement.
Fill	The material placed in an embankment.
Floodplain	Flat large area of alluvium adjacent to a watercourse, characterised by frequent active erosion and aggregation by channelled and overbank stream flow.
Floristic	Refers to the species composition of a plant community.
Frequency	Similar to pitch of a musical note in sound pressure fluctuations of cycles per second (or Hertz). Most sounds contain a composite of frequencies of varying sound pressure level in the range 20 Hertz to 20,000 Hertz. (Symbol; f Unit: Hz).
FYRR	First Year Rate of Return. This is a measure of the benefits achieved in the first full year of a scheme's operation. The FYRR is typically used to determine the best start date for a scheme. If the project has a FYRR below the discount rate then the implementation of the scheme should be deferred until the FYRR either equals or exceeds the discount rate.
Grade Separation	The separation of a road, rail or other traffic so that crossing movements, which would otherwise conflict, are at different elevations.
Greenhouse Effect/Global Warming	The heating of the atmosphere by the absorption of infrared energy remitted by the Earth as it receives energy from the Sun.

Ground Vibration	Representing the combined speed of ground oscillation at a point from a source of vibration such as a blast or piece of mobile plant. (Unit: mm/s, m/s).
Habitat	The place where an organism lives; habitats are measurable and can be described by their flora and physical components.
Ha	Hectare.
Interchange	A grade separation of two or more roads with one or more interconnecting carriageways.
Invert	The level at the lowest point of a drain, culvert, pipe or channel.
km	Kilometre.
km^2	Square Kilometre.
km/h	Kilometres per hour.
L_{AN}	Percentile sound level of fluctuating sound pressure (usually A-frequency-weighted and Fast time response) on the level which is exceeded for N% of the observing time. Common measures are: L_{A1}, L_{A10}, L_{A50} and L_{A90} (Unit: dBA).
L_{A1}	The A weighted sound level exceeded for 1% of the measurement period. (Unit: dBA).
L_{A90}	The A weighted sound level exceeded for 90% of the sample period and referenced as the "average minimum or background noise level". (Unit: dBA).
L_{A10} (18 hour)	Arithmetic average of L_{10} noise levels for each 18 hour sampling period from 6.00am to midnight. (Unit: dBA).
L_{Aeq} (24 hour)	Equivalent continuous noise level over any 24-hour period. (Unit: dBA).
L_{Aeq} (8hr)	Equivalent continuous noise level over the eight hour period between 10.00pm to 6.00am. (Unit: dBA).
L_{Amax}	Maximum A-weighting noise level during a single event such as truck pass by or hammer impact (Unit: dBA).
Level of Service (LOS)	Level of Service is a description of traffic conditions and flow. It ranges from the highest level of service A, (a condition of free flow, high manoeuvrability and comfort), to the lowest level of service F (a zone of forced flow, breakdowns and delays).
m	Metre.
mAHD	Metres above AHD.

mm	Millimetre.
m/s	Metres per second.
m^3/s	Cubic metres per second (of flow).
Median	A strip of road not normally intended for use by traffic, which separates carriageways for traffic in opposite directions.
Net Present Value (NPV)	The present value of benefits less the present value of costs.
Numerical Model	A mathematical representation.
Overstorey Association	The species comprising the tallest structural layer in a flora.
Ozone	A type of pollution (when occurring in the lower atmosphere) produced when emissions of nitrogen oxides and hydrocarbons react in the presence of sunlight to form ozone and other oxidants.
PASS	Potential Acid Sulphate Soils.
pH	A measure of degree of acidity or alkalinity expressed on a logarithmic scale of 1-14 (1 - acid; 14 - alkaline).
Photochemical smog	A type of pollution produced when emissions of nitrogen oxides and hydrocarbons react in the presence of sunlight to form ozone and other oxidants.
PM_{10}	Usually airborne particulate matter less than 10μm (microns or one millionth of a metre) in diameter, a measure of dust.
Sedimentation Basin	An area where runoff is ponded to allow sediment to be deposited. The longer the period that the runoff is held, the smaller the size of the sediment deposited. Such basins have to be cleaned regularly.
Shoulder	The portion of the carriageway beyond the traffic lanes adjacent to the land flush with the surface of the pavement.
Solatium	Token sum given in compensation for inconvenience to property.
Sound Level	The level of the frequency-weighted and time-weighted sound pressure, as determined by a Sound Level Meter. Symbol: L_A, L_{AC} etc. (Unit: dBA, dBC).
Sound Level Meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance, and designed to measure a frequency-weighted and time-weighted value of the sound pressure level.
Sound Power Level	10 times the logarithm to base 10 of the ratio of the energy emitted by a sound source per unit time to the reference sound power. Symbol: Lw or SWL. (Unit: dB).

Sound Pressure Level	20 times the logarithm to the base 10 of the ratio of the root mean square sound pressure to the reference sound pressure. Symbol: L_p. (Unit: dB).
State Environmental Planning Policy No. 14 (SEPP 14)	Policy prepared under the Environmental Planning and Assessment Act (1979) for the protection of identified coastal wetlands in NSW.
Stone Artefact	Fragment of a stone (used by Aborigines) which generally possesses one or more of the following characteristics: positive or negative ring crack, distinct positive or negative bulb of force, definite eraillure scar in a position beneath a platform or definite remnants of flake scars.
Understorey	That layer of vegetation that forms the protective cover of foliage beneath the tree canopy. The understorey usually includes the groundlayer and shrub layer.
Weighting	This usually refers to the frequency weighting characteristics of a Sound Level Meter. A and C weighting filter the measured sound pressure level to varying degrees at different frequencies over the audio frequency range from 20 Hz to 20,000 Hz. A-weighting is commonly used since it is supposed to correlate to the response of the human ear. A Linear (Lin) weighting means that the measured acoustical signal has no relative filtering over the frequency range of interest. The weighted sound pressure levels obtained by the use of weighting networks A, C and Lin are customarily designated dBA, dBC, dBLin.
Wetland	Land either permanently or temporarily covered by water. The areas are usually characterised by vegetation of a moist-soil or aquatic type.

E

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Introduction

The Roads and Traffic Authority (RTA) is proposing to construct a dual carriageway highway bypassing the village of Coopernook and constructing a new bridge over the Lansdowne River. This Environmental Impact Statement (EIS) addresses the effects of constructing and operating the proposed road which extends for 4.5km parallel to and approximately 0.8km east of the existing highway.

The EIS has several main components including a review of the need for a traffic relief route (Section 3), definition of the project objectives (Section 3), consideration of alternative highway routes (Section 4), concept design of the preferred route (Section 5) and assessment of the environmental, economic and social impacts of the preferred route (Section 6).

The Proposal

The proposal is to construct a four lane dual carriageway highway which will extend along a 4.5km route over mostly pasture on the northern edge of the Manning River floodplain and include a new crossing over the Lansdowne River near the village of Coopernook. The preferred route (Option 1, refer Figure 1.2) extends from 1.5km south of Moto Road where it will tie-in with the existing Pacific Highway, then takes a straight course north across the floodplain to bridge over the Lansdowne River. A large radius curve links the proposed road with the existing highway to tie-in near Two-Mile Creek Road.

The proposed Bypass would span the Lansdowne River approximately 700m downstream of the existing bridge which is proposed to be removed. A link for the Moto Road-Coopernook journeys would be available via the proposed highway bridge and Harrington Road. The connection between Coopernook and the highway to the south would be possible via the same link, making the existing bridge redundant. Following consideration of transport, maintenance, environmental and heritage factors the bridge is proposed to be dismantled.

An at grade "staggered-T" intersection is proposed to link Harrington and Coopernook with each other and the proposed highway. This intersection would incorporate a landscaped feature entrance for the village of Coopernook. At the northern end of the proposal, "T" intersections are proposed for the existing Highway and Spring Hill Road. Other connections with the proposed highway would not be necessary.

The proposal would require acquisition of around 30ha of rural land for the road reserve of which approximately half would be directly disturbed by the highway construction. No houses would be demolished to construct the road.

The Environmental Impact Statement

The proposal will be assessed under both Parts IV and V of the Environmental Planning and Assessment Act, 1979.

The bridge crossing of Coopernook Creek affects SEPP 14 Wetland No. 545 and that part of the proposal is designated development, subject to the provisions of Part IV of the Act. A Development Application for this part of the proposal will be submitted to Greater Taree City Council, accompanied by this EIS. Following the exhibition of the Development Application and EIS and consideration of public representations, Greater Taree City Council will decide whether to grant development consent for this part of the proposal.

The remainder of the proposal is subject to the provisions of Part V of the Environmental Planning and Assessment Act. The RTA has considered the likely environmental impacts of the proposal on the environment and has concluded that they have the potential to be significant. Accordingly, the RTA has decided to prepare this EIS.

The EIS has been prepared to satisfy the requirements of both Parts IV and V of the Environmental Planning and Assessment Act. A decision on the proposal, either with or without modification, will be made on the basis of Council's decision on whether to grant development consent in relation to the wetland crossing and the decision of the Minister for Urban Affairs and Planning on whether to approve the proposal. The final determination on whether the proposal proceeds would be made by the RTA, if council consent and DUAP approval is achieved.

The EIS will be exhibited publicly under the requirements of both Part IV and V of the Environmental Planning and Assessment Act. Under Part IV, public submissions on the Development Application will be made to Greater Taree City Council. Under Part V, public representations on the proposal will be made to the RTA. Council and the RTA will provide copies of submissions and representations received to each other, to ensure that all issues raised are considered by both organisations.

Need for the Project

The Pacific Highway is the main road corridor along the North Coast of NSW. The Highway passes through many coastal towns and growing traffic volumes have resulted in impacts such as traffic congestion, accidents, community severance and road traffic noise becoming increasingly severe. Many sections of the Pacific Highway are deteriorating in terms of safety, capacity and asset condition and their ability to act as a major transport artery for commerce, tourism and social activity is diminishing.

The RTA North Coast Strategy and Pacific Highway Upgrade Program present an overall strategy and project development and construction program to address these deficiencies. The proposed Coopernook bypass, along with the constructed Taree Bypass and proposed upgrades between Cundletown and Moorland would jointly contribute to the provision of safe and uniform highway conditions across the Manning Valley. This project is consistent with the objectives of the Hunter Regional Environmental Plan and the Greater Taree Local Environmental Plan. The proposal is also consistent with the RTA Environment Policy with respect to addressing the ESD principles.

The Lansdowne River Bridge at Coopernook has been identified by the RTA as a significant traffic safety black spot on the Highway. The current speed limit falls to 80km/h near the village area and traffic lanes narrow to only 3m at the Lansdowne River Bridge preventing safe two way flow for wide heavy vehicles.

The existing route at Coopernook has a poor accident record with 49 reported accidents in the 5 year period from January 1992 to December 1996, including 2 fatalities and 13 injuries. The casualty accident rate for the study section (38 per 100MvK) is more than double that experienced at an adjacent section of the Pacific Highway, owing particularly to the narrow Lansdowne River Bridge where the two fatalities occurred in 1992.

Traffic volumes in the Coopernook area were forecast over the next 30 years. The existing Annual Average Daily Traffic (AADT) for the study area was calculated for the periods 1994 and 1996 at 8,488 and 9,366 vehicles respectively. The predicted AADT for the year 2016 is 15,173 vehicles and 18,076 for the year 2026. This prediction of traffic growth at around 3.1% per annum would result in degradation of the level of service (LOS) from Level D at present to Level F by 2026. The proposed dual carriageway highway would have an estimated LOS of Level A to beyond 2026.

Corridor Selection

Comparison of the corridor options was based on a variety of environmental, traffic, economic and social impact assessments (see Section 4 and Figure 1.2) as well as road user economic appraisal. The selection of a preferred corridor was based on achieving a balance between road transport objectives and the cost of road construction while minimising the environmental and social impacts.

Following a review of previously defined corridors and an analysis of constraints and opportunities in the study area, three corridor options were identified:

Option 1 would involve construction of a new highway up to 800m east of the existing highway alignment and a new bridge crossing east of the existing Lansdowne River Bridge. This is the shortest option at 4.3km and would involve 5 new intersections, a bridge for crossing Coopernook Creek and SEPP 14 Wetland No. 545, installation of a series of culverts, and around 30ha of land acquisition. No houses would be demolished. The new bridge over the Lansdowne River would be 190m long and located about 400m downstream of the existing highway bridge.

Option 2 would involve construction of a new highway in and adjacent to the corridor of the existing alignment of the Pacific Highway around the eastern edge of the village of Coopernook. This option extends for 4.8km and would involve possible diversion of the western bank of Coopernook Creek near Harrington Road, crossing the floodplain near the existing highway embankment and installation of a series of culverts or viaducts. This option would also require 10-20ha of land acquisition, acquisition of 6 dwellings and 2 commercial properties, 5 new intersections and construction of service roads to segregate local and through traffic. The new bridge crossing the River would be 160m long and located immediately downstream of the existing bridge.

Option 3 would involve construction of a highway between Options 1 and 2, immediately east of Coopernook Creek. This route is approximately 4.6km in length and would involve up to 34ha of land acquisition, installation of series of culverts or viaducts, and up to 5 new intersections. The Bridge over the Lansdowne River would be approximately 150m long and located 150-200m east of the existing bridge.

The corridor options have been developed to a concept level to confirm their feasibility and to allow preparation of cost estimates. The road user economic assessment of the options indicates that all have a positive benefit-cost ratio. Option 1 is the shortest route and gives the greatest road user benefits. It offers the highest return on expenditure by a small margin over Option 3 although it is more costly. Option 3 would be superior to Option 2 because it has a lower cost and higher benefits due to the shorter route length.

Key planning and environmental factors were included in a comparative assessment of the corridors. All options were evaluated in terms of level of service, safety, flexibility, disruption during construction, land and property effects, community impacts, local access changes, natural environment impacts, traffic noise, visual impact, heritage and business effects. The above criteria were identified and weighted with substantial input from the community and other stakeholders (Value Management Study, focus group, public surveys). This weighted factor analysis revealed Options 1 and 3 to be the most suitable of the corridors examined with Option 1 being the best rated. Option 2 was clearly the worst performing of the alternatives, mainly due to its greater impact on the Coopernook village area, particularly in relation to traffic noise and community severance.

Community submissions as well as a survey conducted at an exhibition at Coopernook indicated a significant majority of the community responding favoured Option 1. It was recommended that Option 1 represented the most suitable long term corridor for this section of the Pacific Highway. This recommendation was formally announced as the preferred option by the then Minister for Roads, Mr Michael Knight, in October 1996.

Community Consultation

Consultation with the local community and other stakeholders is an important part of the EIS process. A programme of public information, consultation and participation was incorporated in the option selection phase to ensure that the concerns of local residents, businesses, farmers, road users and a range of interest groups were taken into account in the assessment. The following activities formed the basis of the community consultation programme:

- public notices and media releases
- community representatives involvement in a Value Management Study
- provision of a community telephone hotline for direct enquiries
- distribution of community newsletters
- formation of a contact list
- advertised open public meetings
- calls for written submissions by individuals and interest groups
- interviews with affected individuals, businesses, property owners and interest groups
- community focus group meetings
- an open house public display attended by the study team
- meetings with authorities and interest groups

The issues raised by the community were taken into consideration at key stages in the study including the corridor selection process and while refining the concept design. Specific contributions were also made in locating the route so as to minimise impacts on individual properties and the environment. The public exhibition of the EIS provides a further opportunity for community input to the project.

Land Use, Property and Business Impacts

The preferred option would directly affect 6 rural properties used primarily for dairy and beef production. The impact of the bypass options on agricultural production include the direct loss of land and productive capability as well as the indirect effect of land severance on property management and operations including the loss of access to public roads and other parts of the farm. A total of 13.2ha of moderate to high agricultural capability land would be removed from production as a result of the highway embankment.

The current level of business activities and employment in Coopernook were assessed in terms of local trade and trade associated with through traffic. To assess the impact of the proposed bypass on current business and employment within Coopernook a survey of business operators as well as customers was conducted. Based on the results of this survey, the business effects will be the most severe on service stations and businesses most reliant on passing trade for turnover.

To address the potential for a reduction in turnover by highway related business, the proposal includes a landscaped feature entrance for the town, provision for signage and support for the development of a community based landscape strategy for the highway.

From a regional perspective it is anticipated that the loss in turnover and expected job losses at Coopernook would transfer to other locations or businesses in the Taree Region. Although the anticipated loss of business in Coopernook as a result of the proposed bypass could not be directly offset against the environmental and amenity benefits derived from the diversion of traffic, it would generally increase the attractiveness of the village. The environmental benefits derived from the diversion of traffic could induce new business opportunities and also increase the role of Coopernook as a residential satellite of Taree.

Noise

The construction of a dual carriageway highway would result in an altered traffic noise environment. The EIS examined a number of rural/residential properties that could be potentially exposed to road traffic noise and construction and vibration noise from the proposal. The noise study has shown that some amelioration measures should be considered at several exposed locations based on their cost and effectiveness.

During the construction of the road and road bridge over the Lansdowne River, there would be localised adverse noise impacts at properties where earthworks and road construction activities take place adjacent to several exposed residences. Noise impacts from these activities, which are considered to be transient and short term, would be minimised through planning and programming of the road works, controlled hours of construction and consultation with the occupiers of the affected buildings. From the findings of the vibration assessment for the construction activities, it is not envisaged that there would be any adverse impacts from ground vibration.

The relocation of the Pacific Highway traffic some 800m east of the village would result in a significant reduction of the noise, dust, safety and visually intrusive impacts of a major highway, resulting in an improved noise environment for the residents and businesses of the village.

Hydrology And Water Quality

The highway would be designed to have one carriageway in each direction open in the 1 in 20 year ARI flood. This would require the design of the centerline of each carriageway to be built approximately 2.4m AHD, around 1.5m above the floodplain. Sufficient culverts would be designed to ensure that floodwaters could pass beneath the road without exacerbating the existing flood conditions.

The drainage characteristics of Coopernook Creek wetland would not alter significantly due to the provision of a 170m long bridge over Coopernook Creek and the adjacent SEPP14 wetland area.

The issue of disturbance and possible oxidisation of Potential Acid Sulphate Soils (PASS) is addressed with regard to excavation of proposed roadworks. The soils on the proposed alignment to the south of the Lansdowne River will require substantial treatment (eg: lime stabilisation) during drain construction to minimise the potential for acid leachate runoff. An Acid Sulphate Soil Management Plan is proposed to be incorporated in the Environmental Management Plan for the project.

The road construction will involve minimal disturbance of soils other than compaction and consequent dewatering of the surface layer beneath the road. As a result of high soil permeability, patterns of groundwater flows are not anticipated to alter across the floodplain.

The excavation of bridge abutments and trenching to reinstate the local drainage network of the floodplain would have potential to locally lower the water table where these works are outside the influence of existing drains. Based on the surface and groundwater quality and soil testing results to date the potential for water and groundwater pollution as a result of construction is not significant in the immediate vicinity other than that associated with potential acid sulphate soil conditions.

Water quality in the study area could be affected following opening of the bypass as a result of contaminated run-off from the road pavement. Once opened, runoff and spillage from the road in the immediate catchment of the Coopernook Creek wetland and Lansdowne River would be intercepted by water pollution control basins. These basins would be designed to avoid contamination of groundwater and water courses in the area. The proposed water quality mitigation measures of the bypass would be a considerable improvement on the existing highway conditions.

Biological Environment

The biological environment of the study area has been significantly altered from its condition prior to European settlement. Almost all land capable of supporting agriculture on the Lansdowne River floodplain has been cleared of its original vegetation.

The proposal would result in the destruction of approximately 15.8 hectares of plant communities. This would comprise removal of approximately: 0.60 ha of Open Forest (1), 0.76 ha of Open Forest (2), 0.12 ha of Melaleuca Forest, 0.76 ha of Casuarina woodland, 0.14 ha of Semi-Permanently Inundated Wetland, 0.13 ha of Occasionally Inundated Pasture, 13.2 ha of rural pasture (occasional trees) and 0.09 ha of mangroves.

The loss of 1.36 ha of Open Forest communities for the construction of the bypass is not considered significant with respect to botanical criteria given the widespread occurrence of this community in the locality. The open forest on site is considered to be of low conservation significance given its low species diversity, grazed and trampled understorey in some areas and high degree of fragmentation.

The disturbance to 0.12 ha of Melaleuca Forest adjacent to the Pacific Highway is not considered to be of high significance given the high local and regional representation of this community, particularly in Crowdy Bay National Park. The area affected occurs in a drainage line formed between the Pacific Highway and a small dam adjacent to Spring Hill Road. The strip (13.2ha) of pasture with occasional trees which would be affected by the proposal is of no botanical conservation significance.

The proposal would directly affect part of a SEPP 14 wetland including areas of Casuarina woodland. This community is considered to be adequately reserved in the region. The wetland communities on site are considerably degraded due to ongoing stock access and grazing. By bridging the wetland, existing flowpaths would be unaffected and an opportunity would exist for regeneration of the wetland. A large proportion of the area affected by the proposed bridge would be reinstated with casuarinas and mangroves planted up to and alongside the bridge. Regeneration of open forest and wetland habitat of up to 12 hectares is proposed near the wetlands of Coopernook Creek to compensate the loss of native plant communities.

The alignment of the proposed highway was chosen with consideration for the condition of the various stands of vegetation traversing the study area and the habitat they represent. The areas of wetland and open forest affected are already cleared or disturbed through fragmentation, weed infestation, grazing, human activity, exposure to domestic predators and Highway and local traffic. By adopting the preferred alignment, a balance is achieved which restricts habitat impacts to already degraded bushland and minimises the disturbances to the human environment of Coopernook.

The dual carriageway proposal would create a marginally wider barrier to the movement and dispersal of fauna than the existing Pacific Highway. This increased barrier effect due to the proposal would be primarily restricted to the bushland at the northern end of the route as the open pasture over the rest of the study area is unlikely to be traversed regularly by terrestrial fauna given the absence of plant cover. However, by overlaying a section of the proposed highway on the existing Pacific Highway, the cumulative barrier to fauna movement at the northern end of the route is reduced.

Section 5A of the Environmental Planning and Assessment Act, 1979 sets out eight factors to be considered in deciding whether there is likely to be a significant effect on threatened species, populations or communities, and whether or not a Species Impact Statement is required prior to a development being approved. Upon application of the eight-part test to threatened fauna species likely to occur in the study area, it was concluded that a Species Impact Statement is not required for the proposal (refer Appendix M).

Visual Impacts

The proposed road would create an intrusive road feature into a widespread pastoral environment. Two houses would have their views affected by the road construction located immediately to the west and east of the proposed bridge. The elevated embankment would prevent pleasant foreground pastoral views across the river flat.

Where the road would be near residents there would be negative impacts in visual and landscape terms, experiencing in most cases a loss of pastoral views and rural character and some visual and landscape segregation from adjacent properties and Coopernook.

The maturing of the proposed landscape works would reduce the visual impact of the bypass over time. There would also be amenity benefits to the majority of Coopernook residents with an improved landscape and neighbourhood amenity within their town due to reduced traffic and improved amenity due to reduced noise, improved safety and the opportunity for landscape enhancement of the existing highway. Should the project proceed the visual impacts would be addressed through the implementation of the landscape concept plan and town entrance feature.

Heritage Impacts

The identification of heritage items within the study area that would potentially be affected by the proposal has been undertaken using a variety of sources. The Coopernook village area and surrounds includes a range of items which demonstrate the scale and character of township associated with the timber industry in the late nineteenth century. The following items have been identified as being of potential heritage significance: Coopernook Urban Area, Coopernook School of Arts Hall, Coopernook Police Station and former Courthouse, Macquarie Street, Coopernook Hotel, St Lukes Anglican Church, Anglican Rectory, Bascule Bridge over the Lansdowne River, remains of timber wharf and General Cemetery.

There would be no direct impact on any item within the Coopernook Village area. There would be a net reduction in traffic passing through the Village which may result in some indirect impacts such as loss of passing trade for businesses and improved amenity in the Village. There would be an indirect impact and benefit in relation to the general cemetery as a result of changes to access. However, reduced exposure of Coopernook Hotel may indirectly affect its long term potential to operate as a hotel. There would be no effect on the remains of the timber wharf.

A number of options regarding the future of the Lansdowne River Bridge were assessed including the retention of the Bridge in its current state, retention of the Bridge with an operative span or demolition of the bridge (refer Appendix S for detailed heritage assessment of the Bridge). The assessment concluded that while the demolition of the Bridge would have an adverse impact on an item of local heritage significance, it was the preferred option on a range of factors.

As the bridge is redundant with respect to its traffic function and will attract a significant maintenance and upkeep liability, the Coopernook Bypass project incorporates its removal. The EIS includes the assessment of the environmental and heritage impacts of the bridge removal under Part V of the EPA

Act.

The following mitigation measures with respect to heritage would be put in place prior to demolition of the Bridge: detailed photographic recording of the existing Bridge structure would be undertaken and archived, and means would be investigated by which interpretation of the Bridge structure could be provided to the local community (viz. signage at Bridge site, display in local museum). Prior to any works being undertaken, a survey of the original bridge alignment (viz. the timber bridge constructed in 1884) would be undertaken by an archaeologist to locate any existing remains of the original bridge structure and develop mitigation measures to protect any such relics during construction works. Other environmental management measures to prevent pollution during dismantling would be incorporated in the construction stage EMP.

Aboriginal Archaeology

An aboriginal artefact scatter has been discovered adjacent to Coopernook Creek. This site would not be disturbed by the proposed highway. Further sub-soil investigations would be undertaken for the Lansdowne River bridge abutments.

Other Impacts

This EIS has also investigated a range of other potential environmental impacts associated with the road construction. These include hazard and risk assessment, energy consumption, air quality, biological diversity and other current ecological issues. In each case, the impacts were found to not be significant or effective safeguards were defined to minimise adverse effects.

Public Exhibition

The EIS will be on exhibition at the following locations:

- Coopernook Post Office - Macquarie St, Coopernook
- RTA Centennial Plaza - 260 Elizabeth St, Surry Hills*
- RTA Major Projects - 1 Mort St, Port Macquarie*
- RTA Major Projects - 47 Darby St, Newcastle*
- RTA Pacific Highway Development Office - 21 Prince St, Grafton*
- RTA Motor Registry - cnr Central Rd and Barton Rd, Port Macquarie
- RTA Motor Registry - 7 Macquarie St, Taree
- Greater Taree City Council - 2 Pulteney St, Taree
- National Parks and Wildlife Service - 30 Bridge St, Hurstville
- Department of Urban Affairs and Planning - Gov. Macquarie Tower, 1 Farrer Pl Sydney
- Department of Urban Affairs and Planning - 251 Wharf Rd, Newcastle
- NSW Government Information Centre - Hunter St, Sydney
- NSW Environment Centre - 39 George St, Sydney

Copies of the EIS will be available for purchase at the locations marked with an asterisk above at a price of $20 (EIS only) or $25 (EIS and Appendices).

Submissions

Any person or organisation is invited to make a written response to this EIS. Submissions will be received during the exhibition period. Copies of all submissions received by the RTA or Greater Taree City Council will be referred to the other responsible party. Written submissions should be sent to the RTA with respect to the entire proposal or to Greater Taree City Council with respect to the

Development Application for the SEPP 14 wetland crossing at the addresses below:

Jeff Thompson
Roads and Traffic Authority
1 Mort St
PORT MACQUARIE, 2444

General Manager
Greater Taree City Council
2 Pulteney St
TAREE, 2430

1

INTRODUCTION

1. INTRODUCTION

1.1 Purpose and Scope of EIS

Connell Wagner was commissioned by the Roads and Traffic Authority (RTA) to prepare an Environmental Impact Statement (EIS) for a proposed Pacific Highway traffic relief route at Coopernook, 21km north of Taree (refer Figure 1.1). The route would extend for approximately 4.5km over mostly pasture on the northern edge of the Manning River floodplain including a crossing of the Lansdowne River near the village of Coopernook.

The EIS is required to define and assess the project in terms of a range of environmental, social, economic and engineering criteria in accordance with the statutory requirements of Part V of the Environmental Planning and Assessment (EP&A) Act (1979). The EIS addresses matters for consideration listed under Clause 82 of the EP&A Regulation (1994), as well as the form and content requirements identified by the Director, Department of Urban Affairs and Planning (refer Appendix A). That portion of the proposed highway which traverses a wetland identified under State Environmental Planning Policy 14 (SEPP No.14) is designated development and will be assessed under Part IV of the EP&A Act.

The EIS study has several main components including:

- a review of the need for a traffic relief route for the subject section of the Pacific Highway
- definition of the project objectives
- consideration of possible corridor locations
- selection and justification of a preferred corridor
- determination of a preferred alignment and design concept for the route
- assessment of the environmental, social and economic impacts of the preferred route
- description of the safeguards and mitigating measures to be adopted.

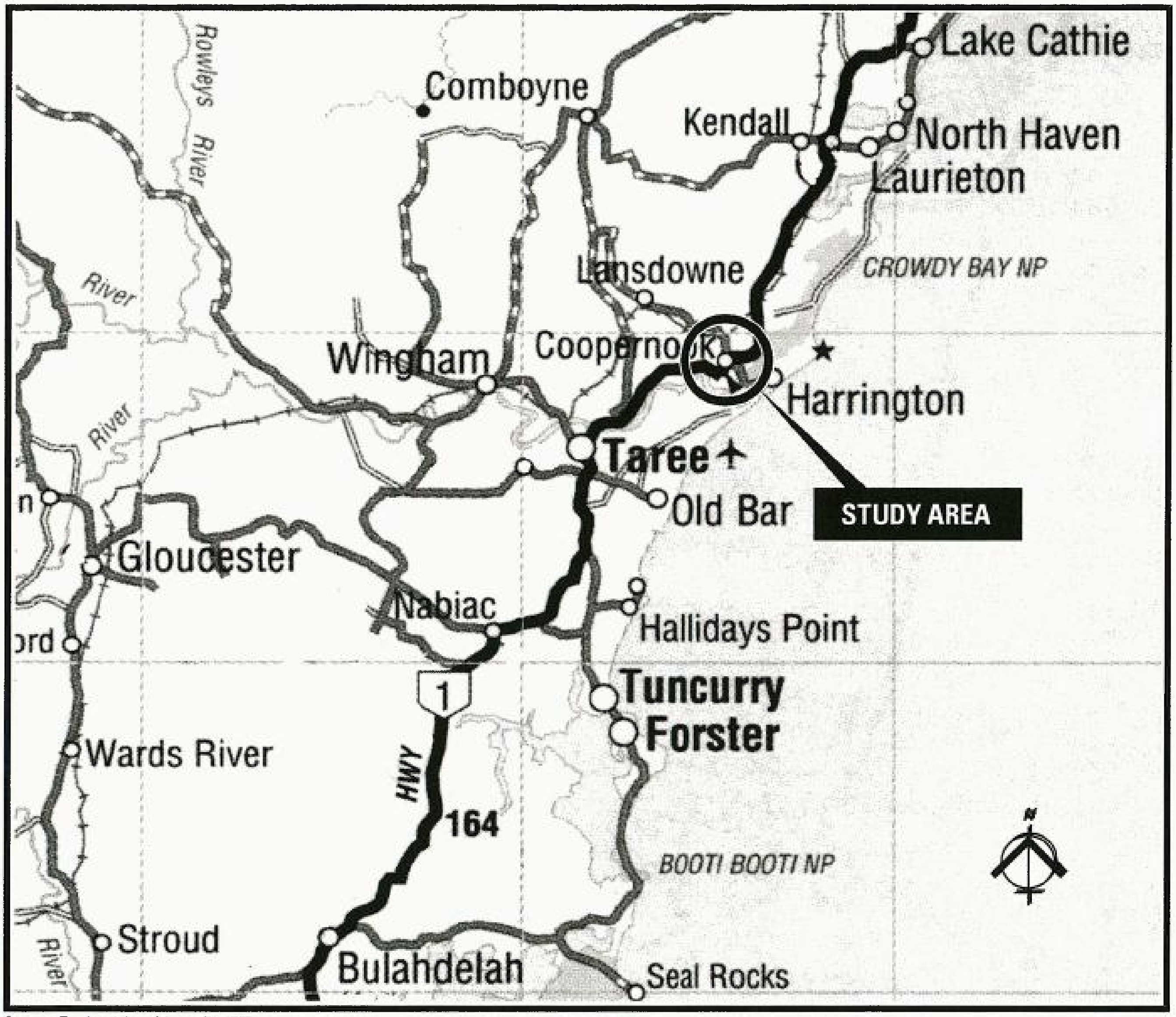
This EIS is the culmination of all the above study components with respect to the range of design and environmental parameters of significance both regionally and within the study area and local community.

The EIS provides a mechanism for the community to scrutinise the proposal and provides the Department of Urban Affairs and Planning, RTA and Greater Taree City Council with the basis for considering the project as well as providing a public record of the assessment process.

1.2 Background to the Proposal

This section of the Pacific Highway has a poor accident record, is subject to flooding, the road formation is narrow and travel efficiency is deteriorating due to traffic growth and speed restrictions. The Lansdowne River Bridge has been identified by the RTA as a significant accident black spot on the Highway. The Coopernook area is one of the key sections of the Pacific Highway on the North Coast which have been identified for priority treatment due to the deterioration of road conditions, traffic growth and the need for a high standard highway capable of managing the future transport needs of the area (North Coast Road Strategy, RTA, 1992).

A new crossing of the Lansdowne River and the upgrading of the Highway has been regarded by the RTA as necessary to meet level of service objectives for this section of the road both now and in the future.



Source : Touring Atlas of Australia 1995

Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 1.1 :
STUDY AREA

The approved route would be designed to accommodate a high standard dual carriageway with restricted access to minimise growing conflict between local and through traffic.

The project would create a consistent and higher (100 km/h) highway speed environment extending to the north and south of Coopernook.

The proposed highway project would aim to achieve road user benefits while minimising environmental and social costs to local residents, the wider community and the natural environment.

The Coopernook section of the Pacific Highway has been the subject of previous investigations. In 1991, the RTA prepared an Environmental Overview of the road conditions, natural environment and the town and rural communities of Coopernook (RTA, 1991). At that stage a range of traffic relief route options were derived and considered following consultation at community forums and with individuals. A Route Selection Report was also prepared by the RTA (1991). From a range of alternatives two town bypass options were developed including an eastern bypass extending straight between Figtree and Spring Hill (Option 1) and an inner bypass on and adjacent to the existing highway alignment (Option 2). The RTA subsequently adopted Option 1 as the preferred corridor.

Following the release of the RTA's North Coast Strategy and improvements to the Pacific Highway to the north and south, including upgrading at Moorland and the commencement of construction of the Taree bypass, improvements to the Highway at Coopernook emerged as a high priority.

Because any traffic relief route of Coopernook was considered likely to have a significant effect on the environment and the community, the RTA decided to prepare an Environmental Impact Statement (EIS) for the project.

A Value Management Study (VMS) for the project was held in October 1994 to bring together government and community stakeholders in the Project; to confirm the need for the road proposal; to identify and refine corridor options and to review factors which would play a role in determining the appropriate corridor option. A third corridor option (Option 3) located between the other corridors was developed during the VMS.

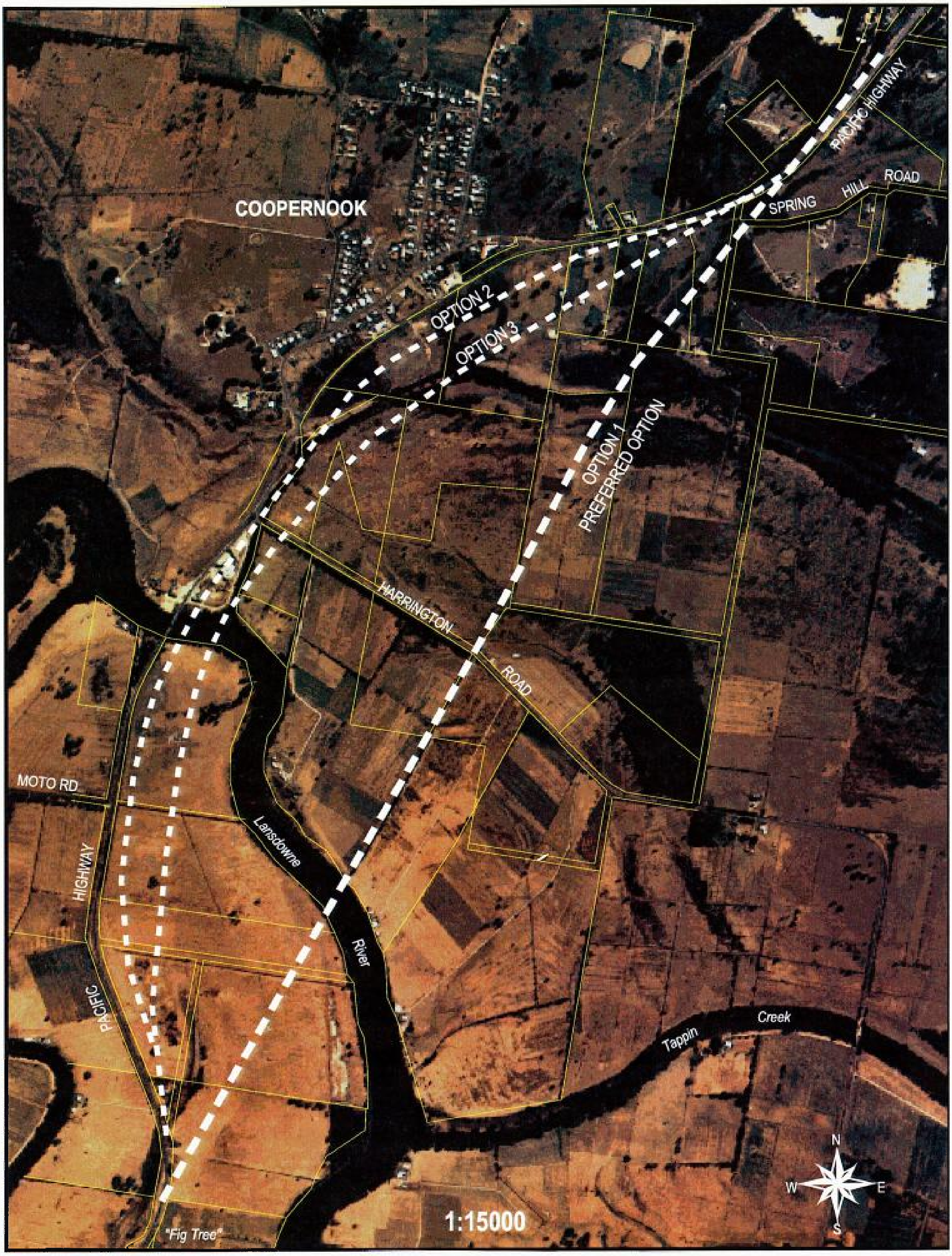
The three corridor options are illustrated on Figure 1.2.

1.3 Study Area

The study area (refer Figure 1.1) is located on the floodplain of the Lansdowne River in the delta of the Manning River. The subject section of Pacific Highway passes through the eastern edge of the village of Coopernook, 21km north of Taree and 8km inland from Harrington on the coast.

The limits of the work would be contained within a 4.5km section of highway which extends from 17.9km to 22.5km north of Taree. The study area lies wholly within the local government area of Greater Taree City Council.

Coopernook village was established in the 1890's and acted as a service centre for surrounding dairy farms and forest industries. The population of the village in 1997 was 440 people and includes both locally employed and a significant number of commuters to Taree.



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 1.2 : CORRIDOR OPTIONS

Coopernook village and the rural residential areas to the north west continue to be an attractive lower cost housing alternative for Taree residents. The alluvial plains associated with the Lansdowne River floodplain are mostly devoted to dairy and beef cattle grazing with some cultivation including citrus orchards and vegetable gardens to the north on better drained land.

The existing highway in the study area is a two lane road on a generally narrow formation. It crosses Lansdowne River Bridge immediately south of Coopernook. Development in the village is mainly to the west of the Highway with accesses onto the Highway from Macquarie and Henry Streets. A number of roadside commercial developments and local property accesses front the Highway. The existing section of road is subject to a 100 km/h posted speed limit on the approach to the existing bridge and to the north of Spring Hill, with an 80 km/h posted speed limit on the bridge and adjacent to the village to reduce the risk of serious accidents caused by the traffic mix.

The existing Lansdowne River Bridge was built in 1932 and is a steel bascule (no longer opening) bridge with a narrow deck width of approximately 6 metres. The poor sight distances, narrow bridge deck and narrowing approaches to the bridge have led to a relatively high accident record on the bridge and its approaches. It is not feasible to widen the existing bridge for structural reasons.

1.4 Statutory Requirements and Approvals Process

1.4.1 Environmental Planning and Assessment Act

The statutory basis for the scope of this EIS is established in the Environmental Planning and Assessment (EP&A) Act, 1979 and the relevant state, regional and local environmental planning instruments. The updated requirements of the Director-General of the Department of Urban Affairs and Planning for the preparation of the EIS have been received and are included in Appendix A.

The proposal will need to be exhibited and determined under both Parts IV and V and of the EP&A Act.

Part V Matters

Most of the proposed route traverses through zones in which the construction of roads is permitted with or without development consent (Greater Taree City LEP, 1995) (refer Section 6.11). The provisions of State Environmental Planning Policy No. 4 (Clause 11c(2)) have the effect of removing the need to obtain consent. Therefore, in all zones where roads are a permitted use, the proposal is classified as an activity under Part V of the EP&A Act and the RTA as the proponent and nominated determining authority, is required to assess the impact on the environment. Section 112 of the Act requires that an EIS be prepared when an activity is likely to have a significant effect on the environment. In its consideration of the activity, the RTA has come to the view that the environmental impacts have the potential to be significant. Accordingly, the RTA has decided to prepare an EIS. In accordance with Section 115A of the Act, the approval of the Minister for Department of Urban Affairs and Planning will be required for the carrying out of the activity.

The proposal to remove the existing Lansdowne River bridge located on the RTA classified road reserve would be undertaken as part of the approval for the road proposal under Part V of the Act. As the Pacific Highway is an unzoned arterial road the removal of the bridge would not require Council development approval.

Part IV Matters

The proposal would bridge a 170m section of the western edge of a wetland which extends up to 10km between Coopernook Creek and Crowdy Bay National Park towards the Manning River delta. This portion of the route is within a wetland classified under State Environmental Planning Policy No 14, Coastal Wetlands (Wetland No 545). Under the provisions of SEPP 14, that part of the proposal is a designated development and the RTA is required to submit a Development Application with an accompanying EIS to Greater Taree City Council for its determination. The Department of Urban Affairs and Planning is required to give concurrence for any consent from Council.

Based on the ecological assessment undertaken within this EIS the construction and operation of the proposed road and bridge over the SEPP 14 Wetland (zoned 7(a) Environmental Protection Habitat) would not be prohibited under Council's performance based planning instrument. The proposal would avoid destroying or damaging a "habitat ecosystem" in the context of the coastal wetland systems of the study area (refer Section 6.6).

A further account of the relevant planning controls as they relate to the proposal, including the implications of relevant state, regional and local environmental plans is addressed in Section 6.11.

1.4.2 Other Approvals and Licences

Other licences and approvals which are likely to be required include:

- Environment Protection Authority; approval to install and licence discharge from pollution control devices during the construction period under Section 17K of the Clean Water Act 1970. Such devices would include sediment basins and silt curtains around the bridge piers for both construction and demolition.

- Department of Land and Water Conservation; approval to remove vegetation within 20m of the bank of a prescribed stream (Section 21C Soil Conservation Act, 1938).

- NSW Fisheries; permit to cut, remove, damage or destroy mangroves or sea grass under Section 205 of the Fisheries Management Act, 1994.

Should items of aboriginal archaeological or non-indigenous heritage significance be discovered within the route during future site investigations the following approvals may be required:

- National Parks and Wildlife Service; consent to disturb or destroy an Aboriginal archaeological site (if discovered) at bridge abutments (S90 NP&W Act, 1974).

- Heritage Council; approval to discover, expose or move a relic (Section 140 Heritage Act, 1977).

1.5 DUAP Directors Requirements

Table 1.1: Summary and Location of DUAP Directors Requirements in the EIS

Action	EIS Reference
1. A summary of the environmental impact statement	• Executive Summary (E1 - E8)
2. A statement of the objectives of the development or activity	• Section 3.5.1 and 3.5.2
3. An analysis of any feasible alternatives to the carrying out of the development or activity having regard to its objectives, including: (a) the consequences of not carrying out the development or activity; and (b) the reasons justifying the carrying out of the development or activity	• Section 3.6 • Chapter 8.0
4. An analysis of the development or activity, including: (a) a full description of the development or activity; and (b) a general description of the environment likely to be affected by the development or activity, together with a detailed description of those aspects of the environment that area likely to be affected: and (c) the likely impact on the environment of the development or activity, having regard to: (i) the nature and extent of the development or activity (ii) the nature and extent of any building or work associated with the development or activity; and (iii) the way in which any such building or work is to be designed, constructed and operated; and (iv) any rehabilitation measures to be undertaken in connection with the development or activity; and (d) a full description of the measures proposed to mitigate any adverse effects on the development or activity on the environment.	• Section 1.3 • Section 4.1 • Chapter 5.0 • Chapter 6.0, particularly Sections 6.1 - 6.13 and 6.18
5. The reasons justifying the carrying out of the development or activity in the manner proposed, having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development.	• Sections 6.1 - 6.15 • Section 6.16
6. Compilation (in a single section of the environmental impact statement) of the measures referred to in 4(d).	• Section 6.18
7. A list of any approvals that must be obtained under any other Act or law before the development or activity may lawfully be carried out.	• Section 1.4.1 and Section 1.4.2
8. For the purposes of Schedule 2, the principles of ecologically sustainable development are as follows: (a) the precautionary principle (b) intergenerational equity (c) conservation of biological diversity (d) improved valuation of resources	• Section 6.16

Action	EIS Reference
9. The matters to be included in item 4(c) might include such of the following as are relevant to the development or activity: (a) the likelihood of soil contamination arising from the development or activity (b) the impact of the development or activity of flora and fauna (c) the likelihood of air, noise or water pollution arising from the development or activity (d) the impact of the development or activity on the health of people in the neighbourhood of the development or activity (e) any hazards arising from the development or activity (f) the impact of the development or activity on the traffic in the local neighbourhood of the development or activity (g) the effect of the development or activity on local climate (h) the social and economic impact of the development or activity (i) the visual impact of the development or activity on the scenic quality of land in the neighbourhood of the development or activity (j) the effect of the development or activity on soil erosion and the silting up of rivers or lakes (k) the effect of the development or activity on the cultural and heritage significance of the land.	• Section 6.1 • Section 6.6 • Section 6.2, 6.5 and 6.4 • Section 6.2 • Section 6.14 • Section 6.8 • Section 6.2 • Section 6.9 • Section 6.7 • Section 6.4 • Section 6.12, 6.13
10. Analysis of soils to determine the presence and severity of acid sulphate or potential acid sulphate soil problems, including sub-surface sampling where excavation is expected to be undertaken. Assessment of options to avoid disturbance and methods to mitigate impacts. Proposed monitoring program during and post construction.	• Section 6.2 • Section 7.4 • Appendix J
11. Discussion of the community consultation process and a review of its findings; outline of decision making process with reference to community consultation.	• Chapter 2.0
12. Impacts on prime agricultural land.	• Section 6.10
13. In addition to those agencies previously identified, results of consultations with the EPA, Department of Land and Water Conservation, NSW Agriculture and NSW Fisheries.	• Section 2.8

2

CONSULTATION

2. CONSULTATION

2.1 Community Involvement Process

A programme of public information, consultation and participation was incorporated in the option selection process to ensure that the concerns of local residents, businesses, farmers, road users and a range of interest groups were taken into account in the assessment.

In summary, the programme of community consultation activities adopted for this EIS was as follows:

- public notices and media releases in the local newspaper to inform the community of the commencement of the EIS
- community representatives involvement in a Value Management Study
- provision of a community telephone hotline for direct enquires
- distribution of community newsletters to inform the community of the EIS and how to get involved
- formation of a contact list on which members of the public were able to register to receive notices and newsletters
- advertised open public meetings
- calls for written submissions by individuals and interest groups
- interviews with affected individuals, businesses, property owners and interest groups
- community focus group meetings
- an open house public display attended by the study team
- meetings with authorities and interest groups

The outcomes of previous community consultation carried out by the RTA in 1991 were also reviewed and taken into consideration.

2.2 Community Newsletters and Media Releases

Three information newsletters were distributed in the study area during the route selection and EIS preparation. These were:

- No. 1 (November 1994) to announce commencement of the study, the process involved and how interested people could be involved including advertisement of a public meeting and community telephone hotline to the study team.
- No. 2 (January 1995) to provide an update on progress in the route selection studies and advise the community of the "open house" display in February 1995.
- No. 3 (October 1996) to advise of the RTA's preference for option 1 based on the findings of the route selection phase. The EIS process and issues to be addressed were also set out.

A common purpose of the newsletters was to give contact details of the study team, including a toll free hotline and cut out coupon for interested parties to be included on a contact list for receipt of information.

The availability of Newsletter No 1, the Open House and the RTA's adoption of the preferred corridor were announced via newspaper notices and press releases to media outlets in the district. The newsletters and public notices were also distributed to key locations in the community such as Greater Taree City Council Chambers, Coopernook Post Office, shops and local libraries. These distributions coincided with the media releases and newspaper articles (eg

Manning River Times) and television interviews organised by the RTA, including features on the public meetings.

2.3 Consultation with Property Owners and Other Stakeholders

2.3.1 Submissions and Contact List

By June 1997 a total of 107 organisations and individuals had registered on the EIS contact list and they comprised:

- individuals - 70
- government bodies - 13 (refer Section 2.7)
- politicians - 3
- businesses and other organisations - 20

Of the above contacts 42 provided the study team with written submissions. The submissions were mostly from residents and businesses of Coopernook village and rural property owners potentially affected by the routes considered.

A pattern was apparent from the location and nature of the submitter:

- the majority of submissions were received from residents of Coopernook who were generally in favour of a bypass moving the highway further from the town
- businesses located along the existing highway at Coopernook were opposed to the bypass proposal primarily due to the potential for loss in passing trade
- potentially affected property owners expressed concern in relation to land take and property management as well as the potential impact on the viability of their properties, loss of productive agricultural land, wetlands and the potential to exacerbate flooding and drainage problems.

Across all written submissions the main issues raised included:

- the benefits to village amenity, lifestyle, and safety of moving the highway further from the village
- concern that the bypass would cause flooding and drainage problems on the floodplain
- loss of passing trade on businesses
- loss of productive agricultural land, property management and property access difficulties due to the proposed highway alignment options
- concern that access onto the proposed highway would be difficult
- environmental concerns of the proposal including impact on wetlands

Other concerns included the hardship and uncertainty experienced by potentially affected landholders during the assessment process.

A petition (61 signatures) was submitted by residents and property owners in the Coopernook area that raised the concern of the effect of the bypass on flooding and erodible soils. The petition advocated that the highway be built in viaduct across the entire floodplain to ensure that sufficient capacity is available beneath the highway to prevent flooding as a result of highway embankment. This issue is addressed in the EIS in Section 6.3.

A list of individuals and organisations who have responded to the project by written submission are listed in Appendix F.

2.3.2 Land Owner Interviews and Other Consultations

During the route selection phase and following announcement of the environmental assessment of a preferred option, land owners directly affected by a proposal as well as businesses on the existing highway were interviewed by the study team. In particular, directly affected property owners (refer Figure 5.9) were interviewed in September 1996 and contact has been maintained since. The focus of these meetings was the implications of the favoured route for each property and the likely property adjustment and acquisition procedures which would apply. The feedback received in relation to property management, landscaping, drainage and flood protection was used by the study team to refine the concept design of the preferred alignment.

2.4 Public Meetings

The purpose of the initial public meeting on 17 November, 1994 was to disseminate information on the EIS and option selection process and to seek community input to the EIS. Presentations were given by the study team and attendees were requested to express their views on the project. Issues of concern ranged from wetland protection and its significance as a wildlife corridor, to disruption of business and the village. Hydrological issues (flooding, wetlands, Lansdowne River bridge) were also prominent. Other issues raised included land take, severance of business, heritage values, cattle crossings and the need for a bypass. Submissions were requested and there was a favourable response to forming a community focus group.

Public Meeting (No.2) was held on 11 February 1995 in conjunction with the 'Open House' display. Presentations were given outlining the performance of corridor options, flooding issues and local access. Following there was general discussion on topics of concern: height of the proposed Lansdowne River Bridge, the now abandoned Motorway Pacific, stock access to property during floods, impact on the school, embankment heights and access to individual properties. Views were expressed about the long term amenity impacts on Coopernook if Option 2 was adopted, the visual impact of Options 1 and 2 and an alternative route from Cundletown to Moorland via Langley Vale was raised.

Public Meeting No.3 was held on 14 March 1995 to keep the community informed of the progress of environmental investigations and the analysis of the exit surveys collected at the previous open house. The issue of the condition of the Lansdowne River Bridge and the possibility of its removal as a consequence of the project were canvassed. WBM Oceanics, hydrological consultants, were invited by RTA to answer questions in relation to flooding and drainage issues.

Following the announcement of the preferred corridor a fourth public meeting (No.4) was conducted on 16 November 1996 to explain the preferred corridor and receive advice on the issues of concern from the local community. The implications of the proposal on flooding and agriculture were highlighted by rural property owners, while the removal of highway traffic from close to the village was identified as a benefit of the preferred corridor by Coopernook residents.

2.5 Focus Group Involvement

A community focus group was established with representatives from a wide range of interests in the area including business people, rural land owners, village residents representative of the tourist industry and road users (refer Appendix F). These groups assisted the RTA in canvasing the key route selection issues from participants from a range of perspectives.

At the first session on 6th December 1994, group members raised many issues of relevance to a decision on highway options including: bridge and highway safety, noise, conserving natural areas of significance, property and business effects, separating through traffic, hydrological concerns, social impact, economics and cumulative economic impact, bridge heights, bushfire shed relocation, impact on the school, buses and noise barriers. Each member participated in ranking these factors to assist in making a recommendation on the corridor option.

The second focus group session was held on 10 February 1995. The potential of the now abandoned Motorway Pacific concept to influence the project and the need for the subject section of the Pacific Highway to be mostly a flood free road were issues discussed at length. Flooding was also specifically addressed in relation to stock movement. The other main issue of concern raised was the loss of business due to changed access arrangements.

2.6 Open House Display and Exit Survey

A public display of the highway corridor options and issues was held at the Anglican Church Hall, West Street, Coopernook on Saturday 11th February, 1995 from 11.00 am to 3.00 pm following on from the second public meeting. The 'Open House' provided a further opportunity to speak with project team representatives and to discuss issues affecting local residents on a one to one basis.

To canvas opinion and obtain feedback on the project, an exit survey questionnaire was issued. All attendees were asked to complete the questionnaire and add any additional comments they wished to express.

Of the 47 returned surveys, 38 were in favour of Option 1, four were in favour of Option 2, three were in favour of Option 3, one equally favoured Options 1 and 2 and one declined to nominate an option on display, preferring a route well to the west of Coopernook. In general the Coopernook residents who responded were supportive of the bypass option located the greatest distance from town.

A list of factors that may have been of concern were listed on the survey and people were asked to indicate how important each factor was in influencing their opinion on a favoured option. Pollution was the issue of most concern with road safety and road access also identified as issues of importance. There were other issues of concern not listed on the survey which were nominated by those completing the survey as follows:

- implications of Option 2 on the oval and fire brigade (17% of completed surveys)
- flooding (11%)
- safety of children and schools (17%)
- maintenance of existing Lansdowne River Bridge (2%)

In asking for any additional comments, most people concentrated on safety aspects, flooding impacts, effects on business and property. Design suggestions were also put forward.

2.7 Value Management Study

The Value Management Study (VMS) was a significant component of the corridor assessment phase of the project. The VMS provided a technical forum for consideration of the need for the project, identification of feasible corridor options and the identification and weighting of corridor assessment factors. The VMS was attended by representatives of the RTA, the EIS consultants Connell Wagner, Greater Taree City Council (GTCC), WMB Oceanics

(Hydrological Consultants), Department of Land and Water Conservation (DLWC), National Parks and Wildlife Service (NPWS), NSW Police and three representatives of the Coopernook community.

The workshop was held in Taree over a two day period on 17th and 18th October 1994. The objectives of the VMS were to:

- confirm the project objectives
- identify opportunities to optimise the scope of works
- confirm key design criteria
- review broad route selection criteria
- examine options to meet the project objectives and identify alternatives
- identify potential environmental and community impacts to be addressed in the EIS
- identify potential sources of borrow for earthworks
- canvass and address key issues and concerns of the major stakeholders
- develop an Action Plan to progress the project

The VMS participants identified the general project objective to be the provision of an improved Pacific Highway in this location to provide safe and reliable travel conditions.

Numerous matters were identified for attention to enable the project to be further developed. The more significant matters:

- Confirmed the key design criteria as:
  - Design to be suitable for 100 km/h posted speed limit
  - Grades and intersections to be suitable for use by heavy vehicles including B-doubles
  - Ride quality to be better than fifty counts per kilometre
  - Lane and shoulder widths in accordance with AustRoads Design Guidelines
  - Batter slopes to be 2 horizontal to 1 vertical or flatter
- Discussed the flooding issues associated with the project and concluded that the EIS should investigate whether the proposed road development should be designed to be consistent with flood level design conditions south of Coopernook.
- Identified an alternative option (Option 3) on the eastern side of Coopernook Creek, which potentially satisfies the project objectives and recommended this option be further developed.
- Reviewed the proposed options and listed their advantages and disadvantages.
- Were not in a position to recommend a preferred option but resolved that Options 1, 2 and 3 be further developed for evaluation on technical, environmental, social and economic grounds and refined in the light of studies still to be undertaken.
- Identified a "Do Minimum" option to improve safety and provide early benefits for further evaluation (viz. bridge replacement). This option however, was seen as a first stage to Option 2 as a decision to replace the existing bridge would commit the RTA to investment in the Option 2 corridor.
- Identified a number of traffic calming measures which could be implemented in the short term to improve safety in Coopernook until the proposed project is constructed.
- Listed a number of potential borrow sources of earthfill for further investigation during the EIS.
- Identified a checklist of potential issues to be addressed during the EIS.
- Were informed of the intended community consultation process for the EIS process and provided input on methods for a community information and dissemination strategy.
- Identified opportunities and design notes to improve the project.

- Were given first hand awareness and appreciation of the wider issues involved in the project (ie. network system issues, technical, social and environmental concerns and community perspectives). Participants were given the opportunity to openly express their points of view and were able to obtain clarification or resolution, where possible, of the issues raised.
- Identified and prioritised the broad route selection criteria on which the rating of different options could be assessed once they were more fully developed so that a preferred option could be selected at the appropriate time.

The selection criteria identified by the VMS participants were evaluated using a weighted factor methodology to reflect their relative importance. The VMS factor weightings were subsequently applied in the corridor evaluation process (refer Section 4). A full account of the VMS is presented in PWD (1994).

2.8 Consultation with Authorities

The authorities consulted during the EIS either have land, facilities and infrastructure within the study area, or they have an advisory role or responsibility during the determination, construction or operational phases of the project.

Consultation with the authorities involved the issue of correspondence (seeking views and requirements for the environmental assessment) as well as meetings including the arrangement of a Planning Focus Meeting on site to brief and receive comment from interested agencies for the EIS. Each authority was invited in writing to the Planning Focus meeting and was requested to advise in writing of its interests and comments on the proposed works, and these have been addressed in this document. The key issues raised during these consultations are outlined below, and the correspondence is included in Appendices A (DUAP) and B (other authorities). Table 2.1 overleaf outlines the written response and attendance from the various authorities contacted.

Table 2.1: Response from Authorities

Authority	Written Response	Attendance at Public Focus Meeting	Other Communication
Australian Heritage Commission	+		+
Department of Land and Water Conservation	+	+	
Department of Public Works and Services	+		
NSW Department of Transport	+		
MSB Waterways	+	+	+
Department of Mineral Resources	+		+
NSW National Parks and Wildlife Service	+	+	+
State Forests	+		
Telstra	+	+	+
Environment Protection Authority (EPA)		+	+
Greater Taree City Council		+	+
Optus	+		+
NSW Fisheries			+

2.8.1 Planning Focus Meeting

Following the RTA announcement of the preferred corridor option, the authorities below were invited to a Planning Focus Meeting on 26 November 1996 held at Coopernook. The meeting was attended by representatives of DLWC, MSB, NPWS, Telstra, GTCC and the EPA. Following a site inspection and project briefing all parties were requested to highlight the key assessment factors to be addressed in the EIS.

2.8.2 Department of Urban Affairs and Planning

DUAP requested the following matters to be addressed in the EIS:

- consult with Greater Taree City Council to clarify the statutory requirements where SEPP 14 wetlands are affected.
- the proposal could be subject to both Part IV and Part V of the Environmental Planning and Assessment (EP&A) Act, 1979
- exhibition of EIS will need to be coordinated with the Council
- the EIS should satisfy clauses 52 and 85 of the Environmental Planning and Assessment Regulation, 1994
- the EIS should follow DUAP's EIS Guidelines for Roads and Related Facilities
- the EIS should be in accordance with clauses 50, 51, 83 and 84 of the Regulation

- issues emerging from consultation with relevant local, State and Commonwealth government authorities, service providers and community groups were to be addressed in the EIS

2.8.3 Greater Taree City Council

The Council requested the following issues be addressed:

- options for location of the proposed Lansdowne River bridge and the future of the existing bridge
- road and property access arrangements including Harrington Road intersection safety and traffic flow
- convenience of access onto and off the proposed highway
- visual impacts of the proposed highway and bridge
- proximity effects of the proposed highway and bridge and environmental impact
- strategic planning considerations in relation to future growth of Harrington and tourist growth
- exposure of and impact on highway businesses
- waterways access upstream of Coopernook
- land acquisition and severance
- convenience of access during flooding
- property management and agricultural effects

2.8.4 NSW Department of Agriculture

The NSW Department of Agriculture's primary concern was the impact of the Highway on the agricultural productivity of specific properties. The issues raised were:

- highway impact on the viability of one existing dairy farm
- compensation for acquired land and for future foregone income
- the significance of the agricultural land resource in the study area

The NSW Department of Agriculture also advised that there are no known stock dip sites in the vicinity of the alignment.

2.8.5 MSB Waterways

MSB Waterways was concerned with the Coopernook Bridge crossing and requested the following:

- a bridge clearance of 5.0m above MHWS to allow houseboats and launches to access navigable waterways upstream
- a horizontal channel width of at least 6m and up to 10m between piers
- the collision impact safety factor applied to the bridge pylons needs to be structured around the 'worst case' scenario

2.8.6 Telecom Australia

Telecom raised no objections to the proposal and provided plans to aid in the relocation of local telephone cabling, potentially affected between the cemetery and existing highway. No optic fibre cables would be affected.

2.8.7 Optus

Optus advised the study team of the location of optic fibre cables in the area. These would not be disturbed by the Proposal.

2.8.8 Department of Land and Water Conservation

DLWC requested the following issues to be addressed in the EIS:

- potential acid sulphate soils in the area and the assessment and remediation of acid sulphate mobilisation should be considered
- the erosion and sediment control plan should include long term revegetation
- protected lands should be considered
- a full assessment of groundwater regimes and groundwater quality
- groundwater impacts of road construction
- risk of groundwater contamination from metals or wastes from the site
- full details of any groundwater dewatering and impacts on groundwater users and soil profile oxidisation
- impacts on wetlands resulting from groundwater dewatering, groundwater regime changes or groundwater quality impacts
- any impacts on river bank stability in the Lansdowne River
- any proposed changes to the existing tidal channel of Coopernook Creek with respect to hydraulic behaviour, sedimentation, pollution of the creek and SEPP 14 Wetland No.545
- the potential impacts, proposed safeguards and management procedures to reduce any adverse impacts on estuarine habitats
- outline a management plan which minimises the amount of silt, rubbish, debris and pollutants entering Coopernook Creek and Wetland No.545
- scour analysis should be undertaken to ensure that there is no significant scour around the bridge piers and abutments during a flood which could cause siltation downstream
- the impact on existing flood behaviour for a range of floods to determine potential changes in flood flow distribution, flood levels, floodwater velocities and duration of inundation
- the cumulative impacts of the Taree Bypass in conjunction with the Coopernook Bypass
- the impacts of the proposal on flood frequency and effects on local drainage

2.8.9 Department of Public Works and Services

Department of Public Works and Services had no specific concerns with the proposal and advised that DLWC would respond in relation to land and water management issues.

2.8.10 State Forests

State Forests raised no objections to the proposal and advised that the Proposal is unlikely to impact on areas of specific interest to State Forests.

2.8.11 New South Wales Department of Transport

The Department of Transport responded with no specific comments in relation to the Proposal but suggested the local commercial bus service operators be consulted. Egging Holdings were subsequently consulted by the study team.

2.8.12 The Australian Heritage Commission

The Australian Heritage Commission requested the following issues to be addressed in the EIS:

- potential for the disruption of local drainage and hydrology, particularly the flow regimes of the Lansdowne River and its tributaries
- erosion and siltation of local rivers, creeks and wetlands as a result of construction and post construction activities
- the possibility of fuel or chemical pollution, or addition of nutrients to the area as a result of construction and post construction activities
- the destruction of natural habitat and native vegetation
- the introduction of exotic species to the local area or spreading new or existing weeds through soil disturbance
- avoidance of disruption of movements of terrestrial fauna by providing methods for animal crossings
- minimisation of the risk of bushfire in the study area
- the need to rehabilitate disturbed areas affected by the Proposal.

2.8.13 NSW National Parks and Wildlife Service (NPWS)

The NPWS requested the following issues regarding flora, fauna and cultural heritage be addressed in the EIS:

- surveys should be undertaken in seasons, climatic conditions and at times optimal for the location of flora and fauna species particularly for reptiles, amphibians, bats and migratory birds
- the duration of the surveys should be specified in the EIS
- fauna surveys should utilise methods specific to protected and threatened species of bats, terrestrial mammals, nocturnal birds and mammals and frogs
- particular attention should be paid to threatened frog species
- the impact of the disturbance of any acid sulphate soils on watercourse fauna

2.8.14 Department of Mineral Resources

The Department of Mineral Resources raised no objections. The proposal would have no effect on access to any known mineralisation, construction material or road base materials in the study area.

2.8.15 NSW Fisheries

NSW Fisheries have advised that a permit is required to cut, remove, damage or destroy mangroves or sea grass under Section 205 of the Fisheries Management Act, 1994.

2.9 Further Consultation

As the Proposal is to be assessed under both Part IV and Part V of the EP&A Act, both the RTA and Greater Taree Council (with respect to SEPP 14 Wetland) have obligations to advertise the EIS and make it available for public exhibition. This responsibility would be coordinated by the RTA in consultation with GTCC in terms of the issue of advertisements, distribution of EIS documents and the display of exhibition material.

The EIS is to be advertised and placed on public exhibition at various centres in or near the study area, including RTA and Council offices and other readily accessible public locations, as well as in Sydney. Copies of the EIS are also to be available for sale to the public at various locations.

During the EIS exhibition period, written submissions can be made to the RTA and Greater Taree City Council. Copies will be made of all submissions received and will be exchanged between the RTA and Council. Copies of submissions will also be referred to the Department of Urban Affairs and Planning for its consideration of the proposed bypass.

3

NEED FOR THE PROJECT

3. NEED FOR THE PROJECT

3.1 Strategic Highway Planning Issues

3.1.1 Highway Planning Context

The Pacific Highway is the main road corridor along the North Coast of NSW serving many rapidly growing tourist and commercial centres. The Highway passes through many coastal towns and growing traffic volumes have meant that some of these towns are suffering from the effects of the Highway with impacts such as traffic congestion, accidents, community severance and road traffic noise becoming increasingly severe.

Many sections of the Highway are deteriorating in terms of safety, capacity and asset condition and in broader terms, the efficiency of the Highway as a transport artery for commerce, tourism and social activity is diminishing.

To address the deficiencies of the existing Highway, the North Coast Road Strategy, released by the RTA in 1992, presents an overall framework to improve road condition and traffic performance along the corridor and reduce adverse impacts on local communities along the Highway.

The strategy concluded that there were two distinct alternative paths for road infrastructure investment over the next 20-30 years being the upgrading of the Pacific Highway or the development of Motorway Pacific along a new route. The 'Pacific Highway Upgrade' option was subsequently adopted by the RTA. It consists of incremental development of the Highway, basically within its existing corridor, to a dual carriageway from Hexham to Grafton and from Bangalow to Tweed Heads. This would be achievable within current levels of Government funding over 20 - 30 years.

In January 1996 the NSW State and Commonwealth Governments announced their joint commitment to a 10-year program to upgrade the Pacific Highway between Hexham and the Queensland border. A total of $2.2 billion funding would be available for the Pacific Highway over the next 10 years on the basis of individual justification of projects.

The intended outcomes of the reconstruction program are:

- reduced accidents and fatalities
- reduced travel times
- reduced freight transport costs
- increased length of dual carriageways
- increased safe overtaking opportunities
- improving alignment and elimination of narrow bridges
- maximum environmental benefits

The proposed Coopernook Traffic Relief Route would contribute to achieving these outcomes and is included as a planning priority to be implemented within the ten-year program.

3.1.2 Statutory Planning Context

The Pacific Highway is identified as a major regional and inter-regional arterial road in the Hunter Regional Environmental Plan and the Greater Taree Local Environmental Plan. Both plans include objectives to provide for future arterial road needs and contain subsidiary objectives relating to the maintenence of level of service, safety and the reduction of local and through traffic conflict, while avoiding or minimising land use and other environmental impacts.

The proposal is permissible and consistent with the relevant State and Local planning policies listed below and discussed in detail in Section 6.11.2:

- State Environmental Planning Policy No. 14: SEPP 14 was gazetted with the aim of preserving and protecting coastal wetlands. As a result a range of alternatives both crossing and avoiding the SEPP 14 and other wetlands were considered. The proposal is designated development and requires Council approval and DUAP concurrence with respect to that portion which bridges the SEPP 14 wetland. The EIS investigation indicates that the location of the wetland crossing would not sever the uncleared portion of the wetland and that the proposed low level bridge and spill containment structures would mitigate the impact of the highway proposal on the water balance and water quality of the wetland.

- Hunter Regional Environmental Plan 1989: the REP includes a range of objectives relevant to the development of major arterial roads and adjacent land uses as discussed in Section 6.11.2. The REP Background Report acknowledges that the provision of dual carriageways, improved alignment, town bypasses and increased overtaking lanes are warranted on the Pacific Highway in the region.

- Greater Taree Local Environmental Plan 1995: the proposal is consistent with the overall aim of the LEP to provide for future arterial roads and is permissible within each of the affected zones. The consistency of the proposal within relevant rural and environmental protection zones is discussed in relation to each zone objective in Appendix Q.

3.1.3 Strategic Environmental Management Context

A component of the strategic background to the need for the project involves the RTA's environmental management objectives for network development as outlined in the State Road Network Strategy (RTA, 1995). Specifically, the RTA is working towards achieving ecologically sustainable development in the planning and implementation of the project.

Section 6.16.2 demonstrates how ESD principles have influenced decision making processes throughout the development of the project. In particular, the various project options have been assessed with respect to the precautionary principle, attempts to place an imputed value on environmental costs and benefits of the project and measures to minimise long term and cumulative impacts of the proposal.

The construction and operation of the project would also be required to involve the development of an environmental management system to ensure the implementation of the proposed mitigation and environmental management measures outlined in Section 7.0.

3.2 Existing Traffic Conditions

3.2.1 Road Environment

The current speed limit varies from 100km/h to 80km/h over the Lansdowne River Bridge and near the village area. Traffic lanes are generally 3.6m to 3.7m wide however, they narrow at the bridge to 3 metres. The restriction prevents safe two way flow for wide heavy vehicles.

Overtaking is possible for northbound and southbound traffic 1km south of the Lansdowne River and within the 80km/h zone at the northern end of the Coopernook village zone. An overtaking lane for southbound traffic is located on Two Mile Creek straight, 3km north of Coopernook.

Road side development includes rural and village residences with numerous driveways and local road connections at the Highway that contribute to traffic friction. Several highway businesses also occur along the subject section of the Highway including two service stations, hotel, motel, gift shop, butcher, caravan business and worm farm.

3.2.2 Road Hierarchy

The road hierarchy in the study area is shown on Figure 1.1. The Pacific Highway provides the principal transportation link from the North Coast to Sydney and Brisbane. The road carries long distance, regional and local traffic.

Harrington Road provides access to rural properties to the east on Mamboo Island and the coastal townships of Harrington and Crowdy Head.

Travelling south through the study area, the following roads intersect with the Pacific Highway:

- Two Mile Creek Road (South)
- Spring Hill Road
- Macquarie Street (North)
- Ridge Street
- Henry Street
- Macquarie Street (South)
- Harrington Road
- Moto Road

Two Mile Creek Road provides access to rural lots north of Coopernook. Spring Hill Road is a minor unsealed road accessing rural lots to the north east of Coopernook.

Macquarie Street provides access to the village of Coopernook from both its northern and southern connection with the existing highway. Moto Road is a light traffic unsealed road servicing rural lots along the Lansdowne River and Ghinni Ghinni Creek floodplain.

3.2.3 Traffic Volumes

Daily Traffic

Annual average daily traffic (AADT) in the years 1970 to 1986, were obtained from the RTA publication Traffic Volumes of Supplementary Data 1995 - Lower North Coast Division AADTs for counting stations on the Pacific Highway (Section 10) immediately north and south at Coopernook are shown in Table 3.1.

AADT's on the Pacific Highway, 3km north of Lansdowne River Bridge increased by 3757 to 7197 between the years 1970 and 1986.

Independent traffic counts were conducted by RoadNet Pty Ltd (Appendix D) at three locations from 15 - 22 November 1994 and during a similar period from 29 November - 5 December 1996. Traffic counts were compared to those obtained from the RTA's Pacific Highway permanent station at Wallamba River Bridge, Nabiac, to convert the traffic counted to AADT's. The calculated AADT's for 1994 and 1996 are shown in Table 3.2.

Table 3.1: Annual Average Daily Traffic

Location	Station	1970	1972	1976	1980	1986	1990
Pacific Highway 3km north Lansdowne Bridge	9.117	3440	4190	5380	6350	7197	Not surveyed

Table 3.2: Comparison of 1994 and 1996 Traffic Volumes

Period	Average number of vehicles/day	% Trucks	AADT for survey week	Survey week as % of 1990 AADT at Nabiac	Calculated AADT
1996: 29Nov-5Dec	8336	16.9%	9390	0.89	9366
1994: 15-22Nov	7379	20.0%	8450	0.89	8488

Weekly Traffic

The Annual Average Weekly Traffic (AAWT) on the Pacific Highway at the nearest permanent counting station at Wallamba River Bridge, Nabiac (1996) is shown in Appendix D, Figure D.1.

The data indicates peaks in traffic during Christmas/New Year, around school holidays and public holiday weekends.

Hourly Traffic Patterns and Peak Flows

A 24 hour continuous automatic counting survey was conducted for one week beginning on 29 November 1996. The peak period was found to be during the late morning (10.00am) and early afternoon (4.00pm). The hourly traffic pattern for all vehicle classes for this period is shown in Appendix D, Figure D.2.

Peak hourly flows in both directions along the Pacific Highway are heaviest in the middle of the day (10.00am to 11.00am) with an average of 630 vehicles/hr recorded for the counting period. On Boxing Day (1996) traffic counts showed over 1000 vehicles per hour travelling in the northbound direction.

Through Traffic

A number plate survey was carried out on Thursday 17 November 1994 between 7.30-9.30am and 3.00-5.30pm at the following survey stations:

- Pacific Highway south of Moto Road
- Pacific Highway south of Two Mile Creek Road
- Pacific Highway south of Harrington Road
- Harrington Road east of Pacific Highway

- Lansdowne Road west of Macquarie Street

The study found that approximately 81% of the vehicles observed were recorded at the northern and southern periphery of the study area (Figure D.3 Appendix D). The directional split indicated that 76% were northbound and 86% were southbound.

Applying this proportion (81%) to the derived 1996 AADT for Coopernook, the through traffic volume along the corridor is estimated to be around 7586 vehicles.

3.2.4 Intersection Performance

The turning movements at key intersections along the Highway were surveyed manually between 8.30 am to 9.30 am, and 3.00 pm to 4.00 pm on Thursday 10 November 1994, and their performance levels assessed using the computer program "SIDRA". The intersections included:

- Macquarie Street (south)
- Macquarie Street (north)
- Moto Road
- Harrington Road

Intersection counts undertaken in 1996 at Harrington Road indicated that turning movements have not substantially changed since 1994 (refer to RoadNet report in Appendix D).

Performance indicators including Degree of Saturation, Average Delay, Side Road Delay, Level of Service and Practical Spare Capacity are shown in Table 3.3.

Assuming the November counts are typical traffic turning flows during school terms, all intersections perform well for most of the year.

Table 3.3: Summary of Intersection Performance (12.00 - 1.00 pm)

Side Road/ SH10	Degree Of Saturation	Average Delay (Secs)	Side Road Delay (secs)	Level Of Service	Practical Spare Capacity
Macquarie Street South	0.23	0.3	5.2	A	250%
Macquarie Street North	0.23	0.1	3.6	A	250%
Moto Road	0.23	0.1	3.6	A	250%
Harrington Road	0.23	0.5	3.3	A	250%

3.2.5 Traffic Patterns

The intersection counts provide a good assessment of traffic patterns along the study route. At Macquarie Street north and south, Moto Road, Ridge Street and Harrington Road, two thirds of side road traffic has an origin or destination to the south (in the direction of Taree).

The proportion of traffic travelling between Harrington and Coopernook on Harrington Road is 20%, or approximately 308 vehicles/day with a 50% directional split.

The overall proportion of traffic driving through Coopernook (north and south) without stopping was 81%.

Harrington Road

Harrington Road carried a total of 1570 vehicles in both directions on the survey day.

It is assumed that traffic on Harrington Road would be subject to similar seasonal influences as the Pacific Highway.

The peak hour turning movements and intersection counts at the existing Pacific Highway and Harrington Road intersection as shown in the Appendix of the RoadNet report in Appendix D.

Lansdowne Road

The survey revealed low traffic volumes on Lansdowne Road - an average of 390 vehicles per day with about 50% in each direction. Most of these completed a return trip into Coopernook from the west. Only one trip was recorded from west of Coopernook to Harrington.

3.2.6 Heavy Vehicles

The percentage of heavy vehicles along the Highway was 16.9% according to 1996 traffic survey. The alignment, narrow pavement (especially across Lansdowne River Bridge), narrow shoulders and limited over-taking opportunities provide a generally unsatisfactory road environment for heavy vehicles.

Harrington Road, which provides the main link between the Highway and Harrington, has 9.5% heavy vehicles.

The service station in Coopernook is a popular stop for heavy vehicles.

3.3 Traffic Safety

3.3.1 Accident History

Accident data on the section of Pacific Highway 2km north and south of Coopernook was analysed for the 5 year period from January 1992 to December 1996. A full accident listing by severity is shown in Table 3.4 overleaf. In this period there were 49 accidents reported with 2 fatalities and 13 injuries. The total number and nature of accidents has remained approximately constant after this period.

Table 3.4: Accident Statistics (1992 -1996)

Accident Severity	1992	1993	1994	1995	1996	Total
Property Damage only	8	3	6	8	9	34
Injury	3	3	2	3	1	13
Fatal	2	0	0	0	0	2
Total	13	6	8	11	11	49
Estimated Traffic Volume	7610	8050	8490	8930	9370	

The accident rate per million vehicle kilometres (Mvk) has been calculated for years 1992 to 1996 for the study section, as shown in Table 3.5. This rate was compared with accident rates encompassing the study section and adjacent section of the highway. These include:

- Arkana Avenue, Cundletown to Railway overbridge, Moorland (Section 56 as per RTA Road Location Data) 18.3 km (which includes the study section of 4km).
- Railway overbridge, Moorland to Passionfruit Crescent, Johns River 13.5km (Section 57).

The accident rate for all accidents has been calculated using the following formula:

Accident Rate = [No. Accidents p.a. * Million]/[AADT * 365 * Route Length (km)]

Table 3.5: Accident Rates (Per Mvk)

Section	1992	1993	1994	1995	1996	Average
Coopernook Study Section	1.17	0.51	0.65	0.83	0.80	0.79
Section 56 (includes Coopernook Study Section)	0.45	0.46	0.30	0.44	0.37	0.40
Section 57	0.32	0.23	0.22	0.16	0.17	0.22

The accident history average of the study section between 1992 to 1996 represents a rate of approximately 0.79/Mvk.

The casualty accident rate per Mvk for the study section is more than double that being experienced at an adjacent section of the Pacific Highway. Advice from local Police and the RTA confirms that traffic safety, particularly in the vicinity of the bridge and its approaches, is a significant issue in the study area and region. The two fatalities recorded in 1992 were associated with the narrow Lansdowne River Bridge.

Traffic Unit Involvement

Light vehicles (cars and station wagons) comprise the majority (77.6%) of accidents. A total of 49 accidents was recorded in the Coopernook area from 1992 to 1996 which included 2 fatalities and 13 injuries. A high proportion of serious accidents occur with heavy vehicles (4 injuries) and motorcycles (2 fatalities, 1 injury).

Table 3.6 overleaf shows the number of accidents recorded in the Coopernook area by the type of vehicle involved.

Table 3.6: Accidents by Vehicle Type

Vehicle Type	1992	1993	1994	1995	1996	Total
Car	8	6	6	9	9	38
Motorbike	2	0	0	0	0	2
Articulated	2	0	0	2	0	4
Heavy	1	0	0	0	0	1
Light	0	0	1	0	2	3
Other	0	0	1	0	0	1
Total	13	6	8	11	11	49

It should be noted that the table shows only the number of accidents per primary vehicle type and does not reflect the total number of accidents as generally there may be more than one vehicle involved per accident.

Time of Day Distribution

Most accidents occur around midday particularly between 8.00am and 12.00 noon, as shown in Table 3.7. Most of the accidents occur during day time (67%). The incidence of fatal and injury accidents are distributed throughout the day.

Table 3.7: Accidents by the Hour of Day

Hour		1992	1993	1994	1995	1996	Total	Percent
00-02	am	1	0	1	1	0	3	6.12%
02-04	am	2	0	0	0	0	2	4.08%
04-06	am	1	0	0	0	1	2	4.08%
06-08	am	1	1	0	1	0	3	6.12%
08-10	am	2	2	1	2	2	9	18.37%
10-12	am	2	1	2	3	1	9	18.37%
12-02	pm	1	0	1	0	0	2	4.08%
02-04	pm	1	2	0	0	3	6	12.24%
04-06	pm	1	0	0	1	1	3	6.12%
06-08	pm	0	0	1	2	1	4	8.16%
08-10	pm	0	0	1	0	0	1	2.04%
10-12	pm	1	0	1	1	2	5	10.20%
Total		13	6	8	11	11	49	100.0 %

Weather

An analysis of weather conditions and accident frequency indicates that 65.3% of accidents occur on fine days, 16.3% under overcast conditions and 18.4% during rain.

Definitions for Coding Accidents - RUM Codes

Road User Movements (RUM) were analysed in terms of the RUM codes detailed in the Coding Manual for Traffic Accident Information. Appendix D, Table D.4 shows the RUM codes.

The number of accidents per accident type (1992 - 1996) are shown in Table 3.8 below.

Table 3.8: Accidents According to Type

Accident Type	Number	Percentage
Rear End	20	35.0%
Opposing Directions	7	15.2%
Manoeuvring	2	4.3%
Overtaking	3	6.5%
Off-Roadway	11	24.0%
Hit Parked Vehicle	2	4.3%
Unknown	1	2.2%
Total	46	100.0%

The analysis of road user movement shows that rear end collisions were the most prominent along the study section (43.5%).

Accident Locations

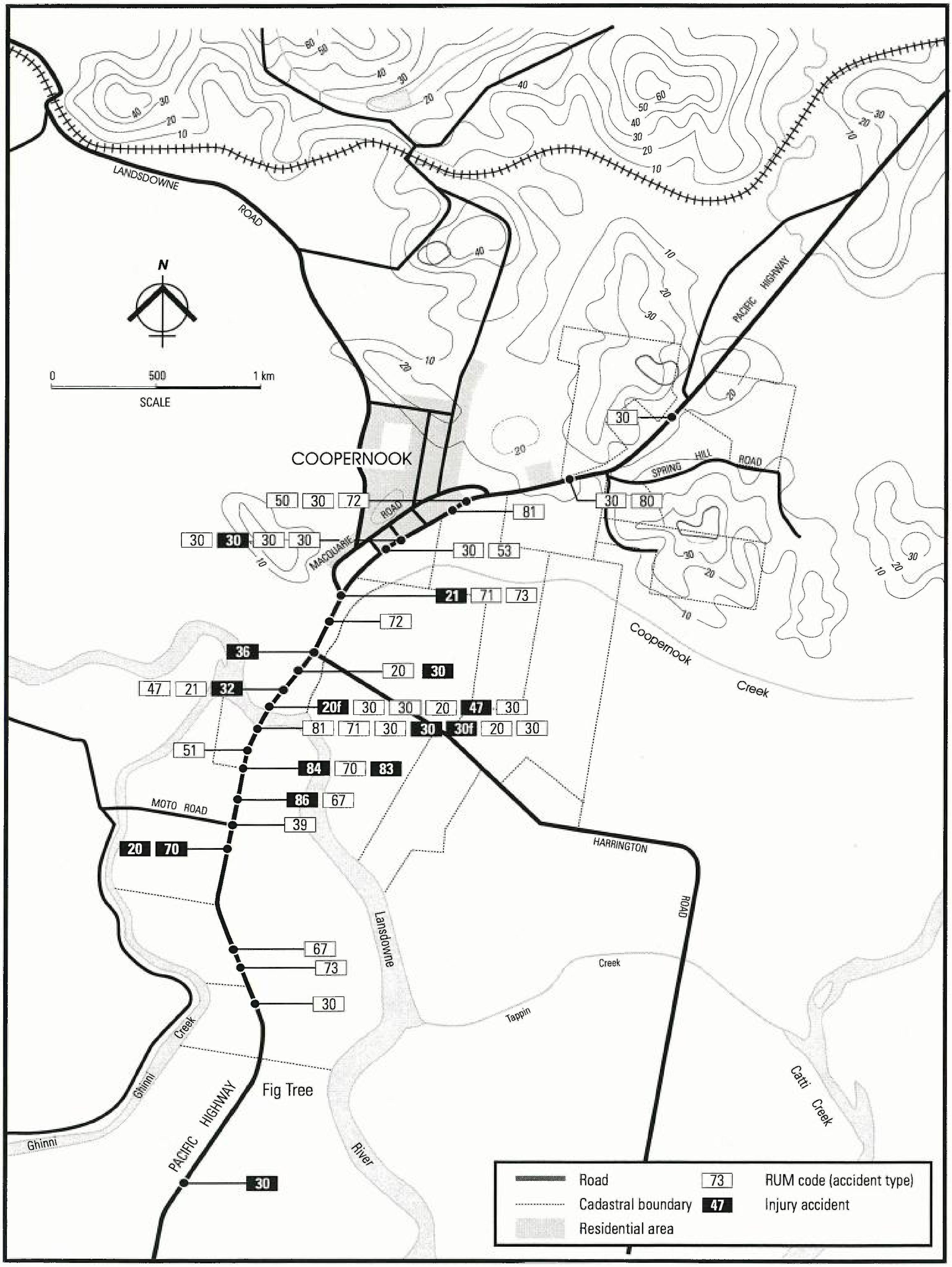
A summary of accidents in different sections of the study area is shown on Table 3.9. A map of accident locations is provided as Figure 3.1. This data indicates that although the Lansdowne River bridge is an accident blackspot, a significant number of accidents are distributed elsewhere along the study section of the highway, including at key intersections and property accesses.

Table 3.9 Summary of Accident Locations

Location	Fatal	Injury	Property	Total
North of Coopernook	0	0	2	2
In Coopernook	0	2	11	13
Between Coopernook and Bridge	0	2	4	6
On Northern side of Bridge	1	2	4	7
On Southern side of Bridge	1	2	5	8
South of Bridge	0	5	7	12
Total	2	13	34	49

3.3.2 Road Safety

Reconstruction of the subject section of the Highway, including replacement of the Lansdowne River Bridge, would be expected to reduce the accident rate significantly.



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 3.1 :
PACIFIC HIGHWAY ACCIDENT LOCATIONS
JANUARY 1992 to DECEMBER 1996

Significant improvement of road safety would be anticipated on the basis of the removal of the accident blackspot at the bridge and its approaches through:

- rationalisation of highway intersections and property accesses
- separation of traffic flows with a wide median
- wider carriageways
- improved alignment

These measures would be expected to significantly reduce the incidence of the predominant accident types recorded in the subject section of the Highway including rear end collisions on the bridge approaches and a range of accident types occurring at numerous major and minor intersections along the route.

3.4 Predicted Road and Traffic Conditions

3.4.1 Future Urban Land Development

Greater Taree City Council's main urban development strategy focuses on the urban expansion of Taree and Wingham which are remote from the immediate study area. Coopernook village is expected to achieve modest growth of around 1% to 1.5% p.a. through infill. Council has identified an area off Bangalow Road in Coopernook as a proposed rural residential area. This area, shown in Figure 4.2, lies west of the Highway and is unaffected by any of the route options. This area has an estimated potential lot yield of less than 30 lots over 20 years and could generate up to a further 270 vehicle trips per day from this area over this period. This level of traffic generation combined with the modest growth of Coopernook, is not considered significant in relation to traffic growth from major centres in the region.

3.4.2 Traffic Growth

The underlying traffic growth can be estimated from historic trends. AADT's on the Pacific Highway at 3km north of Lansdowne River increased from 3757 to 7197 from years 1970 to 1986 (3.1% annual growth) .

Traffic growth on this section of the Pacific Highway is dominated by the growth of larger towns north and south of Coopernook and total growth in traffic overall. Continuation of historic trends in underlying traffic growth will depend to a large extent on the growth of travel demand in these towns as well as Harrington and Crowdy Head to a lesser extent. Growth associated with the Coopernook town itself is small in comparison and would not feature as a significant source of future traffic on consideration of the relative growth rates of Taree and Port Macquarie. The determination of forecast growth along the highway has been based upon past traffic volumes only.

A regression equation has been developed to forecast AADT volumes (ie. AADT = 290 x + 9366 where x is the number of years after 1996).

Forecast traffic volumes for the next 30 years are as shown in Table 3.10 in five year periods.

Table 3.10: Forecast AADT

Year	1996	2001	2006	2011	2016	2021	2026
Forecast AADT	9366	10818	12269	13721	15173	16625	18076

The predicted AADT of 15173 for the year 2016 is in line with RTA forecasts contained within RTA's North Coast Road Strategy Report February 1993. This document reports an AADT of 14754 for the year 2016 along the Highway near Cundletown.

3.4.3 Traffic Assignments

The distribution of flows from the existing highway onto the proposed traffic relief route is based upon the calculated AADT's for 1996 to 2016 and the traffic patterns for the area based upon the number plate survey. Table 3.11 summarises the forecast volumes.

Table 3.11: Traffic Assignment

Year	Existing Pacific Highway As a Local Road	Proposed Traffic Relief Route for Through Traffic
1996	1780	7586
2001	2055	8762
2006	2331	9938
2011	2607	11114
2016	2883	12290

3.4.4 Local Access Arrangements

Figure 3.2 indicates the access arrangements between the proposed corridor options and the existing Pacific Highway. The arrangements would be influenced by a decision to either retain or remove the existing bridge for local traffic. To reduce traffic friction, right turn movements across traffic lanes would be restricted where reasonable alternative access routes are available.

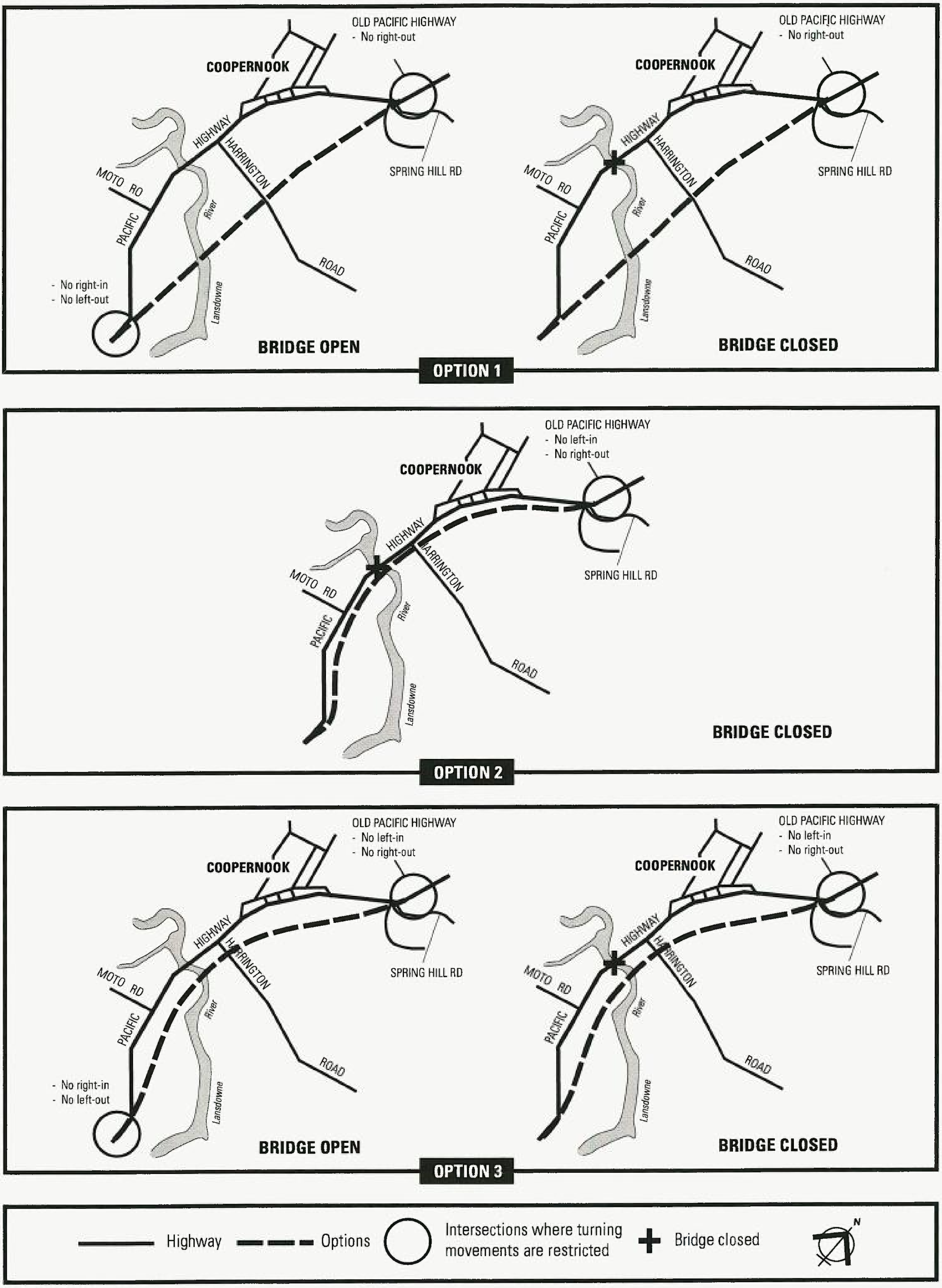
3.4.5 Key Intersection Treatments

All corridor options permit an at-grade intersection design with Harrington Road. Options 1 and 3 suit a cross-treatment and Option 2 a T-treatment.

For the design of cross treatment intersections reference to AUSTROADS standards (formerly NAASRA) Part 5 "Intersections at Grade" indicated that cross intersections are ".. undesirable particularly in rural areas unless treated either to prevent high speed crossing movements, by limiting the crossing speed or by requiring minor road traffic to give way and allowing major road traffic to proceed through the intersection unimpeded".

AUSTROADS recommends two methods of treating cross intersections where capacity is not a constraint. East-west traffic between Coopernook (and settlements to the west) and Harrington would not be likely to approach levels which would warrant grade separation of this intersection during the life of the project. These include (1) staggered T-treatments and (2) wide median treatments.

For their suitability in terms of existing turning volume capacity at the Pacific Highway/Harrington Road, year 2026 traffic volumes along the relief route and relevant data from the origin and destination survey undertaken in November 1994 was used to analyse the performance of a future cross intersection at Harrington Road and the relief route.



0 1 2 km
SCALE 1 : 50000

Figure 3.2 : TURNING MOVEMENT RESTRICTIONS FOR PACIFIC HIGHWAY CORRIDOR OPTIONS

An analysis was undertaken using a traffic analytical program "SIDRA" which revealed ample spare capacity (500%) for the Harrington Road approaches.

Typical AUSTROADS designs for potential cross-treatments were further analysed in Section 5.1. The left-right staggered T-treatment includes a right turn auxiliary lane with a minimum length of 50 metres as well as wide median treatments which were considered as well as cross intersection designs.

3.4.6 Travel Times

Travel time (between the northern and southern extent of the highway study area) would be reduced due to a shortened travel distance, absence of existing obstructions such as the Lansdowne River Bridge and turning traffic adjacent to developments at Coopernook as well as the ability to overtake slow moving vehicles with ease.

Travel time savings calculated from a rural simulation program for the corridor is expected to be between 1 to 2 minutes, depending on the corridor option. Option 1 being 300 m shorter than Option 3, which is 200 metres shorter than Option 2.

3.4.7 Road Capacity and 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.

A level of service definition generally describes these conditions in terms of factors such as speed, and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. The level of service concept and definitions use here are those adopted by the US Highway Capacity Manual 1985. In this Manual six levels of service are described, designated A to F, with level of service A representing the best operating condition (ie. free flow) and level of service F the worst (ie. forced or break-down flow).

Table 3.12 shows the existing highway to be operating at LOS D which is close to the limit of stable flow with all drivers severely restricted. The LOS assessments have taken into account factors including the number of lanes, type of road, direction and distribution of traffic, speed limit, and/or design speed, width of pavement and shoulder, percentage of heavy vehicles, upgrade (in %) and length of upgrade, restriction of sight distance, and /or passing opportunity, type of terrain, characteristics of road users, and road side development. The flow rates for the corresponding levels of service are summarised for the existing highway and for the corridor options with either a 2 lane undivided or 4 lane divided carriageway in Appendix D, Table D.6.

The estimate of peak flows derived from the November 1996 survey and current growth trends as shown in Appendix Table D.6 are used with the flow rates of Appendix D, Table D.6 to develop the predicted Levels of Service in Table 3.12.

Table 3.12: Level of Service Estimates

Year	1996	2001	2006	2011	2016	2021	2026
Existing Highway	D	D	E	E	E	E	F
Undivided Single Carriageway (2 lanes)	C	C	C	C	D	D	D
Divided Dual Carriageway (4 lanes)	A	A	A	A	A	A	A

Table 3.12 shows that traffic (and safety) conditions for the existing highway would deteriorate to unacceptable levels, with LOS falling to E in 2006, continuing at this level to 2021. The provision of a new 2 lane road would provide an acceptable level of service until 2011 with the LOS falling to D at this time. A four lane divided road provides a LOS A to the year 2026.

3.5 Need and Objectives of the Highway Project

3.5.1 Project Need

There is a need to ensure the Pacific Highway as a transport artery for commerce, tourism and social activities is maintained at a level where it can continue to meet the regional (and local) transport objectives it is ascribed in the North Coast Road Strategy, Hunter Regional Environmental Plan and Greater Taree Local Environmental Plan. As described below, the ability of the highway to perform these functions in the Manning district is diminishing with continuing traffic and accident growth, in particular:

- Road conditions are poor in numerous respects (e.g. narrow travel lane, narrow shoulders, narrow bridge, sub-standard horizontal and vertical geometry, very limited overtaking opportunities)
- Road pavement is in poor condition and resultant ride quality is below recommended AUSTROADS standards
- Level of service on the route is presently D (US Capacity Manual) and diminishing over time to unacceptable levels
- The casualty accident rate in the period 1989 - 1993 (38 per 100 MvK) was more than twice that of the rate for adjoining lengths either side of the study area. The Coopernook village and Lansdowne River bridge and approaches are an accident black spot
- Approximately 81% of traffic along the Pacific Highway does not stop at Coopernook
- Present estimated Annual Average Daily Traffic (AADT) on the route is 9,366 vehicles (1996) with forecasted traffic volumes in the year 2016 of 15,173 vehicles
- The frequent closure of the highway due to flooding

3.5.2 Project Objectives

The overall objective of this project lies with the State and Federal Government's announcement of special funding for the upgrading of the existing Pacific Highway over a 10 year period. The objectives specific for this project have been established to respond to the above considerations and from the following:

- The requirements set out in the project brief prepared by the RTA
- The findings of the Value Management Study conducted by the RTA in October 1994
- Feed back from government authorities

The objectives include:

Road Function

- Adequately provide for transport needs of the existing and future development for at least 20 years
- Ensure driver guidance needs are met through appropriate signposting and delineation
- Minimise conflict between local and through traffic whilst providing appropriate connections to service the local community
- Provide turning lanes to reduce impediments to through traffic

Design Standards

- Provide dual carriageways each consisting of 2 x 3.5 m lanes, 2.5m outside shoulder and 1m inside shoulder
- Provide a road such that the "Level of Service" is unlikely to be below a "Level of Service C" up to the year 2026
- Provide a road transport facility that ensures safe efficient travel for the design life of the project taking into account the type, volume and speed of the expected traffic, level of service, safety, frequency and duration of flooding
- Provide a well engineered, safe, aesthetically pleasing and environmentally acceptable road transport facility for all road users including cyclists, with minimal adverse impact on road and non-road users during construction

Accident Statistics

- Provide a road transport facility capable of lowering the accident rate so it is comparable with the lower rates experienced in adjoining sections of the Pacific Highway
- Resolve accident black spot at existing Lansdowne River bridge and approaches
- Meet RTA corporate targets to reduce road deaths and serious injuries in NSW by:
  - developing community involvement in road safety issues.
  - ensuring road safety is a consideration in road network planning.
  - treatment of accident black spots.
  - improving crash avoidance

Financial

- Deliver the project with a Road User Benefit Cost Ratio >2 over a 20 year service life

Environment

- Ensure that the impacts on the environment in the Coopernook area as a result of the project are minimised

Customer Service

- Ensure that the community is aware of the project, is consulted and has input opportunities throughout the project through:
  - Meetings and consultations with affected landowners and stakeholders during the development phase
  - Media releases

— Ensuring the community is aware of the process for development of the project

Economic Development

- Reduce vehicle operating cost through improved traffic flow

3.6 Consequences of No Action or Deferral

The consequences of no action or deferral of the highway project would be ongoing and worsening traffic and safety conditions on the existing highway and intersections. The road and major intersections are already operating at a level of service and safety which is below the desired standard.

Predicted traffic growth would further exacerbate the problems currently experienced with the existing road and traffic environment. Traffic growth has been steady over the last 20 years and present annual average daily traffic is 9,366. Forecast growth is 3.1% per annum linear, suggesting daily volumes of over 18,000 by the year 2026.

With no improvements predicted traffic growth would increasingly expose the deficiencies of the existing road environment over the forecast period. The following aspects would be specifically affected:

- Traffic conditions for the existing road would deteriorate to unacceptable levels with the Level of Service (LOS) falling from D to F in 2026. Level of Service is a description of traffic conditions and flow. It ranges from the highest level of service A (a condition of free flow, high manoeuvrability and comfort), to the lowest level of service F (a zone of forced flow, breakdowns and delays)
- The existing casualty rate, which is more than double that of the adjacent road sections along the Pacific Highway would almost certainly not decrease. Indeed, with traffic growth and declining LOS combined, the accident rate is likely to increase
- Travel time improvements for the project would not be available to road users. Increasing traffic volumes would result in the gradual increase in travel time for the route over the forecast period
- The opportunity to obtain a high standard corridor to cater for future transport needs would be diminished over the forecast period by continued development in and along the corridor and a proliferation of accesses
- No action or deferral of the project is likely to generate worsening road and traffic conditions with consequent adverse community and environmental effects

4

CORRIDOR OPTION EVALUATION

4. CORRIDOR OPTION EVALUATION

4.1 Identification and Description of Corridor Alternatives

The RTA identified and developed two potential corridors (Options 1 and 2) from a long list of options explored during the preparation of the Route Selection Report (RTA, 1991) and Environmental Overview (RTA, 1991). Option 3 was identified as an option warranting further investigation by the participants of the Value Management Study. The options are shown on Figure 1.2, and their main features are outlined below.

4.1.1 Description of Corridor Options

Option 1

Construction of a new road east of the existing highway alignment with a new bridge crossing east of the existing Lansdowne River Bridge. This option, at approximately 4.3 km in length, is the shortest option and involves:

- A bridge over Lansdowne River approximately 190m long and located about 400m downstream of the existing highway bridge, which would no longer carry traffic and would be removed
- Up to 32 hectares of land acquisition (mainly agricultural land) would be required. No dwellings would be directly affected, however some farm improvements would be affected
- Up to 5 intersections could be required (ie. north and south connections with the existing Highway and the intersections with Moto Road, Harrington Road and Spring Hill Road)
- The existing Highway would revert to local road status under Council ownership
- A bridge or viaduct for crossing Coopernook Creek and SEPP 14 Wetland (No. 545)
- Installation of a series of culverts or viaducts with a total length of around 100m
- Option 1 crosses the floodplain for approximately 3.30km

Option 2

Construction of a new highway in and adjacent to the corridor of the existing alignment of the Pacific Highway around the eastern edge of the village of Coopernook. This option is the longest at approximately 4.8km and would involve:

- A bridge over Lansdowne River approximately 160m long and located 20 to 50 m downstream of the existing bridge. Under Option 2 the existing bridge would not continue to carry traffic, and would be removed
- Possible diversion of the western bank of Coopernook Creek near Harrington Road
- Crossing the floodplain near the existing highway embankment
- Installation of a series of culverts or viaducts with a total length of around 70m
- Construction of service roads to segregate local and through traffic which would deny direct property access including movements to highway fronting businesses
- 10 to 20 hectares of land acquisition would be required depending on the outcome of negotiations for land required for the provision of local service roads (eg acquisition of entire properties may result as opposed to strip acquisition)
- Up to 6 dwellings and 2 commercial premises would be acquired for construction of this option
- Up to 5 intersection treatments could be required, including Moto Road, Harrington Road, Macquarie Street (north and south) and Spring Hill Road

- This option would be built under traffic and would require traffic crossovers during construction
- The oval and bushfire brigade shed would require relocation
- Option crosses the floodplain for approximately 3.45km

Option 3

Construction of a dual carriageway highway between Options 1 and 2, immediately east of Coopernook Creek. This option is of intermediate length at approximately 4.6km and involves:

- A bridge over Lansdowne River approximately 150m long located 150-200m east of the existing bridge, which would no longer carry traffic and would be removed
- Up to 34 hectares of land acquisition (mainly agricultural land) would be required
- No dwellings but several farm sheds and other improvements would be directly affected by this option
- Option 3 skirts the western edge of the SEPP 14 Wetland (No. 545)
- Installation of a series of culverts or viaducts with a total length of about 80m
- Up to 5 intersections could be required at the Pacific Highway (each end) with Harrington Road, Moto Road and Spring Hill Road
- The existing highway would revert to local road status under council ownership
- Option 3 crosses the floodplain for approximately 3.15km

Each of the options would ultimately be a dual carriageway of high standard design although short term traffic volumes may dictate that only a single carriageway be constructed initially. The concept designs allows for the Highway to be signposted at 100km/h for this section.

All options were designed to correspond with levels of both the 1 in 50 year and 1 in 20 year flood recurrence intervals. The embankment heights over the floodplain for the 1 in 50 year flood level are RL2.8 m and RL2.36m for the 1 in 20 year flood level. The three options would require between 200,000m^2 and 300,000m^3 of fill.

The difference in earthwork quantities for each route options for the 1 in 50 year and 1 in 20 year flood events would be in terms of total fill quantities. Option 3 would require the most imported fill followed by Option 1. These options would produce less than 5% of their total fill requirements from cut. However, Option 2 would generate approximately 60-75% of its fill requirements as a result of a significant cutting near Coopernook village.

4.1.2 Other Options

To identify any further possible options it was first necessary to define the east-west extent of the study area given that there was already clear end points in the north (Spring Hill) and south (Fig tree on Jones Island).

The study area is constrained to the east and west by features associated with the floodplain of the Lansdowne and Manning Rivers and the village of Coopernook.

Identification of further corridor options to the west of Option 2 are constrained by the alignment of Ghinni Ghinni Creek and the position of the village of Coopernook on the western side of the Pacific Highway. Any corridor options extending around the western side of Coopernook would be further constrained with respect to their length and the limitation they would place on the future growth of Coopernook.

The scope for locating further corridor options significantly to the east of Option 1 is constrained by wetland areas which become more extensive in the lower delta. Option 1 would already affect the western end of a wetland designated under SEPP 14.

The northern end point of this project section has been identified by the RTA as it represents the southern end of a relatively good alignment of the Pacific Highway along Two Mile Creek straight. Similarly, the southern end point of the project represents the beginning of a straight section of road south from the Fig Tree. It would be anticipated that future upgrades of the Pacific Highway would exploit the good existing highway alignment north and south of chosen end points of this project.

A further practical consideration in setting the east-west limits of the study area is the basic requirement to achieve a satisfactory economic benefit from the expenditure which would be involved. Previous experience has shown that the high cost associated with indirect routes between the nominated end points would mean much longer corridors were not viable.

As a result of these constraints (refer Figure 4.1), the corridor options considered were confined to an area generally bounded by the Pacific Highway in the west and the Option 1 corridor in the east.

Constraints Mapping

A constraints analysis within the study area was also conducted. The method used was a mapping procedure involving overlaying different theme maps which represent various constraints to road development (refer Figure 4.1). The objective of this assessment was to eliminate major conflicts and incompatibilities at the earliest stage in formulating proposed road corridors. As such, the actual process was one of identifying alignments through the study area which follow lines of the least resistance or conflict.

Given the nature of the study area, the following constraint categories were adopted for mapping:

- Bio-physical constraints: vegetation, habitat, hydrologic considerations, geology/soils, visual considerations
- Land use and planning constraints: zoning, land use, existing development and services heritage significance, agricultural land

A composite constraints map combining the above features was produced to identify potential new alignments. From the map it was apparent that there were no wholly new alignments which avoid the many study area constraints. This is mainly due to the extensive nature of the floodplain and the presence of productive agricultural land.

Value Management Study - Corridor Options

As previously indicated, Option 3 was identified during the VMS. In addition to the three main corridor options, the VMS also highlighted a "do minimum" option involving the replacement of the existing bridge and approaches. This option would retain a 80km/h speed limit and the other substandard road conditions through the rest of the route. Therefore, this option is not feasible as a long term solution as it does not meet the stated objectives of the proposed road. However, if Option 2 was chosen as the preferred corridor, this proposal could form an initial construction stage with immediate benefits.

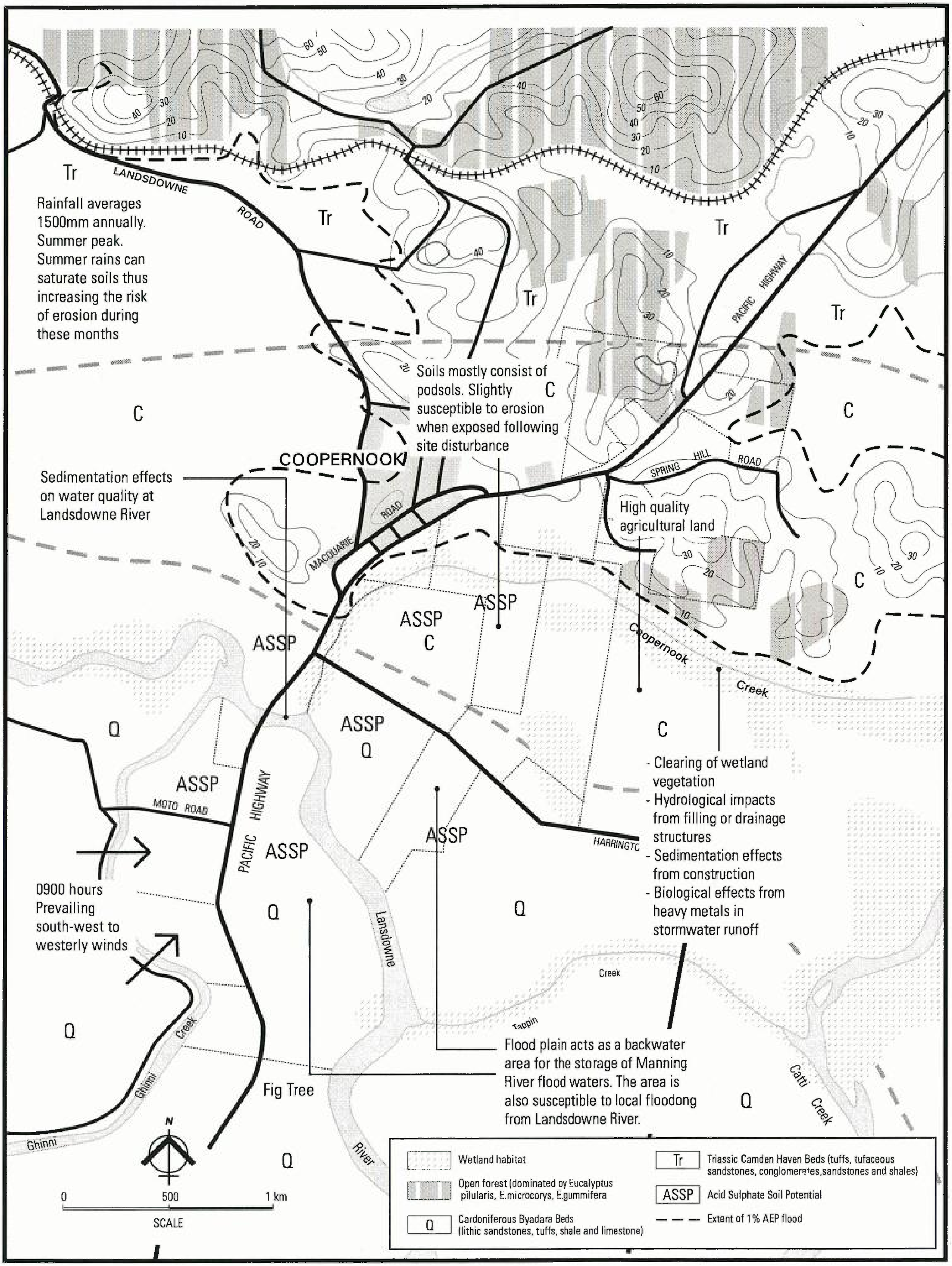
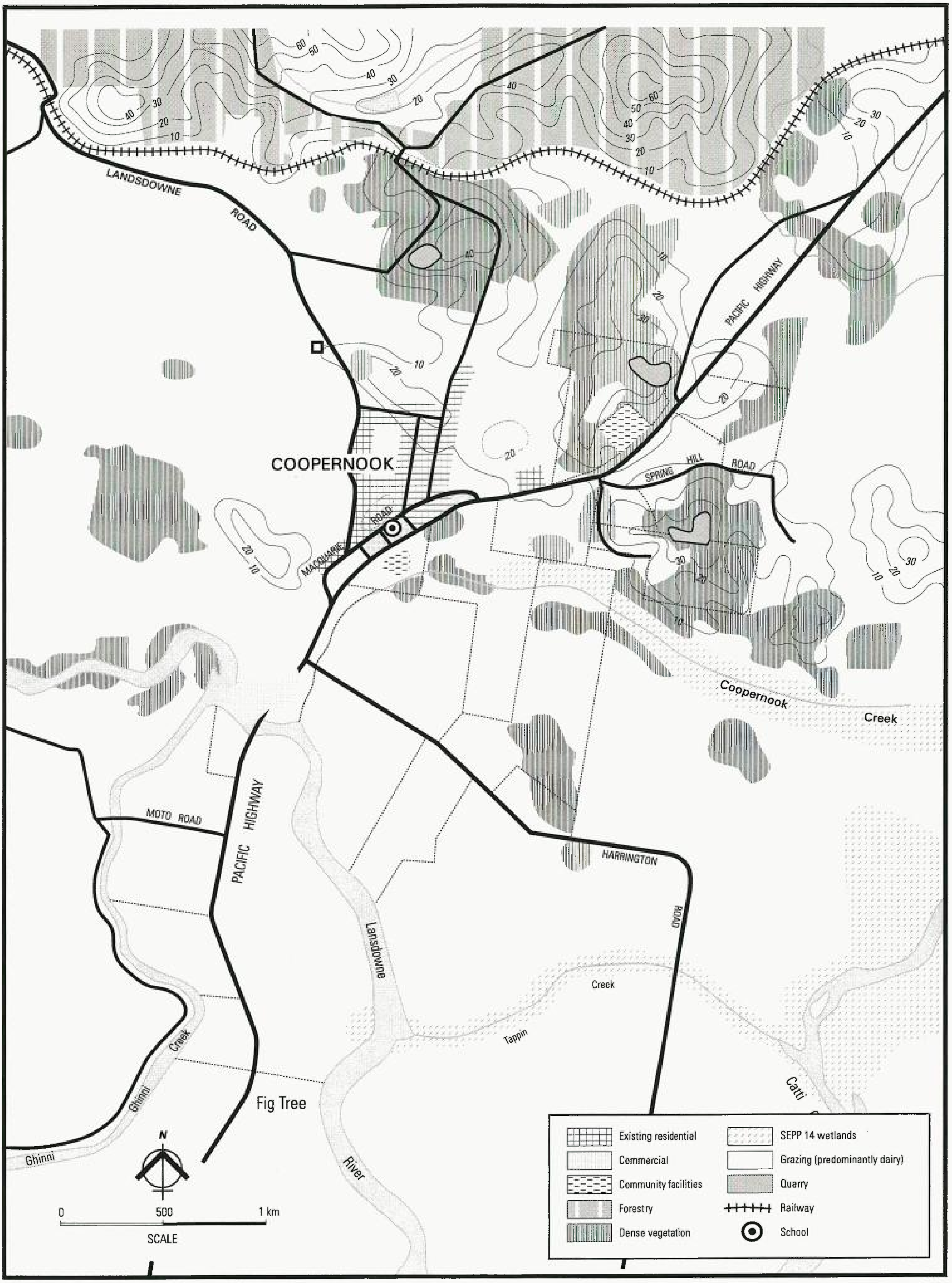


Figure 4.1 :
PHYSICAL CONSTRAINTS



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 4.2 : LAND USE

Community-Corridor Options

While no new corridor options were identified by the community, the potential for hybrid options between Options 1 and 3 at the northern end were considered. However, they were discounted on the basis of the sharp substandard curves that would be required.

4.1.3 Summary of Corridor Options

For the corridor assessment stage of the EIS the options were developed to preliminary concept level sufficient to:

- confirm their engineering feasibility (ie, that appropriate geometric design standards and other physical project requirements can be achieved);
- serve as a suitable basis for preliminary cost estimates to enable cost comparison and road user cost benefit analysis (BCA) of the options;
- ascertain the likely extent of land acquisition required for corridors;
- determine the relative environmental impacts of the options (viz,. bio-physical and socio-economic effects).

A summary of key features of the corridor options are shown in Table 4.1.

Table 4.1: Summary of Corridor Options

Summary Details	Option 1	Option 2	Option 3
Total length (km)	4.3	4.84	4.6
Travel Speed	100km/h	100km/h	100km/h
Minimum Horizontal Curve	4,000 m	600 m	600 m
Maximum Vertical Grade	2.4%	1.7%	1.8%
Number of Intersections	3 - 5	4 - 5	3 - 5
Direct Property Access Points	0	4 - 12	0
Land Acquisition	26 ha	10-20 ha	34 ha
Properties directly affected	10 - 11	13 - 14	9 - 10
Dwellings affected	0	6	0
Highway Businesses directly affected	0	2	0

4.2 Flooding Considerations for Corridor Selection

4.2.1 Road Level Over Floodplain

The project would necessarily traverse the Manning River catchment and its tributaries including the Lansdowne River and associated flood plains. The existing highway at Coopernook is subject to periodic flooding with water depths of up to 0.9m and closure for 2-3 days during the 1 in 20 year event. The lowest point in the study area just south of the Lansdowne Bridge (at 1.4 m AHD) is inundated during flood events with an average recurrence interval of about 1 in 5 years.

When the highway is closed, vehicles use Lansdowne Road as an alternative. This puts pressure on the local road system and is undesirable as the quality of road formation and pavement is suited to light traffic volumes only.

Flooding is an especially sensitive issue in the study area and a key decision relating to the project (regardless of the route) is what road level should be adopted to provide some flood immunity. Based on the hydraulic analysis completed, the 1 in 20 year event (2.36 mA HD) is concluded to be the most appropriate reference level for road design purposes. That is, at the peak of a 1 in 20 year flood, water would theoretically be lapping the centre line of each carriageway. Therefore one lane in each direction would be flood free.

To achieve a completely flood free road in the modelled 1 in 20 year flood event would require elevation by a further 140mm. This would involve higher construction costs with only limited benefits in terms of reduced duration of inundation (see Section 5.3).

A further important consideration is the low lying highway section to the south of the study area across Jones Island. Until that section is elevated the highway would continue to be inundated during events less than 1 in 20 year floods. Preliminary assessment has indicated that, if and when the highway is upgraded across the entire Manning River floodplain, the 1 in 50 year level is not likely to be practical due to the high cost of construction and the limited benefits in reduced inundation time.

4.2.2 Culvert and Bridge Requirements

Initial estimates of waterway requirements for the three options were based on WBM Oceanics (1995).

Subsequently, numerical modelling and more detailed analysis has been undertaken for the preferred option (Option 1, refer Section 6.3 (WBM Oceanics, 1997)). This has been undertaken on the basis of limiting the flood afflux due to the bypass for the 1 in 20 year flood to no more than 50mm (see Section 6.3). Retrospective adjustments were made for the waterway requirements of Options 2 and 3.

Culverts and bridges for the route options have been allowed for as follows:

Option 1

▸ Bridge over Lansdowne River	Twin 150m long x 11m wide (5 metre navigational clearance)
▸ Relief Culverts/Bridges	36 x 3.6m wide x 1.5m high
▸ Bridge over SEPP 14 wetland and Coopernook Creek	Twin 170m long x 11m wide (1.5m environmental clearance).

Bridge length is based on environmental consideration of bridging the SEPP 14 wetland and Coopernook Creek.

Option 2

▸ Bridge over Lansdowne River	Twin 130-160m long x 11m wide (5 metre navigational clearance)
▸ Relief Culverts/Bridges	18-20 x 3.6m wide x 2.1m high

Option 3

▸	Bridge over Lansdowne River	Twin 120-150m long x 11m wide (5 metre navigational clearance)
▸	Relief Culverts/Bridges	14-16 x 3.6m wide x 1.8m high 6-8 x 3.6m wide x 2.1m high

Options 1, 2 and 3 proposed for the Pacific Highway upgrading at Coopernook would have similar impacts on flooding processes in the area. Based on the numerical modelling work by WBM Oceanics (1992, 1995 and 1997 - latter two in Appendix I), flooding can be overcome by design solutions while remaining cost effective.

As the floodplain in the vicinity of Coopernook tends to predominantly act as a backwater area for the storage of flood waters, the culverts will not impede flood waters and scour will not occur at the culverts (see Section 6.3).

Solving potential local drainage problems would be a matter of choosing the appropriate location for culvert and bridge structures as well as adjustment of farm drainage channels which allow flood waters to subside as quickly as practicable (see Section 6.3).

4.3 Road User Economic Evaluation

The RTA undertakes a road user cost benefit analysis as part of its consideration of route options. This analysis enables the ranking of options according to their efficiency in the use of scarce road funding. That ranking is then used as one input only to the route selection process.

The analysis is a limited, road user assessment which is used for this specific purpose only. It does not function as a comprehensive economic analysis.

The comprehensive economic analysis of the proposal is made up of:

- the road user cost benefit analysis (Section 4.3 of this EIS)
- the assessment of economic impacts on farms, properties and other businesses (Section 6.9 and 6.10 of this EIS)
- the results of agency input and community involvement, particularly in relation to expressed preferences resulting in the allocation of scarce resources to modifications to the proposal or to environmental design features or mitigation measures (Section 2.8 of this EIS)

This analysis is consolidated and summarised in relation to the economic justification for the proposal in Section 8.0 of this EIS.

4.3.1 Method

The road user cost benefit analysis followed the general procedure described in the RTA's Economic Analysis Manual (RTA, 1990). The estimated cost for construction and operation of each option was compared with the benefits derived by road users in the form of savings in travel time, travel distance, vehicle operation and road crashes. The road user costs and benefits were discounted to present values and net present values and benefit cost ratios were calculated.

The following parameter values were adopted as the basis of analysis:

- Evaluation Period - 20 years from 1996 to 2016
- Price Year - 1996
- Discount Rate - 7% (with sensitivity tests at 4% and 10%)
- Base Year - 1996
- Value of Travel Time - $22.22/hour
- Value of fuel (Petrol) - $0.343 VOC/litre of diesel fuel consumed
- Value of Fuel 6 axle (Diesel) - $0.287 VOC/litre of diesel fuel consumed
- Freight Differential (Petrol) - $0.019 VOC/litre
- Freight Differential 6 axle (Diesel) - $0.020 VOC/litre
- Vehicle Operating Cost:

—	Existing Road	- $0.127/vkm light vehicles
		- $0.472/vkm heavy vehicles
▸	Improvement Options	- $0.116/vkm Light Vehicles
		- $0.41/vkm Heavy Vehicles
▸	Accident Costs	- $90,800/accident

4.3.2 Estimate of Road User Benefits

Mean speed by vehicle category and fuel consumption was calculated from a recommended RTA rural traffic simulation program "TRARR 4" (as shown in Appendix D). Travel time costs were calculated for the existing and future traffic volumes and tested against each improvement option.

The reduction in accident costs were derived from the average costs of accidents. Approximately 50% of all current accidents are related to the existing bridge across Lansdowne River. It has been assumed that at least 50% of accidents would be reduced with a new road corridor and associated access control.

4.3.3 Estimate of Road User Costs

Land and property costs were estimated on current market values and derived from a pro-rata basis for the likely area of land affected.

Cost estimates for road and bridge construction were based on similar work undertaken by the RTA and current estimates given by public utility authorities. Maintenance costs for retaining the existing highway are included in the analysis. Table 4.2 overleaf shows the summary of the estimate.

Table 4.2: Cost Estimates of Corridor Options (1997$Million)

Item		Option 1 ($)	Option 2 ($)	Option 3 ($)
1. Investigation/Design		418,158	500,000	500,000
2.	Property Acquisition/compensation	860,000	3,000,000	800,000
3.	Utilities	100,000	700,000	100,000
4.	Road Construction			
	a. Construction Preliminaries	90,000	90,000	90,000
	b. Site Preparation	240,000	240,000	240,000
	c. Provision for Traffic	50,000	300,000	100,000
	d. Drainage	1,140,000	2,000,000	1,400,000
	e. Earthworks (1 in 20 year flood)	6,661,400	4,400,000	6,770,000
	f. Structures and Associated Works	8,880,000	7,160,000	7,160,000
	g. Pavement	5,340,000	5,500,000	5,670,000
	h. Miscellaneous Works	546,500	600,000	600,000
	Total Construction Costs	24,606,058	24,490,000	23,430,000
5.	Engineering Services 7%	1,722,424	1,714,300	1,640,100
6.	Contingencies 18%	4,429,090	4,408,200	4,217,400
	Total Costs	30,757,572	30,612,500	29,287,500
	Length (km)	4.30	4.84	4.60

The spread of the costs in the next 20 years would be concentrated up to 2001 and the discounted figures (at 7% discount rate) are shown in Table 4.3. Detailed calculations shown in Appendix G.

Table 4.3: Annual Discounted Capital Cost Estimates (1997 $Million)

Year	Option 1	Option 2	Option 3
1996	0.193	0.193	0.193
1997	0.467	0.467	0.467
1998	1.204	1.204	1.204
1999	8.163	8.163	8.163
2000	11.443	11.443	11.443
2001	3.123	3.019	2.074
Total	24.593	24.579	23.544

The costs already committed to the planning and investigation of the highway network at Coopernook in 1996-1997 (EIS and Concept Design) are not included in the economic analysis for the project.

The cost estimates assume that sufficient and suitable fill material is available within 25 km of the project.

4.3.4 Comparison of Options

The key economic indicators are presented in Table 4.4 with all assuming the expected traffic growth of 3.1%pa. These results show that Option 1 would give the best road user economic performance by a small margin over Option 3. It has a good return even when high discount rates are assumed. Even though it is marginally more costly than Option 3, Option 1 is 300m shorter, giving higher net benefits for road users.

In road user economic terms, Option 1 is superior to Option 2 because the latter has a higher cost and provides much less road user benefits as it is over 500 m longer.

Details of the analysis are provided in Appendix D.

Table 4.4: Summary of Road User Economic Analysis

Option	Discounted Cost $M	Discounted Benefit $M	BCR	NPV $M	FYRR (%)
Discount Rate 4%					
Option 1	27.26	54.75	2.01	27.49	12.30
Option 2	27.14	42.64	1.57	15.50	9.77
Option 3	26.05	47.63	1.83	21.58	11.29
Discount Rate 7%					
Option 1	24.59	37.53	1.53	12.94	11.83
Option 2	24.49	29.28	1.20	4.79	9.40
Option 3	23.54	32.68	1.39	9.13	10.83
Discount Rate 10%					
Option 1	22.26	26.64	1.20	4.38	11.38
Option 2	22.17	20.81	0.94	-1.36	9.04
Option 3	21.35	23.21	1.09	1.86	10.40

4.3.5 Sensitivity Analysis

As noted earlier, there are a number of inputs and assumptions for the road user economic analysis. These need to be tested over a range of conditions in order to assess the extent of changes in the outcome.

The effect of changing traffic growth (ie 2%, 3.1% and 6% annual increases), is summarised in Table 4.5. A higher traffic growth rate would, as expected, yield a better road user economic performance. The lower growth scenario (2%) reduces benefits but the performance remains satisfactory.

Table 4.5: Sensitivity to Traffic Growth

Traffic Growth Rate	2%			3.1%			6%		
Option	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
BCR	1.31	1.40	1.39	1.53	1.20	1.39	1.55	1.21	1.40
NPV ($M)	7.63	9.90	9.24	12.94	4.79	9.13	13.58	5.08	9.32

The effect of varying construction cost by +10% is shown on Table 4.6. The indicators are sensitive to this increase in cost with road user BCR's falling substantially for the three options.

Table 4.6: Sensitivity to Construction Cost

Cost	+10% to construction cost		
Option	**1**	**2**	**3**
BCR	1.39	0.86	1.26
NPV ($M)	10.55	-3.57	6.85

4.3.6 Assessment of Road User Economic Evaluation

Based on the results for the various sensitivity tests completed, there is a consistent indication that Option 1 performs slightly better than Option 3 in road user economic terms. Option 2 presents as being an inferior option when compared to the other alternatives, but it still represents a satisfactory scheme considering the target objective.

Only with the 4% discount rate sensitivity test does Option 1 reach a BCR of greater than the target objective of Option 2. However, due to the relatively high construction costs (owing to bridges and the terrain crossed by all options) the net present road user benefits of the project mostly arising from travel time, accident and vehicle operating cost savings are not double the net present costs of construction and maintenance of the project.

The achieved NPV of around $13m and BCR of more than 1.5 for the best performing options is representative of an economically viable project, with respect to the road user oriented parameters of this aspect of the assessment.

4.4 Planning and Environmental Assessment of Corridor Alternative

There are many other costs and benefits associated with the project that must obviously influence the choice of a corridor. These include the relative merits of the options in terms of the transport function they would fulfil, various environmental, land use and heritage considerations as well as social and regional development impacts.

4.4.1 Assessment Factors

A weighted factor analysis technique was used to compare the options. The study team, VM Workshop and various community responses identified a range of factors on which a decision on the preferred corridor should be based. Each factor was subsequently prioritised for its significance by different stakeholder groups. The weighted factors were then applied to the comparative assessment of each corridor option in relation to each factor. The combined factor weightings and ratings of the corridor options provided a total score or value of each corridor with respect to all the assessment factors.

From a long list of factors put forward at the various forums, the following short list was developed:

Factor 1	-	Flora, Fauna and Wetlands
Factor 2	-	Pollution (air, water, noise)
Factor 3	-	Impact on the town area
Factor 4	-	Effects on Business and Agribusiness
Factor 5	-	Effects on properties
Factor 6	-	Local Access
Factor 7	-	Road Safety
Factor 8	-	Visual Intrusion
Factor 9	-	Aboriginal and non-Aboriginal heritage
Factor 10	-	Disruption during construction

It is noted that flooding is not included in the list of assessment factors even though it was identified as a major planning and design consideration in the project. The exclusion of flooding from this list, and the subsequent comparison of options, was done on the basis that all corridors could be designed so that flood conditions in the Coopernook area would not be exacerbated (refer WBM, 1994). On this basis, the provisions for flooding are addressed through the road design process and by allowance in the cost estimates for drainage/waterway structures. In this regard, the estimates prepared for comparison of the options allowed for a variety of bridges and culverts to suit the particular corridor alignment (see also WBM, 1995).

The issue of road level is a further consideration in planning for the traffic relief route and it is addressed in Section 4.2.

A definition of each of the assessment factors and their associated performance criteria, which are subsequently used to compare the options, is provided in Appendix E.

4.4.2 Weighting of the Assessment Factors

The assessment factors outlined are aspects which should influence to varying degrees the determination of a preferred corridor. Of the 10 assessment factors, it is apparent from a wide range of consultations that some factors should be recognised as being of more importance or relevance than others in determining a preferred option. To account for this, a numeric weighting is applied to reflect the perceived relative importance in the final value for each option.

This procedure of importance weighting is central to the weighted factor analysis technique. In this study, several sets of weightings were compiled from different sources, including:

- The VM Study at which all participants contributed to the weighting of the factors.
- Community Focus Group Meeting (No.1) at which representatives individually prioritised factors from a long list. Weightings were then developed according to how they corresponded with the short listed assessment factors. Factors which would

not assist in distinguishing between options such as road signposting were noted for consideration at the concept design stage, while factors relating to economic performance of the options were taken into account in the separate calculations of economic costs and benefits.

- Exit Survey completed by visitors to the public meeting No.1 at Coopernook and the Newsletter (No. 1) sent to all residents in the study area. In this case, the questionnaire prompted a weighting of the importance of factors expressed as very important (weighting of 3), important (weighting of 2) or less important (weighting of 1). This data was subsequently totalled for each factor to obtain a weighted average value. A total of 48 surveys were used in the weighted factor analysis.

- Exit Survey questionnaire completed by visitors to Public Meeting (No.2) at Coopernook. A total of 47 surveys were handed in and tallied.

- The EIS Project Team comprising members from the RTA and Connell Wagner. Professional disciplines covered by these contributors includes highway engineering, project management, road design, environmental policy, environmental planning, landscape planning, ecology, traffic engineering, social planning and community consultation. Each member completed a schedule of weightings which were then averaged for the team weighting.

The above sources were considered appropriate to achieve a balanced cross-section of attitudes relevant to the project and the study area. Table 4.7 presents the weightings for each of these sources and shows there is a high level of consistency in the rank order of factors. This suggests that there can be a good level of confidence or robustness in the overall assessment.

Table 4.7: Assessment Factor Weightings

Factor	VM Workshop		Community Focus Group		Exit Survey (No. 1)		Exit Survey (No.2)		Project Team	
	Weight	Rank	Weight	Rank	Weight	Rank	Weight	Rank	Weight	Rank
1. Flora, Fauna & Wetlands	16.5	2	9	3	82	7	87	9	14	4
2. Pollution (air, water, noise)	13	3	3	5/6/7	99	2	127	1	15	3
3. Impact on the Town Area	12.5	4	6	4	95	4	114	5	17	2
4. Effects on Business and Agribusiness	9.5	6	0	8/9	85	6	94	7	11	7/8
5. Effects on Properties	10	5	3	5/6/7	92	5	121	4	12	6
6. Local Access	5	7/8	18	2	97	3	124	2/3	13	5
7. Road Safety	21.5	1	30	1	108	1	124	2/3	18	1
8. Visual Intrusion	2	9	3	5/6/7	80	8	88	8	11	7/8
9. Aboriginal and Non-Aboriginal Heritage	5	7/8	0	8/9	58	10	61	10	6	9/10
10. Disruption During Construction	0	10	6	4	65	9	100	6	6	9/10

From Table 4.7 it is apparent that the factor consistently regarded as most important was safety while pollution, local access and impact on the Coopernook town area were also given a high priority by all sources. By contrast, the factors which were typically of lesser importance were disruption during construction, heritage issues and visual intrusion.

4.4.3 Rating the Options

The approach adopted for the comparative assessment of the corridor options involves a rating of the performance of each corridor option based on the factors identified above.

The comparative assessment is presented in Table 4.8 and full description of how those ratings were derived is included in Appendix E. A simple rating in the range from 1 to 5 is given to each option for each factor. A rating of 5 indicates that an option performs very well in terms of the definitions and performance criteria given for each factor, whilst a rating of 1 indicates a relatively poor performance.

It is emphasised that the comparative assessment sought to distinguish the relative advantages of the options rather than their absolute performance. As such, a high rating for one or more criteria does not mean the potential impacts or changes are not significant, but rather that the option rates well compared to other options. The specific type and magnitude of impact or change accompanying an option may not be evident in the table. The subsequent impact assessment phase of the Study addresses such aspects.

Table 4.8: Rating the Performance of Corridor Options

Factor	Option 1	Option 2	Option 3
1. Flora, Fauna and Wetlands	2.5	3.0	3.5
2. Pollution (Air, Water, Noise)	4.0	1.5	3.0
3. Impacts on the Town Area	4.0	1.5	3.5
4. Effects on Business and Agribusiness	1.5	2.5	1.0
5. Effects on Properties	2.5	2.0	2.0
6. Local Access	3.0	2.5	3.0
7. Road and Community Safety	4.5	3.5	4.5
8. Visual Intrusion	2.5	3.5	3.0
9. Aboriginal and Non-Aboriginal Heritage	4.5	4.0	4.0
10. Disruption during Construction	4.5	2.0	4.5
Note: Full description of how the above ratings were reached is included in Appendix E.			

4.4.4 Comparative Assessment Findings

With the comparative rating of corridor options and the importance weightings for each assessment factor, the total suitability scores were computed. These scores are the sum of the product of the rating and weighting values for each factor, as summarised in Table 4.9.

These suitability scores have been generated for each of the weighting sets (refer Table 4.7) with the exception of the set generated by the Community Focus Group. The prioritising of factors by that group was not based on the common short list used by the other sources and some members of the group expressed concern that study team personnel contributed to the weighting. Consequently, it has not been used.

However, it is evident that the priorities set by the group are generally consistent with the weightings by the other sources.

Table 4.9: Suitability Scores

Corridor Option		Weighting Source			
		VM Workshop	Exit Survey No.1	Exit Survey No.2	Study Team
1.	Eastern Corridor	322	2869	3499.5	411
2.	Existing Highway Corridor	246	2196	2598	312
3.	Central Corridor	308	2727	3308.5	393

4.5 Overall Corridor Evaluation

The weighted factor analysis revealed Options 1 and 3 to be the most suitable corridors with respect to the planning and environmental criteria evaluated. With each of the four sets of factor weighting Option 1 scored most highly, followed by Option 3. Option 2 scored the lowest by a margin of more than the value of the highest weighted factor. As such, it was concluded to be a clearly inferior alternative in terms of the range of assessment factors. In particular, Option 2 is less suitable due to worse local access changes, and safety and the more severe town structure impacts and pollution effects (especially traffic noise).

The key planning and environmental factors for which Option 1 performed most strongly are:

- pollution
- impacts on the town area
- disruption during construction
- road and community safety

The performance of Option 1 with respect to most other factors was on par or not significantly worse than that achieved by the other options. With respect to design and road user economic appraisal Option 1 consistently performed better in relative terms over Options 2 and 3. On the basis of BCR and NPV the relative rank order remained robust in relation to a range of sensitivity tests with the exception of significantly slower than anticipated traffic growth.

In October 1996, the then Minister for Roads, Mr Michael Knight, announced the adoption of Option 1 as the preferred corridor for the Coopernook Traffic Relief Route.

5

DESCRIPTION OF THE PROJECT

5. DESCRIPTION OF THE PROJECT

The approach adopted in Chapter 4 for the comparative assessment of the corridor options involved a rating of the performance of each corridor option based on a range of environmnetal and planning factors which would influence to varying degrees the determination of a preferred corridor. The weighted factor analysis revealed that Options 1 and 3 were the most suitable corridors with respect to the factors evaluated. With each of the forums used for factor weighting, Option 1 consistently scored most highly, particularly in the areas of pollution, impact on the town area, disruption during construction and road and community safety. As a result, Option 1 was recommended and adopted as the preferred option for the proposed highway alignment.

5.1 Network Access Arrangements

5.1.1 Decision Making Process

The Preferred Option 1 alignment forms the basis of the Proposed Concept Design. Various intersection and access arrangements for Coopernook and Harrington have been investigated and a preferred arrangement reached based on the following process:

- Development of a schematic network model for the Pacific Highway at Coopernook including the main access road connections (ie. existing/proposed highway intersections, Harrington Road, Moto Road and Spring Hill Road).

- Compilation of a set of ten potential access and intersection arrangement options for the network:

  A1 Grade separation at Harrington Road, existing Lansdowne River Bridge open
  A2 Grade separation at Harrington Road, existing Lansdowne River Bridge closed
  B1 At grade junction at Harrington Road, existing Lansdowne River Bridge open
  B2 At grade junction at Harrington Road, existing Lansdowne River Bridge closed
  C1 Existing highway closed north and south of Coopernook, existing Lansdowne River Bridge open
  C2 Existing highway closed north of Coopernook, existing Lansdowne River Bridge closed
  D1 Harrington Road bridge over proposed highway, existing Lansdowne River Bridge open
  D2 Harrington Road bridge over proposed highway, existing Lansdowne River Bridge closed
  E1 Harrington Road closed west of the existing highway, existing Lansdowne River Bridge open
  E2 Harrington Road closed west of the existing highway, existing Lansdowne River Bridge closed

  Refer to Appendix G for the sketches of the above options.

- Road user economic analysis of the existing Lansdowne River bridge open options (A1, B1, C1, D1, E1) versus bridge closed options (A2, B2, C2, D2, E2) to compare the net present values of the cost of bridge maintenance in relation to travel and other costs associated with the imposed detour and bridge demolition. The results indicated a significant saving in closing the existing Lansdowne River bridge. As a result, options A2, B2, C2, D2 and E2 were retained for further analysis (refer to Section 5.1.2).

- Capacity/delay analysis of Harrington Road junction for at-grade layouts. This was to determine whether traffic would reach saturation during the assessment period in order to determine the need for grade separation at Harrington Road. The analysis showed that an at-grade intersection would not reach capacity during the twenty year analysis period. As a result the high cost grade separation options A2 and D2 were removed from further analysis (refer to Section 5.1.3).
- Traffic, economic and environmental appraisal of the remaining three options (B2, C2, E2) (refer to Section 5.1.4).
- Optimisation of the preferred access and intersection concept design, option B2 (refer to Section 5.2).
- Description of the construction methods and staging (refer to Section 5.3).
- Description of the concept landscape plan (refer to Section 5.4).
- Cost estimate of the concept (refer Section 5.5).

5.1.2 Economic Analysis of Existing Lansdowne River Bridge Closure

The proposed Coopernook Bypass would span the Lansdowne River approximately 1000m downstream of the existing bridge. A link for Moto Road-Coopernook journeys would be available via the proposed highway bridge and Harrington Road. The connection between Coopernook and the highway to the south would be possible via the same link, making the existing bridge redundant.

Consideration has been given to the closure and removal of the existing narrow highway bridge due to its poor safety even at low traffic volumes and in relation to the navigation restriction it imposes on vessels greater than 2m tall due to the non-functional opening mechanism. The new bridge would have a navigational clearance of 5m which would open up to 10km of the upper Lansdowne River to use by houseboats and launches.

The replacement or repair of the bridge opening mechanism is not considered feasible based on the condition of the bridge as well as operating and maintenance costs of the mechanism. The permanent opening of the bridge would have a significant visual impact due to the raised section of the road and is therefore not recommended.

The adoption of the preferred bypass alignment would result in a major reduction of through vehicles on the existing highway alignment. However, the bridge closure would have the marginal additional effect of requiring all of the trips between Coopernook and the south to use the Harrington Road link. It is considered that even with the bridge remaining open a significant proportion of traffic between Coopernook and Taree would use the proposed new bridge over the Lansdowne River to benefit from the improved travel conditions on the proposed highway via the Harrington Road link. However, the small amount of Moto Road to Coopernook traffic would be disadvantaged in terms of distance and travel time as a result of having to join the new highway 1km south of Moto Road near the fig tree.

Thus an economic analysis comparing the closure and removal of the existing bridge with the ongoing maintenance of the existing bridge takes into account the following items over a 20 year economic appraisal period:

- Costs of bridge demolition or costs of recurrent and major bridge maintenance items over the analysis period.
- Costs of upgrade of part of Harrington Road (800m) if bridge is to be removed.
- Travel time and vehicle operating costs over the analysis period associated with an additional 2.7 km travel (1 min 45 secs) for 80 vehicles per day between Moto Road and Coopernook, and an additional 0.4 km (only 5 secs of additional travel time on the higher speed route) for 792 vehicles per day between Coopernook and destinations to the south (apportioned between the existing and new highways).

Based on the current poor safety and high traffic volumes on the existing bridge and the lack of pedestrian walkway, few school children or pedestrians use the bridge as a link with Coopernook.

The economic analysis of bridge open/bridge closed arrangements are presented in Appendix G. In summary, the net present cost of retaining the existing bridge exceeds the cost of closing and removing the existing bridge by $260,000 (7% discount rate). The very high and ongoing cost of bridge maintenance greatly exceeds the accrued travel time and vehicle operating cost savings due to the relatively low numbers of vehicles required to detour.

The economic analysis incorporates a range of assumptions which are tested for their sensitivity to change in Appendix G. Alternative discount rates, values of time and traffic assignments were tested, each demonstrating the robustness of the outcome of the analysis. There is a strong economic justification for the closure and demolition of the existing bridge once the new highway bridge is open. As a result, further analysis of access arrangements with the bridge open (A1, B1, C1, D1, E1) is not considered necessary. The heritage significance of the Bridge is discussed in detail in Appendix S.

It is noted that the construction of the bypass, not withstanding the status of the existing bridge, would significantly reduce the volumes of traffic using the existing highway between the southern connection and Harrington Road. The commercial impact of a reduction of passing traffic to local business is addressed later in the EIS.

5.1.3 Harrington Road Intersection Analysis

Grade separation of the proposed Pacific Highway junction at Harrington Road has been considered in the event that the less costly at-grade treatments prove unsuitable due to safety or capacity constraints.

Intersection capacity was evaluated for 5 at-grade junction layouts for the 20 year design life. All were found to perform to a Level of Service B (defined as acceptable delays and spare capacity) and achieve a degree of saturation averaging 0.2. The assumptions made to determine design year traffic volumes were as follows:

- corridor traffic to grow at 3.1% per annum linear
- local traffic growth includes an conservative estimate of an additional 2500 lots for Harrington over the design period and another 250 lots for Coopernook. This represents around 166% growth from the year 1996
- existing turning movements have been distributed for each of the different layout options and factored up in accordance with the above assumptions
- the analysis has also been undertaken for the peak holiday traffic period

An at-grade junction has capacity to accommodate high growth scenarios for Harrington as well as increased tourist traffic potentially associated with future tourist routes to the north via Harrington.

As stated in the RTA's Road Design Guide (Section 4.6.2): "Comparison of intersection proposals from the viewpoint of safety is difficult because it is difficult to isolate specific features which cause accidents. The principles of safe design tend to favour the more elaborate (and expensive) design".This includes grade-separation as by separating some of the road user movements (RUM) which dominate intersection accidents, points of conflict can be decreased.

The higher risk vehicle movements are those involving cross movement conflicts, right turning/nearside conflicts, right turning/through traffic conflicts and right turning/rear end conflicts. In Section 5.2.5 of this report various layouts for the Harrington Road junction have been analysed on the basis of safety performance, delay performance and construction costs. While this table demonstrates that grade-separation reduces the number of high risk RUM from a possible 16 to 6 (compared to a reduction from 16 to 10 for some at-grade junctions), delay penalties are incurred given the geometry of such a layout and the construction costs are estimated to be approximately $3 million more than any at-grade solution.

Grade separation of a junction will always have increased safety benefits over an at-grade layout but is not considered warranted in this location where an at-grade junction can perform sufficiently well in the design year with acceptable delays and capacity. An at-grade junction would be located on a straight section of highway on a fill embankment creating clear visibility for 1 km to the south and an even greater distance to the north. This provides very good sight lines to help reduce the risk of accidents. On this basis no further investigation has been carried out on the more expensive and more visually intrusive grade separated access arrangements (ie. options A2 and D2).

5.1.4 Traffic, Safety and Environmental Appraisal of the Network Access Options

Having discarded the bridge open and grade-separation at Harrington Road options, the following access arrangements have been analysed further in terms of safety and other environmental factors:

Option B2 — This option has three Pacific Highway Junctions. Access to Coopernook is from the Harrington Road Junction and the Northern Junction.

Option C2 — Existing highway closed north of Coopernook. Access to Coopernook from the Harrington Road Junction only.

Option E2 — Harrington Road closed to the west of the proposed highway. Access to Coopernook from the Northern Junction only.

A weighted factor analysis technique was used to compare these access arrangements. A range of environmental factors were identified on which a decision on the preferred option should be based. Each factor was subsequently scored for each option. The factors were weighted by the study team drawing where appropriate on the weightings for comparable factors used for the route selection process. The weighted factors were then applied to the comparative assessment of each remaining access option. The following factors were considered:

- safety and traffic flow
- convenience of access
- convenience of access during flooding
- land take
- proximity of traffic to houses
- exposure of highway businesses
- property management effects

The comparative assessment is presented in Table 5.1. A simple rating in the range of 1 to 5 is given to compare the performance of each option for each factor. A rating of 5 indicates that an option performs very well in terms of the definition of that particular factor, whilst a rating of 1 indicates a relatively poor performance. The weightings range from high (3) to low (1) significance. The highest weighted factors include safety, traffic flow and convenience of access.

Table 5.1 shows that Option B2 generates the highest weighted score by a margin greater than twice the highest weighted factor. The greatest influencing factor is convenience of access, with Option B2 performing well with two access points to Coopernook. This option also has the most direct access to Coopernook and Harrington of all the options assessed.

On this basis Option B2 was adopted and enhanced through the concept design process.

5.2 Concept Design

5.2.1 Design Guidelines

The proposed concept has been designed using the following documents as guidelines:

- RTA Road Design Guide
- NAASRA (AUSTROADS) Guide to Engineering Practice, Part 5 - Intersections at Grade
- RNI Pacific Highway Schedule of Design Policies and Specifications for the Construction of New Sections of Dual Carriageway

5.2.2 Cross Section

The typical cross section has been extracted from the RNI Pacific Highway Schedule of Design Policies (refer Figure 5.1). The basic configuration will be dual carriageways each with an 8m width of high strength pavement. This will be made up of 2 x 3.5m lanes, with extensions of 0.5m on each side for structural purposes. The width of the median will be 8m between edges of pavement with a depressed centre. Provision will be made for pedal cyclists with a 1m sealed hard stand adjacent to the carriageway. The cross fall on each carriageway will normally be 3% towards the nearside.

Laybys to allow cars to stop along the highway have been provided along the route. Assuming that vehicles can pull off at junctions in emergency situations, allowance has been made for 4.5m x 20m laybys at Ch.19,050 and 20,900 on the nearside of the northbound carriageway and Ch.19,500 and 20,900 on the southbound.

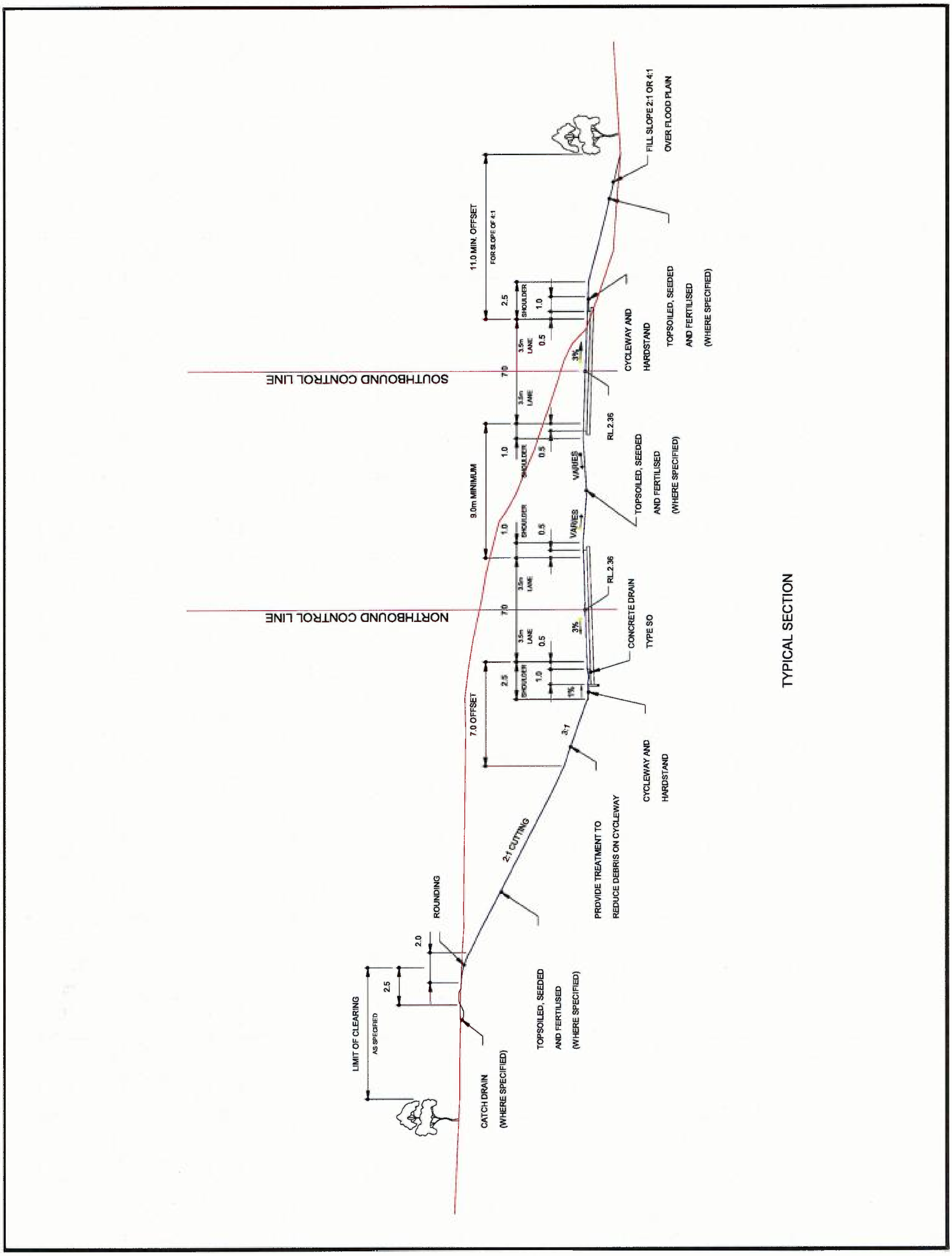
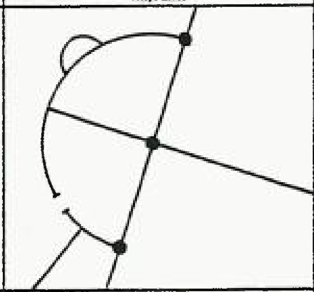
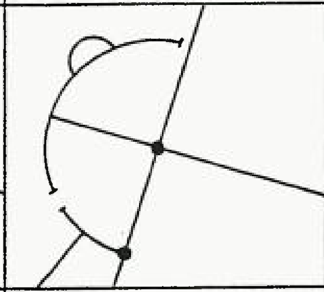
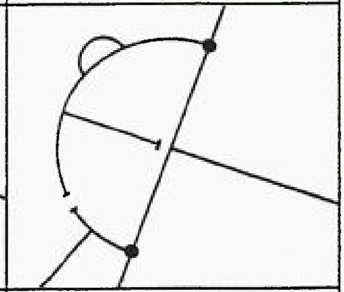


Figure 5.1 :
CROSS SECTION OF HIGHWAY

TABLE 5.1 ANALYSIS OF ACCESS ARRANGEMENTS B2, C2 and E2

ASSESSMENT FACTORS	ACCESS ARRANGEMENT OPTIONS					
	HARRINGTON ROAD JUNCTION AT GRADE B2 bridge closed		EXISTING HIGHWAY CLOSED NTH. AND STH. OF COOPERNOOK C2 bridge closed		HARRINGTON ROAD CLOSED WEST OF PROPOSED HIGHWAY E2 bridge closed	
Option sketches						
SAFETY AND TRAFFIC FLOW	– Intersections:- 1 at-grade cross junction, 2 at-grade T junctions. – 1682 vpd crossing the path of through traffic. – 4 large right turn movements. – narrow bridge closed, increasing safety.		– Intersections:- 1 at-grade cross junction, 1at-grade T junction. – 1374 (G.S.) or 1682 (A.G.) vpd crossing path of through traffic. – 4 large right turn movements. – narrow bridge closed, increasing safety. – traffic movements concentrated at one junction.		– Intersections:-3 at-grade T junctions. – 1682 vpd crossing the path of through traffic. – 4 large right turn movements. – narrow bridge closed, increasing safety.	
Weighting (high)	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating
3	2.5	7.5	2.5	7.5	3	9
CONVENIENCE OF ACCESS	– good access to Harrington. – access between C'nook and south longer by 0.4km for 792 vpd. – access between C'nook and Moto Rd. longer by 2.7km for 80 vpd. – Additional 532 veh. km/day		– access to Coopernook restricted to the 1 junction. – good access to Harrington. – access between C'nook and north longer by 2km for 570 vpd. – access between C'nook and south longer by 0.4km for 792 vpd. – access between C'nook and Moto Rd. longer by 2.7km for 80 vpd. – Additional 1673 veh. km/day		– access to Coopernook restricted to the 1 junction. – access between C'nook and south longer by 1.4km for 792 vpd. – access between C'nook and Harrington longer by 1km for 308 vpd. – access betwee:: C'nook and Moto Rd. longer by 3.7km for 80 vpd. – Additional 1713 veh. km/day	
Weighting (high)	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating
3	4	12	2	6	2	6
CONVENIENCE OF ACCESS DURING FLOODING	– Coopernook accessable from northern junction when Harrington Road in flood.		– No access to Coopernook when Harrington Road in flood. An emergency access route could be provided at the northern end.		– Coopernook accessable from northern junction when Harrington Road in flood.	
Weighting (medium/low)	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating
1.5	3	4.5	2	3	3	4.5
LAND TAKE	– additional 4 to 5 Ha for at-grade staggered T at Harrington Rd.		– additional 4 to 5 Ha for at-grade staggered T at Harrington Rd.		– minimal additional land take at Harrington Rd. T junction.	
Weighting (low)	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating
1	2.5	2.5	2.5	2.5	4	4
PROXIMITY OF TRAFFIC TO HOUSES	– Coopernook bound traffic only with little passing traffic.		– this option has the least traffic through Coopernook.		– traffic from the southern side of town will pass through C'nook to travel south.	
Weighting (medium)	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating
2	4	8	5	10	3	6
EXPOSURE OF HIGHWAY BUSINESSES	– light exposure		– least exposure		– light exposure	
Weighting (medium)	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating
2	2	4	1	2	1.5	3
PROPERTY MANAGEMENT EFFECTS	– at-grade junction at Harrington Rd creates a barrier to stock movement.		– at-grade junction at Harrington Rd creates a barrier to stock movement.		– creates a barrier to stock movement which a low stock underpass beneath the new highway could rectify.	
Weighting (low)	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating	Comparative rating =	Weighted rating
1	2.5	2.5	2.5	2.5	3.5	3.5
TOTAL SCORES	Raw Score 20.5	Weighted Score 41	Raw Score 17.5	Weighted Score 33.5	Raw Score 20	Weighted Score 36

5.2.3 Horizontal Alignment

The proposed Coopernook Highway Bypass route extends from Ch.17,980 where it ties-in to the existing highway approximately 1500m south of Moto Road. From the tie-in it takes a straight course north across the flood plain to bridge over the Lansdowne River near Ch.19,300. The route continues on the same straight alignment to cross Harrington Road at Ch.20,140. A large radius curve of 4000m links the first straight to the final straight which extends northward beyond the study area. The northern highway tie-in occurs at Ch.22,200, approximately 50m south of Two Mile Creek Road. The total length of new construction is 4220m. Figure 5.2 shows the horizontal and vertical alignment of the proposed highway.

5.2.4 Vertical Alignment/Flood Height

The route traverses the Lansdowne River and associated flood plain for the majority of its distance. The highway in this area has been designed to a road level of RL 2.36m, maintaining one vehicle lane in each direction above the 1 in 20 year flood. This road level is based on a modelled 1 in 20 year flood height of RL 2.31m plus a 50 mm allowance for afflux associated with the road. A cross-section showing the highway in the 1 in 20 year flood is presented in Figure 5.3.

The road maintains this level over the flood plain creating an average fill height of 1.7m rising to RL 6.175m over the Lansdowne River. This enables the proposed bridge to provide a navigational clearance of 5m under the bridge. At the northern end of the project from Ch.21,100 the alignment rises out of the flood plain and maintains a geometry suitable for stopping sight distance to 110 km/h. A maximum gradient of 2.5% occurs around Ch.21,400.

5.2.5 Intersections and Local Accesses

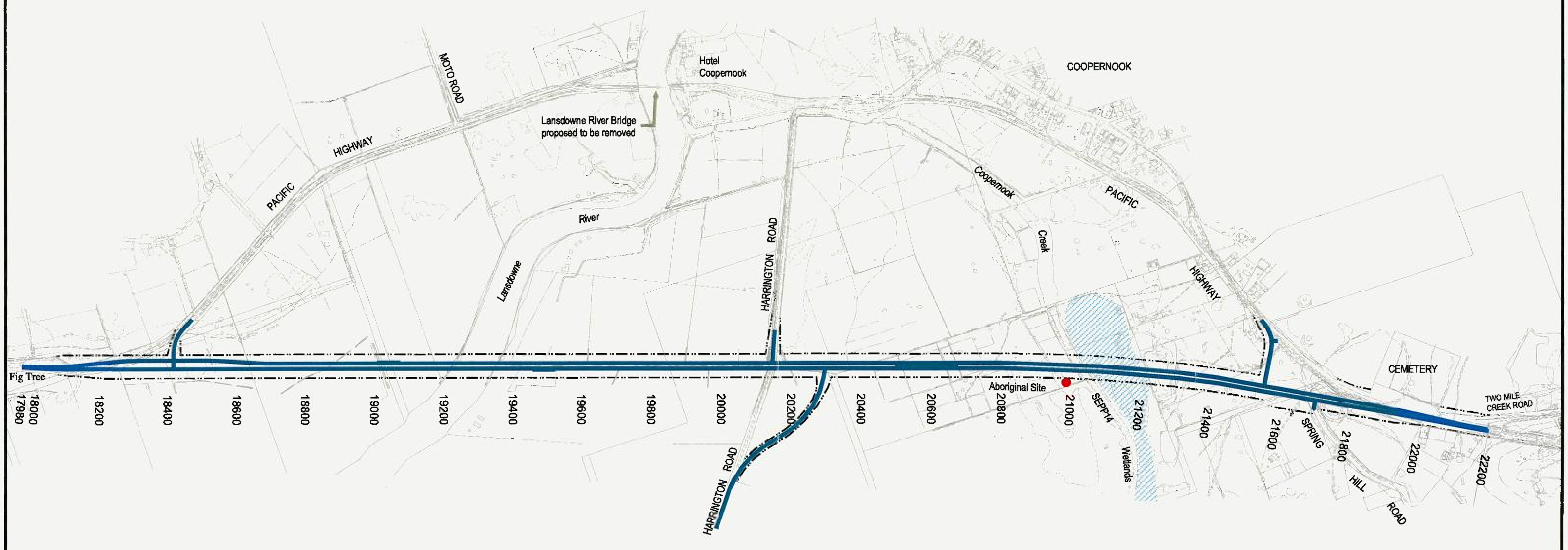
Starting at the southern end the following intersections, closures and access arrangements are proposed at:

Southern Junction with Existing Highway

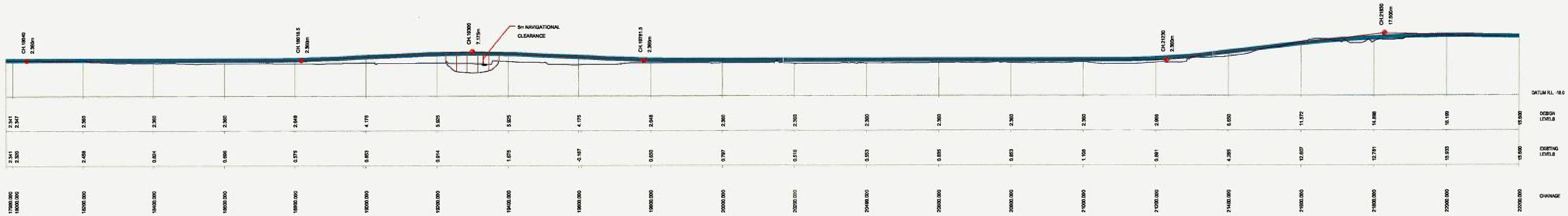
The existing Highway will connect into the proposed highway at Ch.18,425 creating a 90 degree T-junction (refer Figure 5.4). This connection will give access to Moto Road and properties along the existing highway as far as the old Lansdowne River bridge. The bridge is recommended for demolition so this section of the existing highway would not carry traffic to Coopernook.

The traffic volumes to Moto Road are very low. A T-junction has been designed which provides a left turn taper for traffic coming from the south into the side road and a protected right turn for traffic approaching from the north. The layout will also allow vehicles approaching the junction from the south (including 19.5m semi-trailers) to make a U-turn in order to access dairy farms east of the highway in the event of highway upgrading south of this scheme.

The typical cross-section median width does not provide for a vehicle greater than 8m in length to turn right out of the side road and store within the median without encroaching onto a through lane. Although the volumes of heavy vehicles estimated to make this move based on 1996 flows is very low (approximately 6 vehicles per day assuming the same percentage of heavy vehicles carried by Harrington Road ie 9.5%), it is a requirement of the RNI Pacific Highway Schedule of Design Policies that provision be made for such vehicles to store in the



ROUTE ALIGNMENT



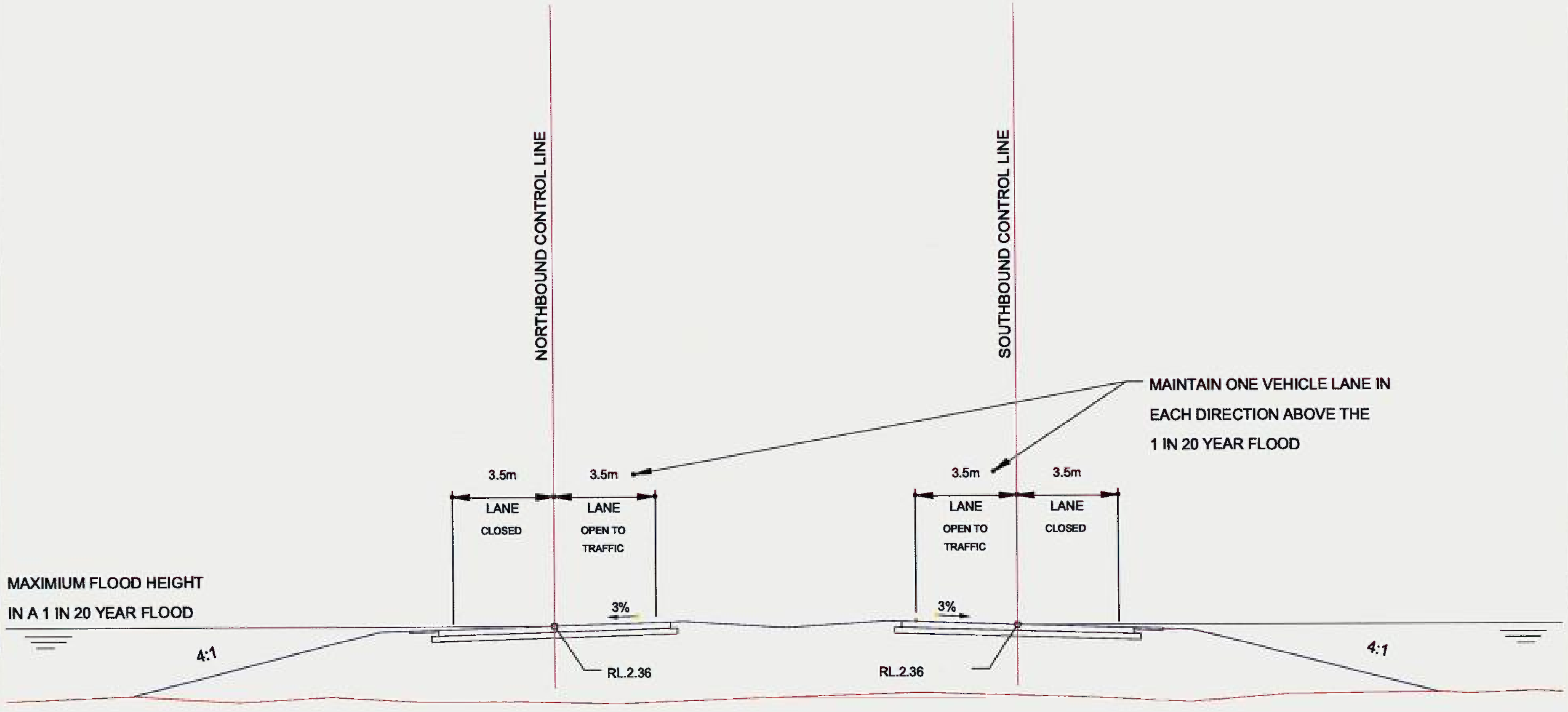
LONGITUDINAL SECTION ALONG SOUTH BOUND CENTRELINE

SCALE : 1:2000 V 1:10000 H

Connell Wagner
COOPERNOOK EIS
5606.01.CE

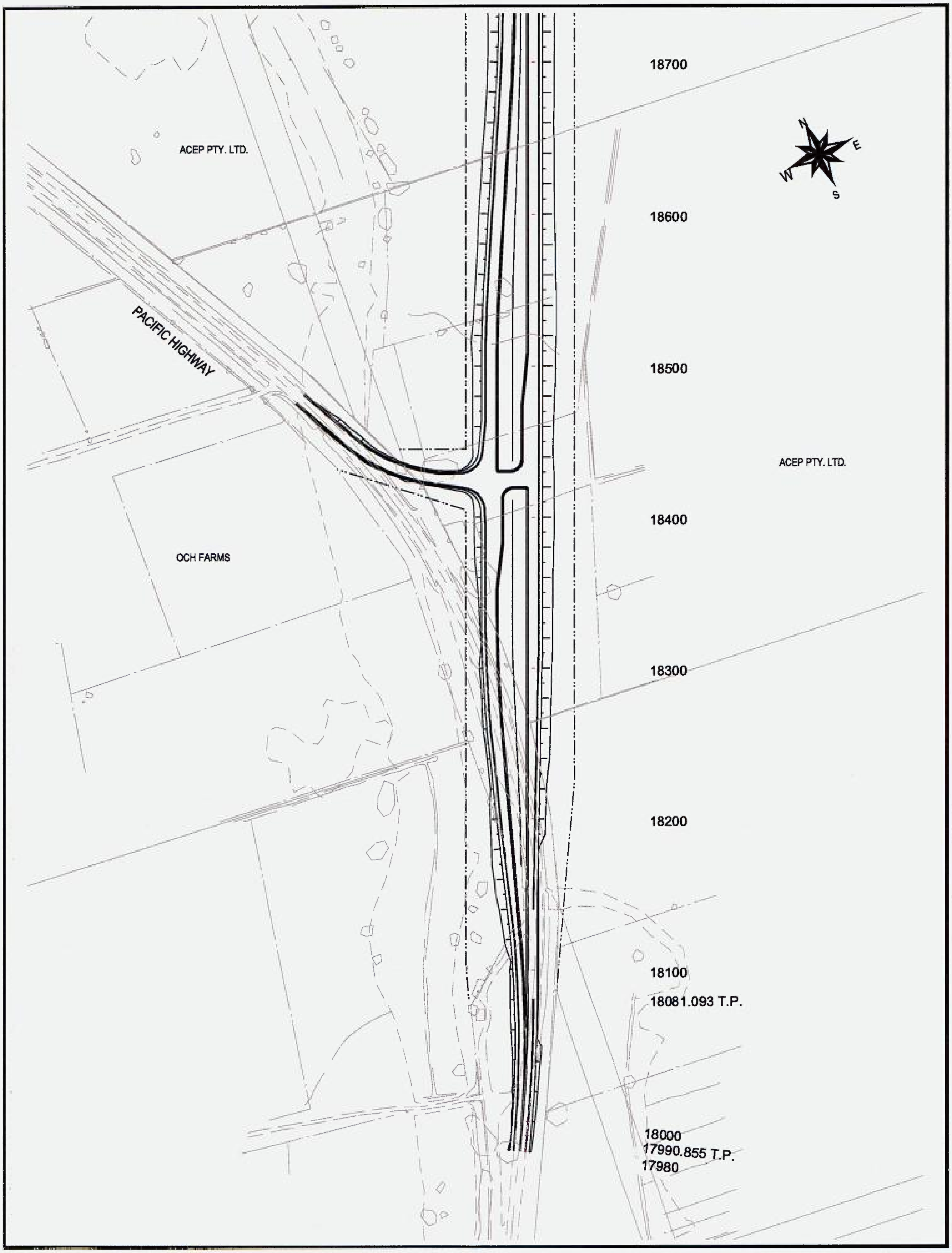
**Figure 5.2 :
HORIZONTAL AND VERTICAL ALIGNMENT
OF PROPOSED HIGHWAY**

Connell Wagner
COOPERNOOK EIS
5606.01.CE



TYPICAL SECTION OVER FLOODPLAIN
IN THE EVENT OF A 1 IN 20 YEAR FLOOD

Figure 5.3 :
CROSS SECTION OF FLOODPLAIN



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 5.4 :
SOUTHERN JUNCTION WITH EXISTING HIGHWAY

median if need be before completing the right turn. The following solutions have been considered:

- widen the median to 20m between through lanes to accommodate such movements
- provide a median acceleration lane

A median acceleration lane would require less land take but the layout in the centre of the junction would be made dangerously confusing with the inclusion of the U-turn provision. The location of the southern tie-in to existing highway would be pushed south by approximately 100m more than expected for a widened median arrangement. This would affect right turns in and out of the existing property access around Ch. 17,000 on the eastern side of the existing highway.

For these reasons a widened median as shown in Figure 5.4 is considered to be a more suitable arrangement at the Southern Junction.

Harrington Road Junction

The proposed highway crosses Harrington Road at Ch.20,140 (refer Figure 5.5). The proposed junction layout will continue to allow the cross movement between Coopernook and Harrington, as well as providing access between Coopernook and the south and access between Harrington and the Pacific Highway.

Five junction layouts were considered:

- Staggered-T
- Cross
- Wide median treatment
- Cross, with Harrington Road (west) one-way westbound
- Longitudinal-wide median treatment

All junctions were found to have a Level of Service B and degree of saturation of 0.2 for the design year when analysed using the INTANAL traffic modelling program. A further assessment was carried out to assess the safety performance, delay performance and construction costs of each layout. Each factor has been prioritised with safety performance receiving the highest importance weighting in order of priority, followed by delay performance and construction costs. The results of this assessment are presented in Table 5.2.

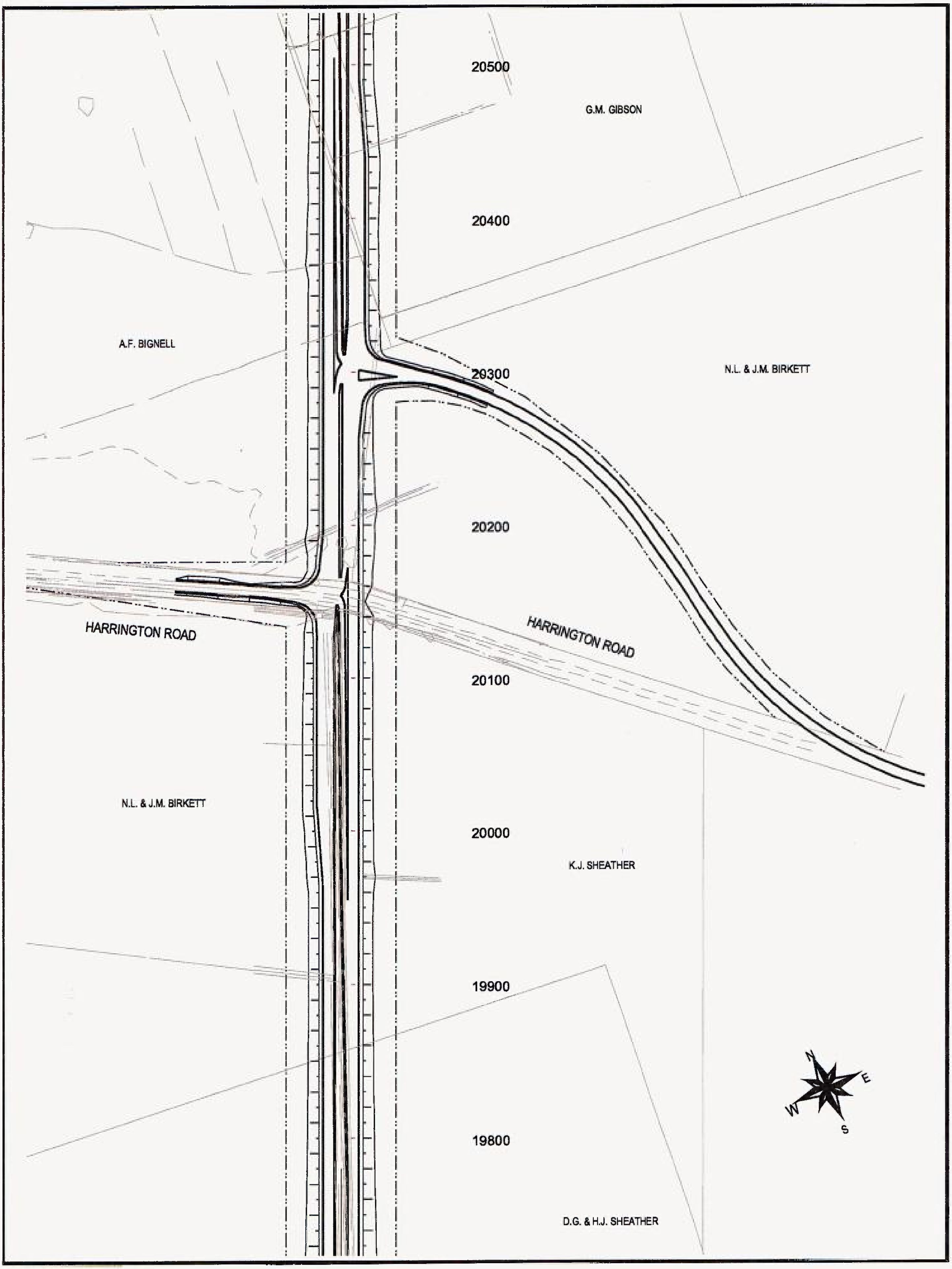
The staggered-T has the highest comparative assessment score of the at-grade options and is the recommended junction layout. It is considered to be the safest of the at-grade cross junction layouts.

The staggered-T would comprise of two T-junctions on opposite sides of the highway with a distance of 150m between them. The length of this stagger is designed for 110 km/h design speed deceleration lanes for Pacific Highway right turning traffic. The junction has a left-right stagger allowing Harrington Road cross traffic to undertake the manoeuvre in two stages. Deceleration lanes have been provided for traffic turning left into Harrington Road.

As for the Southern Junction, the typical cross-section median width does not provide for a vehicle greater than 8m in length to turn right out of the side roads and store within the median without encroaching onto a through lane. The two solutions of a widened median and median acceleration lanes have again been investigated.

TABLE 5.2 HARRINGTON ROAD JUNCTION ANALYSIS

LAYOUT TYPE	*AT GRADE OPTIONS* Staggered 'T'	Cross	Wide Median	One-Way Harrington Rd	Long - Wide Median	*GRADE-SEPARATED OPTION* Grade-separated
Safety Performance:- The road user movements (RUM) resulting in the majority of accidents are:- Cross (RUM 1) Right/near (RUM 4) Right/through (RUM 6) Right/rear (RUM 8) Coopernook Leg 2; South Leg 1; North Leg 3; Harrington Leg 4. At each junction there is a possible 16 higher risk RUM's ie. 4 legs x 4 RUM's	A staggered T junction removes the cross traffic conflict from all legs and the right/through conflict from legs 2 & 4. It is generally considered a safer layout than the cross junction as crossing traffic from the minor road can store safely in the storage lane in the center of the road while waiting for a gap in the traffic. Note from RTA Road Design Guide Sect.4.6.2 :- "On rural roads Staggered T junctions are preferred over cross junctions." A staggered T junction will have 10 out of 16 of the higher risk RUM's	A cross junction has all of the conflicting movements at each leg making it one of the least safe junction options. A cross junction will have all of the higher risk RUM's	A wide median layout has all of the conflicting movements at each leg making it one of the least safe options. A report carried out by Vic Roads :-Volume warrants for wide median treatments, comes to the conclusion "for cross intersections if the sum of the two entering side volumes is greater than 1000 ie. the sum of the two way side road volumes on each approach is greater than 2000 vpd [2640 vpd for this junction in 1996] the investigation found a significant increase in accidents." A wide median junction will have all of the higher risk RUM's	With Harrington Rd. as a one way street (from new highway to old highway) all of the conflicting movements are elimineted from the one way street (leg 2). From leg 3 there is no right/near conflict and from leg 4 there is no right/through conflict. One-way Harrington Rd will have 10 out 16 of the higher risk RUM's	This unusual layout results in none of the high risk right turns or cross movements except the right/rear from legs 1 & 3. It does however create U-turn movements for right turning traffic from all legs and for cross movements between legs 2 & 4. A long-wide median junction has 8 out of 10 of the higher risk RUM's However drivers will find this an unfamiliar layout which could lead to confusion and erratic driver behavior.	Assuming a simple diamond junction with Harrington Rd over the highway:- This has the least conflicting movements of all the layouts. Grade-separation removes all of the cross-junction conflict as the two cross movements are separated. The right-through movements and right-rear movements are eliminated from legs 1 & 3. The right-near movements are eliminated from legs 2 & 4. This has the least conflicting movements of all the layouts. This grade-separated junction has 6 out of 16 of the higher risk RUM's
Weighting (High) 3	Comparative rating 3; Weighted rating 9	Comparative rating 1; Weighted rating 3	Comparative rating 1; Weighted rating 3	Comparative rating 3; Weighted rating 9	Comparative rating 3; Weighted rating 9	Comparative rating 5; Weighted rating 15
Delay Performance:- Geometric delay has been calculated as the cost per annum based on $22.22 per vehicle hour for 1996 traffic flows. (For comparison of layouts only.)	Additional 150m for 158 vpd from leg 2 to 4. Additional 150m for 150 vpd from leg 4 to 2. $25,000	Most direct geometrically $0	Most direct geometrically $0	Additional 1400m for 432 vpd from leg 2 to 1. Additional 1400m for 158 vpd from leg 2 to 4. $50,000	Additional 100m for 440 vpd from leg 1 to 4. Additional 100m for 158 vpd from leg 2 to 4. Additional 100m for 342 vpd from leg 2 to 1. Additional 100m for 150 vpd from leg 4 to 2. Additional 100m for 242 vpd from leg 4 to 3. $35,000	Additional 50m for 440 vpd from leg 1 to 4. Additional 50m for 342 vpd from leg 2 to 1. Additional 50m for 242 vpd from leg 4 to 3. $14,000
Weighting (Medium) 2	Comparative rating 3; Weighted rating 6	Comparative rating 5; Weighted rating 10	Comparative rating 5; Weighted rating 10	Comparative rating 1; Weighted rating 2	Comparative rating 2; Weighted rating 4	Comparative rating 4; Weighted rating 8
Construction Costs:- Costs given are estimated to be additional to the base case of a simple cross junction.	Construction costs for additional 320m of Harrington Rd. to create stagger ie. approx. 3,000 cu m of fill. Land take costs for 1Ha of agricultural land. $300,000	No additional costs compared with the other junction layouts. $0	A localized wide median at this junction will require approx. 1 Ha of additional land take and approx.. 10,000 cu m of fill $210,000	No additional costs compared with the other junction layouts. $0	A localized wide median at this junction will require approx. 1.3 Ha of additional land take and approx.. 15,000 cu m of fill $320,000	Construction costs for a grade-separated junction include approx. 3 Ha of additional land take, 115,000 cu m of imported fill, bridge over the Pacific Hwy. 5000 sq m of additional pavement construction and drainage of the slip roads. $3,300,000
Weighting (Low) 1	Comparative rating 4; Weighted rating 4	Comparative rating 5; Weighted rating 5	Comparative rating 4; Weighted rating 4	Comparative rating 5; Weighted rating 5	Comparative rating 4; Weighted rating 4	Comparative rating 1; Weighted rating 1
TOTAL SCORES	Raw Score 10; Weighted Score 18	Raw Score 11; Weighted Score 18	Raw Score 10; Weighted Score 17	Raw Score 9; Weighted Score 16	Raw Score 9; Weighted Score 17	Raw Score 10; Weighted Score 24



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 5.5 :
HARRINGTON ROAD JUNCTION

Median acceleration lanes are proposed at this junction in order to maintain the straight horizontal alignment and prevent short lengths of reverse horizontal curves which median widening would entail. No additional land take would be required as the acceleration lanes are contained within the median width.

Northern Junction and Spring Hill Road Access

The existing highway will connect with the proposed highway at Ch.21,555 creating a T-Junction which provides access between Coopernook and the north (refer Figure 5.6). Traffic travelling from Coopernook to the south can gain access to the Pacific Highway at Harrington Road Junction and it is proposed that only right turns from the existing highway at the Northern Junction be banned, providing a safer and less complicated arrangement. A deceleration lane has been provided for highway traffic from the north turning right into Coopernook. A left turn taper has been provided for traffic from the south entering Coopernook at this junction.

At Ch.21,705 access to Spring Hill Road will be provided to serve the 6 houses, the worm farm and an infrequently used quarry on the J.R. Gillogly property. Articulated vehicles have not operated at the quarry in the last 5 years (pers. comm J.R. Gillogly, 1997), however an occasional articulated vehicle is expected to use this access for stock and heavy plant transportation. A protected right turn is provided for traffic from the south turning into Spring Hill Road, and a left turn taper would be provided for traffic from the north.

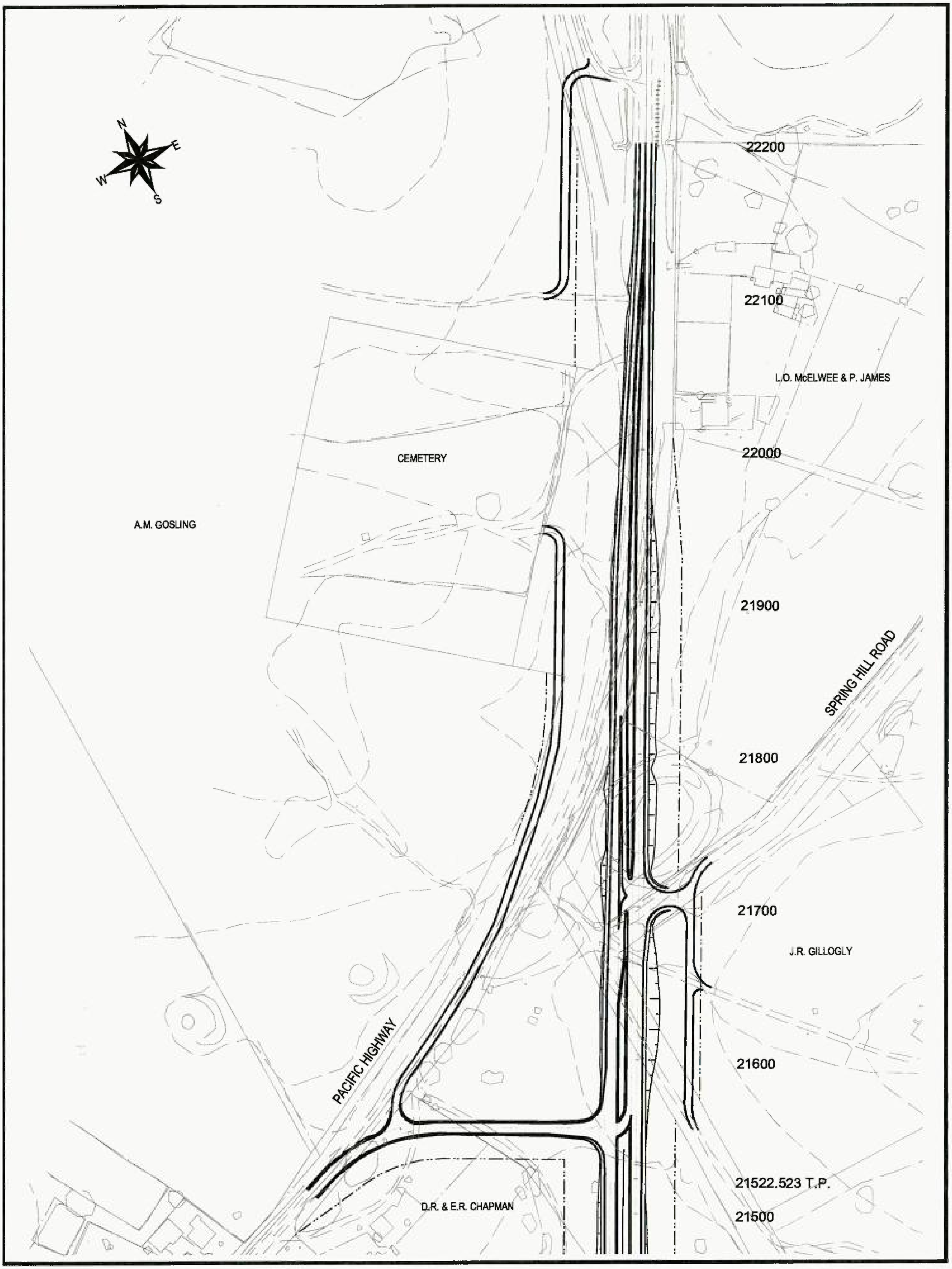
The combination of the Spring Hill Road junction and the junction with the existing highway form a staggered-T layout with a 150m left-right stagger allowing traffic between Coopernook and Spring Hill Road to undertake the manoeuvre in two stages. Similar to the Southern Junction and Harrington Road Junction, the 8m median width does not provide for a vehicle greater than 8m in length to turn right out of Spring Hill Road and store within the median without encroaching onto a through lane. Although the volumes of articulated vehicles using this junction are likely to be extremely low, it is a requirement of the RNI Pacific Highway Schedule of Design Policies that provision be made for such vehicles to store in the median if need be before completing the right turn. The two solutions of a widened median or a median acceleration lane have again been considered. The rural property residences of Gillogly and McElwee & James, as well as the cemetery, are in the close vicinity of this junction and median widening could affect these properties. Therefore a median acceleration lane of 150m in length is proposed in order to prevent the additional land take which median widening would entail.

Cemetery Access

A new access is proposed to run from the existing highway near the northern junction, alongside the proposed highway and connect into the existing access track. This will provide direct access between Coopernook and the cemetery while maintaining a route to the Pacific Highway through the Northern Junction. Direct connections between the highway and cemetery access would be closed.

Access to the Gosling Property

A new access is proposed to run from the existing track, alongside the highway and connect into Two Mile Creek Road. From there access to the highway is available beyond the extent of the median. Access via the cemetery would remain possible.



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 5.6 :
NORTHERN JUNCTION AND SPRING HILL ROAD ACCESS

Access to Shady Acres Worm Farm

To limit the number of accesses onto the highway and improve safety it is proposed that the rear driveway of the worm farm be upgraded as the primary point of access to the worm farm and household to allow access from the upgraded Spring Hill Road junction.

5.2.6 Tie-ins

The southern tie-in to existing highway is at around Ch.17,980 tapering out to the proposed 4 lane highway by Ch.18,320, approximately 50m south of the Southern Junction

The proposed 4 lane highway will start to taper back to the existing highway at Ch.21,645 approximately 50m north of the Northern Junction. The tie-in to the existing highway will be around Ch.22,200. The existing Two Mile Creek Road should remain unchanged.

5.2.7 Earthworks

The majority of the route (3 km) is on fill embankments averaging 1.7m in height over the floodplain. Batter slopes are proposed to be 4 to 1 over the floodplain with the exception of Lansdowne River bridge approaches where they are steepened to 2 to 1 to reduce land take. From Ch.21,150 where the alignment rises out of the floodplain, batter slopes of 2 to 1 are proposed. For cut slopes 2 to 1 batters have been provided.

From the concept grading, preliminary earthwork quantities have been extracted which reveal the following:

- Total Cut = 4,200 m^3
- Total Fill = 240,000 m^3

Recent investigation (pers. comm. R.Carr, 1997) has shown that very little fill material will be available from the nearby quarries and it is expected that up to 90% of the required fill will be obtained from the Taree Bypass project some 25km to the south. Further environmental assessment would be required to gain access to fill material currently in the steep cut batters of the Taree Bypass south of Purfleet. Preliminary analysis indicates that sufficient quantities of suitable material are readily available (refer Section 5.3.4.).

5.2.8 Drainage

On sections of the highway in fill over the floodplain where there is little or no longitudinal gradient it is proposed that stormwater will be directed via catch drains running longitudinally parallel to the fill embankment to the water pollution control ponds.

Type 'SO' kerb may be provided on the nearside of the carriageway at the following locations:

- Lansdowne River bridge approaches
- In cut situations
- In fill situations where the longitudinal gradient is 0.5% or steeper ie. from Ch.21,150 to 22,200

The depressed median will require enough slope longitudinally to allow rain falling on the median to be collected in catchpits.

All of the carriageway and median runoff whether collected at the toe of embankments or in Type 'SO' kerbs adjacent to the carriageway would pass through water pollution control ponds before dispersion. These ponds will be capable of containing a spillage of 20,000 litres of liquid escaping from a vehicle on the road. They will be located within the proposed highway reserve boundaries with suitable access arrangements for maintenance vehicles. Bridges would be designed without scuppers to direct runoff or spillage to the water pollution control ponds and not the river or wetland. Locations of water pollution control ponds are expected to be on both sides of Coopernook Creek outside the wetland and on both sides of the Lansdowne River. A further two ponds would be located on the floodplain. Property drainage would be independent of the highway drainage.

Flood relief structures are essential to ensure that the effect of flooding is not exacerbated by the highway construction. A series of culverts under the proposed highway are anticipated on the basis of waterway requirement investigations undertaken for the preferred option using floodplain modelling prepared by WBM Oceanics (1995 and 1997). Thirty six 3.6m wide x 1.5m high culverts would be required across the floodplain.

5.2.9 Structures

As well as the flood relief culverts mentioned above, two sets of bridges/viaducts are anticipated along the proposed highway route:

- Two parallel bridges would be required over Lansdowne River for the northbound and southbound carriageways. They would be skewed bridges of approximately 150m in length, 10.5m width (between guardrails) and obtain 5m vertical navigation clearance. Each is envisaged to have 5 spans and 4 piers at 30m spacing. A concept sketch for the proposed Lansdowne River bridges is included as Figure 5.7.

- Parallel bridges/viaducts over Coopernook Creek and the adjacent SEPP 14 wetlands are envisaged to be of a pile trestle plank type, approximately 170m in length and 10.5m width (between guardrails) for each carriageway. These bridges will not require navigational clearance but would maintain the carriageway level of RL 2.6m required to keep open one traffic lane in each direction in the 1 in 20 year flood.

5.2.10 Utilities

Utilities in the study area are illustrated in Figure 5.8. An assessment of existing utilities indicates that there would be minor disruption to Telstra (local underground telephony) on the cut batter in the vicinity of the cemetery. A 150mm water main attached to Lansdowne River bridge would be required to be relocated by North Power (Water) prior to removal of the bridge.

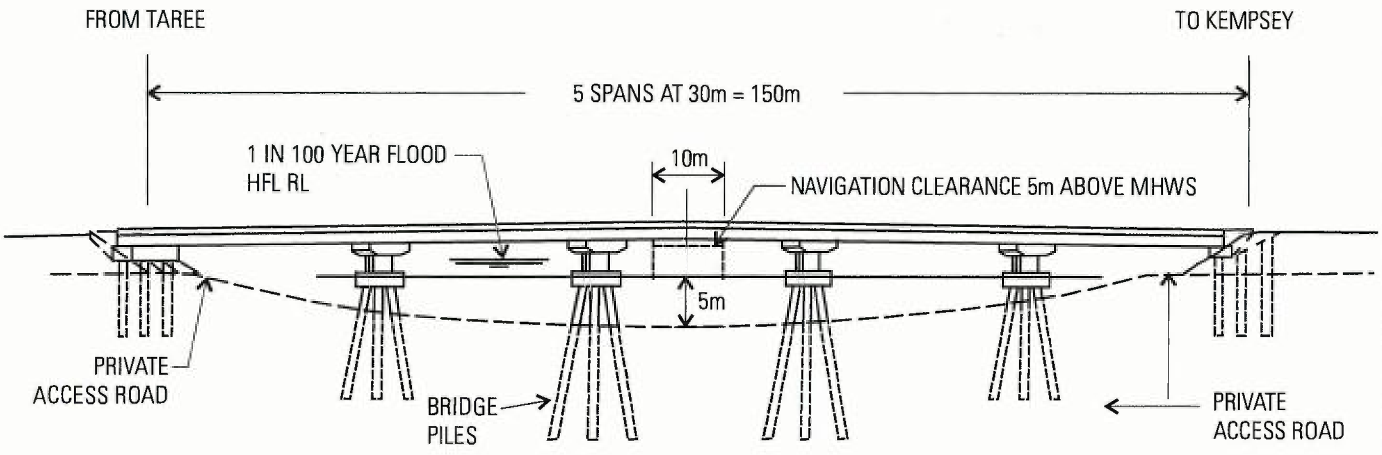
The water supply main for Harrington would also be protected prior to being crossed by the proposed highway adjacent to Harrington Road.

5.3 Property Adjustment / Land Take

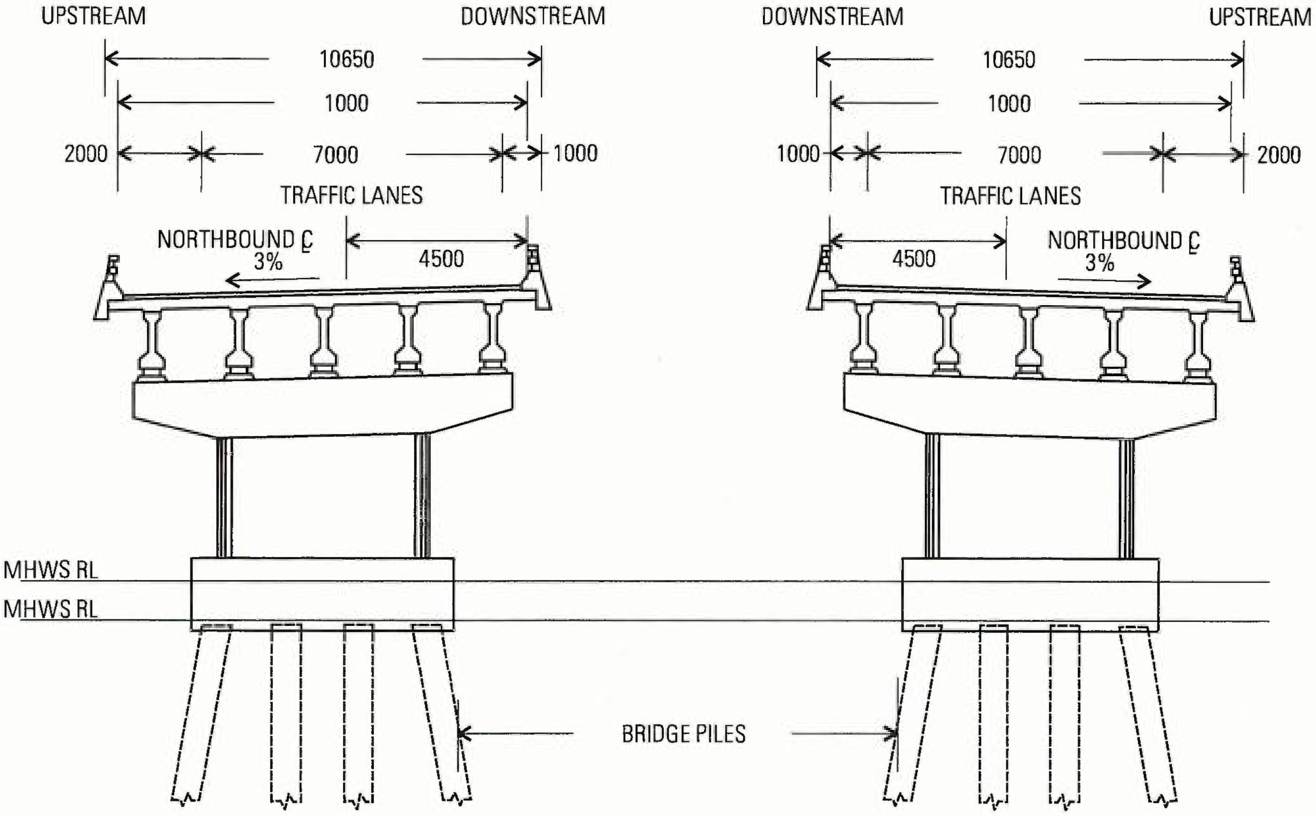
5.3.1 Property Adjustment

Approximately 26 ha of land is required for a 70m corridor width and major severance of 4 rural properties will be caused by this corridor and intersection arrangements (ACEP, Birkett, GM Gibson and Chapman).

PROPOSED TWIN BRIDGE OVER LANSDOWNE RIVER, COOPERNOOK



CROSS SECTION OF BRIDGE



Not to Scale

Figure 5.7 :
LANSDOWNE RIVER
(MANNING RIVER FLOOD PLAIN)

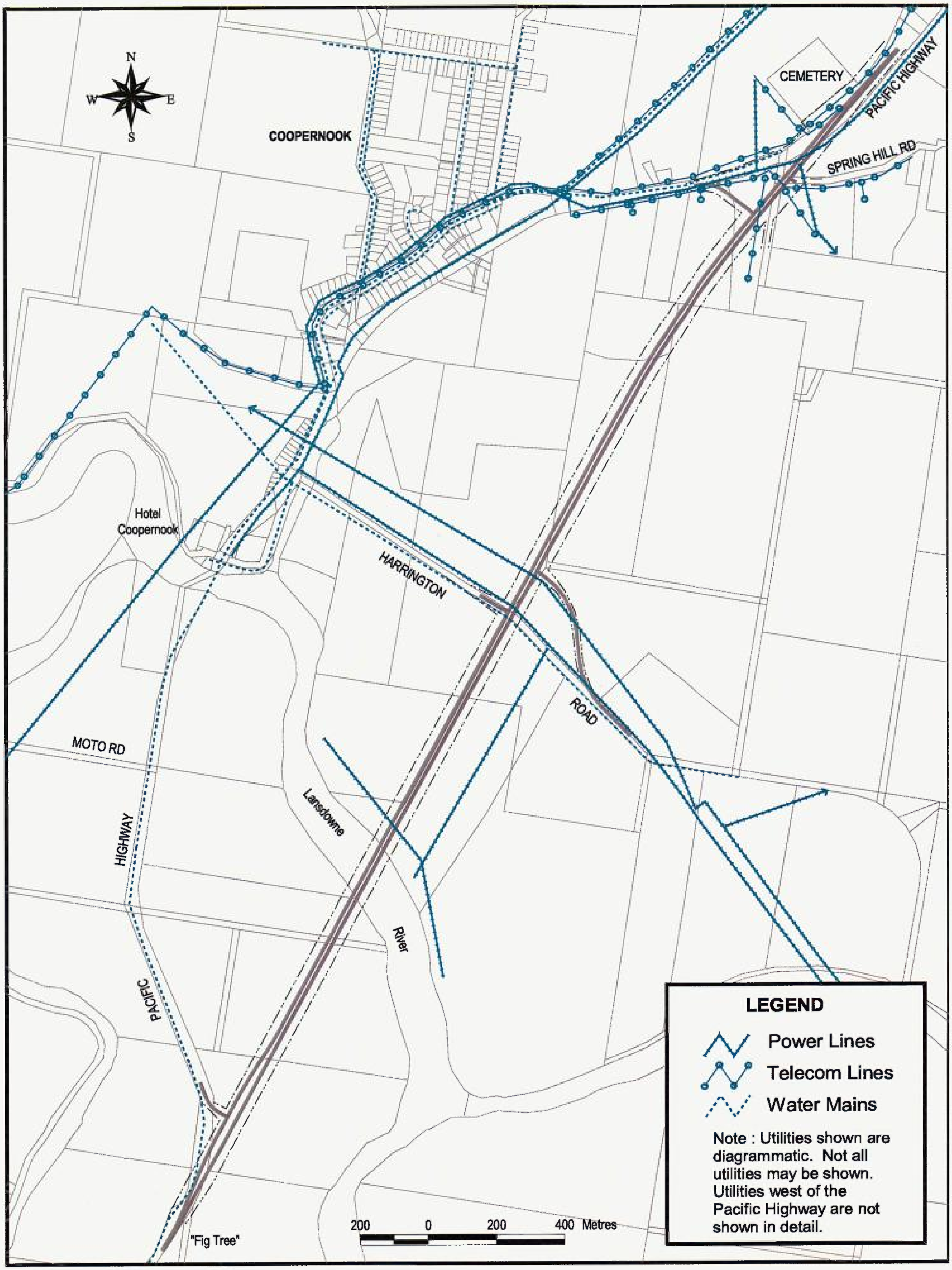


Figure 5.8 : UTILITIES

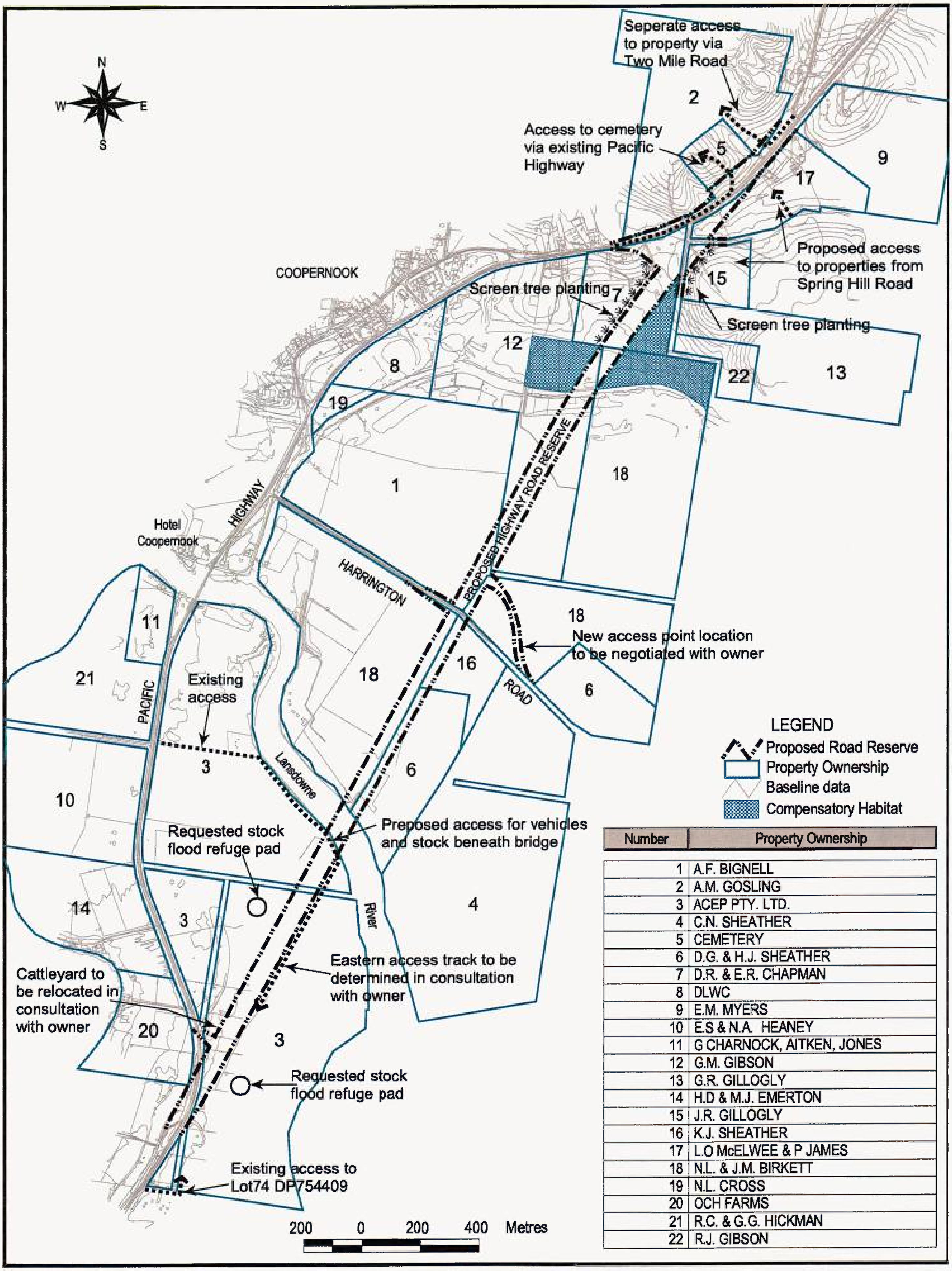
Four rural properties will suffer moderate affection and adjustment (Sheather, Bignell, JR Gillogly and Mc Elwee & James). No residences will require demolition. Table 5.3 represents the land take within the proposed road reserve.

Figure 5.2 shows the indicative location of new road reserve boundaries and land ownership while property adjustment issues are shown on Figure 5.9. The boundaries as marked reflect the property requirements known at the concept design phase. They would be further refined following detailed survey and road design and decisions as to whether severed residual portions of properties would be included in the land acquisition and whether the proposed compensatory habitat areas would be acquired.

The potentially affected property owners and properties along the route are listed in Table 5.3 and shown on Figure 5.9. Table 5.4 describes the proposed adjustments to each affected property in relation to access, fencing and other property management issues. The RTA would contact each owner prior to any decision on the range of land acquisition and property adjustment options.

Table 5.3: Land Take within the Proposed Road Reserve

Property Owner	Title Identifier	Total Area (ha)	AreaWithin Proposed Road Reserve (ha)	Percentage of Total Land Holding (%)	Area of Residual Portions (ha)
ACEP Pty Ltd	Lot 3 DP621153 Vol 14454 Fol 130 Lot 2 DP612368 Vol 12133 Fol 149	96.8	7.1	7%	N/A
Birkett	BK3291 No 646 Lots 1&2 DP10754 Lots 17&18 DP32272 Lot 55 DP754415	89.7	4.3	5%	(2.7ha[1])
Sheather	Lot 1 DP780787 Lot 5 DP10754	77.3	2.4	3%	N/A
Bignell	Lots 1&2 DP108536	39.4	1.5	4%	N/A
Gibson G M	Vol 2776 Fol 69 Lot 1 DP957426 Lot 2 DP576017 Lot A DP 926633	38.9	5.1	13%	(7.8ha[2])
Chapman	Lots 591,592 & 593 DP 740564	12.3	4.2	34%	(2.1ha[3])
Gillogly J R	Lot 1 DP628221	4.6	0.3	7%	N/A
McElwee & James	Lot 4 DP590141	10.2	1.0	10%	N/A



Number	Property Ownership
1	A.F. BIGNELL
2	A.M. GOSLING
3	ACEP PTY. LTD.
4	C.N. SHEATHER
5	CEMETERY
6	D.G. & H.J. SHEATHER
7	D.R. & E.R. CHAPMAN
8	DLWC
9	E.M. MYERS
10	E.S & N.A. HEANEY
11	G CHARNOCK, AITKEN, JONES
12	G.M. GIBSON
13	G.R. GILLOGLY
14	H.D & M.J. EMERTON
15	J.R. GILLOGLY
16	K.J. SHEATHER
17	L.O McELWEE & P JAMES
18	N.L. & J.M. BIRKETT
19	N.L. CROSS
20	OCH FARMS
21	R.C. & G.G. HICKMAN
22	R.J. GIBSON

Figure 5.9 : PROPERTY ADJUSTMENT AND OWNERSHIP

Table 5.4: Proposed Property Access and Management Adjustments

Property Owner	Title Identification	Property Access	Other Adjustments
ACEP Pty Ltd	Lot 3 DP621153 Por 71-73 CT Vol 14454 Fol 130 Lot 2 DP612368 Lot 52 DP654950 Lot 74 DP754409	• Those portions west of the proposed highway would be accessed via the existing Pacific Highway. • The eastern portions would be accessed via a track suitable for farm machinery beneath the proposed Lansdowne River bridge. The track beneath the bridge would have a 1 in 5 year flood immunity (approx 1.5mAHD). • The track would extend south along the eastern side of the proposed highway to access as far as Lot 3 DP621153. The alignment of the track would be determined in consultation with the owner. • Access to Lot 74 DP754409 would remain via the existing Pacific Highway.	• Two cattle pads for flood refuge (approx 1.5m AHD) are proposed to be constructed on either side of the proposed bypass. The location, shape, size and flood immunity of the pads would be negotiated with the landowner. It is noted that there is the potential for dual use of the proposed pads for construction equipment storage during the construction phase. • Fencing layout would be revised in consultation with the owner. • Cattle yards would be relocated in consultation with the landowner. • Drainage adjustments are proposed where intersected by the proposed highway. • There would not be surplus topsoil available for use on this property. • Lansdowne River bank protection with respect to this property is beyond the scope of this project.
Birkett	Bk3291 No 646 Lots 1&2 DP10754 Lots 17&18 DP32272 Lot 55 DP754415	• Property access would remain via Harrington Road.	• Adjustments to drains are proposed where intersected by the proposed highway. • It is recommended that the RTA negotiate acquisition for compensatory wetland habitat of all land north of Coopernook Creek in Lot 55 DP754415 (8ha) in addition to the directly affected north west corner (mostly included in SEPP14 wetland).
Sheather	Lot 1 DP780787 Lot 5 DP10754	• Property access would remain via Harrington Road.	• Adjustments to drains and fences are proposed where intersected by the proposed highway
Bignell	Lots 1&2 DP108536	• Property access would remain via Harrington Road.	• Adjustments to drains and fences are proposed where intersected by the proposed highway
Gibson GM	Pt Por. 54/CT Vol 2776 Fol 69 Lot 1 DP957426 Lot 2 DP576017 Lot A DP 926633	• Property access would remain via the existing Pacific Highway.	• It is anticipated that Pt Por 54 and Lot 1 DP957426 would be acquired by the RTA. • Adjustments to fences are proposed where intersected by the proposed highway • Lot 1 (4ha) (incorporating mostly cleared SEPP 14 wetland) is recommended to be aquired by the RTA and regenerated as compensatory wetland habitat.

Property Owner	Title Identification	Property Access	Other Adjustments
Chapman	Lots 591,592 & 593 DP 740564	• Property access would remain via the existing Pacific Highway. • Access to the isolated eastern portion would be via Spring Hill Road.	• The residential south eastern portion of the property isolated by the proposed highway is recommended to be acquired by the RTA and regenerated as compensatory open forest habitat. • Adjustments to fences are proposed where intersected by the proposed highway.
Gillogly JR	Lot 1 DP628221	• Property access would be via a residential Spring Hill Road intersection. • The lower portion of the driveway would be modified.	• Screen tree plantings are proposed along the boundary of this property with the proposed highway. • Fencing and gates would be replaced along the proposed highway reserve.
McElwee & James	Lot 4 DP590141	• Property access would not be permitted directly off the highway. • Access would be provided via a rear driveway (to be upgraded) connecting to Spring Hill Road.	• The Spring Hill dam would be partially filled. Property and stock access to the dam from the north/east would be maintained. • Fencing would be replaced along the proposed highway reserve. • Screen plantings are proposed along the eastern side of the proposed highway.
Gosling	Lot 1 DP603025	• Property access would be via both cemetery access and via a constructed unsealed driveway off Two Mile Creek Road (north of cemetery)	• No land take or other adjustments are proposed.
GTCC Cemetery	Lot 118 DP616233	• Access would be reconstructed off the existing Pacific Highway without access onto the proposed highway.	• No land take or other adjustments are proposed.

5.3.2 Acquisition Policy

The RTA Land Acquisition Policy describes the process of land acquisition by the Authority. The process is intended to achieve a purchase of land by negotiation between the Authority and the land owner. A copy of the RTA Land Acquisition Policy is included as Appendix R.

The acquisition process would only begin if the project was approved by the RTA, and programmed for construction. Detailed design refinement would follow a survey of the approved road reserve boundary in relation to each property affected.

Land acquisition for the proposed road would follow the provisions of the Land Acquisition (Just Terms Compensation) Act, 1991. Compensation is assessed by having regard to the market value of the property as if it were unaffected by the road proposal as per Division 4 Section 55 of the Act. In addition to the market value, regard is also taken of special value, severance, disturbance, solatium and any increase or decrease in the value of any other land adjoining or severed by the carriageway due to the proposal. The purchase price would be negotiated with the land owner to establish an agreement satisfactory to both parties. There is no appeal against acquisition, but provisions exist for appeal to the Land and Environment Court regarding the amount of compensation to be paid.

Where partial acquisition of a property is necessary, the RTA would purchase the affected portion of the property. In these cases, the RTA would be responsible for the relocation and replacement of fences, driveways, landscaping and any other affected improvements to a standard similar to existing, and for the relocation of gas, electricity and water as appropriate.

The RTA seeks only to acquire the land that is needed for the road reserve. However, if owners of directly affected property can demonstrate that property and/or businesses are rendered unviable as a result of part acquisition, then the RTA would acquire the whole property if requested by the owner.

If agreement cannot be reached, the RTA have available a statutory process for compulsory acquisition of land under the Land Acquisition (Just Terms Compensation) Act, 1991. This legislation sets up a process to enable landowners to have access to an independent valuation and assessment of compensation by the Valuer General, if agreement cannot otherwise be negotiated with the Authority. This process is also able to resolve title problems if they arise.

In circumstances where an affected property owner desires immediate purchase of land, the RTA would consider acquisition under the hardship provisions of the Land Acquisition (Just Terms Compensation) Act, 1991. This would usually occur once the project has been approved and the need to acquire the property has been established. In each case a genuine hardship has to be demonstrated (as defined in the Act) and agreed by the Authority, following which the owner would negotiate the sale of the land with the RTA or require acquisition under the compulsory acquisition process.

In each case where the proposed road requires property acquisition, the RTA would consider a range of acquisition options including:

- Partial acquisition of the property affected is usually a strip of land to be included in the road reserve. Partial acquisition would usually occur where there are no major improvements being affected.
- Where the road reserve requires strip acquisition which severs and isolates a portion or portions of a property the RTA would upon request, negotiate to purchase the isolated

portions. The RTA would be responsible for relocation of services, fence reconstruction and access adjustments should they be required in either of the above cases.

- Where the road proposal affects the majority of a property including major improvements or structures such as houses and businesses, or otherwise affects the viability of the property, the RTA would consider acquisition of the entire property.

Following acquisition of any land in the course of the property adjustment process, the RTA as owners retain the option to transfer or sell any surplus land.

5.4 Construction Methods, Staging and Sources of Fill Material

5.4.1 Geotechnical Conditions

Construction of the Proposal will be restricted by the prevailing geotechnical conditions in the area, particularly in relation to the need for significant embankment construction and the need to import extensive amounts of fill material for those embankments.

A detailed geotechnical investigation was undertaken by Robert Carr and Associates during production of this EIS and the subsequent report is included as Appendix J of this report. An appraisal of this report is provided in Section 6.1 of this main volume.

The lowland areas encountered over the majority of the project length are characterised by a variable thickness of highly compressible, soft, estuarine sediments. The depth of highly compressible material varies from 10-20 metres south of Harrington Road, to generally less than 2 metres (but up to 3.5 metres) to the north of Harrington Road.

At the northern end of the project, the geological conditions in the hillside areas at Spring Hill Road are variable, comprising deep soil and extremely weathered rock profiles and a clay fraction that contains halloysite. High in-situ moisture contents associated with poor subgrade conditions are likely to be encountered during excavation, with claystone, siltstone, sandstone and pebbly sandstone rock generally with significant clay and shear seams/zones in cut areas. There are possible fault zones with deep weathering/decomposition in the sub-surface rock strata.

5.4.2 Construction Methods

The detailed construction methods would be developed by the successful contractor in response to the RTA's specification and with regard to ongoing RTA project management direction. The specification would incorporate the design features and other measures such as environmental safeguards highlighted in this EIS.

In general, the following road construction methods would be applied to the Coopernook Bypass:

- site compounds and access tracks would be established
- erosion and sedimentation controls would be put in place prior to any substantial road construction
- the bridge sites and road alignment would be cleared, outside the floodplain the topsoil would be stripped and stockpiled, and catch drains would be established. Topsoil will not be stripped from the floodplain and geotextile would be used on the flood plain
- drainage lines would be installed, particularly those where substantial box culverts are necessary to allow floodwaters to pass below the proposed embankments

- specialised (wick) drainage would be installed in certain areas prior to embankment construction
- preparation of an Acid Sulphate Soil Management Plan
- any available material would be excavated using excavators, bulldozers, scrapers and trucks
- excavated material would be hauled directly to fill area
- the majority of fill material required for embankment construction would be imported from elsewhere
- additional material (up to 1 metre high) would be incorporated to surcharge embankments south of Harrington Road, providing additional foundation loading to accelerate soil consolidation and embankment settlement
- the fill material would be compacted by rollers and vibrating compacters and then graded
- pavement would be constructed on completed embankments and cuttings
- installation of traffic management devices and roadside furniture
- the completion of work would require a range of rehabilitation and landscaping activities

5.4.3 Construction Staging

The detailed construction staging would be the responsibility of the successful contractor. Construction of the Proposal would not be difficult from a traffic management perspective, with all work separate from the existing highway. Fill would be imported to the site. The southern and northern connections would be as described in Section 5.2.6. However, the requirement for embankment construction over soft soils, with associated drainage, surcharging and subsequent relocation of some earthen materials will require careful planning.

Impacts on the road construction and factors to be considered in developing a staging strategy would include:

- the construction across the lowlands will be very weather sensitive
- poor trafficability of the natural soils with typical subgrade CBR's of less than 2%. It is expected that there will be a requirement of an initial bridging layer of fill to provide a firm platform for compaction of imported materials
- stability problems for embankments of significant height. Embankments higher than 3-4 metres are expected to require monitored staged construction to maintain an adequate factor of safety against slip
- ongoing settlement of embankments over very long time periods (1-3 years) necessitating the surcharge and pre-loading of embankments (up to 1 metre) to reduce post-construction settlement and differential settlement
- importation of additional material to compensate for that lost (up to 0.7 metres in height) during embankment settlement
- more specialised techniques (such as wick drains) will be required for embankments containing structures or where substantial completion of settlement is required by the end of construction
- allowance for post-construction settlement is required where minimum long term embankment levels need to be maintained
- allowance for ongoing settlement and differential settlement effects in pavement and culvert design will be required
- detailed investigation and design requirements for all embankments, particularly those adjacent to significant structures in order to cater for interaction effects

- piling to in excess of 25 metres for significant structures (ie bridges) in the Lansdowne River area and 10m to 15m in the vicinity of Coopernook Creek
- traffic management during importation of fill based on the recommendations of an environmental impact assessment of the fill quarry

In consideration of these difficulties it is expected that the requirement to surcharge embankments is likely to extend the construction period by at least eighteen months to allow adequate settlement to occur. In the event that this surcharging can only be undertaken on certain sections at a time (possibly for hydrological reasons) this time period is likely to increase.

5.4.4 Sources of Fill Material

Owing to local topographical constraints, insufficient fill is available from the Spring Hill cuttings at the northern end of the Coopernook Bypass to form the embankments across the lowlands. With the exception of Goslings and Gillogly quarries, local quarries do not hold current extraction licences. However, as both Gosling's and Gillogly's quarries are limited to their existing extent the quantity of material likely to be available from these quarries is small (around 10% of total fill requirements) and as such, alternative sources of fill material for the majority (~90%) of the fill requirements for the project have been investigated as follows:

- quarries in the vicinity of the site were inspected for suitability as potential sources of filling, subject to development consent and licencing
- discussions were held with the Forestry Commission of NSW in regard to the quarries on forestry land
- discussions were held with the DLWC in respect of the sand resources in the Harrington channel and back channel
- inspection of cut batters on the Taree Bypass construction (south of Purfleet) which require either stabilisation or battering down to a flatter slope

A location map of quarries in the local area is included in Drawing 3 of Volume 2 of Robert Carr and Associates (1997) (refer Appendix J).

Sufficient quantities of suitable material would be available from the Taree Bypass construction site (south of Purfleet) and it is expected that this would constitute the most likely borrow source (potenitally augmented by local quarries). The Taree Bypass cut batters would require additional works on that construction site and a long haul (up to 25 km) to Coopernook and as such would require a separate Review of Environmental Factors to assess the environmental impacts of such a source.

5.4.5 Sources of Pavement Material

Aggregate would be sourced from approved local hard rock quarries in the Manning and Hastings region. Concrete and asphalt would be sourced from suppliers from outside the district. Concrete would be provided from an established batching plant in Taree. Should a further on-site plant be required this would be the subject of further environmental assessment to be undertaken by the contractor.

5.4.6 Waste Management

The strategies for waste management for the proposal would be in accordance with the following principles:

- waste which is unsuitable for re-use or recycling would be disposed of to a licensed landfill, any chemical or contaminated waste would be disposed of to a facility approved by the EPA for that purpose
- any waste oil would be sent to approved recyclers
- secure rubbish bins would be provided at site compounds and emptied regularly
- toilet waste would be transported and disposed of to the sewerage system
- chemical management - fuels, oils and chemicals would be stored in a secure compound with an impermeable floor and appropriate bund walls

Further details relating to waste management procedures would be outlined in the EMP.

5.5 Concept Landscape Plan

A landscape strategic plan has been developed for the project site, as illustrated on Figure 5.13. Figures 5.10-5.12 are artist impressions of the proposed highway showing landscaping features. The main objective of this strategy is to establish a clear set of design principles to guide the future detailed design phase. These principles have been developed primarily from the landscape and visual assessment presented in Section 6.7, and seek to highlight the positive characteristics of this site, whilst minimising any potential negative outcomes.

5.5.1 Design Principles

The design principles of the landscape strategic plan are to:

- emphasise the dominantly rural character of the surrounding landscape and its relationship to the town of Coopernook
- incorporate landscape treatments that reflect the surrounding landscape types and vegetation patterns, and thereby reinforce both the overall landscape character, and local context
- emphasise the hierarchy of the Pacific Highway in regard to the more local functions of intersecting streets
- establish visual screens in locations identified as requiring these during the visual assessment
- recreate a recognisable gateway to Coopernook from the Highway
- allow wider views of the surrounding pleasant rural environment where this would not adversely affect the local community
- stabilise embankments, cuttings and sites along watercourses through the use of appropriate landscape treatments
- comply with the RTA's Draft Roadscape Guidelines (1995), and general ESD principles, by using plant species that occur naturally within the local area
- consider safety aspects such as driver sight distances, road crossings and the personal safety of pedestrians and cyclists
- take into account possible future land use changes

5.5.2 Landscape Strategic Plan

The landscape strategic plan is presented in Figure 5.13. There are four main landscape treatments proposed as part of that plan, as well as a town gateway site. Typical cross sections are provided as Figure 5.14 for the following main landscape treatments.

Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 5.10:
ARTIST IMPRESSION OF PROPOSED HIGHWAY - SOUTHERN VIEW

Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 5.11:
ARTIST IMPRESSION OF PROPOSED HIGHWAY - CENTRAL VIEW

Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 5.12:
ARTIST IMPRESSION OF PROPOSED HIGHWAY - NORTHERN VIEW

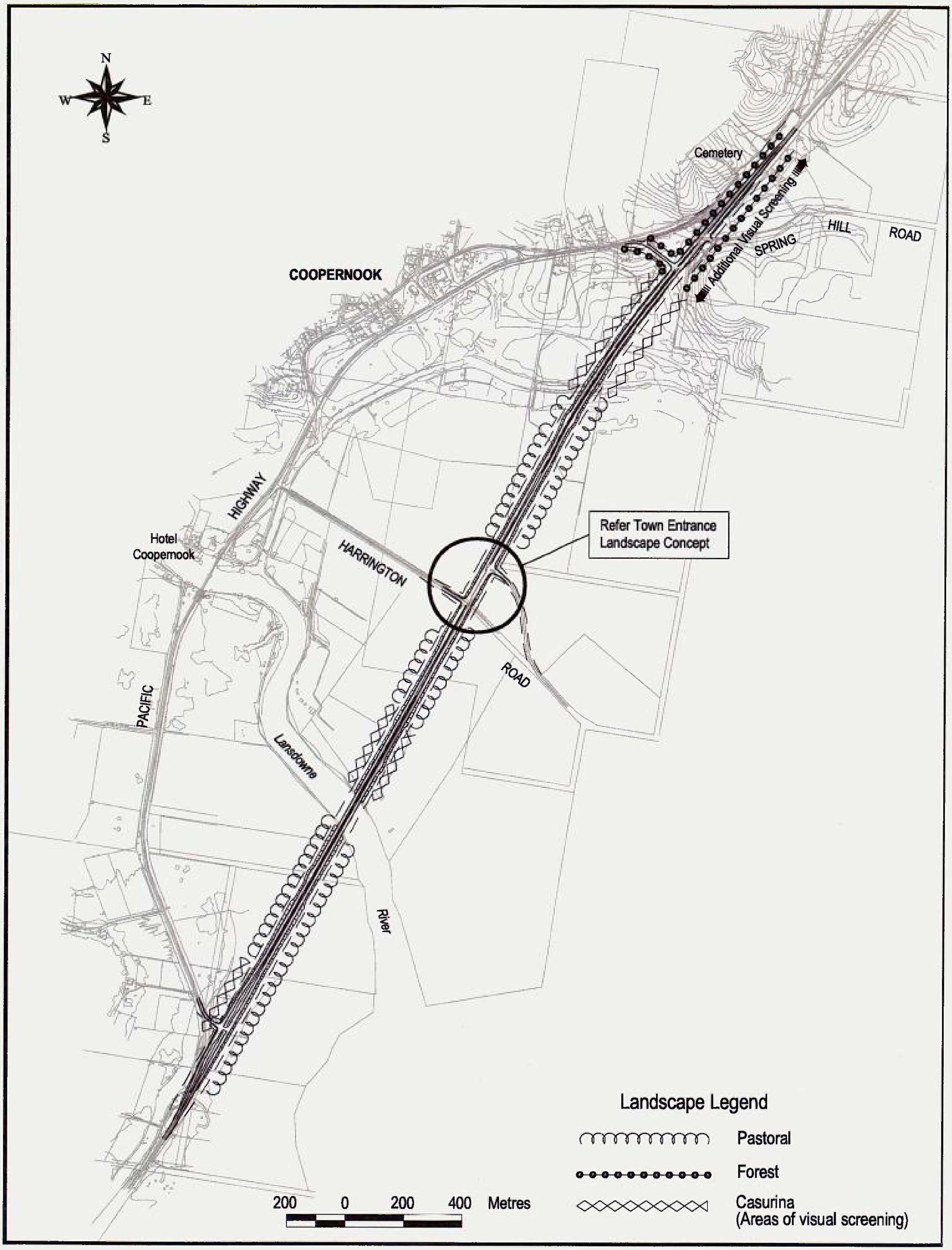


Figure 5.13 :
LANDSCAPE STRATEGIC PLAN

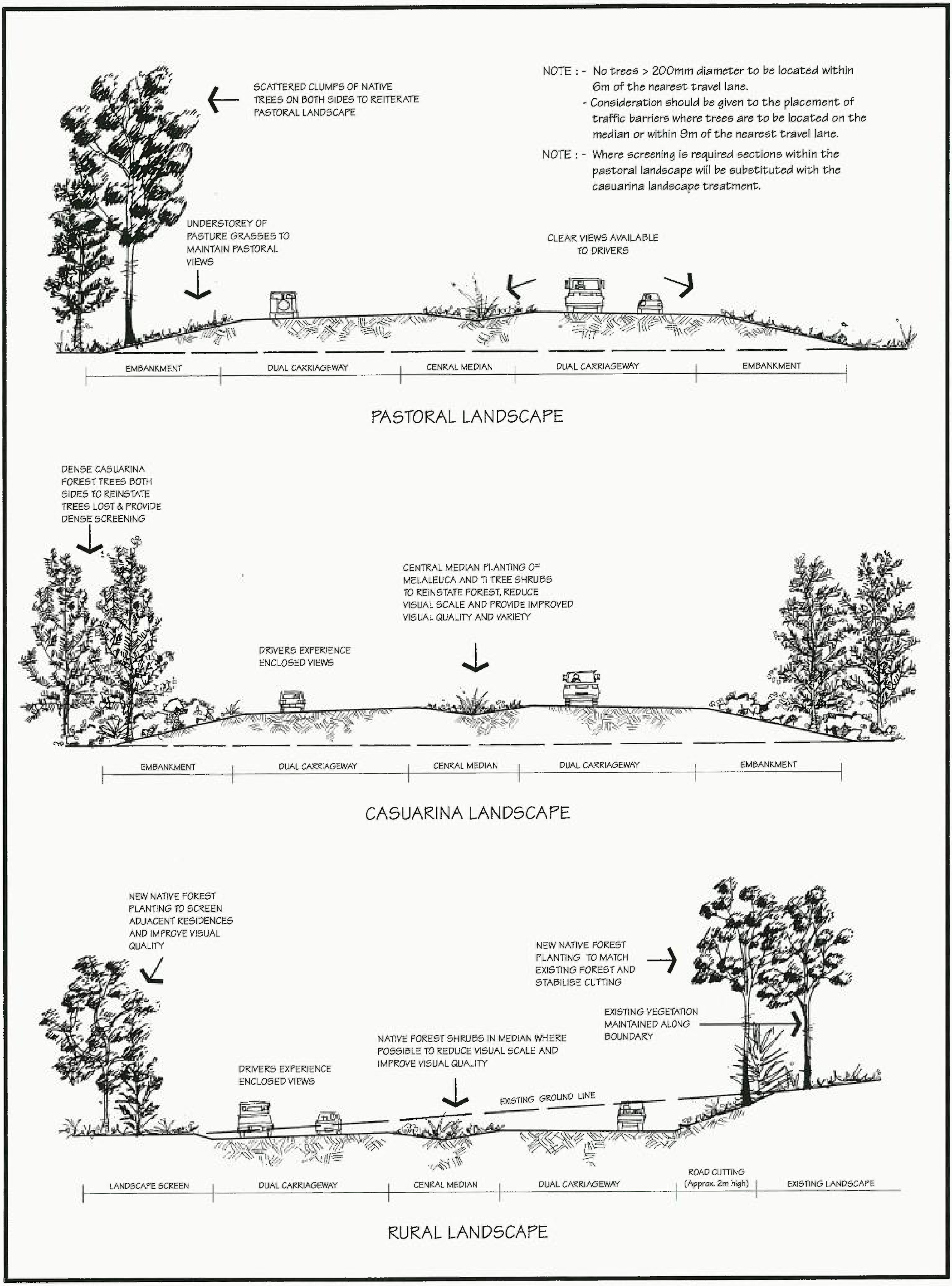


Figure 5.14 : LANDSCARE TREATMENT CROSS SECTIONS

Pastoral Landscape

The pastoral landscape treatment is derived from the surrounding rural landscape and consists of groups of native trees set amongst pasture grass areas. It is proposed for locations where there are pleasant views available across the countryside, and screening is not required. The treatment would allow quite open views, while still introducing new native trees.

Forest Landscape

The forest landscape consists of a dense band of native trees, and is proposed for locations that are either adjacent to native forest or where screening or embankment stabilisation is needed where such forest would naturally occur. Within such forested areas road users would experience enclosed views.

Casuarina Landscape

The casuarina landscape treatment imitates the areas of casuarina forest that occur across the river floodplain in the vicinity of the site. It is proposed along areas adjacent to such sites and for screening and embankment stabilisation where needed across the floodplain.

River Crossing

Mangroves are an appropriate species to stabilise the area around the river crossing, as they naturally occur here. These plantings would reinforce the river crossing and natural landscape variety, while stabilising and protecting the riverine environment.

Entrance Design

A concept plan for the town entrance site at the Harrington Road intersection is provided as Figure 5.15. This includes the use of Araucaria pine species to emphasise it as a landmark and reinforce these common local trees. Indigenous figs are suggested to form the actual gateway entrance to Coopernook from Harrington Road. Moreton Bay Figs commonly occur as older plantings around rural homes as well as remnants of floodplain rainforest prior to European settlement. A small-leaved fig is proposed along the Harrington Road section which leads to Harrington and Crowdy Head to create a complementary entrance to this coastal area. Appropriate signs and possibly even a low rustic rockwall design in the case of Coopernook and Harrington entrance, should be included. As stated in Section 6.7, the detailed design of the entrance should be in close consultation with the local community.

Median Planting

Only frangible low shrub median plantings are proposed within forest and casuarina landscape treatments more than 200m from any intersection. Tree plantings are not proposed as necessary guard rails would detract from the visual character of the plantings.

5.5.3 Plant Species

All plants used in landscape works would be native to the surrounding area, except for some Araucaria pine species and possibly some other exotics that may be part of the town entrance site at Harrington Road.

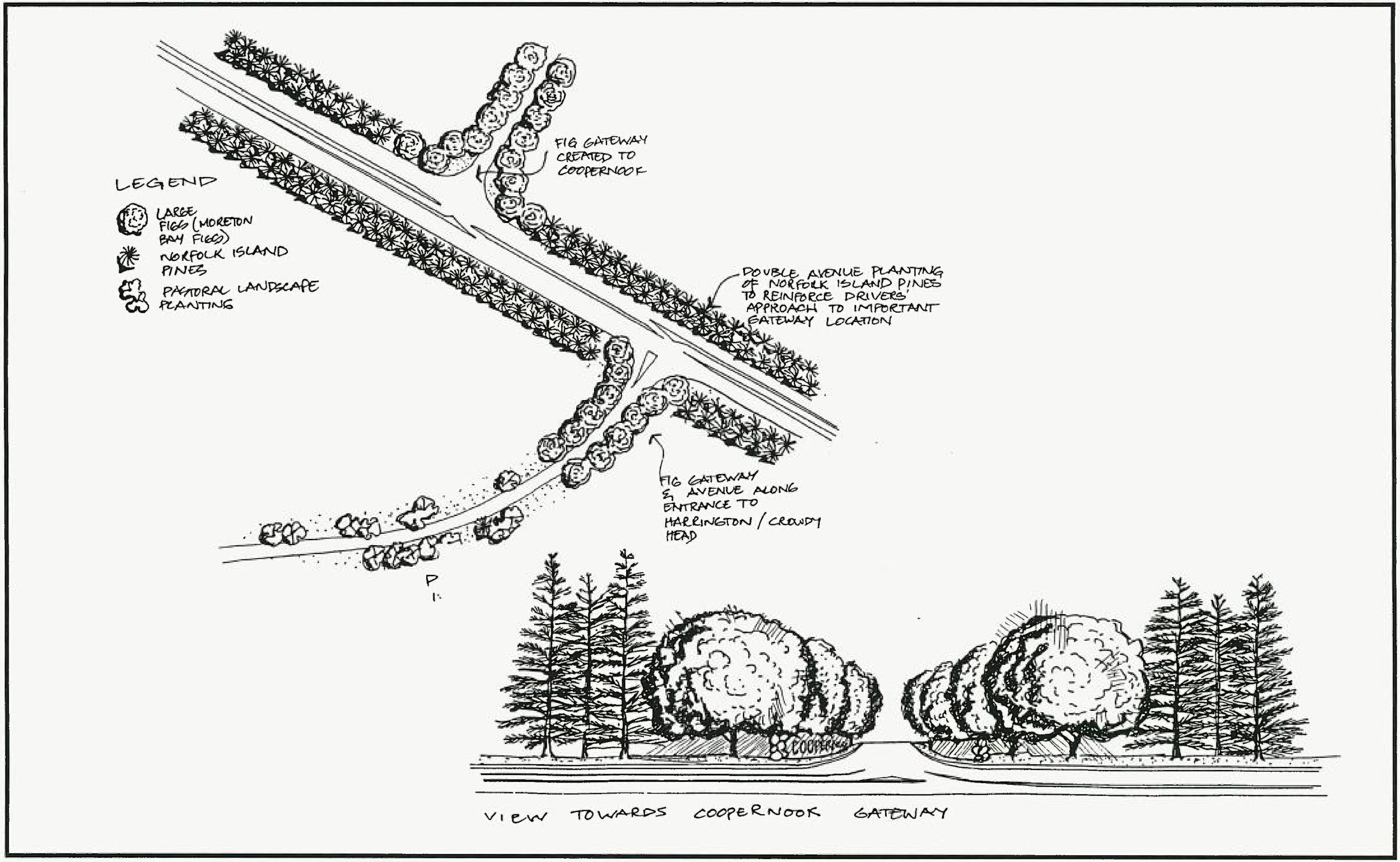


Figure 5.15 :
COOPERNOOK TOWN ENTRANCE LANDSCAPE PLAN

Suitable native species have been identified elsewhere in the vegetation description (refer Section 6.6). A brief summary of the species that would be planted in each of the four main landscape treatment types is as follows:

Pastoral Landscape

Eucalypts *(E.botryoides, E.microcorys, E.pilularis)*, Melaleucas *(M.quinquenervia, M.sieberi)* and Casuarina species *(C.glauca)*.

Forest Landscape

Eucalypts *(E.microcorys, E.gummifera, E.pilularis)* and Angophoras *(Angophora costata)*, with an understorey of Acacias *(A.parramattensis, A.longifolia)*, Leptospermum *(L.attenuatum, L.flavescens)* and other shrubs and ground covers.

Casuarina Landscape

Casuarinas *(C.glauca)* and Melaleucas *(M.quinquenervia, M.sieberi)*.

River Crossing

Grey Mangrove *(Avicennia marina)* and the River Mangrove *(Aegiceras corniculatum)*.

5.5.4 Road Safety Considerations

During the detailed design phase it would be ensured that all landscape planting concur with guidelines for road safety as set out by the RTA (1996) (Road Design Guide). This would include safe sight distances and sufficient clear zones beside the carriageways. Tree planting is permitted unprotected greater than 9m from the nearest carriageway. Between 6-9m, the use of a guard rail should be considered on safety grounds, while closer than 6m and in median situations a guard rail would be mandatory to allow tree planting.

5.5.5 Landscape Components and Management

Planting

All planting would occur in fully prepared mulched beds following a complete weed removal program. Where individual trees are to be planted within grassed areas they are to be in a mulched area with a minimum size of 1.5m x 1.5m to reduce any retarding of tree growth which is a common problem in roadside planting schemes. Tubestock sized plants would generally be used, with some larger planting sizes around key sites.

Soil used for planting, including both site soil and any imported topsoil as a result of the construction method on the floodplain, would be tested prior to use. Any additives required to ensure soil is optimal for plant growth would be specified and added. It is anticipated that a slow release, low-phosphorus fertiliser and a soil saturation-aid (eg bentonite) would be used to improve tree growth rates at the town entrance site only.

Existing Vegetation Protection

Any vegetation to be retained would be protected during construction. This would include installing temporary fencing beyond tree canopies (where possible), minimising vehicle movements and preventing stockpiling within this zone. All contractors involved with construction should be thoroughly briefed on the importance and techniques of tree protection prior to any works.

Final engineering designers should also be aware that where the road construction is within tree canopy lines, or local drainage patterns are altered in proximity to trees, existing trees are likely to die. Vegetation protection considerations, both during the design phase and construction, should be detailed in the EMP.

Soil Management

Any existing topsoil stripped from the site during construction would be stored so as to retain maximum soil quality. This would include mounds with a maximum height of 2m, the establishment of temporary sterile grasses for stabilisation during storage, and protection from traffic. Soil imported to the site would be from an approved source.

Maintenance

A 12 month full maintenance program would be undertaken for all landscape works and would include watering, weeding, pruning, mowing and replacement of any failed plants.

5.6 Cost Estimate

5.6.1 Assumptions

A cost estimate for the Proposal has been prepared in standard RTA Concept Estimate format, taking into account the following factors and assumptions:

- Costs after EIS determined does not include Connell Wagner costs, contingencies up to EIS determination and overheads up to EIS determination.
- Drainage costs have incorporated the 'Pacific Highway Schedule of Design Policies' requirement for all highway drainage to be collected and passed through gross pollutant devices before discharge.
- Earthwork costs have been calculated on the assumption (after consultation with Council and local quarry operators) that only 10% of the fill requirement can be met within 10km of the project, with 90% of the fill required to be hauled from the Taree Bypass construction approximately 25km away.
- Earthworks fill quantities have been calculated for cut batters of 2:1 with fill embankment slopes of 4:1.
- Earthworks fill quantities have been calculated assuming a 1 metre surcharge is required on all embankments south of Harrington Road. This requires an additional 105,000 m^3 of material to be placed on these embankments. Of this amount, 75,000 m^3 will be 'lost' to embankment settlement and as such represents an additional import requirement. The 30,000m^3 of excess material is available for use in other embankments on the project (not susceptible to rapid settlement) and represents an additional cut to fill cost only.
- The structures cost estimate includes an allowance for a longitudinal viaduct/bridge crossing Coopernook Creek and the SEPP 14 Wetland No. 545
- Pavement costs have been calculated for typical pavement depths being used on other Pacific Highway projects. The updated estimate is based on:

Concrete Pavement:	or	*Flexible Pavement:*
300mm select material CBR 15		300mm select material CBR 15
150mm plain lean mix conc.5 Mpa		185mm bound base material DGB20
240mm plain unreinforced conc. 32 Mpa		170mm Asphaltic Concrete

- Allowances to cover contingencies and variations at 18% of direct costs.

5.6.2 Summary of Cost Estimate

A summary of the Concept Design Estimate for the Proposal is provided below. A more detailed breakdown of this estimate is provided in Appendix G.

Item 1	Investigation/Design (2% of Item 4)	418,158
Item 2	Property Acquisition	860,000
Item 3	Utilities	100,000
Item 4	Construction Works	
	a. Preliminaries	90,000
	b. Site Preparation	240,000
	c. Provision for Traffic	50,000
	d. Drainage	1,400,000
	e. Earthworks	6,661,400
	f. Structures	8,880,000
	g. Pavement	5,306,000
	h. Miscellaneous Works	546,500
	TOTAL DIRECT COSTS	24,606,058
Item 5	Engineering Services 7%	1,722,424
Item 6	Allowances 18%	4,429,090
	TOTAL CONCEPT ESTIMATE	$30,757,572

6

EXISTING ENVIRONMENT, IMPACTS AND SAFEGUARDS

6. EXISTING ENVIRONMENT, IMPACTS AND SAFEGUARDS

6.1 Landform, Geology and Soils

6.1.1 Landform

The study area is located in the lower catchment of the Manning River on the floodplain of the Lansdowne River.

The Lansdowne River is saline and tidal in the study area with an average width of 70m and depth of 4m. For most of its length (3.5km) the corridor route traverses the floodplain at an elevation of up to 1m A.H.D. Narrow strips of slightly higher ground occur as levees in the study area along the banks of both the Lansdowne River and Coopernook Creek. The southern side of the Lansdowne River (Jones Island) is bounded by a 0.5m high bank and a narrow artificially-elevated levee which falls away to very low flats with distance south. A more substantial natural levee runs along the River's northern bank reaching approximately 100m in width. This levee diminishes gradually from the bank which rises to 1.4m above the water level. The floodplain has minimal gradient making local agricultural drainage difficult.

Coopernook Creek is a shallow incised semi-permanent brackish watercourse. On the southern bank of the creek, the floodplains rise only slightly (0.36m) before giving way to the wetland vegetation of the channel. To the north, Coopernook Creek is defined by a bank to 1m in height which represents the northern edge of the Lansdowne floodplain. North from this bank the proposed route corridor traverses the eastern periphery of a ridge system which extends south-east from the Comboyne Plateau some 30km further inland separating the Manning River Catchment from that of the Camden Haven River. This ridge system features a series of low hill crests up to 40m elevation and with typical gradients of 5-15% in the vicinity of Coopernook. The road corridor traverses gentle slopes separating two of these crests, reaching a maximum elevation of 13m A.H.D. at its junction with the existing Pacific Highway in the north.

6.1.2 Geology

The study area is characterised by a number of different geological features. Low lying floodplains of the Lansdowne River are comprised of Quaternary alluvial deposits containing mud, silt, sandy clay and fine gravel. On its northern periphery the route crosses the southern rim of the Lorne Basin, a Triassic basin formed on the New England Fold Belt. The Camden Haven Beds found in this basin consist of tuff, tuffaceous sandstones, massive conglomerates, sandstones and red-purple clay-shales. The conglomerates contain boulders and pebbles of sandstone, mudstone, quartzite, jasper, chert and quartz and outcrop to form a high escarpment around the western rim of the Lorne Basin to the north-west of Coopernook.

Situated under the village of Coopernook itself and sandwiched between the Lansdowne floodplain and the Lorne Basin is a narrow band of older Carboniferous rocks known as the Byabbara Beds. These beds contain lithic sandstone, tuff, shale and limestone and have decomposed to form compact grey and yellow clays across hillslopes on the northern section of the study corridor. Red clays are found immediately to the north of this location.

6.1.3 Soils

Soil Characteristics

The soils across the Coopernook area may be generalised as podzols (Soil Conservation Service, 1985). Pedological mapping in accordance with Australian Soil Classification indicates that the soils across the lowland areas are relatively uniform. They are classified on the basis of order, suborder, greater group, subgroup and family as follows:

- Hydrosols, redoxic, sulphuric, humose acidic, (medium, non gravelly, clayey [some sandy], giant).

The term hydrosol refers to a range of seasonally or permanently wet soils with key criteria being saturation of the profile for prolonged periods in most years. The soils may not experience reducing conditions for all or part of the period of saturation and reducing and oxidising conditions can co-exist within the soil profile. Redoxic refers to the presence of a seasonal or permanent groundwater table. Sulphuric indicates the presence of sulphuric materials in the upper 1.5m of the profile. Humose-acidic indicates a humose (topsoil) layer and that the major part of the secondary layer (subsoil) is strongly acidic.

The soils in the Spring Hill area are less consistent. They mostly comprise:

- Kurosols, red, grey and yellow, natric and mesonatric, mottled with variable family associations.

The term kurosol refers to soils with a strong textural contrast between topsoil and strongly acid subsoil. The term natric indicates that the upper part of the subsoil layer is sonic. Some vertisol soils, that exhibit shrink and swell properties were also noted in the Spring Hill area.

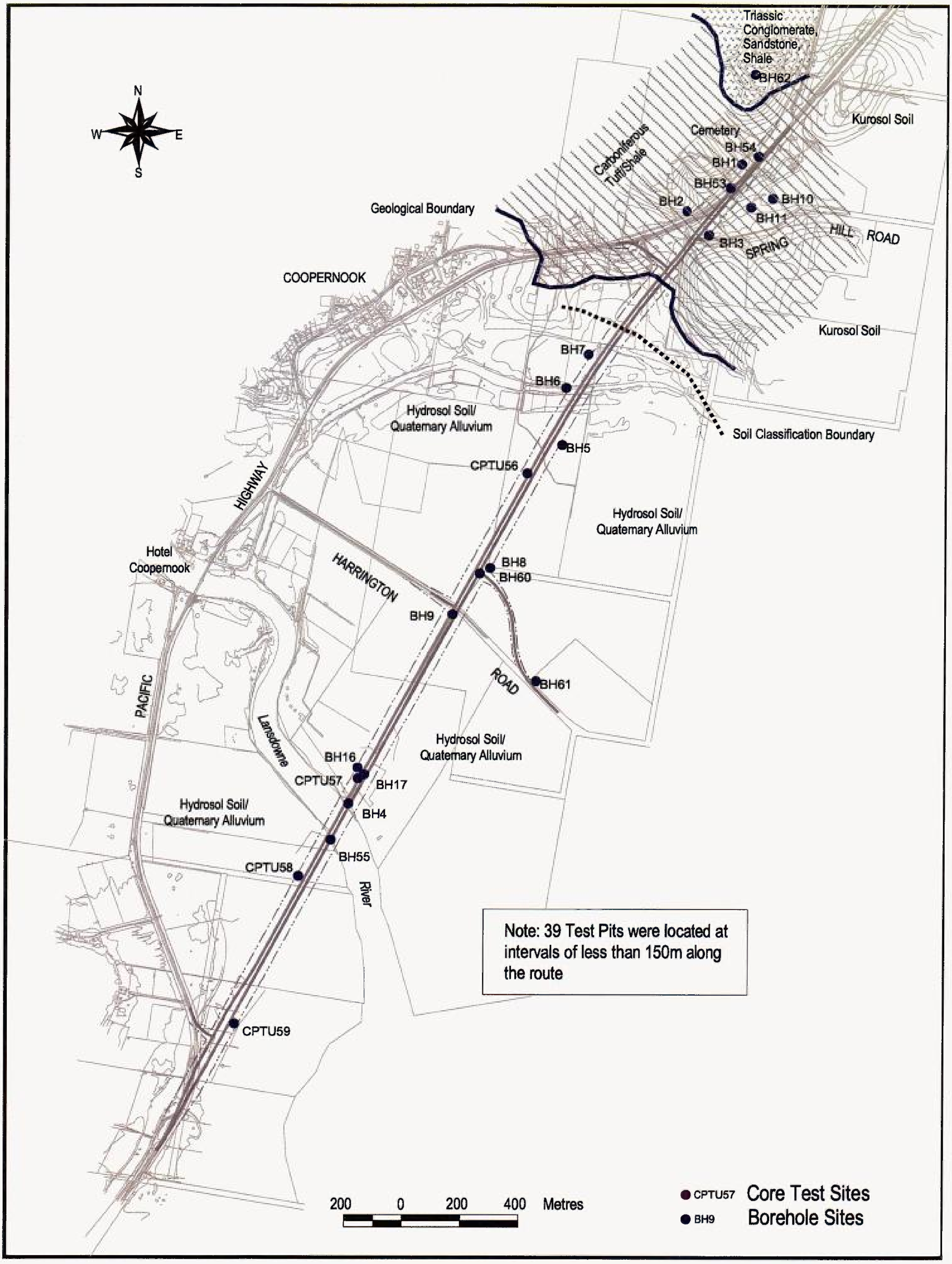
The geological setting and the pedological description of the soils along the proposed alignment are shown in Figure 6.1 This figure has been produced using DLWC soil data cards in conjunction with the test pits and borehole programme undertaken during the EIS investigations at Coopernook. Details of the location of these investigations are also shown on Figure 6.1.

Acid Sulphate Soils

The generation of acidic runoff from the soils containing sulphide compounds (eg soils under anaerobic conditions such as waterlogging) can occur when they are exposed to the atmosphere during earthworks. This leads to the oxidation of sulphides to form sulphates and the generation of sulphuric acid. Acidification of soils restricts plant growth and acid drainage both pollutes waters directly and by dissolving naturally occurring metal compounds which may generate toxins to aquatic flora and fauna.

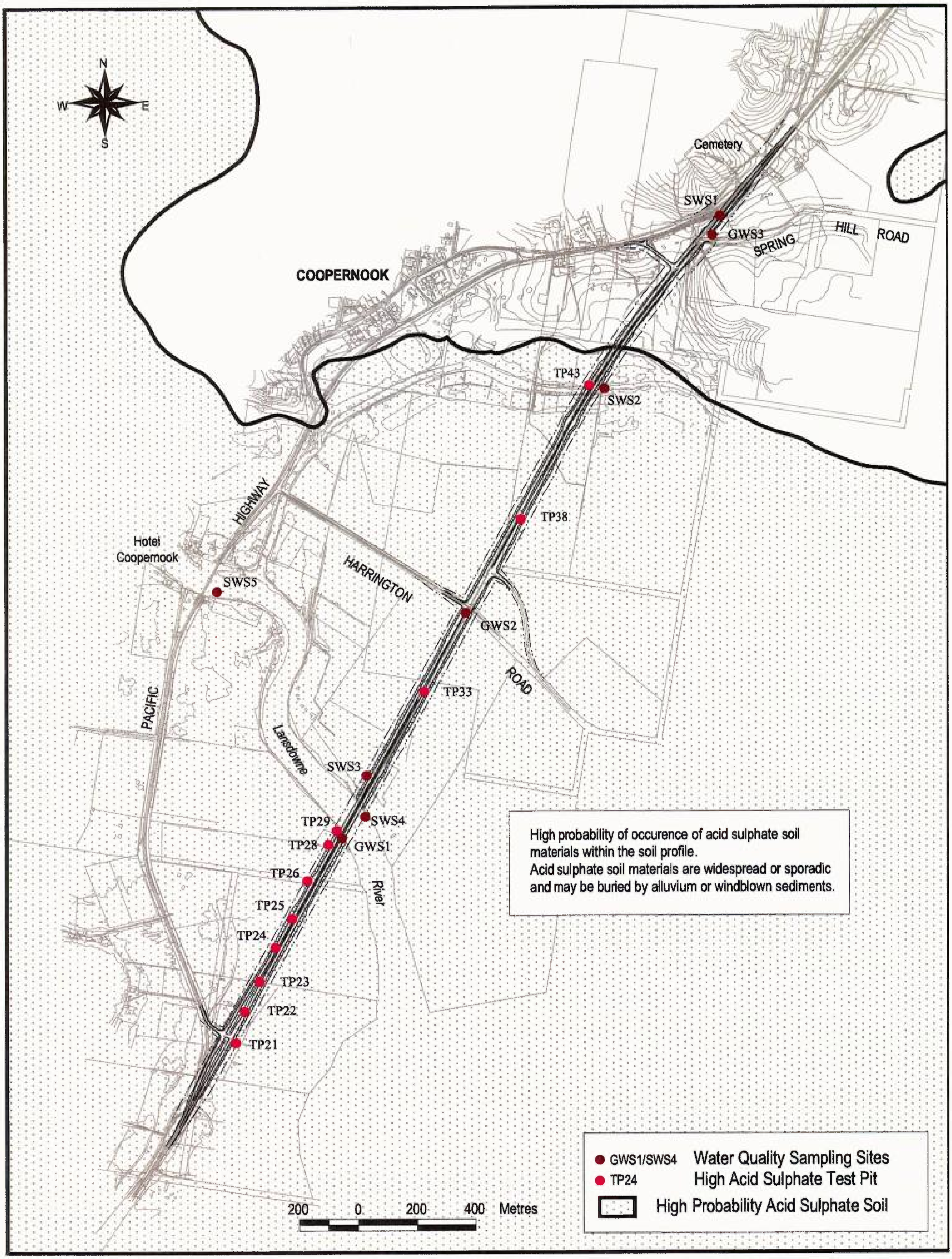
Potential acid sulphate soils have been identified from test pits in the area south of the Lansdowne River and there may also be sporadic pockets of acid sulphate soils located between Lansdowne River and Harrington Road and north of Harrington Road.

The inferred distribution of potential acid sulphate soils is shown on Figure 6.2 which shows that most of the potentially acidic soils identified (8 of 11 locations) are located in the area south of the Lansdowne River.



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 6.1 : GEOLOGICAL MAP AND SOIL DISTRIBUTION



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 6.2 :
ACID SULPHATE SOILS AND WATER QUALITY SAMPLING SITES

On site activities which may impact on acid sulphate soils are as follows:

- excavation of organic soils
- excavation for water retaining structures
- excavation for toe drains
- importation of filling materials

In the event acid sulphate soils do occur, the principles outlined in the Acid Sulphate Soil Guidelines (RTA, 1996) would be implemented to manage the situation. Such measures would be detailed in the EMP for the project and, if necessary, in a dedicated Acid Sulphate Soil Management Plan.

Acid Sulphate Soils Management Principles include:

- avoid land management activities that disturb potential acid sulphate soils (PASS)
- prevent oxidation of PASS
- neutralise ASS or acid produced in PASS
- oxidise and leach PASS
- remove pyritic material

Of particular concern from an acid sulphate soil perspective is that the route alignment lies directly along a tidal drain located between Harrington Road and Lansdowne River. It is proposed to install another drain adjacent to the highway embankment to maintain drainage to the Lansdowne River. Excavation of this open drain should be as shallow as possible to limit the effect of lowering the water table and restricting acid production resulting from creating oxidising conditions in potential acid sulphate soils.

A preliminary acid sulphate management plan to minimise potential impact of these activities has been presented as part of the detailed geotechnical investigation in Appendix J. Some of the activities presented in acid sulphate management plan which can potentially impact on acid sulphate soils are presented below:

- Excavation: Toe drains will be required and their excavation will impact on acid sulphate soils. The relocation of the existing drain may cause oxidation of acid sulphate soils and may require treatment in isolated areas. Excavation for water retaining structures may encounter acid sulphate soils and require treatment.
- Release of sub-surface water during settlement: Minor amounts of water will be generated by wick drains if used to accelerate settlement.
- Change in permeability of the strata under embankment loading: As any change in strata permeability is unlikely to cause significant changes to the groundwater flow direction it is considered that this effect would be minimal.
- Heave at the toe of the embankment: Significant heave at the toe of the embankment is considered unlikely.

Control of the above impacts is considered in detail as part of the Environmental Management Plan for the proposal which is outlined in Chapter 7.0.

Soil Contamination

There are no indications of stock dip sites or other forms of significant chemical contamination on the site with the potential to pose a risk to health or the environment during the construction period.

6.2 Climate and Air Quality

6.2.1 Climate

The study area lies near the southern limit of the subtropical zone and the climate remains relatively mild at all times of the year. In the lower Manning valley, mean summer temperatures range from 18°C to 29°C with cool northeast breezes often tempering the effect of midsummer maxima. Light frosts may be experienced on the riverine lowlands, however winter temperatures seldom fall below 6°C. January is the hottest month with average maximum temperatures of 28.9°C. July is the coldest month, with an average minimum temperature of 5.3°C.

On the floodplain, mean annual rainfall averages 1550mm annually with a summer peak, though seasonal variability may be extreme. Excessively high summer rainfalls, sometimes greater than 500mm result from southward extensions of tropical cyclones. Periods of high rainfall also frequently occur during June and July when intense low pressure systems form on the NSW central coast. On such occasions flood conditions may develop along the Manning River and its tributaries and in the Coopernook district, the Lansdowne floodplain may be inundated to a depth of around 1m every five years. Temperature, humidity and rainfall data for Taree are set out in Table 2 of Holmes' Air Quality Study in Appendix L.

Prevailing winds are generally from the southwest and west throughout the year, however the spring and early summer months are often characterised by strong and hot winds from the northwest as temperatures rise. In the afternoons, winds can tend to shift to blow from the eastern quadrant especially in summer when stronger north easterly sea breezes are common. Annual and seasonal windroses can be viewed in Figures 4a - 4c in Appendix L.

6.2.2 Existing Air Quality

A desk top assessment of air quality during construction and operation of the proposed highway was conducted by Holmes Air Sciences (1997) which is included in Appendix L.

In the absence of data specific for this project, data from the Bulahdelah Pacific Highway upgrading project was adopted due to comparable land use and traffic conditions. Monitoring on the Pacific Highway project at Bulahdelah indicated that levels of all pollutants associated with motor vehicles were low.

In the Coopernook area there are unlikely to be any regional air quality problems associated with vehicle emissions. The most important air quality issue associated with the proposed road development would be the local impacts at kerbside and nearby residences from specific emissions from vehicles. In general, air quality is likely to decrease due to the shorter overall route and more economic vehicle speeds rather than constant accelerating and braking through the village.

6.2.3 Relevant Air Quality Criteria

Motor vehicles have the potential to emit a range of substances which can have varying impacts on human health and the environment. The major pollutants which have been assessed are as follows:

- carbon monoxide (CO)
- nitrogen oxides (NO_x)
- hydrocarbons including benzene

- particulate matter (PM) and lead

The NSW EPA recommends air quality goals for all of these pollutants, except hydrocarbons, which have been based on levels determined by the Vic EPA, World Health Organisation (WHO) and National Health and Medical Research Council (NH&MRC). A summary of these goals is provided in Table 6.1.

The construction of the bypass would result in dust generation which could have impacts on human health, residential amenity and agricultural activities in the study area. Acceptable criteria for dust generation has been set by the EPA and are also summarised in Table 6.1.

Table 6.1: Air Quality Goals Relating To Motor Vehicle Emissions

Pollutant	Goal	Agency
Total Particulate Matter	90μgl/m^3	NH&MRC
Particulate Matter < 10μm (PM_{10})	50μ/m^3 (annual mean) 150μg/m^3 (24-hour maximum)	USEPA
Lead	1.5μg/m^3 (90 day average)	NH&MRC
Carbon Monoxide	87ppm or 108mg/m^3 (15 minute maximum) 25ppm or 31mg/m^3 (1 hour maximum) 9ppm or 11mg/m^3 (8-hour maximum)	WHO WHO NH&MRC
Nitrogen Dioxide	0.16ppm or 328μg/m^3 (1-hour maximum) 0.05ppm or 103μg/m^3 (annual mean)	NH&MRC USEPA
Dust	maximum acceptable increase in dust fallout when existing levels between 3-4glm^2/month: residential land use: 0μglm^2/month other land use: 1μglm^2/month intermediate: 3-μglm^2/month	EPA

Source: Holmes Air Sciences, 1997

6.2.4 Estimated Emissions

Emission rates during morning and afternoon peak hours for the two scenarios are from the total traffic volume and the emission rate per vehicle. Details of assumptions relating to the percentages of heavy vehicles, petrol and diesel fuelled, are presented on pages 22-25 of Appendix L. Table 6.2 presents the estimated peak hour traffic emissions for the year 2016.

Table 6.2: Estimated Peak Hour Traffic Emissions for 2016 (Kg/km/hour)

Roadway Section		Carbon Monoxide	Nitrogen Oxides	Hydrocarbons	Particulate Matter (PM_{10})
Normal Peak					
South of Harrington Road	Northbound	4.10	1.66	0.43	0.09
	Southbound	2.97	1.21	0.31	0.07
North of Harrington Road	Northbound	3.11	1.26	0.32	0.07
	Southbound	2.63	1.06	0.27	0.06
Holiday Peak					
South of Harrington Road	Northbound	8.35	2.35	0.72	0.09
	Southbound	3.60	1.01	0.31	0.04
North of Harrington Road	Northbound	7.11	2.00	0.61	0.08
	Southbound	3.22	0.91	0.28	0.04

Source: Holmes Air Sciences, 1997

6.2.5 Prediction of Pollutant Concentration and Assessment of Impacts during Operation

The Caline4 dispersion model was used to estimate the concentration of oxides of nitrogen, carbon monoxide, hydrocarbons and particulate matter, that are likely to be produced in the vicinity of the proposed highway. Table 6.3 shows the predicted increase in 1 hour average ground level concentrations of vehicle emissions at various distances from the roadway edge. An assessment of the impacts of the increased level for each pollutant is given below.

Table 6.3: Predicted Increase in 1-hour Vehicle Emissions along Proposed Highway[1]

Roadway Section	Distance from the edge (m)	Carbon Monoxide (mg/m^3)	Nitrogen oxides ($\mu g/m^3$)	Nitrogen dioxide ($\mu g/m^3$)	Hydro-carbons (mg/m^3)	Particulate Matter ($\mu g/m^3$)
South of Harrington Road	0 10 30	1.4 0.7 0.5	560 299 196	56.0 44.8 39.2	0.14 0.08 0.05	30.1 16.0 10.5
North of Harrington Road	0 10 30	1.1 0.6 0.4	448 247 163	44.8 37.1 32.7	0.11 0.06 0.04	24.0 13.3 8.8

[1] Peak hour flows during the normal operation of the roadway
Source: Holmes Air Sciences, 1997

Carbon Monoxide

The highest predicted 1-hour carbon monoxide concentration 10m from the road is $0.7mg/m^3$ along the southern section of the proposed bypass. This is well below the EPA's 1-hour goal of $31mg/m^3$ and levels at 30m are even lower. Levels at kerbside are also below the EPA's goal.

Nitrogen Dioxide

The highest predicted 1-hour nitrogen dioxide concentration 10m from the road during the normal day-to day peak is 44.8$\mu g/m^3$, again along the southern section of the route. This is below the EPA's goal of 320$\mu g/m^3$. Levels at kerbside are also below the 1-hour goal, at 56$\mu g/m^3$ using a 10% conversion rate.

Particulate Matter/Dust

The highest predicted increase in PM_{10} (<10μm) at 10m from the road during normal peak is 16$\mu g/m^3$, south of Harrington Road. This well below the EPA's 24-hour goal of 150$\mu g/m^3$ (after conversion). Kerbside levels are also predicted to be below the 24-hour PM_{10} goal.

Hydrocarbons

From Table 6.3 the predicted maximum 1-hour increase in total hydrocarbons is of the order of 0.08mg/m^3 at 10m from the roadway. This is only 4% of the Victorian EPA design 3-minute goal.

The predicted concentrations for the holiday peak are all higher (except for PM_{10}) than the normal peak due to increased traffic flows, but none of the emissions are predicted to exceed EPA goals. The predicted decrease in PM_{10} levels during holiday peak times is due to the reduced percentage (and real numbers) of heavy vehicles that make up the fleet. For normal peak hour traffic heavy vehicles constitute almost 17% of the vehicle fleet, but this is reduced to around 6% during the holiday period. Heavy vehicles contribute significantly to PM_{10} emissions and as such the predicted concentrations have decreased. The predicted emissions for holiday peak are attached in Appendix L.

6.2.6 Emissions Generation During Construction

Dust would be generated from earthworks associated with construction of the proposed route. Dust has the potential to affect nearby residences by causing poor visibility, nuisance and in severe cases, contributing to respiratory problems. In a rural setting such as the study area, the impact of dust generation on farming activities also needs to be assessed. The main concern in a rural environment is that dust generated by the construction of the road may affect the palatability of pastures for grazing cattle thus affecting their feeding habits and milk production. Other nuisances include dust in houses and rainwater tanks.

Estimates of dust emissions from construction operations can be made using emission factors developed by the SPCC (1983) and the USEPA (1981). These emission factors relate the amount of dust generated by different types of equipment and operations associated with construction work. The most likely equipment to be used in the project includes back hoes, rollers, excavators, pavers, concrete trucks, jackhammers and haul trucks. The major sources of dust would be the dozers, excavators, scrapers and wind erosion during construction. An estimate of the amount of dust generated by each operation per day is summarised below:

- Dust from loading of material by excavator to trucks assuming dust is generated at the rate of 0.01kg/lt and that 50 x 15 cubic metre trucks are removed in a ten-hour day, making a total of approximately 750m^3 or approximately 1125t of material removed per day gives a total dust generation of 11.25kg/day.
- Dust from trucks travelling on the unsealed road surface assuming a 400m round trip distance, five movements per hour and 2kg of dust/vehicle/km (after taking account of

dust suppression by watering of the trafficked areas) would generate 40kg during a ten-hour working shift.

- Dust from wind erosion from an exposed area 200m long by 30m wide (the exposed area would be greater than this but the area which could contribute significant amounts of dust to a particular residence would be unlikely to be larger) assuming an erosion rate of 0.4kg/ha/hour gives a total of 2.4kg in ten hours.

Thus the total dust generated in a ten-hour working day could be as high as approximately 50-60kg. On a hot, dry, windy (worst case emission conditions with respect to dust) the amount of dust from wind erosion could be much higher, and should be controlled using water sprays.

The appropriate air quality goal for determining impacts from construction work is the EPA 24-hour goal for PM_{10} of $150\mu g/m^3$. This is approximately equivalent to the former EPA 24-hour goal of $260\mu g/m^3$ for total suspended particulate matter (TSP). It is still useful to refer to this goal as many historical measurements are for TSP. There is no direct relationship between the PM_{10} measurement and total dust generation. However, the EPA goal represents the threshold of nuisance conditions.

Dust generation arising from the earthworks and vehicle movement on unsealed areas would be controlled by watering of disturbed areas. In addition, measures implemented to conserve soil and protect water quality will assist in reducing dust potential. These measures include minimising the area disturbed and exposed at any one time, revegetating or otherwise stabilising disturbed areas as soon as practicable and confining vehicle movement to designated areas. These measures would be implemented via an Environmental Management Plan for the project (refer Section 7.0).

6.2.7 Emissions from Plant and Equipment during Construction

Emissions from construction machinery, vehicles and trucks would remain with the air quality goals nominated in Table 6.1. Compliance with EPA guidelines would be achieved by maintenance of plant and vehicles to be specified in the construction stage EMP.

6.2.8 Air Quality Conclusions

Holmes Air Sciences assessed the air quality impacts along the proposed route. The results of the assessment conclude that:

- Due to the present emission controls on motor vehicles and the projected traffic conditions for 2016, the EPA's carbon monoxide 1-hour or 8-hour goals are not expected to be exceeded during the operation of the bypass.
- The PM_{10} annual and 24-hour maximum air quality goals, are not likely to be exceeded at kerbside or at any nearby residences.
- The predicted increases in concentration of nitrogen dioxide indicate that the EPA's goals would not be exceeded at any distance from roadway.
- Predicted concentrations of benzene (and other pollutants) are not at levels which should pose any health effects. However, it is recognised that there may be no safe level for exposure to benzene.
- Dust impacts would be able to be managed to acceptable levels according to the Environmental Management Plan.

6.3 Hydrology and Flooding

6.3.1 Existing Flooding and Drainage Characteristics

The Manning River is bounded by the Hunter River and Karuah River catchments to the south, the Great Dividing Range to the west and the Macleay River and Hastings River catchments to the north. The major tributaries include the Barnard, Nowendoc, Rowleys, and Barrington (or Gloucester) Rivers. The Manning River catchment has an area of approximately 8,100 km^2 (upstream of the junction of the Manning and Lansdowne Rivers).

The catchment of the Lansdowne River is approximately 200 km^2 (upstream of the proposed bypass). Hence, this catchment comprises 2.5 % of the Manning River catchment.

Due to the difference in these catchment areas, the study area generally experiences two types of flooding: short duration (less than one day) flooding from the Lansdowne River, or 'back-up' flooding from a long duration (more than two days) Manning River flood. As well, a combination of both flooding types can occur.

The proposed Coopernook Bypass forms another component of the roadworks associated with improving the flood immunity of the Pacific Highway across the Manning River floodplain. The major component of these works is the Taree Traffic Relief Route, and an assessment of the impacts of these roadworks on the flooding characteristics of the Manning River has been carried out by WBM Oceanics using the same techniques and numerical model outlined herein. The existing conditions described in this report are those flooding conditions with the Taree Traffic Relief Route constructed.

Manning River Floods

In a flood dominated by Manning River Catchment flooding, the peak flow in the Manning River can be in the order of 15,000 m^3/s. This type of flooding is often combined with elevated ocean levels (storm tides) of extended duration. The Manning River rises at the junction with the Lansdowne River to levels of approximately 2.0 to 3.0mAHD over a number of days.

The Lansdowne River floodplain has the potential to store a significant volume of flood water. There are large areas of low-lying land to the west of Coopernook and on the Moto floodplain (refer Figure 6.3).

The rising flood levels in the Manning River result in flood waters filling the Lansdowne River floodplain through back-up onto the floodplain and from the Lansdowne River. The volume of flood water storage available on the Lansdowne River floodplain is such that in some Manning River flood events, the Lansdowne River will actually flow backwards (ie. upstream) for a period of time as Manning River flood waters move to fill the floodplain.

For the portion of the study area to the north of the Lansdowne River, floodwaters will initially pond on the floodplain due to back-up flows from Cattai Creek and Coopernook Creek. This back-up will typically result in ponding on the floodplain adjacent to Coopernook Creek and to the north-east of Harrington Road. Ponding can also occur as a result of back-up from Tappin Creek.

The area to the south-west of Harrington Road typically floods due to rising flood levels in the Lansdowne River and the river breaking its banks just downstream of the existing highway bridge.

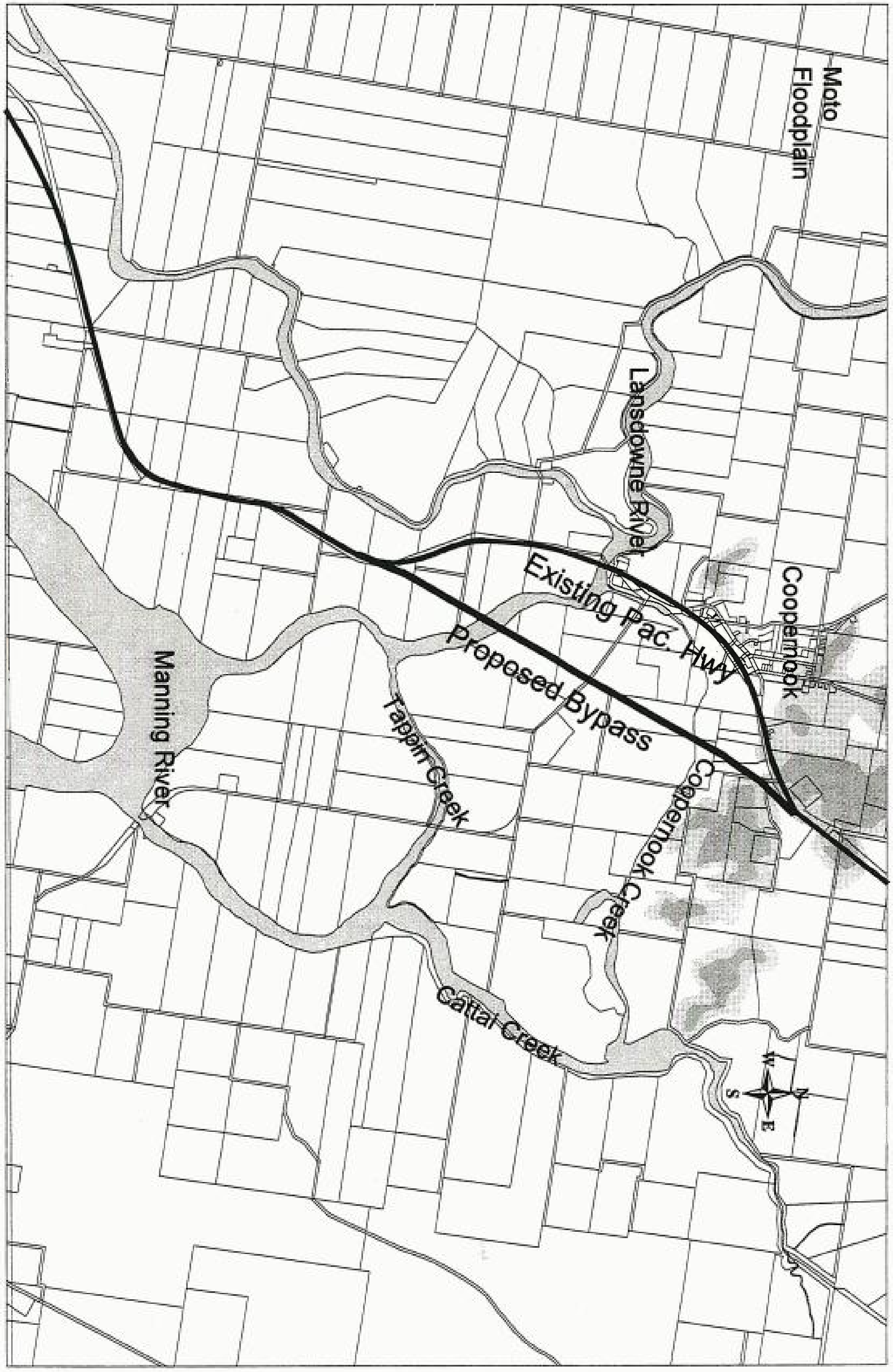


Figure 6.3 :
LANSDOWNE RIVER
(MANNING RIVER FLOOD PLAIN)

These two sources of flooding (ie. back-up from the smaller creeks and overflow from the Lansdowne River) in conjunction with flow under (via culverts) and over Harrington Road result in flooding of the northern side of the Lansdowne River.

For the portion of the study area to the south of the Lansdowne River, floodwaters will enter the floodplain through a number of low points in the artificial levee banks along the Lansdowne River.

Lansdowne River Floods

For floods which are dominated by rainfall and flooding in the Lansdowne River catchment, the peak flow in the Lansdowne River can be in the order of 500 m^3/s. For these flood events, the entry of flood waters onto the floodplain is due to rising levels in the Lansdowne River. This results in the river breaking its banks just downstream of the existing Pacific Highway bridge and flowing into the area to the south-west of Harrington Road. The area to the north-east of Harrington Road is then typically filled by flow either under or over Harrington Road. In large events, floodwaters also flow over the existing Pacific Highway and onto the northern floodplain of the Lansdowne River.

For the portion of the study area to the south of the Lansdowne River, floodwaters will enter the floodplain through a number of low points in the artificial levee banks along the Lansdowne River.

Combination of Flooding Sources

It is often the case that flooding of the study area is attributed to both the rising water levels in the Manning River resulting in back-up, and flood waters flowing in the Lansdowne River. The variations in the timing and degree of dominance of these two effects ensure that no two floods are exactly the same.

Existing Drainage Network

On the northern floodplain of the Lansdowne River, the areas to the north of Harrington Road are drained by three lateral drains which join a main drain that follows the same alignment as the proposed bypass route, draining to the south via a culvert under Harrington Road (refer Figure 6.7). This main drain has an outlet to the Lansdowne River with a tidal flap-gate.

Immediately on the northern side of Harrington Road (west of the bypass route) a lateral drain extends between the culvert on the bypass alignment and another culvert 200m to the west. On the southern side of Harrington Road, this drain joins a network of drains that service the area to the south of Harrington Road (east and west of bypass route), and which drain to the main drain grading south to the Lansdowne River on the bypass alignment.

On the southern floodplain, the drainage network crosses the proposed bypass route at two locations. The most northerly location is the main drain for this area. It receives flows from lateral drains to the east and west of the bypass route, and flows toward the east and into the Lansdowne River through a tidal flap-gate.

To the south on the southern floodplain a small drain crosses the bypass route and is joined by a short lateral drain to then flow to the south-east. West of the bypass route a large drain flows to the south parallel to the bypass alignment and crosses the existing highway. This is a main drain for lands to the west of the bypass route.

The above drains play an important role in draining the agricultural areas of the study area. They allow runoff from local rainfall on the area to drain from the land as well as draining the floodplain in the latter stages of the recession of larger flood events. It is recognised that maintenance of adequate drainage is essential for the continued operation of the agricultural enterprises in the study area.

6.3.2 Numerical Modelling

A numerical model of the Manning River system was developed by WBM Oceanics Australia (then trading as Oceanics) as part of the Manning River Flood Study (PWD, 1991). The model has two parts: a hydrologic model and a hydraulic model. The models aim to simulate the flooding characteristics and behaviour of the Manning River system and flood plains over the duration of a flood event.

The hydrologic model, employing the commercial computer program called RORB, simulates the process of rainfall on the catchment becoming flow in a river. The hydrologic model is made up of a number of sub-catchments which are represented by parameters such as the area, length, vegetation cover and steepness of each sub-catchment. The inputs to the hydrologic model are rainfall patterns (over the duration of the flood event) and the outputs are flows (over the duration of the flood event).

The hydraulic model, employing the WBM Oceanics in-house computer program called ESTRY, uses as input the flows from the hydrologic model as well as the variations in ocean water levels (over the duration of the flood event). The hydraulic model simulates the relationships between flows and water levels in the rivers and creeks and on the floodplain, and allows for scouring of sediment that can build up at the Manning River entrance. The hydraulic model represents over 350 flowpaths with parameters such as the size (width and area of flow), slope and roughness of the waterway. There are over 40 flowpaths within the study area represented in the model. It also simulates the capacity of over 170 storage areas on the floodplain.

Hence, using rainfall as input into the hydrologic model and in conjunction with the hydraulic model, the numeric modelling can reproduce flood level behaviour anywhere on the floodplain or in the river system.

In order to assess the impacts on flooding of the proposed bypass, three 'design' flood events were considered.

- **Flood Event A:** This flood is the 100 year ARI (Average Recurrence Interval) flood for the entire Manning River, combined with the appropriate 100 year ARI ocean levels[1]. It is referred to as the '100 year Manning River flood'. This flood was chosen to assess the performance of the bypass when it is overtopped. The proposed bypass is to be trafficable in floods up to the '20 year Manning River flood' (see 'Flood Event B' below).

  As part of the Manning River Flood Study (AWACS, 1989 - referred to in WBM Oceanics, 1997), ocean water level profiles, sometimes called 'storm tides', have previously been determined for the entire duration of various ARI flood events. In the numeric modelling for the Coopernook Bypass the peak of the various ARI storm tides (ie. peak ocean levels) coincides with the maximum rainfall, which is consistent with the nature of typical storm cells that result in major Manning and Lansdowne River floods.

- **Flood Event B:** This flood is the 20 year ARI flood for the entire Manning River combined with the appropriate 20 year ARI ocean levels. It is referred to as the '20 year Manning River flood'. This flood was chosen as it is approximates the largest flood that will not overtop the proposed bypass.
- **Flood Event C:** This flood is the 100 year ARI flood for the Lansdowne River with a 20 year ARI Manning River flood and normal tidal variations in the ocean. It is referred to as the '100 year Lansdowne River flood'. This flood was chosen to assess the performance of the bypass in a flood dominated by Lansdowne River flows.

For the 100 year and the 20 year Manning River flood events, the influence of the elevated ocean water levels result in a very flat gradient for flood levels along the river and floodplain. The 100 year Lansdowne River flood event has a steeper gradient and higher velocities across the floodplain, although at a shallower depth of inundation.

Relevant design flood levels for existing conditions at the bypass location are:

- 100 year Manning River flood = 2.95 mAHD
- 20 year Manning River flood = 2.31 mAHD
- 100 year Lansdowne River flood = 2.06 mAHD

Floor Levels in Study Area

There are a number of structures immediately upstream of the proposed bypass route. These floor levels need to be considered in conjunction with the predicted flood levels of the three flood events detailed above.

The house currently owned by J and N Birkett (Bk 3291 No646) is immediately upstream of the proposed bypass route on the northern bank of the Lansdowne River. It has a floor level of 3.27m AHD and the associated dairy has floor level of 2.66m AHD.

The Coopernook Hotel has a floor level of 2.00 mAHD and there are a number of other houses and buildings (eg. the petrol station) in the vicinity with floor levels between 2.0 and 2.5m AHD.

Due to the height of the embankment being mostly less than 1.6m, there is insufficient height for stock underpasses without major earthworks implications.

6.3.3 Details of Bypass

Design Level

The road is to be constructed such that at least one lane (in either direction) is trafficable in a 20 year ARI flood event. The existing 20 year ARI flood level is 2.31m AHD. If an allowance of 50mm (0.05m) for flood afflux (due to the bypass) is made, then the centre line level of the road will be constructed at 2.36m AHD.

The highest point on the cross-section (of the part of the road crossing the floodplain) is at the inside edge of each of the two carriageways, and this point is 4.5m from the centre line and 0.14m above the centre line level. Hence, the modelling assumed that, in the ultimate case, the road will be overtopped by flood waters higher than 2.50 mAHD (refer Figure 5.3).

The road will maintain the 2.36m AHD level throughout the floodplain, creating an average fill height of 1.7m. The road rises to 6.2m AHD over the Lansdowne River, thus enabling the proposed bridge to provide a navigational clearance of 5m under the bridge. The road rises up from 2.36m AHD to the Lansdowne River bridge and then down again to 2.36m AHD over a length of 1200m, and this geometry has been included in the hydraulic model.

The parallel bridges over Coopernook Creek and the adjacent SEPP 14 wetland will not require navigational clearance, but would nominally maintain the minimum carriageway level of 2.36m AHD.

Due to the height of the embankment being mostly less than 1.6m, there is insufficient height for stock underpasses without major earthworks implications.

Construction Levels During Settlement Period

Due to the geotechnical qualities of the soils along a significant section of the route, pre-loading of these parts of the road embankment will be required during the construction period. The purpose of this pre-loading is to increase the rate of settlement over a short period of time in order to limit settlement following construction.

The section of embankment from the southern limit of the bypass to Harrington Road (approximately) will require pre-loading. This will involve the placement of approximately 2m of additional earth fill on the top of the embankment for a period of between 12 and 18 months.

The most probable construction program for the embankment will have the pre-loading of the embankment occurring over the initial 12 to 18 months. During this time, there will be no embankment constructed along the route to the north of Harrington Road. Following this pre-loading period, the earth fill used for the pre-loading on the southern portions of the embankment will be used for the fill in the northern embankment.

The likely program of embankment levels is summarised in Table 6.4.

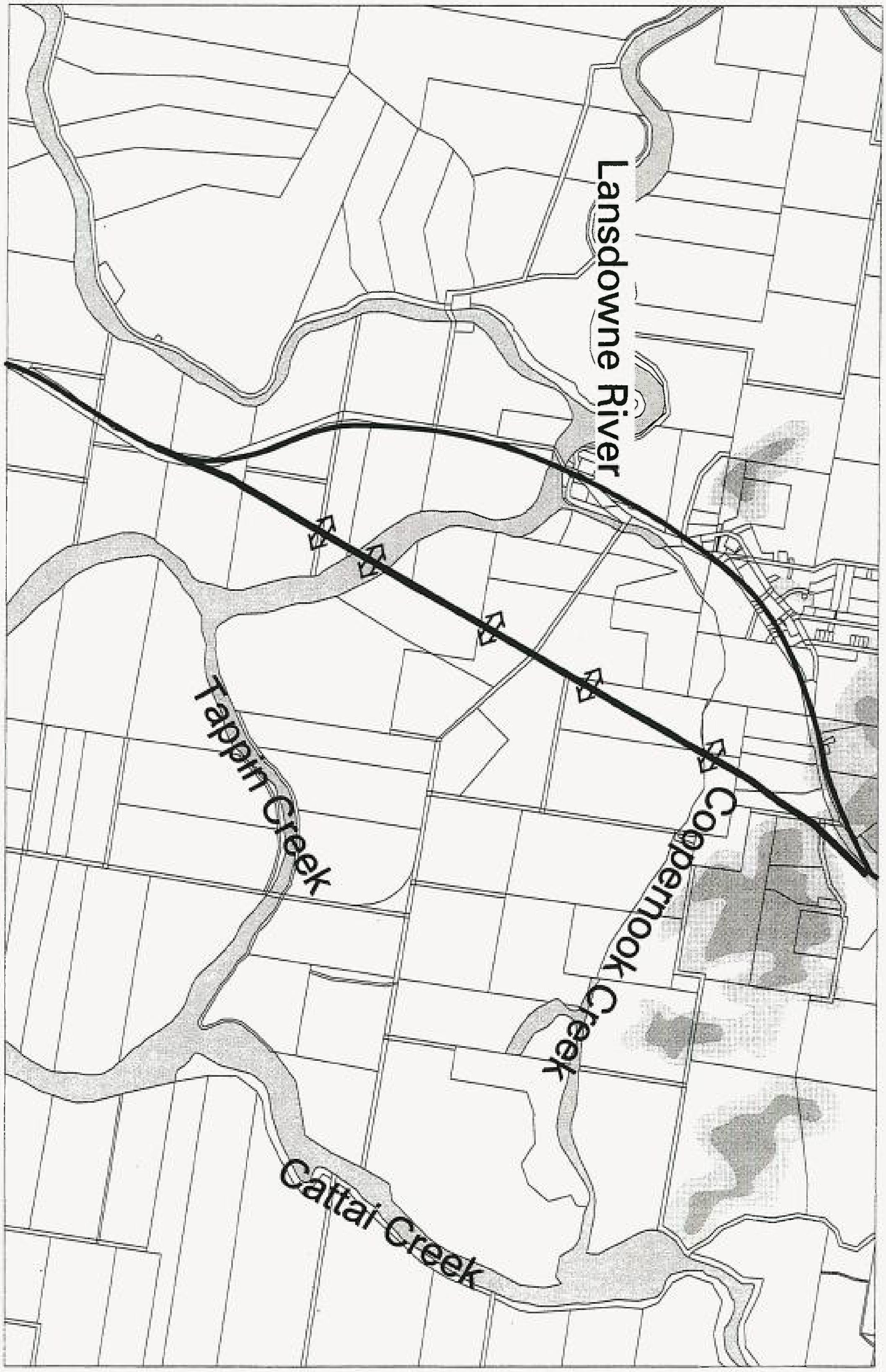
Table 6.4: Program of Embankment Levels

Period	South of Harrington Rd	North of Harrington Rd
Initial 12 - 18 months	4.5m AHD (no culverts)	no embankment
Medium Term (20 - 30 years)	2.70m AHD to 2.36m AHD	2.36m AHD
Long Term (more than 30 years)	2.36m AHD	2.36m AHD

In the medium term, settlement of approximately 340mm is expected for the embankment south of Harrington Road.

Required Waterway Openings

The waterway openings under the bypass required to result in acceptable impacts to flood levels and times of inundation (refer Section 6.3.3) are detailed in Table 6.5 and shown in Figure 6.4.



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 6.4 :
APPROXIMATE LOCATIONS OF WATERWAY OPENINGS

Table 6.5: Required Waterway Openings

Approx. Chainages (m)	Location	Description of Waterway Opening	Details
19,050	Southern floodplain of Lansdowne River (location 1 on Fig. 6.4)	Floodway Structure	6 RCBC's[1] 3.6m wide, 1.5m high at invert level of 0.4 mAHD
19,225 to 19,375	Lansdowne River	Bridge over Lansdowne River	150m long bridge (5 spans of 30m) with 5m navigational clearance
19,900	Northern floodplain of Lansdowne River (south of Harrington Road) (location 2 on Fig. 6.4)	Floodway Structure	15 RCBC's 3.6m wide, 1.5m high at invert level of 0.4 mAHD
20,380	Northern floodplain of Lansdowne River (north of Harrington Road) (location 3 on Fig. 6.4)	Floodway Structure	15 RCBC's 3.6m wide, 1.5m high at invert level of 0.4 mAHD
21,050 to 21,220	Coopernook Creek and wetland (location 4 on Fig. 6.4)	Bridge over SEPP 14 wetland and creek	Piled bridge structure 170m long with 15m spans

Note 1 - RCBC = Reinforced Concrete Box Culvert

It was assumed that the structure over the SEPP 14 wetland would be a piled bridge structure. The clearance between this bridge and the wetland was conservatively assumed to be in the order of 1.5m. This would not cause an increase in flood level and may lead to a slight decrease.

It was also assumed for the purpose of flood evaluation that the bridge over the Lansdowne River will only span from bank to bank. Final bridge details would include sufficient width for an access road on both banks, and indeed discussions with the local landowners indicates a requirement for such access roads for stock and vehicles. The provision of access roads are proposed and would not cause an increase in flood level, and may lead to a slight decrease.

6.3.4 Impacts on Flooding Characteristics

Potential impacts associated with the new highway bypass can result from the following processes:

- loss of floodplain storage volume
- restriction of 'within bank' flood flows by bridge piers and embankments
- restriction of 'overbank' or floodplain flows by filling works associated with elevating the highway above design flood levels

Numerical modelling of flooding in the Manning River catchment and floodplain has been undertaken to determine the potential for these impacts and what design considerations are necessary to mitigate their effects. Flooding impacts of the proposed bypass were assessed by considering changes to:

- flood levels, including peak flood levels
- times of inundation of the floodplain
- velocities
- flow distribution across the floodplain

It was assumed in the flooding assessments that the waterway openings, as described in Table 6.5, would be constructed. These waterway openings were determined by considering the impacts on flood levels and limiting these impacts to a maximum increase of 50mm.

This magnitude of increase is considered to be negligible in relation to the existing depths of inundation on the floodplain of 2 to 3m. It can also be considered negligible in relation to other common occurrences during flooding including boat and wind waves that can result in flood level increases of similar or greater magnitude.

General Impacts on Flooding Behaviour in the Long Term

Any assessment of the impacts of the bypass on flooding needs to recognise the existing distribution of flows across the floodplain. Initially, flood waters are contained within the banks of the Lansdowne River. Depending on the nature of the flood and the location in the study area, flood waters enter the floodplain from either the Lansdowne River or back-up from the Manning River.

The existing dominant flowpath on the northern floodplain is towards the location of the proposed intersection of the bypass and Harrington Road. During the times of peak flow, this flowpath accounts for approximately 60% of the total northern floodplain flow, with the other 40% evenly distributed to the north and south of the intersection (refer Figure 6.5).

If the proposed bypass is constructed, the distribution of flow across the floodplain will be altered. Due to the large waterway opening to be constructed across Coopernook Creek and the SEPP 14 wetland at the northern end of the bypass route, there will be an increase in the proportion of flow via this flowpath. During the times of peak flow with the bypass constructed, this flowpath would account for approximately 40% of the total northern floodplain flow, with the other 60% evenly distributed via the other two flowpaths (on either side of Harrington Road) (refer Figure 6.5). The impact of the bypass results in no significant redistribution of flows on the southern floodplain (refer Figure 6.5).

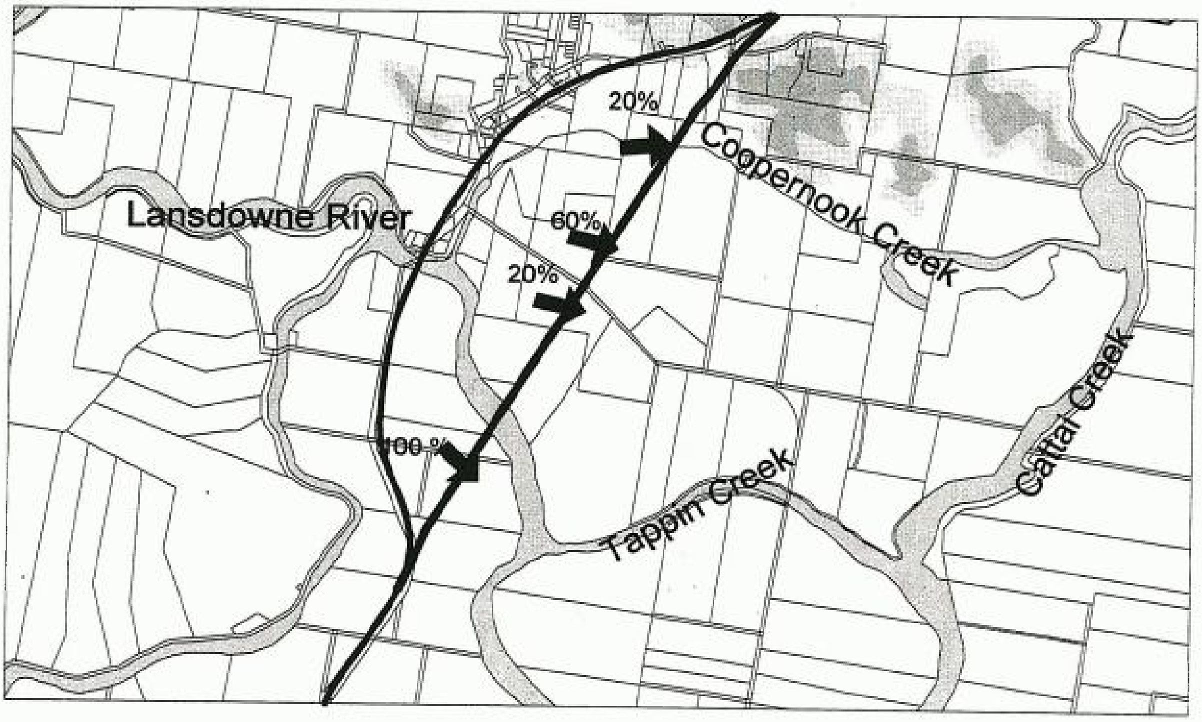
Long Term Impacts on Flood Levels

The predicted impacts of the bypass on peak flood levels are less than 50mm and can be considered to be negligible. At the peak of the 100 year Manning River flood, the increase is no more than 5mm, for the 20 year Manning River flood no more than 10mm, and for the 100 year Lansdowne River flood no more than 30mm.

Immediately upstream of the bypass the maximum increase in flood levels does not occur at the peak of flooding. In order to illustrate this situation, the behaviour of flood levels at two locations (ie. northern and southern flood plains) over the full duration of the 100 year Manning River flood event is presented on Figure 6.6. Two-thirds of the way into the period of rising flood waters, flood levels for the 'existing' and 'bypass' cases deviate for a short duration. This results in flood levels upstream of the bypass being increased by approximately 50mm for a short time compared with the existing situation. The impact of the bypass at the peak of flooding is somewhat less than 50mm, as discussed above.

Impacts During Pre-Loading Period

During the short term pre-loading period (refer Construction Methods and Staging Section 5.3), it is likely that there will be no waterway openings on the floodplain embankment to the south



Existing Case

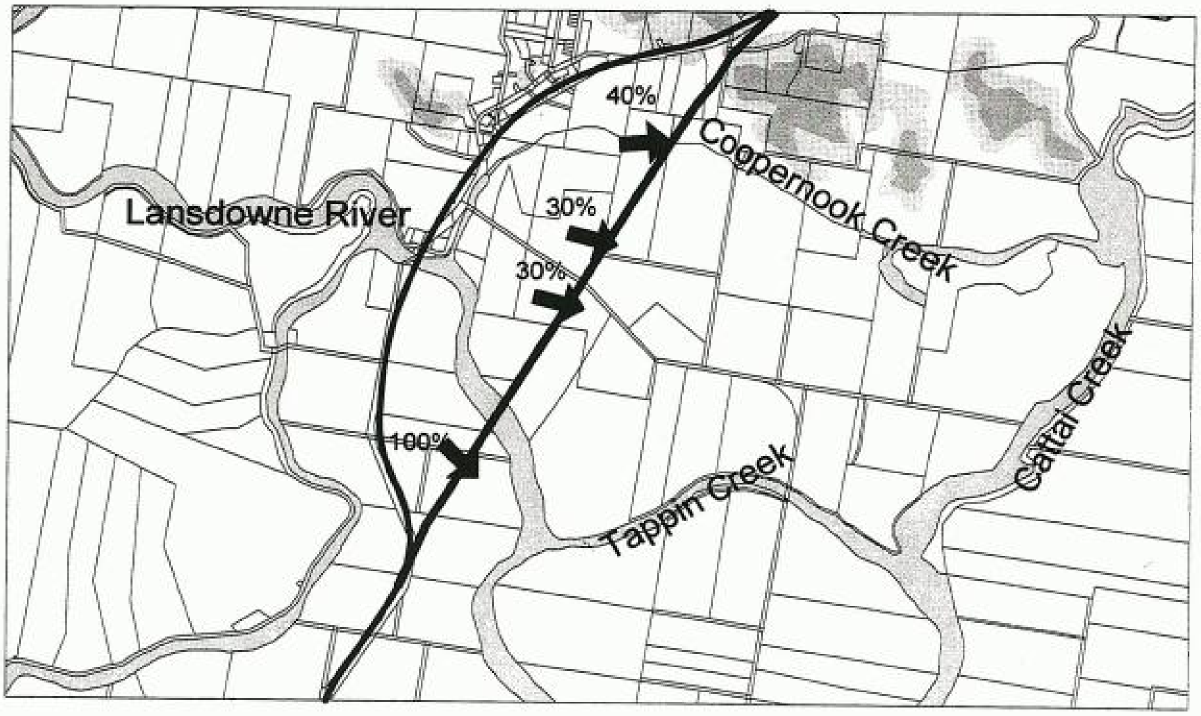
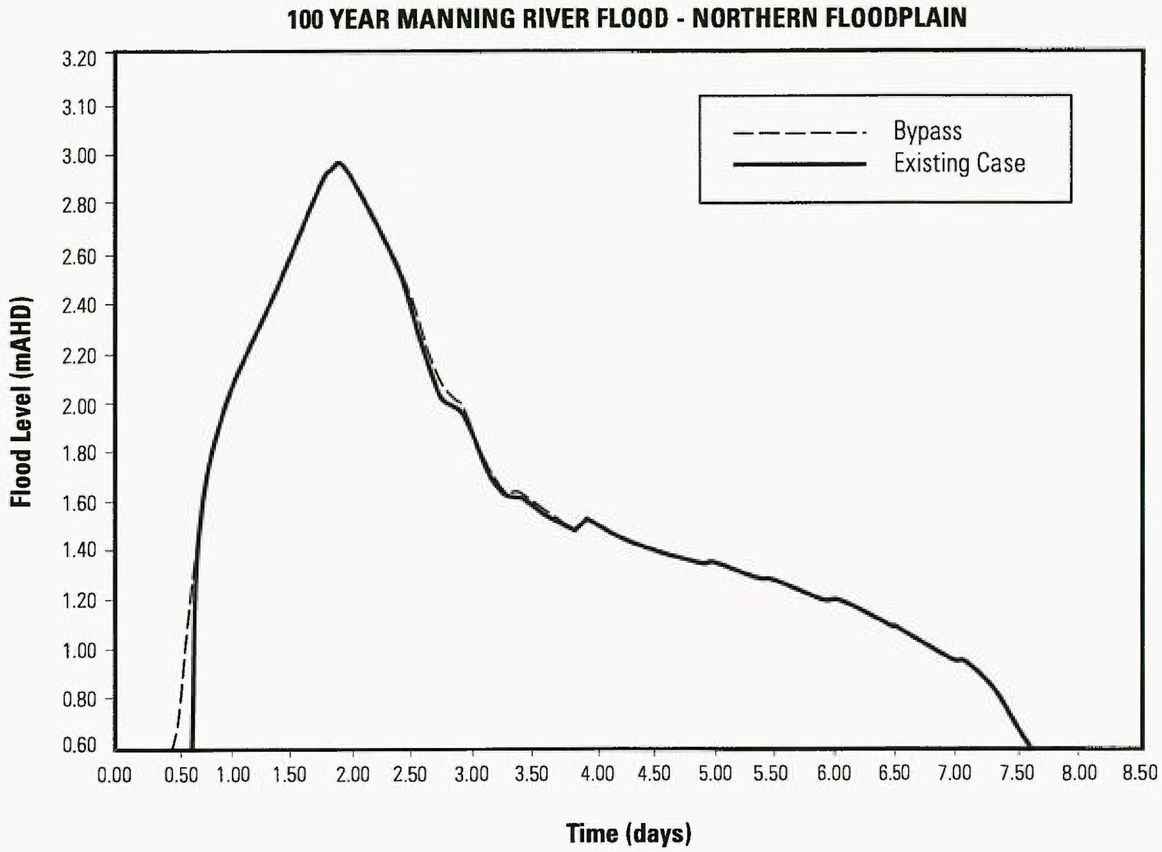


Figure 6.5 :
IMPACTS TO FLOW DISTRIBUTION



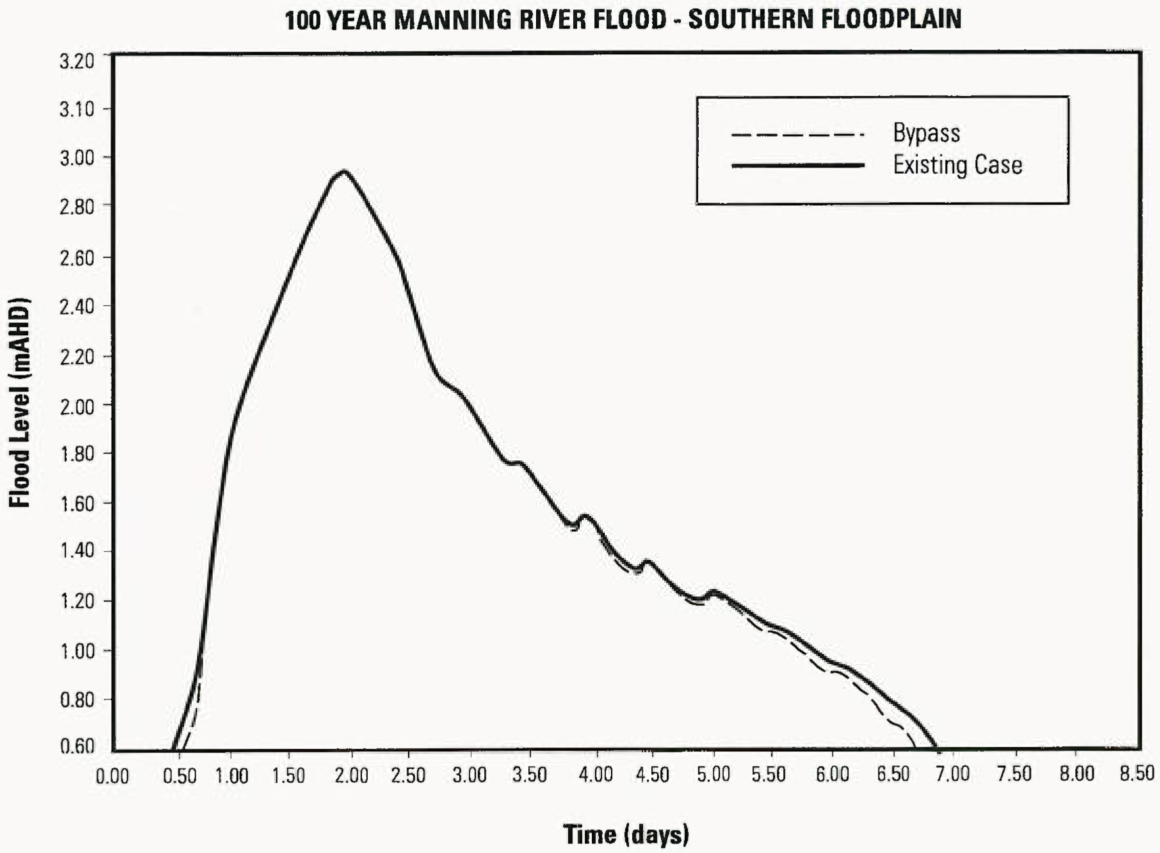


Figure 6.6 :
IMPACTS TO FLOOD LEVELS
100 YEAR MANNING RIVER FLOOD

of Harrington Road. For the floodplain to the north of Harrington Road, there will be no embankment in place during this period. This will result in slightly higher flows in the Lansdowne River and significantly higher flows in the northern floodplain (north of Harrington Road where no embankment will be constructed during this period). The velocities on the northern floodplain would still be relatively low. A minor increase in flood level would result on the southern floodplain, with virtually unchanged flood levels on the northern floodplain.

On the southern floodplain, peak flood levels will increase (relative to existing conditions) adjacent to the embankment by:

- 13mm for the 100 year Manning River flood
- 4mm for the 20 year Manning River flood
- 3mm for the 100 year Lansdowne River flood

These impacts are considered to be negligible, especially when considered in the context of the lower likelihood of these flood events occurring during the period of pre-loading (12 to 18 months), then during the post construction period.

In the medium term when embankment levels south of Harrington Road are falling from 2.70m AHD to 2.36m AHD, the flooding impacts will be similar to those in the long term described above. The only difference would occur for a flood event that has a peak level between 2.36m AHD and the high point of the road (ie. 2.84m AHD allowing for the cross fall of the road). The 50 year Manning River flood is an example of this type of flood (peak level of 2.73m AHD). This flood event would not overtop the road at a design level of 2.70m AHD (highest point on road 2.84m AHD), but would overtop at a design level of 2.36m AHD (highest point on road 2.50m AHD). However, due to the significant length of overtopped road to the north of Harrington Road and significant flow through the associated waterway openings, there would only be a small increase in peak flood levels adjacent to the southern embankment. The modelling indicated that the additional impact of the higher embankment levels in the medium term (over and above the long term situation) would be less than 7mm for the 50 year Manning River flood.

The impacts to the recession of flooding during the period of pre-loading will be similar to those associated with the long term situation (see section below titled 'Impacts on Recession of Floods'). The height of the pre-load embankment has little bearing on the rate of flood recession, especially for those floods which do not overtop the road embankment.

During the period of short term pre-loading, the higher embankment on the southern floodplain will result in a complete blockage of the southern floodplain, since the culverts will most likely not be constructed until the short term settlement is complete (12-18 months). The flood waters will still be able to recede from the floodplain over the levees along the river. Residual flood waters behind the levees will be removed by the local drains (refer Figure 6.8 on page 6-28), which do not cross the bypass route, except as noted in the following paragraph.

On the southern floodplain a short drainage line to the south will be directed under the embankment with small flexible piping to operate under a residual upstream head when the embankment settles. An alternative, at considerably greater cost, is to direct this drain to an existing large drain to the west that drains in a southerly direction and passes under the existing highway.

At the northern end of the southern floodplain, a main drainage line currently flowing east to the Lansdowne River, will be directed north to the Lansdowne River (refer Figure 6.8).

Impacts on Frequency of Floor Level Inundation

Consideration was also given to the potential impact of flood level increases on existing houses and other buildings within the floodplain. Buildings with floor levels above the 100 year ARI flood level are considered by definition to be 'flood free'. An assessment was made of existing floor levels and it was found that none were just above the 100 year ARI flood level. Hence, there were no 'flood free' buildings which would lose this status due to the proposed embankment.

The floor levels of the houses and other buildings in the study area are presented in Section 6.3.1 under the heading "Floor Levels in Study Area". The long term impacts on flooding described above will result in a marginal increase in the frequency of flood inundation of some of these structures. The house currently owned by J and N Birkett (Bk 3291 No646) has a floor level of 3.27m AHD, and hence would not be inundated in the 100 year Manning River flood event.

The associated dairy has a floor level of 2.66m AHD, which is between the 100 year and 20 year Manning River flood levels. It would therefore, experience a small decrease in its current level of immunity from approximately 49.1 years to 46.1 years. Alternatively, this impact could be expressed as an increase in the probability of flooding in any one year from 2.04% to 2.17% (an increase of 0.13%).

Similar magnitudes of flood immunity decrease would result for the other houses and buildings further upstream nearer to the existing Pacific Highway route.

During the medium term pre-load period, floor levels significantly above the 50 year Manning River flood level will not have their degree of flood immunity affected by additional flood afflux caused by the embankment at 2.70m AHD. Buildings with floor levels near the 50 year flood level would experience a slight reduction in flood immunity (compared with the long term), similar to that discussed above for the J and N Birkett dairy.

Impacts on Flood Velocities and Bank Erosion

There is concern by some within the floodplain community in the study area that the construction of the bypass will result in a concentration of flow in the Lansdowne River and a subsequent increase in river velocities.

The numerical modelling of the flooding impacts associated with the bypass is able to assess the impacts on river velocities. For the 100 year Lansdowne River flood event, the modelling indicated that there will be a negligible increase in the peak velocity in the Lansdowne River from 0.89m/s to 0.90m/s, an increase of approximately 1%.

The primary reason for the negligible increase in the velocity in the river and creek is due to the construction of appropriate waterway openings on the floodplain as discussed in the previous sections of this report, and the fact that Manning River flood waters impede and slow down flows from the Lansdowne River.

The rate of flow in the Lansdowne River is also not significantly increased, due again to the provision of adequate floodplain flowpaths through the bypass embankment.

Presently floodplain velocities are very low and generally less than 0.1m/s, although isolated higher velocities can occur for short durations (eg. during initial overtopping of the river bank).

The numerical modelling indicates that the velocities of flood waters on the floodplain will not experience any significant increases, except where they pass through waterway openings. The peak velocity through the waterway openings will be in the order of 0.7m/s, which is still a relatively low value. The existing land use of the floodplain ensures that an adequate cover of vegetation is maintained. The velocity of the floodwaters entering and exiting the floodplain waterway openings are not expected to result in significant erosion of soil from the floodplain assuming that the existing grass cover or other erosion protection is maintained.

The increase in the proportion of floodplain flow carried by Coopernook Creek and the SEPP 14 wetland area would result in a small increase in peak floodplain velocities from 0.15m/s to 0.25m/s. These velocities are low and would not result in any scour of the wetland or changes to the stability of the soils or vegetation in the wetland.

The length of road within the floodplain is approximately 3100m, and for the road within the floodplain at a design level of 2.36m AHD the highest point on the road is 2.50m AHD. For an average floodplain level of 0.7m AHD, the presently available flow area along the bypass route below 2.5m AHD, is approximately 5600 m^2. With the bypass in place, the waterway area to be provided below 2.50m AHD is approximately 960 m^2, comprising:

- Bridge over Lansdowne River — 500 m^2
- Bridge over Coopernook Creek and SEPP 14 wetland — 260 m^2
- Culverts (36 No.) — 200 m^2

The proposed waterway area below 2.50m AHD is slightly more than one-sixth of the existing flow area. Hence, it would be expected that floodplain velocities in the vicinity of the waterway openings would have to increase by about six times, for the same floodplain flows and rate of recession of flood waters to be maintained. In fact, this is the case, with the increase in velocity being from 0.1 to 0.7m/s.

The velocity of 0.7m/s through the waterway openings is still relatively low, and hence the waterway area provided is more than adequate. The proposed culverts will not impede flood flows. They will increase peak flood levels by no more than 30mm for any flood event.

It is recognised that there are some existing problems of bank erosion on the southern bank of the Lansdowne River on the outside of the bend immediately upstream of the proposed bypass route. The location and nature of this erosion is not unexpected. It is considered to be partly due to the natural response of the river's morphology to changing land-use upstream and the natural progression of the river. However, although the construction of the bypass is not expected to exacerbate this erosion, consideration should be given to protecting this bank against further erosion in order to protect the integrity of the bridge embankment foundations.

Impacts on Recession of Floods

There is concern by some in the community within the study area that the bypass will result in significant increases to times of inundation of floodplain land. This perception is based on a belief that the bypass embankment will act as a significant barrier to flood flows receding into the river system.

Figure 6.6 shows the behaviour of flood levels at a location upstream of the bypass over the full duration of the 100 year Manning River flood. From these figures, it is evident that there will be a negligible change in the time that land is inundated. This also applies to the 20 year

Manning River flood and 100 year Lansdowne River flood, which can be seen by reference to Appendix I - Flooding and Drainage Studies (WBM Oceanics, 1997).

An explanation for this flood behaviour with the bypass in place follows:

- Flood waters on the downstream side of the bypass will recede as normal.
- A small increase in flood levels will occur on the upstream side of the bypass (50mm or less). This water level difference will be sufficient to drive flow through the proposed waterway openings.
- The rate of flow through the waterway openings will equal the rate of flow across the floodplain for existing conditions, and the time for floods to recede will remain the same.
- This occurs because the velocity through the waterway openings is 0.7m/s, compared with current floodplain velocities of less than 0.1m/s. Thus the waterway openings can move water at seven times the existing general flow rate across the floodplain. This compensates for the fact that the proposed waterway area is about one-sixth of the existing floodplain flow area (see section above titled 'Impacts on Flood Velocities and Bank Erosion').

Flood Storage Considerations

The volume of flood storage occupied by the proposed highway embankment is small compared to the available flood storage. The modelling showed that the impacts on flood behaviour due to the proposed highway embankment, even though quite small, are due mainly to the change in flow patterns caused by the embankment and not by the small reduction in flood storage.

As part of the works associated with construction of the proposed bypass, there may be a need to create a number of elevated pads of earth to provide a flood-free storage area for construction plant and equipment. Alternatively, these pads may be used for stock refuge in times of flood. These areas will be small relative to the area of the floodplain (eg. 1 or 2 hectares), and will have a negligible impact on flooding behaviour and drainage within the floodplain.

Compensation works associated with the proposed bypass could include some minor filling of low-lying areas to improve the agricultural value and use of some parcels of land. It is assumed that the filling would involve raising existing ground levels from approximately 0.4m AHD to approximately 1.0m AHD and that the area of land under consideration is small (ie. in the order of 10 hectares). The volume of flood storage lost to the floodplain system through these works would represent only a very small percentage of the entire flood storage available. The impacts to flood levels due to this loss of flood storage would be negligible.

Impacts of Further Roadworks on the Manning River Floodplain

It is proposed (although not part of this project) eventually to raise the remaining portion of the Pacific Highway between the northern end of the Taree Traffic Relief Route and the southern end of the Coopernook Bypass.

A preliminary assessment (Appendix I - Flooding and Drainage Studies, WBM Oceanics, 1995) has indicated that this future road is feasible, from a flooding perspective, and can be raised without resulting in significant impacts to Manning River flooding. The cumulative impacts associated with raising of the entire route across the Manning River floodplain will be contained to minimal proportions, similar to the Coopernook Bypass, by the construction of numerous waterway openings through the future raised embankment. The total length of waterway opening required for this future embankment is approximately 200 to 300m.

The provision of this future flowpath is important as it allows significant volumes of flood water to flow from the Manning River onto the Moto floodplain during the rise of flood waters in the Manning River, and to then return when Manning River flood levels recede.

6.3.5 Impacts on Drainage Network

Figure 6.7 shows the existing local drainage network, which was discussed under the heading 'Existing Drainage Network' in Section 6.3.1.

The construction of the bypass has the potential to block the local drainage network if appropriate allowances for drainage through or along the bypass are not made. For example, the bypass will sever a number of local drains with east-west alignments on both the northern and southern flood plains, and will be constructed over a main north-south drain on the northern floodplain.

Recommendations for changes to the existing drainage network to ensure continued operation of the drains are detailed in Section 6.3.4 below.

Recommendations for Mitigating Drainage Impacts

It is recommended that the drainage network be altered as shown in Figure 6.8 to allow for the continued operation of the drains.

An important consideration in the proposed drainage network is that the embankment constructed during the pre-loading period (ie. short term of 12 to 18 months) will most probably not contain any waterway openings due to problems associated with the expected settlement of the embankment.

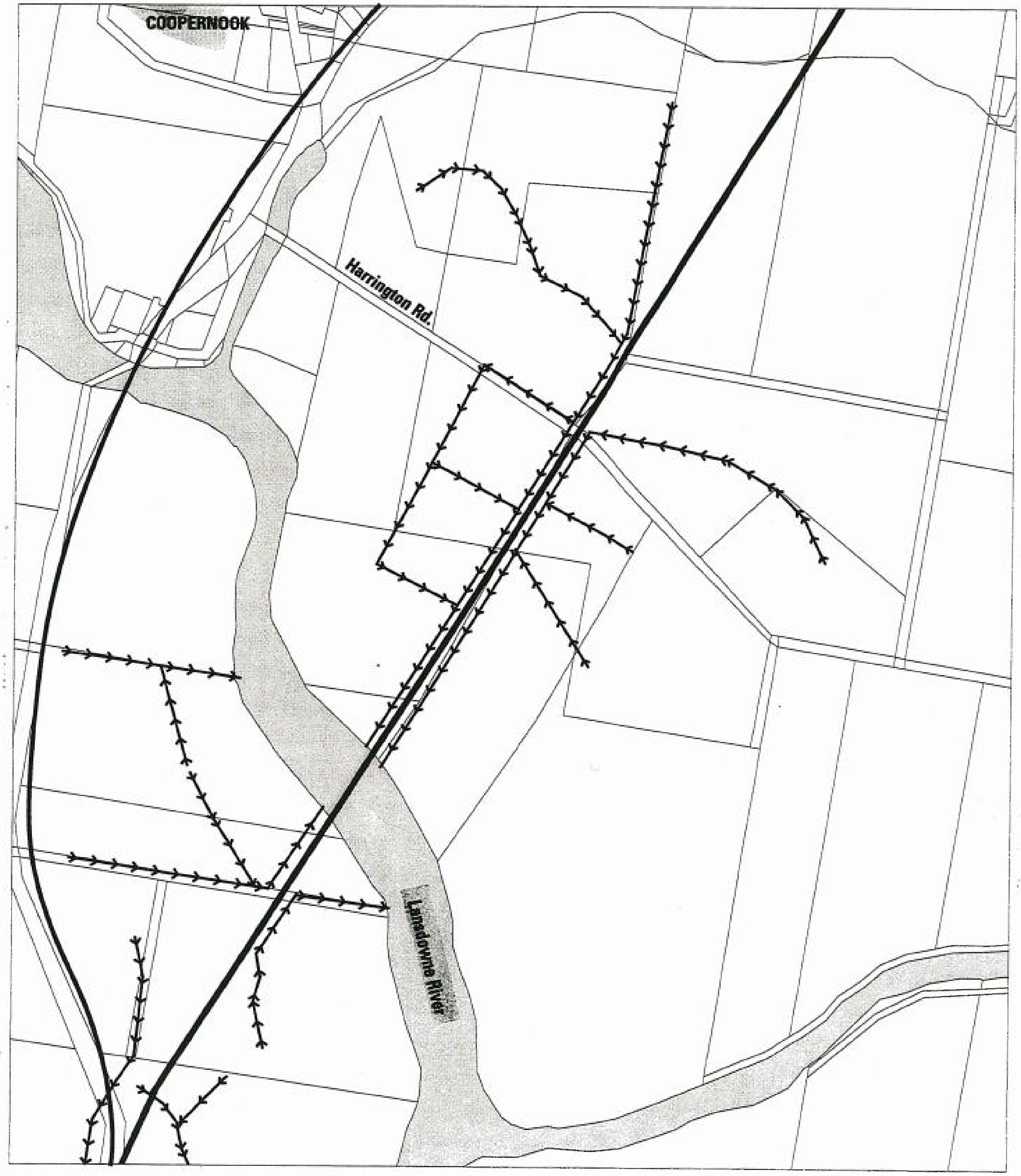
The proposed local drainage alterations involve re-routing some drains along the bypass, while generally minimising drainage through the bypass embankment due to problems associated with substantial settlement in the pre-load period. More detailed investigations into the proposed alterations to the local drainage network should be carried out at the detailed design stage of the project.

At the northern end of the southern floodplain, a main drainage line currently flowing east to the Lansdowne River, should be re-routed north to the Lansdowne River (refer Figure 6.8), at least in the short term. In the medium to long term, a drain crossing the bypass route to the east can by accommodated by replacing two of the six nominated floodway culverts (3.6m wide by 1.5m high) with two larger culverts (3.6m wide by 3.0m high) at a lower invert level of -1.0m AHD. A decision on the appropriate longer term route for this drain should be subject to detailed design at the time, and would need to consider Potential Acid Sulphate Soils, as discussed below.

On the southern floodplain a short drainage line to the south can be accommodated with a 900mm diameter pipe. In the short term during the preload period, this drain can function with flexible piping to operate under residual upstream head when the embankment settles (see 'Impacts During Pre-Loading Period' in Section 6.3.3).

Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 6.7 :
EXISTING LOCAL DRAINAGE NETWORK



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 6.8 :
PROPOSED LOCAL DRAINAGE NETWORK

On the northern floodplain, the provision of one main drain along the route of the bypass was examined. This would entail a substantial crossing under the bypass in the area south of Harrington Road to relieve drainage on the western side. This approach was not favoured as there are significant potential problems south of Harrington Road during the pre-load period (short and medium term). It would be difficult to provide a major drain crossing that tolerated substantial settlement, and also it would be difficult and costly to drain land on the western side in a south-westerly direction to the Lansdowne River, due to the distance involved and higher ground adjacent to the river.

Consequently, for the northern floodplain it is recommended that the large drain presently on the same alignment as the bypass should be replaced by two drains of similar size on either side of the bypass embankment. This will enable land to the west of the bypass to drain into the drain on the western side and similarly, land to the east of the bypass can drain into the drain on the eastern side of the bypass. Relevant matters to consider during detailed design are:

- Table drains will be required only below cut batters along the bypass and where runoff is required to be captured in sensitive areas on the floodplain (including Lansdowne River and Coopernook Creek) in accordance with the RTA Water Policy.
- Local drains would be separate to any bypass table drains. In this case there are two options for the western side local drain, in order that it does not interfere with the large existing Norfolk Island pine tree on the bank of the Lansdowne River, namely:
    - incorporate road design features to accommodate the drain between the road embankment and the tree (eg. steeper batters, retaining wall, etc), or
    - the drain be diverted to the south-west around the tree, and replacement high ground for stock refuge in this area be provided for the landowner.
- Table drains located to protect sensitive areas would flow to water pollution control ponds located to protect the environment of Coopernook Creek and the Lansdowne River. It is recommended that farm drainage be independent of the road drainage system to avoid the potential for road runoff or spillage to enter farm drains.

North of Harrington Road on the northern floodplain, land should continue to drain via existing drains. On the eastern side this will require a culvert crossing to be constructed under Harrington Road. Based on the culvert crossing under Harrington Road further to the west, it is recommended that this crossing comprise two cells of 1.2m wide x 0.6m high at an invert level of -0.2m AHD.

Main drains should generally be constructed to a similar size to the existing main drains. For example, the two drains crossing Harrington Road would need to be approximately 3m wide at the base with a bed level of -0.4m AHD and side slopes of 1 in 1. Tidal flap-gates should be provided where drains discharge into the river system.

The issue of disturbance and possible oxidisation of Potential Acid Sulphate Soils (PASS) is considered with regard to excavation of proposed drains. Based on an assessment of PASS for this project (Robert Carr and Associates, 1997), the soils on the bypass alignment to the south of the Lansdowne River will require substantial treatment (eg. lime stabilisation) during any disturbance, including drain construction to minimise the potential of acid leachate runoff. During the construction of the project, the flows in the drains will also require treatment. This treatment can be incorporated with the treatment of flows in the table drains of the road embankment. The Acid Sulphate Soils Management Plan is contained in Appendix J, while other soil erosion and sedimentation controls are described in Section 6.4.

Due to the significant occurrence of PASS on the southern floodplain, the general intention is to limit the extent of new drains in this region. Subject to detail design, it may be possible to limit the depths of new drains in this region to the upper layers of the soil profile (eg. top 0.5m) where the potential for oxidisation and acid leachate is much lower than in the lower horizons. Nevertheless, consideration will need to be given to neutralising the soils in this region, associated with drain construction.

The drainage characteristics of Coopernook Creek should not alter significantly due to the provision of a 170m long bridge with a significant waterway opening, that is to be provided over Coopernook Creek and the adjacent SEPP 14 wetland area.

6.4 Water Quality

6.4.1 Introduction

Connell Wagner undertook the first stage of a water quality monitoring program at Spring Hill Dam, Coopernook Creek and Lansdowne River to establish a base line for future monitoring of the catchment. Samples were taken on 22nd May, 1997 under dry weather conditions. Three further monthly dry and wet weather samples are programed in 1997 to provide a more representative baseline of water quality conditions.

Water quality in the study area is presently influenced by estuary flow, urban runoff from Coopernook Village, road runoff and agricultural runoff. The results of this sampling exercise were directly influenced by recent weather patterns, tidal range, saline intrusion and the immediate tide. The instrument used was a calibrated YSI probe, while samples were tested at a NATA laboratory for nutrients, metals and pesticides.

The ANZECC (1992) "Australian Water Quality Guidelines For Fresh and Marine Waters" has been used as the basis for the assessment of water quality in the Coopernook area. Results of the monitoring programme are presented in Table 6.6. Measurements of water quality parameters from the study site were compared to the ANZECC recommended values for the protection of aquatic ecosystems.

6.4.2 Existing Surface Water Quality

Five sampling sites were selected in the Coopernook area for water quality testing. The sites are arranged upstream and downstream of the impacted area as follows:

- Site 1 - Spring Hill Dam (fresh water)
- Site 2 - Coopernook Creek (fresh water)
- Site 3 - Constructed Channel into Lansdowne River (estuary salt/brackish)
- Site 4 - Lansdowne River (estuary)
- Site 5 - Lansdowne River from Bridge (estuary)

Locations of each site are shown in Figure 6.2. The results of the analysis for water quality are shown in Table 6.6 and a description of the existing water quality is given below.

Site 1 - Spring Hill Dam

Spring Hill Dam is located at the northern end of the study area between the Pacific Highway and Spring Hill Road. The dam comprises a mostly spring fed fresh water pond approximately 30 x 40m in area which is used for irrigation. Dense vegetation surrounds the dam.

The results indicate that the water quality of Spring Hill Dam was, at the time of survey, of an acceptable level for aquatic ecosystem protection and other non-potable uses. All values recorded were within relevant ANZECC guideline limits.

Site 2 - Coopernook Creek

Coopernook Creek is an intermittently flowing ponded, brackish watercourse. Wetland vegetation lines the banks with algal blooms being a dominant feature of the pond sampling site. There was no flow at the time of sampling and water clarity was poor.

The results show that at the time of survey the Coopernook Creek site had relatively poor water quality (refer Table 6.6). Levels of salinity, conductivity, Total Dissolved Solids (TDS), turbidity and suspended solids were extremely high and dissolved oxygen low, reflecting the brackish and stagnant nature of Coopernook Creek at that time. The low concentration of dissolved oxygen recorded was related to the low water flow rate and a proliferation of algal growth potentially related to runoff of nutrients from agricultural activities.

Site 3 - Constructed Channel into Lansdowne River

This sampling site is located in a constructed drainage channel. At the time of survey the tidal gate was open and the tide was falling. The physico-chemical parameters of the water body were potentially influenced by both local and Lansdowne River factors including runoff from agricultural land. The channel is in the estuarine portion of the river and is influenced by tidal flow. The channel is lined with grass and had a flow of less than 20cm/sec at the time of sampling. The samples were brackish and extremely high in nitrate and ammonia.

Site 4 - Lansdowne River - left bank

Site 4 is located on an estuarine reach of the Lansdowne River. Samples were taken from the left bank, one metre upstream of the junction of the above channel. The River had an ebbtide flow of about 20cm/sec at the time of sampling. The sampling site was lined with mangrove vegetation.

Lead, aluminium, faecal coliform and nutrient concentrations were high and pH slightly low indicating a poorer water quality than would be expected for a pristine estuary. It is likely that the water quality at the site was affected by any local discharges from the constructed channel and runoff from agricultural land.

Site 5 - Lansdowne River from the Bridge

Samples for Site 5 were collected from downstream of the Lansdowne River Bridge. Mangroves are the dominant vegetation along both left and right banks. Water clarity was moderate with visibility for approximately 3m. Significant depth stratification in salinity and to a lesser extent dissolved oxygen was apparent at this site.

Results suggest that the water quality of the Lansdowne River is influenced by two sources: intruding seawater and agricultural runoff. The increase in conductivity (salinity) and total dissolved solids with depth is related to the intrusion of seawater up river and the process of stirring, re-suspension and mobilisation of bottom-sediments (and contaminants) into the water-column as tidal currents move up and down the river. High levels of ammonia and nitrate in the water are usually indicative of runoff from agricultural activities or other human sources.

Table 6.6: Surface Water Quality Testing Results

Parameters	Site 1	Site 2	Site 3	Site 4	Site 5			ANZECC Guidelines Values for Fresh and Marine Waters
					0.8m depth	2m depth	4m depth	
Dissolved Oxygen (mg/L)	14.26	5.26	15.51	12.34	15.96	15.03	13.57	> 6 (>80 - 90% saturation)
pH	8.09	6.34	6.43	6.18	6.22	6.74	6.95	Fresh: 6.5 - 9; Marine: 8 - 8.2
Temperature (°C)	19.19	17	17.65	18.22	18.28	18.81	19.19	Increase <2
Salinity (ppt)	0.25	4.74	30.10	31.58	30.01	48.5	55.72	Fresh: 1ppt; Marine: 30 - 35ppt
Electrical Conductivity (EC) (μs/cm)	463	6 400	39 800	42 088	40 200	63 000	70 600	Fresh: 1 500μs/cm; Marine: NV
Turbidity (NTU)	7.2	22	NA	7.8	NA	NA	NA	<10% change in seasonal mean concentration
Suspended Solids (mg/L)	<2	16	NA	4	NA	NA	NA	<10% change in seasonal mean concentration
Total Dissolved Solids (g/L)	0.34	6.617	30.13	31.38	29.95	44.6	52.46	If EC: 280 - 800 then TDS: 1.75 - 5 If EC: >5500 then TDS: >35
Aluminium (μg/L)	NA	NA	NA	190	NA	NA	NA	If pH: <6.5 then Aluminium: <5μg/L If pH: >6.5 then Aluminium: <100μg/L
Lead (μg/L)	NA	NA	NA	86	NA	NA	NA	Fresh: 1 - 5μg/L; Marine: <5μg/L
NH4 (mg/L)	0.149	9.3	21.17	25.82	20.78	32.5	38.01	Fresh: measured as a function of pH and temperature; Estuarine: <0.005 mg/L
NO3 (mg/L)	2.608	9.840	19.65	19.72	20.89	24.8	25.56	Fresh: NV; Estuarine: 0.01 - 0.1 mg/L
Ortho-Phosphate (μg/L)	15	28	NA	15	NA	NA	NA	NV
Total-Phosphorus (μg/L)	56	87	NA	39	NA	NA	NA	Fresh: 10 - 100μg/L; Estuarine: 5 - 15μg/L
Organochlorine (μg/L)	NA	NA	NA	<LOQ (0.1 μg/L)	NA	NA	NA	Limits for individual pesticides, total < 0.1
Organophosphate (μg/L)	NA	NA	NA	<LOQ(0.2 μg/L)	NA	NA	NA	Limits for individual pesticides, total<0.18
Faecal Coliform	NA	NA	NA	13/100ml	NA	NA	NA	No faecal coliform for drinking water 1000/100ml faecal coliform for agriculture use

Notes: NA = Not Analysed, LOC = Limit of Quantisation, NV = No Value specified

6.4.3 Existing Groundwater Quality

Three sampling sites were selected in the Coopernook area for groundwater quality testing (refer Figure 6.1). The sites are as follows:

- Site 1 - Southern Floodplain (Saline water)
- Site 2 - Northern Floodplain (Saline water)
- Site 3 - Floodplain (Fresh water)

The results of the analysis of groundwater testing are shown in Table 6.7 and a description of the existing water quality is given below:

- Site 1 - Southern Floodplain:

  Ammonia, nitrate and phosphorus levels were extremely high. This result may be indicative of the application of fertiliser. Readings for turbidity, suspended solids, aluminium and lead were also notably high. Other parameters were typical of a coastal floodplain.

- Site 2 - Northern Floodplain:

  The Northern Floodplain site also has an existing groundwater quality of a poor standard in relation to ANZECC guidelines. pH was slightly lower than expected and as per Site 1, levels of ammonia, nitrate, phosphorus, turbidity and suspended solids were high.

- Site 3 - Floodplain (North of Coopernook Creek):

  Turbidity, suspended solids, phosphorus, ammonia and nitrate levels measured in this area were high. The results show that Site 3 groundwater is fresh water and is generally of a poor standard for aquatic ecosystem protection.

Table 6.7 : Groundwater Quality Results

Parameters	Site 1	Site 2	Site 3	ANZECC Guideline Values for Fresh and Marine Waters
Dissolved Oxygen (mg/L)	13.36	17.12	9.51	> 6
pH	6.7	6.06	6.96	Fresh: 6.5 - 9; Marine: 8 - 8.2
Temperature (°C)	7.18	9.42	9.63	Increase <2
Salinity (ppt)	37.57	35.29	0.39	Fresh: 1ppt; Marine: 30 - 35ppt
Electrical Conductivity (µs/cm)	37 770	37 766	565.0	Fresh: 1 500µs/cm; Marine: NV
Turbidity (NTU)	245.7	264.7	1522.8	<10% change in seasonal mean concentration
Suspended Solids (mg/L)	160	470	8 500	<10% change in seasonal mean concentration
Total Dissolved Solids (g/L)	37.20	35.05	0.504	If EC: 280 - 800 then TDS: 1.75 - 5 If EC: >5500 then TDS: >35
Aluminium (µg/L)	2500	NA	NA	If pH: <6.5 then Aluminium: <5µg/L If pH: >6.5 then Aluminium: <100µg/L
Lead (µg/L)	80	NA	NA	Fresh: 1 - 5µg/L; Marine: <5µg/L
NH4 (mg/L)	36.5	21.05	0.215	Fresh: measured as a function of pH and temperature; Marine: <0.005mg/L
NO3 (mg/L)	18.44	20.50	3.697	Fresh: NV; Marine: 0.01 - 0.1mg/L
Ortho-Phosphate (µg/L)	20	161	105	NV
Total-Phosphorus (µg/L)	264	230	287	Fresh: 10 - 100µg/L; Estuarine: 5 - 15µg/L
Organochlorine (µg/L)	<LOQ (0.1 µg/L)	NA	NA	Limits for individual pesticides, total < 0.1
Organophosphate (µg/L)	<LOQ (0.2 µg/L)	NA	NA	Limits for individual pesticides, total<0.18

Notes as for Table 6.6

6.4.4 Water Quality Impacts and Safeguards

The method of road construction will involve minimal disturbance of soils other than compaction and consequent dewatering of the surface layer beneath the road. As a result of high soil impermeability, patterns of groundwater flow are not anticipated to alter across the floodplain.

The spring water flows at Spring Hill Dam are discussed in Appendix J based on peiozometer testing. The construction of the proposed highway over part of this dam would not interfere with the aquifer, however reshaping of the dam and diversion of road runoff around the dam would be required as a result of the project.

The excavation of bridge abutments and trenching to reinstate the local drainage network of the floodplain would have potential to locally lower the water table where these works are outside the influence of existing drains. Based on the surface and groundwater quality and soil testing results to date, the potential for water and groundwater pollution is not great other than that associated with potential acid sulphate soil conditions where former estuarine sediments are oxidised. An Acid Sulphate Soil Management Plan (refer Appendix J) would be implemented to prevent and control the potential for the escape of acidic leachate.

The following measures are proposed to control potential surface water quality impacts on turbidity and the transport of suspended solids and sediment during construction. According to the RTA Water Policy only environmentally sensitive receptors such as Coopernook Creek SEPP 14 wetland and Lansdowne River would have a closed highway drainage system with all runoff from the carriageways on the bridge and abutments flowing to water pollution control ponds sized to accommodate the possibility of road tanker spillage as well as collecting runoff from the carriageway. Elsewhere on the floodplain the carriageway drainage would disperse into the grassed embankment. This system would capture and prevent pollution of the most environmentally sensitive aspects of the wetland system and Lansdowne River.

Safeguards Prior to Construction Works

Before construction commences a number of erosion and sediment control measures would need to be implemented as follows:

- buffer strips, 20m wide would be maintained with their existing vegetation and fenced off adjacent to Lansdowne River and Coopernook Creek to improve the quality of run-off from construction sites before entering the stream
- sediment fences would be erected adjacent to the buffer strips and downslope of construction sites
- diversion banks and channels would be constructed to accommodate runoff from undisturbed areas to flow directly to waterways
- diversion banks and channels would be constructed to prevent sediment laden runoff from leaving a construction/disturbed area and prevent off-site (clean) runoff entering the construction site.
- where possible, diversion banks would be constructed along contours to reduce runoff peaks and erosion rates (peak runoff is reduced by the increased overall travel time afforded by the longer flow distance; erosion is reduced due to slower velocities along the contour compared with directly downslope velocities)
- sediment basins would be constructed at the receiving end of the diversion banks to intercept and retain sediment from runoff

- sediment basins would be designed to take account of peak flows, including rates, volumes and sediment yield from the contributing catchment
- sediment basins would be fitted with outflow baffles to prevent the discharge of any oil and grease products
- excess water would be treated, if necessary, prior to discharge to ensure that water quality is acceptable
- channels would be planted with wetland vegetation immediately post construction to prevent erosion of the channel

Construction Stage Safeguards

The most significant potential impact during construction would be soil erosion from exposed works areas including access tracks, and subsequent downstream pollution with sediment, dissolved salts, raised acidity from acid sulphate soils, organic matter and other associated material.

Environmental effects of sediment pollution are mainly due to the smaller clay sized particles known as colloids which are difficult to remove by physical sedimentation processes. Their presence results in increased turbidity. This reduces light penetration and impedes aquatic plant growth. Sediments containing high concentrations of phosphorus and nitrogen (derived from agricultural sources) can cause excessive growth of algae and other water plants leading to the eutrophication and degradation of the aquatic habitat. The build up of sediments in waterways alters stream hydraulics and can increase riverbank erosion and the pattern of flooding.

The following specific practices would be included in developing a range of site specific water quality controls:

- minimise the volumes of water which is sediment laden
- keep sediment laden water separate from clean run-off
- re-use sediment laden water on-site
- treat excess contaminated water on site to an acceptable standard for release
- the smallest possible area of land would be exposed for the shortest possible time
- where topsoil is excavated it would be stripped, stockpiled and stored for reuse in revegetation works
- stockpiles would be stored outside hazard areas and protected with temporary control measures
- erosion and sediment control measures would be maintained by regular inspection
- temporary revegetation on regraded, cleared or disturbed land would be undertaken to provide soil stabilisation during construction. Seeding would be carried out by hydro seeding and/or hydro mulching
- in areas of dispersive soils, water in sedimentation ponds would be flocculated to aid in the settling of the colloidal particle fractions
- sedimentation basins would be emptied when 60% full, during the construction stage to ensure that capacity is available to contain storm events

Principles and practices relating to construction methods, access arrangements and site management for the Proposal would include the following:

- construction activities would be confined within the proposed road corridor
- all temporary access tracks would be constructed using clean aggregate, have site specific erosion and sediment controls and be rehabilitated following construction

- any potential impact on water quality due to disturbance of potential acid sulphate soils would be addressed practically through implementation of an Acid Sulphate Soils Management Plan in areas known to contain PASS
- reuse of water on site, from sedimentation ponds, would be maximised for purposes such as washing of construction equipment, dust suppression and watering of revegetated areas
- areas for storage of oils and other hazardous liquids used during construction would be bunded and any spillage would be collected and disposed of off-site at an approved facility
- stockpile areas would be located away from flood plains and drainage lines and would have site specific erosion and sediment controls including silt fences downslope and diversion banks or drains on the upslope side
- ongoing monitoring of water quality in receiving waters of the construction site following the methodology adopted in Section 6.4.2

Prior to construction, detailed soil and water and Acid Sulphate Soil Management Plans would be prepared as part of the EMP for the works. They would include details of site specific control measures designed in accordance with relevant RTA, DLWC and EPA guidelines. A comprehensive water quality monitoring programme which covers the pre-construction, construction and post construction phases of the project would also be developed. A concept erosion and sediment control plan is included as Figure 7.1.

Operation Stage Safeguards

Operational stage measures would be implemented to mitigate the potential adverse long term effects of erosion, sedimentation and pollution on water quality in the study area. Water quality in the study area could be affected following opening of the bypass as a result of contaminated run-off from the road pavement. Potential road and vehicle pollutants include a range of trace materials (eg lead, zinc, cadmium, copper, chromium and nickel), hydrocarbons from accidental spillages, oil leaks and combustion emissions. These pollutants would either evaporate or build up in dry weather periods and wash from the road in stormwater run-off.

The RTA Water Policy is to design roads to ensure that the existing natural overland flows and groundwater regimes in and around road corridors are either retained or will have only minimum alterations. Appropriate technologies to contain and treat runoff to avoid or minimise impacts on sensitive aquatic environments are to be incorporated into the road design.

To meet this policy the RTA proposes to install a system of table drains and water pollution control ponds to protect the sensitive aquatic environments of the immediate catchments of Coopernook Creek and Lansdowne River from the effects of direct discharge of stormwater and the escape of spillage into these environments. The remainder of the carriageway, beyond the Lansdowne River bridge abutments and the northern catchment of Coopernook Creek, would drain in a diffuse manner into vegetation on the road shoulder and fill embankment. The spring fed dam between Shady Acres Worm Farm and Spring Hill Road would be protected by a road drainage diversion bund, bank or drain.

The water pollution control ponds would be lined to avoid contamination of groundwater and water courses in the area. Access to ponds would be provided to allow regular removal of accumulated sediment and containment, treatment and removal of any accidental spills.

The primary aim of installing these structures would be so that runoff from all sections of the bypass would drain to the pond which would provide ongoing water quality protection by:

- removing sediments, nutrients and pollutants in stormwater from the bypass. The ponds would have the capacity to contain the first flush from a 1 in 10 year storm to ensure they would not release accumulated pollutants into the surrounding environment
- removal of accumulated sediment in the ponds at appropriate times to ensure the basins maintain adequate capacity
- long term stabilisation of pond batters would be undertaken using native species;
- use of grassed verges and stormwater gutters feeding to the ponds
- fitting the ponds with outflow baffles to prevent the discharge of oil and grease products and
- containing accidental spills from vehicles on the route

Other measures to be taken to mitigate long-term effects would include:

- removal of temporary control measures put in place during construction
- batters and exposed areas would be revegetated through hydro seeding, hydro mulching and subsequent mulching and watering
- undertake long term maintenance of permanent control measures
- establish a water quality monitoring programme that would extend into the post-construction phase of the bypass to ensure that water quality goals were being met.

6.5 Noise and Vibration

6.5.1 Road Traffic Noise

Introduction and Traffic Scenarios

The proposed highway will pass through a number of rural properties not currently exposed to highway noise as well as overlying portions of the existing highway at the northern end where the highway is already close to several residences. In order to assess the impacts of road traffic noise, Atkins Acoustics were appointed to measure, predict and assess the implications of the proposed highway with respect to several traffic growth scenarios.

The assessment of traffic noise based on projections of the existing Annual Average Daily Traffic to the day of opening (2001) and ten years following (2011) was initially undertaken on the basis of the RTA Interim Traffic Noise Policy (1992). This analysis indicated no exceedence of RTA Traffic Goals. This report is included in Appendix K.1.

Following consultation with the EPA (correspondence Appendix B) and the development of a new position between the EPA and RTA in relation to highway traffic noise assessment, a supplementary road traffic noise assessment was undertaken with respect to a calculated 'worst day' traffic scenario. This was projected using a linear growth rate of 3.1% (290 vehicles/year) to the day of opening (2001) as well as 10 years (2011) and 20 years following (2021). The results of the supplementary assessment are also included in Appendix K.2.

In calculating the 'worst day' traffic case, the highest existing traffic day (Boxing Day, 1996) was adopted. The proportion of heavy vehicles was factored for the existing average daily heavy vehicle count to ensure that there would not be an under representation of heavy vehicles. It is noted that this is an extremely conservative assessment especially when noise levels from calculated worst day are to be compared with existing levels measured during average traffic conditions.

A tabulation of the 'worst day' traffic scenario for evaluation against EPA goals is presented in Table 6.8.

Table 6.8 Projected 'Worst Day' Traffic Volumes for Noise Assessment

Location	Worst Day Traffic Volumes		
	2001	2011	2021
Coopernook Bypass North of Harrington Road	17,195	20,095	22,185
Coopernook Bypass south of Harrington Road	21,226	24,126	26,216

It is noted for comparison that the annual average daily traffic for the Pacific Highway (1996) near Coopernook is 9,366.

Traffic Noise Assessment Methodology

In accordance with the EPA recommendations (refer Appendix K.2), the predicted road traffic noise levels have been assessed in terms of the existing noise levels and the $L_{Aeq,15hour}$ and $L_{Aeq,9hour}$ assessment goals. The $L_{Aeq,15hour}$ being the equivalent fifteen (15) hour sound level for the period from 7.00am to 10.00pm, and the $L_{Aeq,9hour}$ level being the equivalent sound level for the period from 10.00pm to 7.00am. As reported in Appendix K.1, noise level measurements were also recorded in an manner consistent with the RTA Interim Noise Policy (1992).

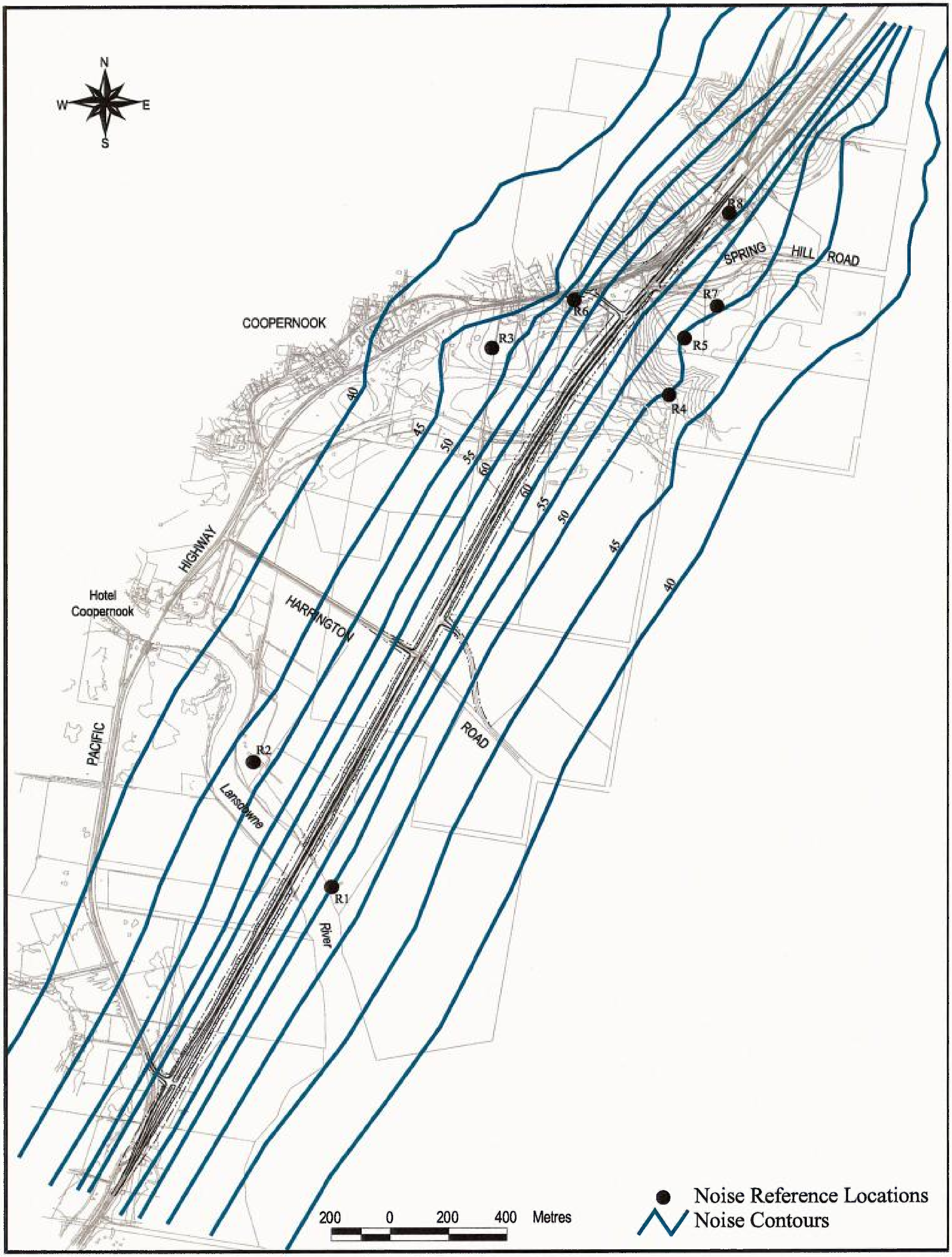
Existing Noise Level Measurements

The existing noise levels in the study area were measured and recorded from Friday 29 November to Monday 9 December 1996. The measurements were conducted at four (4) reference residential locations selected to represent the existing residential/rural properties that were identified as being potentially exposed to traffic noise from the proposed bypass. The measurement locations together with other reference residential properties identified during the assessment are shown in Figure 6.9, and described with the approximate chainage distances from south to north in Table 6.9.

Table 6.9: Reference Measurement and Assessment Locations

Reference Location	Chainage (metres)	Owner/Lessee	Property
R1	19300	K & S Sheather	Lot 1 DP 780787
R2*	19500	J & N Birkett	Bk 3291 No 646
R3	21200	G Pullen	Lot 2 DP 576017
R4	21250	J Gibson	Lot 364 DP 754415
R5*	21600	J R Gillogly	Lot 1 DP 628221
R6*	21400	D&E Chapman/P Kidd	Lot 592 DP 740564
R7	21600	M Gillogy	Lot 2 DP 628 221
R8*	22000	L McElwee and P James/Stimson (Shady Acres Worm Farm)	Lot 4 DP 590141

* Reference Measurement Locations



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 6.9 :
PREDICTED NOISE CONTOURS (LAeq, 8 hour) AND REFERENCE LOCATIONS

A summary of the measured ambient noise levels is included in Table 6.10.

Table 6.10: Range of Existing Noise Levels (29/11/96 - 8/12/96)

Location	Range of Sound Pressure Levels (dB(A) re:$10x^{-6}$Pa)	
	$L_{Aeq, 15\ hours}$	$L_{Aeq,9\ hours}$
R2: N & J Birkett	45.0 - 48.1	40.6 - 45.9
R5: R Gillogly	52.1 - 56.9	48.3 - 54.8
R6: P Kidd/Chapman	53.5 - 59.6	51.6 - 57.3
R8:L McElwee & P James/Stimson) Shady Acres Worm Farm	54.7 - 57.9	51.5 - 57.9

Traffic Noise Descriptors

Traffic noise is measured, described and assessed by reference to the percentile noise level or noise accedence level. The parameter relevant to the EPA goals is the L_{aeq}, which is the A-weighted (audible range) energy equivalent continuous (constant) sound level.

Traffic Noise Modelling

The traffic noise predictions presented in this report have been computed from the procedures recommended in the UK, DoE , CORTN (The Calculation of Road Traffic Noise) traffic noise model. The noise contour plots presented in Appendix K were developed by the Tonin Technology, Environmental Noise Model (ENM).

Traffic Noise Goals

The traffic noise assessment goals presently recommended by the EPA for new highways and road corridors are $L_{Aeq,15\ hour}$ 55dB(A) and $L_{Aeq,9\ hour}$ 50dB(A) for traffic growth predictions based on a worst day case (refer EPA correspondence in Appendix B). For the redevelopment of existing road corridors, the EPA have recommended that the appropriate design goalswould be $L_{Aeq,15\ hour}$ 60dB(A) and $L_{Aeq,9\ hour}$ 55dB(A). Where the existing traffic noise levels already exceed their goals for the redevelopment of an existing road, the assessment goal would be 2dB above the existing noise level. In such situations the EPA recommend that consideration be given to reducing the traffic noise levels to satisfy the recommended assessment goals, where cost effective and practical.

Considering the proposed Coopernook bypass alignment, eight (8) residential properties were identified for assessing future traffic noise levels. Table 6.11 identifies the properties, and presents a summary of the existing noise levels and the recommended noise assessment goals.

Table 6.11: Project Noise Assessment Goals

Location/Chainage	Sound Pressure Levels (dB(A) re: $10x^{-6}$ Pa)			
	Existing		Noise Goals	
	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$
R1/19300	46.7	42.3	55	50
R2/19500	-	-	55	50
R3/21200	-	-	55	50
R4/21350	-	-	55	50
R5/21600	54.5	52.4	60	55
R6/21500	55.9	54.8	60	55
R7/21800	-	-	60	55
R8/22000	56.1	55.3	60	57.3

Traffic Noise Predictions and Assessment

The main factors reviewed and considered for the Coopernook Bypass traffic noise assessment, included the following;

- The road alignment as shown in Figure 5.2.
- The traffic volumes, growth and heavy vehicle content calculated for the worst day.
- An average traffic speed of 100km/h.
- The use of a dense grade asphaltic concrete (DGAC) road surface or acoustic equivalent.

Alternative road surface finishes that could be considered without adversely affecting the traffic noise levels are cement concrete-hessian dragged and cold asphalt overlay. The use of chip seal asphalt or random grooved concrete would increase the traffic noise levels by up to 3dB(A) and are not recommended.

In accordance with the assessment procedures, the noise modelling has considered the worst day future road traffic noise levels for years 2001, 2011 and 2021. A presentation of the predicted 2001 AADT and 'worst day' $L_{Aeq,15hour}$ and $L_{Aeq,9hour}$ noise levels is presented as noise contour plots in Figures 1 - 8 of Appendix K.2. Figure 6.9 of the EIS shows the night time ($L_{Aeq, 9 hours}$) noise contour plot for the predicted 'worst day' scenario upon opening in the year 2001 with respect to the reference locations. Table 6.12 presents a summary of the predicted 'worst day' traffic noise levels (2001, 2011 and 2021) for the reference residences (without additional noise mitigation controls) and the relevant assessment goals.

Table 6.12: Assessment Goals and Post Construction Traffic Noise Predictions (dB re: 20 x 10^{-6} Pa)

Reference Location	Assessment Goals		AADT Post Construction 2001		'Worst Day' Post Construction 2001		'Worst Day' Post Construction 2011		'Worst Day' Post Construction 2021	
Chainage	$L_{Aeq,15hour}$	$L_{Aeq,9hour}$	$L_{Aeq,15hour}$	$L_{Aeq,9hour}$	$L_{Aeq,15hour}$	$L_{Aeq,9hour}$	$L_{Aeq,15hour}$	$L_{Aeq,9hour}$	$L_{Aeq,15hour}$	$L_{Aeq,9hour}$
R1/19300	55	50	55	50	**57**	**55**	**57.5**	**55.5**	**57.9**	**55.9**
R2/19500	55	50	50	46	52	50	52.5	50.5	52.9	50.9
R3/21200	55	50	47	44	49	47	49.6	47.7	50.1	48.2
R4/21250	55	50	46	44	50	47	50.6	47.7	51.1	48.2
R5/21600	60	55	50	46	53	49	53.6	49.7	54.1	50.2
R6/21400	60	55	54	50	56	54	56.6	54.7	57.1	**55.2**
R7/21600	60	55	49	46	53	49	53.6	49.7	54.1	50.2
R8/22000	60	57.3	56	55	59	**58**	59.6	**58.7**	60.1	**59.2**

Note: **Bold** figures indicate potential exceedences of project assessment goals.

The predicted traffic noise levels for the projected 2001 AADT traffic conditions show that without any additional noise mitigation controls, the traffic noise levels satisfy the EPA assessment goals. The predictions have also shown that the 2001 traffic noise levels could increase over the twenty (20) year period to the year 2021 by up to 0.9dB(A) south of Harrington Road and 1.2dB(A) north of Harrington Road, resulting in noise levels for projected AADT at Location R1 (Sheather - western residence) that marginally exceed EPA assessment goals 0.9dB(A)..

The traffic noise predictions for the peak day traffic flow or the 'worst day' of the year in the year 2001, have shown that the traffic noise levels would exceed the night time EPA assessment goals at Location R1 (Sheather - western residence) and Location R8 (McElwee and James, Shady Acres Worm Farm), by 5dB(A) and 0.7dB(A) respectively. The daytime assessment goal at the Sheather (western residence) would also be exceeded by 2dB(A).

The assessment of the 2021 traffic noise levels for the 'worst day' traffic of the year has shown that the EPA goals would be exceeded at Locations R1, R2, R6 and R8. Considering that the AADT traffic noise predictions generally satisfy the EPA goals, the noise exceedances that occur for the 'worst day' or one day a year would not be considered as significant in terms of noise annoyance.

The increase between the predicted noise levels for the proposed highway in 2021 under avergae (AADT) versus calculated 'worst day' traffic conditions are listed below for each reference location for which there is an exceedance of the EPA 'worst day' goal.

- Reference Location R1: increase of +2dB(A) day; +5dB(A) night
- Reference Location R2: increase of +2dB(A) day; +4dB(A) night
- Reference Location R7: increase of +4dB(A) day; +3dB(A) night
- Reference Location R8: increase of +3dB(A) day; +3dB(A) night

In recognition that the 'worst day' traffic noise levels at the Sheather (western residence) and McElwee/James (Shady Acres Worm Farm) residences will exceed the EPA assessment goals, it is recommended that the RTA initiate consultations with the property owners to discuss cost effective and practical options for the two properties with respect to managing traffic noise prior to determination of the project.

It is emphasised that the noise assessments are undertaken using an extreme worst traffic day scenario based on traffic predictions and traffic noise generation assumptions relevant to the existing average composition of highway traffic. In these circumstances the assessment is likely to be highly conservative, especially when projected 25 years into the future, when it is unlikely that vehicle noise emissions, pavement conditions and overall vehicle fleet make up would be comparable to the existing situation.

It is also noted that predicted 'worst day' noise levels are compared to average day noise measurements, further creating a situation in which exceedences may be over-represented.

6.5.2 Construction Noise and Vibration Assessment

Construction Activities and Plant

Section 5.3 of the EIS outlines the key construction methods and staging issues. To evaluate the level of noise and vibration envisaged during the construction of the road and bridges, the following activities and plant have been considered and further described for the purposes of the noise and vibration assessment undertaken by Atkins Acoustics and reported in Section 7 of Appendix K.1:

- Preliminary Site Works will involve the relocation of services and access adjustments to local roads. At this time it is envisaged that trucks, graders and excavators will be used to excavate and move materials during the site works.
- Earthworks will involve both excavation and filling for sections of the road. During this phase of the road construction, dozers, scrapers and excavators will be used to excavate and relocate fill materials where required. Dozers, scrapers, graders and compactors will be used to spread, level and compact the fill material to form the road.
- Sub-base Preparation, following the earthworks, the road sub-base will be prepared by a fleet of graders, rollers and compactor's.
- Road Surfacing, the laying of the concrete pavement will be carried out by concrete paving, asphalt laying machines and a fleet of trucks and rollers.
- Bridge Construction, would involve use of a new prefabricated bridge structure supported on concrete foundations (bored piles) and a pre-cast concrete deck. During the construction of bridges, it is envisaged that the main plant and equipment will consist of trucks, a boring machine, cranes and compressors.

To minimise construction noise impacts, it is recommended that the construction activities be restricted to between 7.00am to 6.00pm Monday to Friday, and 8.00am to 1.00pm on Saturday. Work outside the above hours would require approval of the EPA and consultation with the local community.

For the assessment of the likely range of noise levels for the various construction activities and plant, the sound power levels summarised in Table 7 of Appendix K.1 have been established from data presented in Australian Standard AS2436-1981 and previous measurements conducted by Atkins Acoustics.

As part of the construction requirements it will be necessary to use plant and equipment that will generate ground vibration. To evaluate the likely range and affects of ground vibration that may be caused by the construction activities, vibration levels established from similar assessments have been considered these are listed in Table 8 of Appendix K.1.

Construction Noise Assessment Criteria

For the evaluation of the noise and vibration levels during the construction of the road, the following assessment goals recommended in the EPA, Environmental Noise Control Manual (ENCM) (Chapter 171) have been considered:

- Construction periods of 4 weeks and under - the $L_{A10,15min}$ noise level from the construction activities should not exceed the background level by more than 20dB(A).
- Construction periods greater than 4 weeks and upto 26 weeks - the $L_{A10,15min}$ noise level from the construction activities should not exceed the background noise level by more than 10dB(A).
- Construction periods greater than 26 weeks - the $L_{A10,15min}$ noise level from construction activities should not exceed the background noise level by more than 5db(A).

From the field surveys results, the daytime (0700-1800 hours) background (L_{A90}) noise levels at the reference measurement locations ranged between 33-35dB(A) at isolated rural properties, and 39-50dB(A) adjacent to the existing highway, the lowest repeatable level at location R2 was 33dB(A), at location R8 (Shady Acres Worm Farm), the level was 40dB(A). Based on the existing background noise levels, the most appropriate criteria for the assessment of the road construction noise is 43dB(A) (isolated properties) and 50dB(A) (exposed properties) 53dB(A) and 60dB(A). The above noise levels are assessed as L_{A10} values measured at the affect property over a sampling period of 10-15 minutes.

Prediction and Assessment of Construction Noise Levels

Considering the various construction scenarios described earlier, the following range of noise levels (Table 6.13) have been calculated for referenced residential properties identified as being potentially exposed to construction noise. It is noted that the predicted noise levels represent the worst case scenario, that is when the construction activities are in close proximity to the subject property.

Table 6.13: Range of Noise Levels from Construction Activities

Reference Location	Sound Pressure Levels dB(A) re: 20 x 10^{-6} Pa				
	Site Establishment	Earthworks	Bridge Construction	Sub-base Preparation	Road Surfacing
R1	59	64	67	65	57
R2	51	56	59	59	49
R3	53	58	45	59	51
R4	55	60	45	61	53
R5	59	64	24	65	57
R6	58	63	24	64	56
R7	54	59	45	60	52
R8	73	78	22	79	71

The assessment shows that noise emissions from the construction activities immediately adjacent to an exposed property will exceed the recommended assessment criteria for both short term and normal construction periods. As a result of the type of plant and equipment required to construct the road, other than plant selection, there is little opportunity to reduce noise levels. To minimise potential noise impacts during the construction activities, it is recommended that the plant and equipment be selected and operated with appropriate mufflers and noise controls, and where practical work practices and plant selection be considered such to minimise noise impacts. These measures would be implemented through the construction stage Environmental Management Plan.

Construction Vibration Assessment Criteria

British Standard BS6472 (1992) provides the relevant guidelines for assessing potential disturbance to persons exposed to building vibration. The levels of vibration referenced in the Standard that may give rise to adverse comment are shown in Table 6.14.

For comparison purposes continuous vibration is normally felt at levels of about 0.15mm/s, and becomes noticeable at a level of approximately 1mm/s.

Table 6.14: Vibration Levels for Assessing Human Comfort

Type of Space	Time of Day	Vibration Levels mm/s			
		Continuous Vibration		Intermittent Vibration and Impulsive Vibration Excitation with Several Occurrences per day	
Occupancy		*Vert.*	*Hor.*	*Vert.*	*Hor.*
Residential	Day	0.3 to 0.66	0.8 to 1.6	8.4 to 12.6	24 to 36
	Night	0.2	0.6	2.8	8

Note: Ref: British Standard BS6472

German Standard DIN 4150 - Part 3:1986 provides relevant guidelines for evaluating the affects of vibration on structures. The values recommended in the Standard (maximum levels measured in any direction at the building foundation) are summarised in Table 6.15.

Table 6.15: Structural Damage - Safe Limits for Building Vibration

Type of Structure	Vibration Velocity mm/sec		
	Frequency		
	Less than 10Hz	10Hz to 50Hz	50Hz to 100Hz
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50
Dwellings and buildings of similar design and/or use	5	5 to 15	5 to 20

Note: Reference: German Standard DIN4150

As the buildings in the vicinity of the proposed road works would be classified as residential structures, vibration levels of 5mm/sec and 20mm/sec respectively have been recommended for assessing the potential for structural damage. It should be noted that this level is a "safe limit", up to which no damage due to vibration effects has been observed for the particular class of building. "Damage" is defined by DIN 4150 to include minor non-structural superficial cracking in cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load bearing walls.

In addition to the human comfort and structural damage guidelines, the threshold for visible movement of susceptible building contents (eg. plants, hanging pictures, blinds, etc) is approximately 0.5mm/s, the audible rattling of loose objects (eg. crockery) generally does not occur until levels of about 0.9mm/s.

Prediction and Assessment of Ground Vibration from Construction Plant

Plant and equipment used during the road construction will give rise to ground vibration. Table 6.16 below, presents a summary of the likely range of vibration levels that could be generated by that plant.

Table 6.16: Typical Plant Vibration Levels

Plant Description	Vibration Levels mm/sec	
	20 metres	40 metres
Rock-breaker (small)	0.2	0.02
Dozer	0.2	0.02
Jack-hammer	0.2	0.02
Compactor	2	0.3

The main sources of ground vibration from the construction plant will be associated with compactors. Typical ground vibration levels from compactors range up to 2mm/sec at a distance of twenty (20) metres, at distances greater than forty (40) metres, vibration levels will be generally below 0.3mm/s.

As a result of distance separation between the construction activities and the existing buildings adjacent to the road, it is unlikely that the activities will give rise to vibration levels that exceed the structural damage criterion for residential buildings of 5mm/sec.

To ensure the ground vibration levels are within acceptable limits and comply with the limits set, it is recommended that the vibration be monitored during any compaction activities that are within twenty (20) metres of any sensitive building structure. The nearest residence (Shady Acres Worm Farm Residence) to the construction site is approximately 20m away. It is recommended that monitoring occur only at this location.

Recommendations to Control Construction Noise and Vibration

During the construction of the road and road bridge over the Lansdowne River, there will be localised adverse noise impacts at properties (Birkett and Sheather) where the earthworks and the road construction activities take place adjacent to exposed residential properties. Noise impacts from these activities, which are considered to be transient and short term, can be minimised through planning and programming of the road works and consultation with the occupiers of the affected buildings. From the findings of the vibration assessment for the construction activities, it is not envisaged that there will be any adverse impacts from ground vibration.

To control and minimise the degree of noise and vibration generated during the construction activities, it is recommended that as part of the construction contractors undertaking that an Environmental Management Plan (EMP), be prepared to address the issues of noise and vibration. As part of the EMP, the following measures should be considered:

- the incorporation of a construction noise and vibration control plan in the construction stage EMP
- the selection of plant and equipment where practical on acoustic performance
- the use of the plant and equipment to minimise potential noise and vibration impacts
- the implementation of a noise and vibration monitoring program to ensure that best possible practices are being implemented
- initiate an information program to inform the local residents of the construction program and time periods when noise levels could exceed the recommended assessment guidelines
- install permanent noise controls at the earliest possible stage in construction

6.6 Biological Environment

The biological environment of the study area has been significantly altered from its condition prior to European settlement. Almost all land capable of supporting agriculture on the Lansdowne River floodplain has been cleared of its original vegetation. Regeneration of saline and waterlogged soil tolerant species (eg. Casuarinas) has occurred in some poorly drained areas, while remnant or regrowth groves of eucalypts remain on the elevated lands along property boundaries and in steeper areas of relatively lower agricultural value.

The casuarina lined banks of the intermittently flowing Coopernook Creek represent the western extremity of SEPP 14 Wetland No. 545 which extends for more than five kilometres to the east over the northern portion of the delta of the Manning River. The banks of the tidal Lansdowne River are lined with a gallery row of mangroves.

The wetland in question does not form part of any Wetland of International Importance as Waterbird Habitat as defined by the RAMSAR Convention.

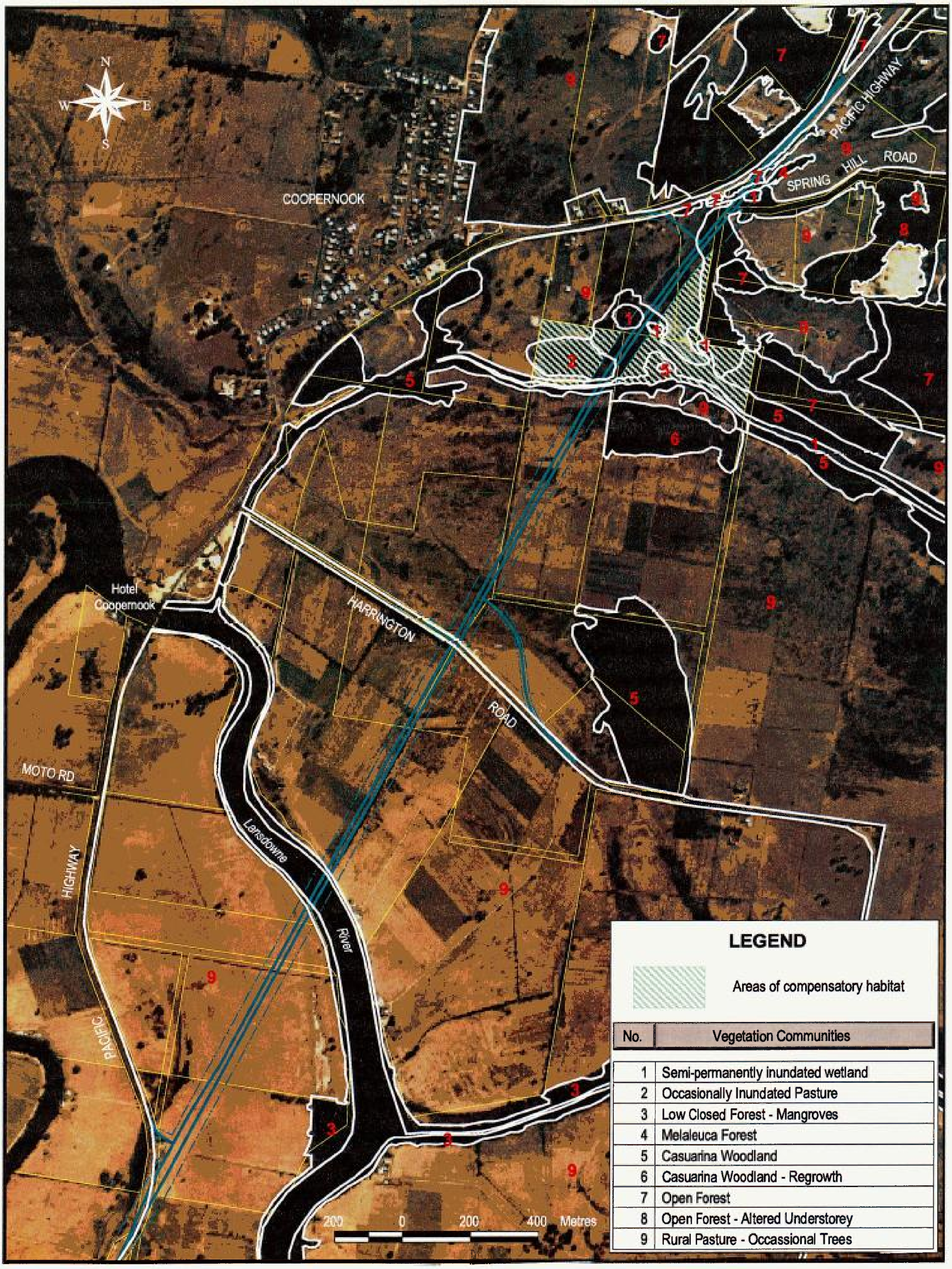
6.6.1 Flora

Survey Methodology

An initial assessment of the relative environmental impacts on vegetation of the three corridor options involved a survey of the study area during September 1994. This survey described the condition and quantified the areas of different habitats and vegetation types affected by the options. Upon adoption of the preferred corridor a more detailed survey of the vegetation was undertaken along the Option 1 route between 16-19th April, 1997.

The vegetation survey of the preferred corridor involved the selection of representative vegetation sampling sites based on a stratified random sampling approach with replicate grids within several sites in each of the major plant communities identified in the study area. The dominant vegetation communities were identified by remote sensing and ground truthing and were characterised according to their structure, floristics and habitat. The vegetation survey of the study area together with aerial photograph interpretation were used to develop the vegetation map for the preferred corridor (refer Figure 6.10).

A review of the conservation value of the communities was undertaken with reference to regional vegetation studies including Hagar and Benson (1994). Areas of high conservation value were identified based on their floristic criteria, physical and visual role, presence of threatened or significant species or communities and as value for habitat.



No.	Vegetation Communities
1	Semi-permanently inundated wetland
2	Occasionally Inundated Pasture
3	Low Closed Forest - Mangroves
4	Melaleuca Forest
5	Casuarina Woodland
6	Casuarina Woodland - Regrowth
7	Open Forest
8	Open Forest - Altered Understorey
9	Rural Pasture - Occassional Trees

Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure : 6.10
VEGETATION COMMUNITIES

Plant Community Descriptions

The following broad plant communities were identified in the study area and are further described in Table 6.17 and shown on Figure 6.10. Equivalent classifications adopted in previous vegetation surveys of the region are also listed in Table 6.17.

- Open Forest (1) - *Eucalyptus pilularis - Eucalyptus microcorys*

  This tall open forest community occurs in isolated pockets on slightly higher ground north of Coopernook Creek. The canopy is dominated by *Eucalyptus microcorys, E. gummifera, E. pilularis* and *Angophora costata* with a shrub layer dominated by *Acacia suaveolens, Acacia myrtifolia* and *Persoonia linearis*. The groundlayer is mostly native grasses such as *Themeda australis* and *Imperata cylindrica* as well as *Pteridium esculentum* and *Lomandra longifolia.*

- Open Forest (2) - *Eucalyptus pilularis - Eucalyptus microcorys* (altered understorey)

  This community has a similar canopy cover to Community 1 , however, the understorey shrub layer has been cleared resulting in a mainly introduced grass ground cover comprising *Paspalum dilatatum*, Axonopus affinus*, Pennisetum clandestinum*, Imperata cylindrica* and *Pteridium esculentum.*

- Melaleuca Forest

  This vegetation type comprises a moderately dense, low forest which is found in low lying regularly inundated areas. This community occurs along the creek line at the entrance to Spring Hill Road at the northern end of the alignment. *Melaleuca quinquenervia* forms the upper canopy with *Melaleuca nodosa* and *Melaleuca linariifolia* dominating a moderately dense understorey.

- Casuarina Woodland

  This community is found along the creek lines and wetland areas of the floodplain. The canopy is dominated by *Casuarina glauca, Cinnamomum camphora*, Melaleuca quinquenervia* and *Glochidion ferdinandi* with an understorey comprising *Phragmites australis, Gahnia sieberana, Dichondra repens* and *Ranunculus inundatus.* The understorey cover has been disturbed through stock trampling in several locations.

- Semi-Permanently Inundated Wetland

  This community is dominated by the spike-rush *Eleocharis sphacelata* and other members of the Cyperaceae and Juncaceae families including *Cyperus difformis* and *Juncus usitatus*. Areas where the water table is frequently above the ground surface along Coopernook Creek support *Nymphaea gigantea, Ranunculus inundatus* and *Hydrocotyle bonariensis*.*

- Occasionally Inundated Pasture

  This community comprises an area of low lying rural grassland to the north of Coopernook Creek which is subject to occasional inundation following heavy rain and comprising pasture grass *Pennisetum clandestinum** and Tussock Rush *Juncus usitatus.* Other species in this community include *Hydrocotyle bonariensis* and Waterbuttons

Cotula coronopifolia. The understorey of this community has been partially degraded by stock trampling.

- Rural Pasture - Occasional trees

  These areas have been largely cleared for agricultural purposes and cover the majority of the study area. Vegetation is mainly pasture grasses and occasional weeds (*Pennisetum clandestinum*, Cynodon dactylon** and *Paspalum dilatatum**) interspersed with trees such as *Eucalyptus tereticornis, Melaleuca quinquenervia, Cinnamomum camphora** and *Casuarina glauca* defining track and paddock boundaries.

- Low Closed Forest - Mangroves

  This vegetation type is associated with the Lansdowne River and adjoining creeks. Vegetation of this community is dominated by *Aegicerus corniculatum* and *Avicennia marina* in the overstorey and *Pennisetum clandestinum*, Ipomoea indica* and *Paspalum dilatatum** in the ground cover.

* Denotes introduced species

Table 6.17: Plant Community Descriptions

Community Description/ Equivalent Classification	Structure			Dominant Species		Habitat	Variation /Disturbance
	Strata	Height (m)	Cover (%)	Overstorey	Understorey		
1. Open Forest - *Eucalyptus pilularis - Eucalyptus microcorys.* Hagar and Benson (1994): *E. pilularis - E. microcorys.* Benson (1989): *E. pilularis.* Baur (1979) Forest Type 37 - Blackbutt.	Trees: Sm. Trees: Shrubs: Ground Layer:	15-25 10 1-3 0-1	25-40 10-15 15-30 0-30	*Eucalyptus microcorys* *E. gummifera* *E. pilularis* *E. acmenoides* *Angophora costata* *Allocasuarina torulosa* *Callicoma serratifolia*	*Persoonia linearis* *Acacia suaveolens* *A. myrtifolia* *Leptospermum polygalifolium* *Xanthorrhoea sp.* *Pteridium esculentum* *Lomatia siliafolia* *Imperata cylindrica* *Hardenbergia violacea* *Lantana camara**	Found on slightly higher, exposed ground north of Coopernook Creek and along the perimeter of the Cemetery. Soils are a clayish lithosol.	This vegetation has been fragmented over the study site through clearing for agricultural purposes, rural housing and construction of the existing highway. Several relatively undisturbed but isolated stands still remain at the northern end of the alignment.
2. Open Forest - *E. pilularis - E. microcorys* (Altered Understorey) Hagar and Benson (1994): *E. pilularis - E. microcorys.* Benson (1989): *E. pilularis.* Baur (1979) Forest Type 37 - Blackbutt.	Trees: Sm. Trees: Shrubs: Ground Layer:	25-30 1-3 <1	15-30 5 40-70	*Eucalyptus microcorys* *E. gummifera* *E. pilularis* *Angophora costata*	*Acacia falcata* *A. myrtifolia* *Imperata cylindrica* *Pteridium esculentum* *Lomandra longifolia* *Hypochoeris radicata* *Geitonoplesium cymosum* *Paspalum dilatatum**	Found in same conditions as Community 1.	Native understorey cover has been extensively cleared for grazing and replaced with grass species and bracken

Community Description/ Equivalent Classification	Structure			Dominant Species		Habitat	Variation /Disturbance
	Strata	Height (m)	Cover (%)	Overstorey	Understorey		
3. Melaleuca Forest Hagar and Benson (1994): *Melaleuca quinquenervia-Casuarina glauca* Baur (1979) Forest Type 31 - Paperbark	Trees: Sm. Trees: Shrubs: Ground Layer:	8-12 5-8 1-3 0-1	25-30 5 5-10 20-30	*Melaleuca quinquenervia* *Melaleuca nodosa* *Melaleuca linariifolia* *Casuarina glauca*	*Kunzea ambigua* *Hypolepis muelleri* *Philydrum lanuginosum* *Cyperus difformis* *Pteridium esculentum* *Commelina cyanea* *Ranunculus inundatus* *Ipomoea indica** *Bidens pilosa** *Lantana camara** *Verbena bonariensis**	Found in minor gullies and depressions near watercourses. Poorly drained soils.	This community has a moderate degree of disturbance due to clearing and weed invasion along the road edge. Found in only one location within study area, adjacent to Pacific Highway at northern end of alignment. This community would have become established following the construction of the existing Highway and the adjacent network of dams and access roads.
4. Casuarina Woodland Hagar and Benson (1994): *Melaleuca quinquenervia-Casuarina glauca* Baur (1979) Forest Type 32 - Swamp Oak	Trees: Sm. Trees: Shrubs: Ground Layer:	10-16 3-8 0-1.5	20-30 10 10-20	*Casuarina glauca* *Cinnamomum camphora** *Melaleuca quinquenervia* *Glochidion ferdinandi*	*Phragmites australis* *Gahnia sieberana* *Hypolepis muelleri* *Commelina cyanea* *Ranunculus inundatus* *Dichondra repens* *Bidens pilosa** *Pteridium esculentum* *Persicaria strigosa* *Viola hederacea* *Lantana camara** *Verbena bonariensis** *Rubus sp.** *Opuntia stricta** *Ligustrum sinense**	*Phragmites australis* is found in the frequently inundated lowlying wetland areas along Coopernook Creek. *Casuarina glauca* dominates along the wetland fringe with *Cinnamomum camphora* occurring on higher ground. Predominantly estuarine and alluvial sediments.	Understorey vegetation has suffered from high degree of stock trampling and weed invasion. This vegetation has been reduced over the study area due to clearing for agricultural development.

Community Description/ Equivalent Classification	Structure			Dominant Species		Habitat	Variation /Disturbance
	Strata	Height (m)	Cover (%)	Overstorey	Understorey		
5. Semi-permanently inundated wetland	Trees: Sm. Trees: Shrubs: Ground Layer:	10-16 0.5-2 1-1.5	<5 <5 30-40	*Casuarina glauca*	*Eleocharis sphacelata* *Cyperus difformis* *Juncus usitatus* *Hydrocotyle bonariensis** *Nymphaea gigantea* *Dichondra repens* *Ranunculus inundatus*	Occurs in a lowlying poorly drained area north of Coopernook Creek subject to occasional inundation.	Subject to drying out. Cattle disturbance is widespread. This community represents less than 1% of the study area, however it directly overlies the proposed alignment.
6. Occasionally Inundated pasture	Trees: Sm. Trees: Shrubs: Ground Layer:	 <1			*Pennisetum clandestinum** *Juncus usitatus* *Hypochoeris radicata*	Lowlying pasture area adjacent to wetland communities. Poorly drained soils.	This community is restricted to one area north of Coopernook Creek. Weed invasion is evident as is disturbance by cattle.
7. Rural Pasture - Occasional Trees	Trees: Sm. Trees: Shrubs: Ground Layer:	10-25 <1	<5 40-60	*Cinnamomum camphora** *Eucalyptus tereticornis* *Melaleuca quinquenervia* *Casuarina glauca*	*Paspalum dilatatum** *Pennisetum clandestinum** *Imperata cylindrica* *Cynodon dactylon* *Rubus sp** *Axonopus compressus* *Silybum marianum**	Improved pasture, roadsides and other disturbed ground.	This community is predominant south of Coopernook Creek and represents approximately 80% of study site. Dominated by introduced grass species and grazed by cattle. Evidence of fertiliser use.
8. Low Closed Forest - Mangroves Baur (1979) Forest Type 33 - Mangrove	Trees: Sm. Trees: Shrubs: Ground Layer:	4-12 2-5 <1	20-30 5 10-40	*Avicennia marina* *Aegiceras corniculatum* *Casuarina glauca*	*Pennisetum clandestinum** *Ipomoea indica* *Ranunculus inundatus* *Paspalum dilatatum**	Estuarine wetland in the intertidal zone. Found on alluvial/estuarine sediments along the banks of the Lansdowne River.	Understorey vegetation on the tidal fringe has been disturbed by introduced species such as *Pennisetum clandestinum* and *Paspalum dilatatum.*

* Denotes Introduced Species

Significant and Threatened Plant Species

A review of the NPWS Wildlife Database Atlas for the 1:100 000 Camden Haven Sheet located 12 threatened plant species. Of these species two have habitat requirements and distribution patterns consistent with the study area, however no specimens of the species were located:

- *Brasenia schreberi* is a water plant with floating leaves similar to those of the water-lilies. This species is found in lakes and the backwaters of rivers and creeks where it flowers from January through to March. Wetland communities along the proposed alignment and in the study area where the occurrence of this species is possible were searched but no specimens were located.

- *Durringtonia paludosa* is a 1m tall herbaceous plant known to occur in freshwater coastal swamps from Myall Lakes to south-east Queensland. Investigation of wetland communities for the occurrence of this species did not locate any specimens.

The vegetation survey of the study corridor did not locate any rare or threatened plants (Briggs and Leigh, 1988), scheduled species (TSC Act, 1995) nor any plants of local significance. A review of the Commonwealth Endangered Species Protection Act, 1992 (Schedule 1) located two species (also identified under the TSC Act, 1995) which have distribution patterns consistent with the study area, however, the habitat requirements of these species are not comparable with those found within the study area.

A floristic list of the plants located within the study area is included in Appendix M.

Representation and Conservation Significance of Plant Species

The extent to which the study area contains plant communities represented in the local area and reserve system provides for an assessment of the study area as a representative of the flora of the region. Reviews of the representation of the vegetation of the region have been undertaken by Hagar and Benson (1994) with respect to the north east NSW (Forestry Commission (1985) for the Taree Management Area); and Binns and Chapman (1992) with respect to the Wingham Management Area. These investigations describe the relative distribution of specific forest communities in National Parks, State Forests, Flora Reserves and other conservation areas with respect to their proportion of overall area and distribution within the north coast region.

The Open Forest Communities 1 and 2 occurring in the study area include elements of Forest Types 37 and 41 (Baur, 1979). Binns and Chapman (1992) have given these blackbutt communities a conservation code of N2 (N = not threatened; 2 = inadequately conserved) in the Wingham Management Area. Hagar and Benson (1994) report that this community is extensive in the coastal foothills of north eastern NSW, but "inadequately conserved" on a sub-regional basis in the south (Hunter-Kempsey). This result is based on the relatively small area of this community which is conserved in these sub-regions as compared to the total area of this common community in the north east of NSW. Local examples of this community occur at the South Brother Crown Reserve as well as Coopernook State Forest.

Melaleuca Swamp Forest (Type 31 (Baur, 1979)) is regarded by Binns and Chapman (1992) as being "adequately conserved" throughout the region with around 5% of the total area of this community included in areas with a high conservation status. Hagar and Benson (1994) also regard this community as adequately conserved throughout north-eastern NSW. Extensive examples of this community are represented in Crowdy Bay National Park.

Casuarina Open Forest (Type 32 (Baur, 1979)) is regarded as "adequately conserved" by Hagar and Benson (1994) for the north-east region of NSW. There are reported to be 17 samples of this community in reserves within north-eastern NSW, representing approximately 25% of the total area of this community. Extensive examples of this community are reported in Crowdy Bay National Park within 5km of the study area.

The proportion of Community 8 (Open Forest - Mangroves) conserved in reserves in north-eastern NSW is yet to be determined Hagar and Benson, 1994. Gallery mangrove communities line tidal portions of most of the Manning River delta, many of the larger examples are protected under SEPP 14 and in Council Reserves.

Assessment of Flora Impacts and Safeguards

The construction of dual carriageways along the Option 1 corridor would have a range of direct impacts on plant communities through construction of embankments, access roads, bridges and cuttings over the length of the route (4.5 km). The proposal would result in the destruction of approximately 15.8 hectares of plant communities. This would comprise removal of approximately:

- 0.60 ha of Open Forest (1) - *Eucalyptus pilularis - Eucalyptus microcorys*, mostly along the far northern end of the route adjacent to the existing Pacific Highway
- 0.76 ha of Open Forest (2) - *Eucalyptus pilularis - Eucalyptus microcorys* (altered understorey) in the vicinity of Spring Hill Road at the northern end of the route
- 0.12 ha of Melaleuca Forest between the Pacific Highway and the eastern arm of Spring Hill Road
- 0.76 ha of Casuarina woodland on low lying land adjacent to Coopernook Creek
- 0.14 ha of Semi-Permanently Inundated Wetland in and adjacent to Coopernook Creek
- 0.13 ha of Occasionally Inundated Pasture in the vicinity of Coopernook Creek
- 13.2 ha of rural pasture (occasional trees) over the length of the route
- 0.09 ha of mangroves along the banks of the Lansdowne River

The loss of 1.36 ha of open forest communities is not considered significant with respect to botanical criteria given the widespread occurrence of this community in the locality. Although this community is considered to be inadequately conserved on a sub-regional basis, the open forest on site is considered to be of low conservation value relative to other examples of this vegetation type represented in reserves in the region, as a result of its low species diversity, grazed and trampled understorey in some areas and high degree of fragmentation. The open forest affected is already traversed by the existing Highway and Spring Hill Road and is broken up by cleared paddocks and the cemetery.

The loss of the open forest is recommended to be compensated by the acquisition of the adjacent residential portions of Lot 592-3 DP740 564 and the reestablishment and enhancement of approximately 3ha of open forest on this site.

The disturbance to 0.12 ha of Melaleuca Forest adjacent to the Pacific Highway is not considered to be an important impact on a regional scale given the extensive local and regional representation of similar communities in less disturbed condition, particularly in Crowdy Bay National Park. The area affected occurs in a drainage line formed between the Pacific Highway and a small dam adjacent to Spring Hill Road. The proposed wetland compensatory habitat would include Melaleuca Forest.

The strip (13.2ha) of pasture with occasional trees which would be affected by the proposal is not considered to have a high botanical value.

The significance of the impact of the proposal on mostly Casuarina woodland contained in and around Coopernook SEPP 14 wetlands and associated wetland habitat compensation proposals are discussed below.

A 45m strip of mangroves on either side of the Lansdowne River would be affected by the construction of the twin bridges. The loss of this area of mangroves by overshadowing is not considered a major ecological impact of the proposal given the narrow width of each stand and the good representation of mangroves along the banks of the Manning River and its tidal tributaries. Demolition and removal of the existing crossing of Lansdowne River would permit the re-establishment of mangroves along the banks of that section of the river by way of compensation.

SEPP 14 Wetlands and Compensatory Habitat

The Proposal would affect part of SEPP 14 Wetland No 545 by direct clearing for wetland bridge and piers and indirect loss or change of some wetland vegetation due to overshadowing by the bridge. The wetland would not be drained or filled or have a levee constructed as a result of the proposal. The boundary of this wetland in relation to the proposed corridor is shown on Figure 6.10. An aerial oblique photo showing the location of the proposed highway and wetland bridge is produced as Figure 6.11. As indicated in Figure 6.11, the majority of the mapped SEPP 14 wetland west of the proposed crossing has been cleared and is degraded due to stock access. As a result, the proposal does not represent severance of a continuous wetland.

The corridor affects the western arm of the SEPP 14 wetland and would directly affect areas of Casuarina woodland, semi-permanently inundated wetland and occasionally inundated pasture. These communities are considered to be adequately reserved in the region (Hagar and Benson, 1994). The wetland communities on site are considerably degraded due to ongoing stock access and grazing.

Although this section of wetland would be bridged, the construction of piers would require the removal of the vegetation at 15m intervals in a corridor 30 metres wide. Overshadowing by the bridge would eventually remove plant cover beneath the bridge.

Floodplain velocities will increase in the SEPP 14 Wetland/Coopernook Creek area from a low value of 0.15m/s to 0.25m/s. It is not expected that this will result in any changes to the stability of soils or vegetation in the wetland area as these velocities are low.

Construction machinery within the SEPP 14 wetland would be limited to pile driving rigs only. The remaining plant and equipment would access the site by the bridge deck. The bridge deck would be constructed in sections and lowered by crane from the span already in place. Subsequent materials required, such as concrete and steel reinforcement, would be transported across the existing spans. This method would keep construction activity in the wetland to a minimum and would avoid disturbance of acid sulphate soils and the pattern and level of groundwater flows.

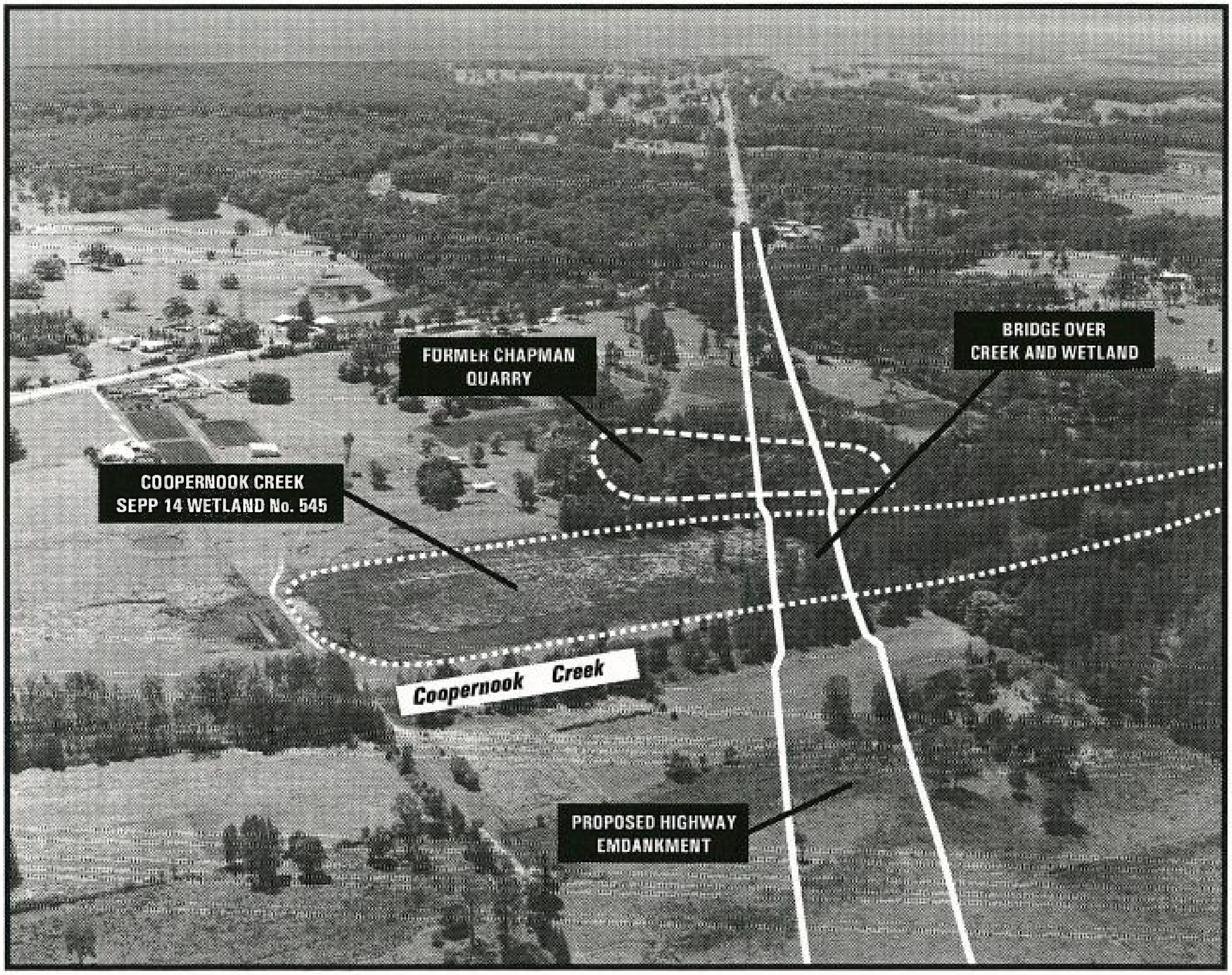


Figure 6.11 :
AERIAL OBLIQUE PHOTO OF WETLAND CROSSING (VIEW TO NORTH)

A number of safeguards would be implemented to reduce the impact of the vegetation loss and protect the adjacent wetland areas. They include:

- specialist supervision of the construction by a project environmental officer to ensure that the project is managed according to the EMP
- mesh fencing of the construction easement across the wetland to limit disturbance
- construction methods to limit movement of machinery in the wetland area by progressive construction and use of the Coopernook Creek Bridge over the wetland
- progressive placement and removal of a geotextile silt fence placed around the active construction site to prevent alteration of water quality
- progressive surface stabilisation and revegetation using wetland species alongside and beneath the bridge structure once the bridge piers are in place
- regular water monitoring during construction
- other measures including construction of detention basins, sedimentation ponds and erosion control measures and water pollution control ponds for runoff and spillage as outlined in Section 6.4 would also be adopted
- reestablishment of mangroves beneath the existing Lansdowne River Bridge once demolished

By bridging the wetland, existing flowpaths would be unaffected and an opportunity will exist for regeneration of the wetland. A large proportion of the area affected by the proposed bridge would be reinstated with casuarinas and mangroves planted right up to and alongside the bridge. Beneath the bridge only low growing species, such as rushes and reeds, would be re-established.

Compensatory Wetland Habitat Proposal

The proposed compensatory habitat areas are identified in Figure 5.9 and represent the following vegetation types and habitats:

- Lot 1 DP957426 (GM Gibson), approximate area - 4ha. This area contains temporarily inundated cleared and grazed land mapped within SEPP 14 Wetland No. 545. The opportunity exists to reestablish Casuarina woodland and Melaleuca forest in this area by the exclusion of grazing and planting of locally collected seed stock.
- Lot 55 DP754 415 (NL and JM Birkett), approximate area - 8ha. Exclusion of cattle from this area and replanting of cleared areas would reestablish and connect elements of Casuarina woodland habitat adjacent to Coopernook Creek SEPP 14 Wetland east of the proposed bypass.
- Lots 592-593 DP740564 (Chapman), approximate area - 2ha. Eastern residue of severed lots contains a small area of open forest adjacent to the SEPP 14 wetland. This is proposed to be expanded and enhanced by replanting endemic tree and shrub species.

The combined effect of the adjacent compensatory habitat proposals would be the consolidation and buffering from perimeter disturbances of the SEPP 14 wetland habitat in the vicinity of the proposed highway.

The interpretation of compensatory habitat opportunities would involve:

- negotiations with GM Gibson, N & J Birkett and D & E Chapman for the purchase of areas of property north of Coopernook Creek cut off by the Proposal to be established as new terrestrial forest and wetland areas/riparian buffer zones (total area 10-12 ha).

These areas would be revegetated and managed by an organisation yet to be negotiated according to the operational stage EMP.

- alternatively, restoration of wetland areas on adjacent private land already disturbed through grazing. These areas could be protected from clearing or other damage by retaining them in public ownership.
- the ongoing management of any acquired compensatory habitat areas would be the responsibility of an organisation yet to be negotiated. Management activities such as revegetation, weed control or stock access control would be the subject of a plan of management to be included in the operational EMP for the project.

SEPP 14 Matters for Consideration

As the Proposal affects an area of SEPP 14 wetland a number of statutory issues must be addressed including the matters for consideration of SEPP 14 and the objectives and goals of the "National Conservation Strategy for Australia" insofar as they relate to wetlands.

"*(a)* *the environmental effects of the proposed development, including the effect of the proposed development on-*

(i) the growth of native plant communities;
(ii) the survival of native wildlife populations;
(iii) the provision and quality of habitats for both indigenous and migratory species;
(iv) the surface and groundwater characteristics of the site on which the development is proposed to be carried out and of the surrounding area, including salinity and water quality;"

The Proposal would directly affect approximately 0.39ha of wetland communities which constitutes a small proportion of this habitat type in the Manning Valley. The area affected is significantly degraded due to trampling and grazing of the understorey by stock. As such it is of low habitat value for fauna populations particularly as large areas of alternative habitat in relative undisturbed condition are reserved in the district. The area disturbed does not sever any wetland community due to its location on the cleared western edge of the extensive wetland area contained in Wetland No. 545 and Crowdy Bay National Park.

"*(b)* *whether adequate safeguards and rehabilitation measures have been, or will be, made to protect the environment;"*

A range of safeguards including habitat compensation and rehabilitation measures (12ha of wetland) and the low impact bridge construction techniques over the wetland will protect the environment of the wetland (refer (g) below).

"*(c)* *whether carrying out the development would be consistent with the aim of this policy;"*

By developing a proposal which adopts an alignment and bridging technique that has a minor impact on relatively depauperate wetland and also protects the long term viability of the wetland through acquisition, enhancement and management of compensatory habitats, the aims of SEPP 14 have been addressed by the RTA.

"*(d)* *the objectives and major goals of the "National Conservation Strategy for Australia" (as set forth in the second edition of a paper prepared by the Commonwealth Department of Home Affairs and Environment for comment at the National Conference* *on Conservation held in June, 1983, and published in 1984 by the Australian Government Publishing Service) insofar as they relate to wetlands and the conservation of "living resources" generally, copies of which are deposited in the office of the Department;"*

In considering whether to grant concurrence, the Director is required to consider the objectives and major goals of the National Conservation Strategy for Australia in so far as they relate to wetlands and the conservation of living resources generally. The objectives and relevant major goals are given below and are addressed in the context of the SEPP 14 wetlands affected by the Proposal.

<u>Objectives</u>

" to maintain essential ecological processes and life support systems (such as soil regeneration and protection, the recycling of nutrients, and the cleansing of waters), on which human survival and development depend;"

The bridging of SEPP 14 Wetland No. 545 and regeneration of compensatory wetland habitat would avoid any long term interference with the essential ecological processes and life support systems of the wetlands which may contribute to human survival and dependence.

" to preserve genetic diversity (the range of genetic material found in the worlds organisms), on which depend the breeding programmes necessary for the protection and improvement of cultivated plants and domesticated animals, as well as much scientific advance, technical innovation, and the security of many industries that use living resources;"

In minimising the disturbance to the wetlands and avoiding any severance of movement corridors, the ongoing genetic diversity of the biota of the wetland habitats of the Coopernook district is protected.

" to ensure the sustainable utilisation of species and ecosystems (notably fish and other wildlife, forests and grazing land), which support millions of rural communities as well as major industries."

The proposal to bridge the wetlands and provide compensatory habitat is expected to have a long term beneficial effect on the species and ecosystems of the wetlands of the study area.

<u>Major Goals</u>

" ensure that living resource development is such as to optimise the quality of life of Australians"

The protection of the ecosystems of the Coopernook Creek wetlands would make a small but important contribution to the retention of biological diversity which is fundamental to sustaining quality of life in Australia.

" ensure that land management practices are consistent with long term productivity of living resources;"

The operational safeguards to be implemented during the operation of the bypass represent sound land management practices which are consistent with the ongoing productivity of the wetlands.

"preserve the genetic diversity of Australia's plant and animal species and ecosystems and of those introduced species which support plant and animal based industries;"

In minimising the disturbance to the wetlands, avoiding any severance of movement corridors and providing compensatory habitat, the ongoing genetic diversity of the biota of the wetland habitats of the Coopernook district would be preserved.

"Manage the impact of development on the coastline, on aquatic resources, on the quality of coastal waters and on critical habitats such as wetlands, estuaries, bays and reefs so that their ability to meet conservation and development objectives is not diminished;"

The conservation values of the wetlands of Coopernook Creek would be upheld by the adoption of low impact construction techniques, the implementation of operational safeguards and the establishment of areas of compensatory habitat.

"ensure that the increasing use of the aquatic environment is managed so that its ecological integrity is retained and its utility and productive capacity are sustained;"

Minimising overall disturbance through bridging, regenerating compensatory habitat and implementation of operational safeguards serves to retain the ecological integrity and productive capacity of the wetlands associated with Coopernook Creek.

"ensure that pollution and its effects on Australia's living resources are minimised;"

The bypass design incorporates a range of erosion and sediment controls to be implemented during its construction and operation to avoid pollution of the wetland.

"(e) whether consideration has been given to establish whether any feasible alternatives exist to the carrying out of the proposed development (either on other land or by other methods) and if so, the reasons given for choosing the proposed development;"

A number of alternatives (Options 2 and 3) were considered which would have avoided the SEPP 14 wetlands, however, they would have had a more significant effect on other unclassified wetlands and the amenity of Coopernook. These options are addressed in Section 4.4.

"(f) any representations made by the Director of National Parks and Wildlife in relation to the development application (Section 2.7); and"

Correspondence from NPWS (13 January 1997) related the need for the EIS to consider the impact of the Proposal on the SEPP 14 wetlands

"(g) any wetlands surrounding the land to which the development application relates and appropriateness of imposing conditions requiring the carrying out of works to preserve or enhance the value of those surrounding wetlands."

Conditions would be imposed through a construction and operational EMP which would protect and enhance the value of wetlands to the east and west of the proposed route. These may include:

- implementation of the proposed compensatory habitat areas as shown on Figure 5.9 (within the Operational EMP)
- preparation of a plan of management for compensatory habitat areas to manage their rehabilitation and enhancement
- construction of a bridge over the crossing of the SEPP 14 wetland
- adoption of low impact bridge construction techniques including transport of materials along the bridge abutments and over the successively completed bridge sections to minimise ground level disturbance during construction
- construction of the wetland bridge early in the construction project to enable transport of materials along the site without having to create a temporary bridge over the wetland
- implementation of erosion and sedimentation controls during the wetland crossing including sediment fences around the bridge abutments and silt curtains around the bridge piles
- construction of water pollution control ponds to prevent spillage and polluted runoff from the highway entering the wetland once operational.

The wetland in question does not form part of any Wetland of International Importance especially as Waterfowl Habitat as defined by the RAMSAR Convention.

6.6.2 Fauna

Wildlife Habitats

The various parcels of naturally vegetated land along the proposed route provide habitat for many of the common fauna occurring in the Coopernook District. The main wildlife habitat features of the study area can be described in relation to the vegetation classifications described in Section 6.6.1.

Mixed Eucalypt Open Forest

The Open Forest communities affected by the proposal cover an area of 1.36ha, most of which is along the northern boundary of the route. With the exception of a few areas to the east of Spring Hill Road this community is in a relatively undisturbed state and provides the following habitat resources:

- the mature trees in Communities 1 and 2 provide food and shelter for arboreal fauna including possums, gliders and bats as well as roosts for predatory birds
- several fallen trees and hollows were observed in these communities which provide habitat for many of the animals listed above
- understorey habitat of Community 1 is grazed and foraged by such terrestrial mammals as Wallabies, Brown Antechinus and Bush Rats
- flowering and fruiting trees and shrubs provide food resources and shelter for many common woodland and forest birds
- the ground layer and leaf litter provide habitat for a range of herpetofauna including Brown Snakes, Lace Monitor and a range of Skinks and other reptiles.

Casuarina/Melaleuca Forest

The Melaleuca and Casuarina communities of the study area are located at the northern end of the route and provide habitat resources including the following:

- the wetland vegetation fringing Coopernook Creek provides nesting, roosting and feeding resources for local and migratory water birds, as well as some terrestrial species
- the loose bark of Melaleucas offers diurnal roosts for several bat species
- the occasionally inundated understorey of the swamp forest (where freshwater) provides for frog habitat which in turn provides a feeding resource for reptiles and birds. The understorey also provides habitat for introduced and endemic rodents and small marsupials.
- specimens of the Casuarina mistletoe (*Amyema cambagei)* at a density of 2-3/ha were located in this community providing feeding resources for the threatened Painted Honeyeater (*Grantiella picta*) (Schedule 2 TSC Act, 1995).

Open Water and Semi-permanently Inundated Freshwater Wetlands

- the floating macrophyte vegetation in the semi-permanently inundated wetlands provides habitat for fish and invertebrates which are also prey to water birds. However relatively poor water quality is likely to restrict aquatic species diversity.
- elevated sections of semi-permanent freshwater wetlands also provide habitat for species of frogs and reptiles such as the long-necked tortoise (*Chelonia longicollis*).

Low Mangrove Forest and Lansdowne River

- mangroves within the study area are associated with the Lansdowne River and related creeks. The mangroves are an important source of habitat for many commercially important fish species and also intertidal benthic fauna (ie molluscs and crustaceans).
- the riparian vegetation acts as a filter strip to runoff thereby improving river water quality and protecting marine environments for fish species.
- the tree layer of this community provides roosting and nesting sites for many shorebirds and waterbirds including Herons, Cormorants and Ibises which may feed in the River and along its banks.
- understorey vegetation on the river bank provides for shelter and food resources of both terrestrial and semi-aquatic reptiles.
- riparian vegetation provides nesting sites and habitat for the Water-rat (*Hydromys chryogaster*) and Eastern Water Dragon (*Physignathus lesueurii*).

Rural Pasture

The majority of the study area is open pasture. Domestic and feral predators such as cats and dogs frequent the bushland and rural/pasture interface. This habitat, along with the scattered trees, provides the following habitat resources:

- grass seed, insects and other terrestrial invertebrates are commonly found within this community providing food for common native and introduced birds such as the Cattle Egret, Sacred Ibis, Australian Raven, Magpie and a variety of raptors.
- mammal species such as the Swamp Wallaby and Eastern Grey Kangaroo also feed on the grass seed of this community.

Fauna Corridors

The study area is traversed by the Lansdowne River and Coopernook Creek both of which represent linkages to the main body of SEPP 14 Wetland No. 545. These vegetated watercourses provide uninterrupted cover for fauna, particularly avifauna, moving in and out of the wetlands. Bridging of these two watercourses for the construction of the bypass would not sever these corridors, however, fauna movement may be impeded during the construction phase.

Fragmented stands of open forest towards the north of the route offer disjointed cover for fauna moving between Coopernook State Forest and Crowdy Bay National Park. The existing Highway, open paddocks, fences and dwellings all constitute barriers to terrestrial species, however, opportunities for avifauna movement and dispersal are unrestricted.

The open pasture of the study area offers little cover for terrestrial species and as such has little value as a movement corridor.

Survey Methodology

Three independent studies were carried out on the fauna of the study area. Glenn Holmes and Associates undertook a comprehensive survey in November 1994 involving field investigations of terrestrial and arboreal mammals, bats, birds, reptiles, frogs and fish. The survey procedures involved habitat searches, call records, avifaunal transects and spotlighting and were employed over a four-day (3-night) period in which the weather was fine and warm for the first three days and cool and raining on the fourth.

A bat survey was conducted by Ecotone Ecological Consultants Pty Ltd of the study area over a period of three nights with mild evening weather on the 24-27th March, 1997. A full copy of both reports are attached in Appendix M.

The final survey involving mammal trapping and arboreal fauna spotlighting was conducted by Connell Wagner along the proposed route between 16th and 19th of April, 1997. The weather for this survey was fine and warm with light to moderate winds, calm overnight and early morning. The survey procedures of the three studies are outlined below:

<u>Terrestrial and Arboreal Mammals</u>

- Small mammal trapping was employed using Elliot traps (types A and B) in the open forest and wetland communities (300 trap nights). Elliot traps were baited with a mixture of rolled oats, honey, peanut butter and bacon. As traps were cleared, the species name and sex of captured animals were noted. A proportion of the Elliot traps (60 trap nights) were tree mounted to target arboreal species.
- Searches of potential niches for cryptic fauna were conducted mainly near pools and watercourses.
- Searches for evidence of mammals using recognition and identification of scats, diggings and scratchings were undertaken in all vegetation communities.
- Spotlighting transects and nocturnal searches were undertaken through suitable arboreal habitat at Spring Hill and Two Mile Creek Roads. The transects were conducted on foot with a 20-watt torch and by vehicle (total 4km) with a 100-watt spotlight.
- Surveys for bats included harp trapping and the recording and analyses of echolocation calls. Harp traps were set at eight locations during the study period and bat detectors set

at four locations. A hand-held detector was also used on the final night (26th March) when a walked transect in the northern part of the study area was carried out.

Birds

- Diurnal traverses of the survey area were made for incidental observations of birds, including west bank and parts of east bank of Lansdowne River downstream to Tappin Creek, west bank of Ghinni Ghinni Creek upstream to 'Brightview', Coopernook Creek east almost to Cattai Creek, both branches of Spring Hill Rd, cemetery, crown reserve, existing route of Pacific Highway, and portions of paddocks belonging to all landholders impacted directly by the highway realignment.
- Broadcasts of Powerful Owl, Masked Owl, Koala and Yellow-bellied Glider calls were intermittently performed in an attempt to elicit responses throughout the study area.

Herpetofauna and Fish

- Searches of temporary and semi-permanent ponds for fish and frog larvae were undertaken. Recognition of frog calls was performed near water bodies over three nights.
- Records of reptiles were the result of incidental sightings throughout the study area.

Occurrence and Distribution of Fauna

A list of species expected in the region was compiled following a review of relevant literature, the NPWS Wildlife Atlas and local records. Table 6.18 incorporates the predicted and observed fauna groups within the vicinity of the three route options.

Table 6.18 : Observed and Predicted Fauna

Fauna Group	Number of Species	
	Predicted	**Observed**
Mammals	47-56 (6*)	17 (6*)
Birds	240-254(7*)	129(5*)
Amphibians	22-25	9
Reptiles	30-37	12
Totals	339-372	172

* Introduced Species

Terrestrial and Arboreal Mammals

A review of the NPWS Wildlife Atlas and a district fauna review indicates a possible 56 native mammal species occurring in the vicinity of the study area. Of these, 17 were observed during the field studies of the preferred route location. A further six species of introduced mammals were expected and observed in the study area.

Small terrestrial mammal trapping located four species: Brown Antechinus (*Antechinus stuartii*), Bush Rat (*Rattus fuscipes*), Black Rat (*Rattus rattus**) and House Mouse (*Mus musculus**).

Trapping results indicated that these small terrestrial mammals were concentrated in both the wetland and open forest communities.

Spotlighting revealed the presence of Brush-tailed possums in the open forest (altered understorey) community east of the Pacific Highway at the northern end of the alignment.

A bat survey conducted across the study area located seven species of insectivorous bats. A further two species may occur but could not be positively identified as the ultrasonic calls obtained were inconclusive (refer Table 6.19).

Table 6.19: Bat Species Recorded In Study Area

Common Name	Where Located		
	Trap Site Number	Detector Site Number	Hand Held Detector Site
Little Bent-wing Bat (Schedule 2, TSC Act 1995)	T(2);T(4)	D(1);D(2); D(4)	b
Common Bent-wing Bat (Schedule 2, TSC Act 1995)		D(2)	
Lesser Long-eared Bat	T(2);T(5)	D(4)	
Freetail Bat		D(2);D(4)	
Little Forest bat	T(2)	D(2);D(4)	a
Eastern Forest Bat	T(3);T(6)		b;c
Large Forest Bat			c
Gould's Wattled Bat		D(4)	
Chocolate Wattled Bat			c

a = swamp; b = Gibsons Road; c = Cemetery
D() denotes Detector Site Number
T() denotes Trap Site Number

Bat trap results were low and may reflect the lack of suitable trap sites as well as a low number of bats using the study area particularly as the bat detector also indicated a relatively low bat activity.

Flying-foxes were not sighted in the bat survey conducted, however, the survey recorded specimens of the Grey-headed Flying-fox. A major colony of this flying fox occurs in the Wingham Brush, 25km south west of the study area.

Birds

Of the 254 bird species known and expected to occur within the study area 129 were located close to or within the route corridor. A high percentage of the bird assemblage was associated with the wetland habitats of the floodplain. A list of species recorded is in included in Appendix M.

Frogs

Of the 25 species of frog known in the vicinity of the study area, 9 were recorded. These are:

- Great Barred Frog (*Mixophyes fasciolatus*)
- Common Eastern Froglet (*Crinia signifera*)
- Striped Marsh Frog (*Limnodynastes peronii*)
- Spotted Marsh Frog (*Limnodynastes tasmaniensis*)
- Red-backed Toadlet (*Pseudophyrne coriacea*)
- Green Tree Frog (*Litoria caerulea*)
- Bleating Tree Frog (*Litoria dentata*)
- Dwarf Tree Frog (*Litoria fallax*)
- Peron's Tree Frog (*Litoria peronii*)

None of the above species are included in Schedules of the TSC Act.

Significant and Threatened Fauna recorded in the District

A review of the NPWS Wildlife Atlas located 24 threatened fauna species (TSC Act, 1995) which occupy habitat niches comparable to those which are represented in the study area and which have been reported within 25km of the study area.

Field work in the route corridor located 6 of these species. A list of these species is included in Table 6.20.

Table 6.20: Threatened Fauna Species (TSC Act) Recorded Within 25km of Study Area

Common Name	Scientific Name	Recorded within 25km of study area	Recorded within 100m of proposed route
Wallum froglet	*Crinia tinnula*	+	
Giant Barred Frog	*Mixophyes iteratus*	+	
Pied Oystercatcher	*Haematopus longirostris*	+	
Comb-crested Jacana	*Jacana gallinacea*	+	
Black Bittern	*Ixobrychus flavicollis*		
Black-necked Stork	*Ephippiorhynchus asiaticus*		+
Wompoo Fruit-Dove	*Ptilinopus magnificus*	+	
Collared Kingfisher	*Todiramphus chloris*	+	
Square-tailed Kite	*Lophoictinia isura*		+
Osprey	*Pandion haliaetus*		+
Painted Honeyeater	*Grantiella picta*		+
Glossy Black Cockatoo	*Calyptorhynchus lathami*	+	
Powerful Owl	*Ninox strenua*	+	
Queensland Blossom Bat	*Synconyteris australis*	+	

Common Name	Scientific Name	Recorded within 25km of study area	Recorded within 100m of proposed route
Common Bent-wing Bat	*Miniopterus schrebersii*		+
Little Bent-wing Bat	*Miniopterus australis*		+
Greater Broad-nosed Bat	*Scoteanax rueppellii*	+	
Parma Wallaby	*Macropus parma*	+	
Koala	*Phascolarctos cinereus*	+	
Tiger Quoll	*Dasyurus maculatus*	+	
Brush-tailed Phascogale	*Phascogale tapoatafa*	+	
Common Planigale	*Planigale maculata*	+	
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	+	
Stephens Banded Snake	*Hoplocephalus stephensii*	+	

+ Denotes presence

A review of the Commonwealth Endangered Species Protection Act, 1992 (Schedule 1) located two species of fauna which possess habitat requirements and distribution patterns comparable with those found within the study area. A survey of the study area for any evidence of the presence of the Swift Parrot (*Lathamus discolor*) or Regent Honeyeater (*Xanthomyza phrygia*) did not locate any individuals of either species.

Eight-Part Test

Section 5A of the Environmental Planning and Assessment Act, 1979 sets out eight factors to be considered in deciding whether there is likely to be a significant effect on threatened species, populations or communities, and whether or not a Species Impact Statement is required prior to a development being approved. The following species were considered under the eight-part test in Appendix M after either being found in the immediate vicinity of the proposed route (ie 100m from the corridor) or possessing habitat requirements which are comparable to those found within the study area: Common Bent-wing Bat (*Miniopterus schreibersii*), Little Bent-wing Bat (*Miniopterus australis*), Painted Honeyeater (*Grantiella picta*), Square-tailed Kite (*Lophoictinia isura*), Black-necked Stork (*Xenorhynchus asiaticus*), Osprey (*Pandion haliaetus*) and Glossy-Black Cockatoo (*Calyptorhynchus lathami*). The results of the eight part test are that there would not be a significant effect on threatened species, populations or ecological communities or their habitats and as such a Species Impact Statement is not required for this proposal.

Assessment of Fauna Impacts and Safeguards

The impacts on fauna of the proposed bypass would be derived from:

- destruction of habitat along the northern section route and further intrusion of edge disturbances into several small patches of remnant vegetation
- disturbance of minor and creekbank habitat at crossing points of Lansdowne River and Coopernook Creek
- increased barrier effect of the dual carriageway to mobile terrestrial fauna

- increased potential for road kill due to higher speeds and a wider road (however, sight distances and ability to avoid fauna would be improved by dual carriageway)
- potential for indirect effects due to construction disturbance including downstream and wetland water quality changes, erosion and sedimentation.

Habitat Destruction

A total of approximately 15.8 ha of bushland habitat would be removed by the bypass construction as described in Section 6.6.1. The habitat affected is comprised mostly (~75%) of open pasture, however, towards the north of the route, both open forest and wetland communities are affected. A short length (45m) of gallery mangrove forest would be affected along the banks of the Lansdowne River.

The alignment of the bypass was chosen with consideration for the condition of the various stands of vegetation traversing the study area and the habitat they represent. The areas of wetland and open forest affected are already disturbed through fragmentation, weed infestation, grazing, human activity, exposure to domestic predators and Highway and local traffic. By adopting the preferred alignment, a balance is achieved which restricts habitat impacts to already degraded bushland and also minimises the disturbances to the human environment of Coopernook.

Disturbance to River Banks and Wetland Habitat

Lansdowne River and Coopernook Creek would be spanned by twin concrete bridges. The existing crossing of the Lansdowne River is proposed to be demolished and removed. The bridge construction would result in vegetation clearing and earthworks on the stream banks. During both construction and demolition, bridge piers should be contained within silt curtains to prevent the escape of turbid waters.

The Lansdowne River Bridge would require the removal of several mangroves and fringing vegetation including *Casuarina glauca*. However, the clearing for the highway embankment is not considered significant given its small extent and the relative value of the habitat affected with respect to the large area of mangroves in the district. Creek bank revegetation and landscaping would be undertaken using locally occurring estuarine fringe species including those species directly affected. The removal of the existing Lansdowne River bridge would facilitate regrowth of mangroves along this section of the river. Mangrove replanting is proposed at the site of the Lansdowne River Bridge following demolition.

Barrier Effects

The dual carriageway proposal would create a marginally wider barrier to the movement and dispersal of fauna than the existing Pacific Highway. The existing Highway and Main Northern Railway is already a barrier to terrestrial fauna movement to the east and west of the highway. This increased barrier effect due to the Proposal would be primarily restricted to the bushland at the northern end of the route as the open pasture over the rest of the study area is unlikely to be traversed regularly by terrestrial fauna given the absence of vegetation cover.

By overlaying a section of the bypass on the existing Highway, the cumulative barrier to fauna movement across the open forest remnants at the northern end of the route is reduced.

The construction of a 170m bridge across the wetland habitat associated with Coopernook Creek and a bridge over Lansdowne River allows ongoing east-west movement for fauna travelling along the banks of these watercourses. These movement corridors may be temporarily obstructed during the construction phase.

Indirect Fauna Impacts

The potential exists for construction work to impact on water quality and cause erosion and downstream sedimentation of aquatic and estuarine habitats. Particular problem areas would be creek crossings, stream diversions and the major fill batters. These sites would need to be managed through appropriate endemic revegetation via the adoption of an erosion and sediment control plan incorporated in an Environmental Management Plan (EMP) for construction. The components of this plan are outlined in Section 7 of the EIS.

6.7 Visual Environment

6.7.1 Visual Assessment Methodology

The project area has been divided into a number of landscape units, as shown on Figure 6.12 by grouping together common features such as land use, vegetation cover and topography.

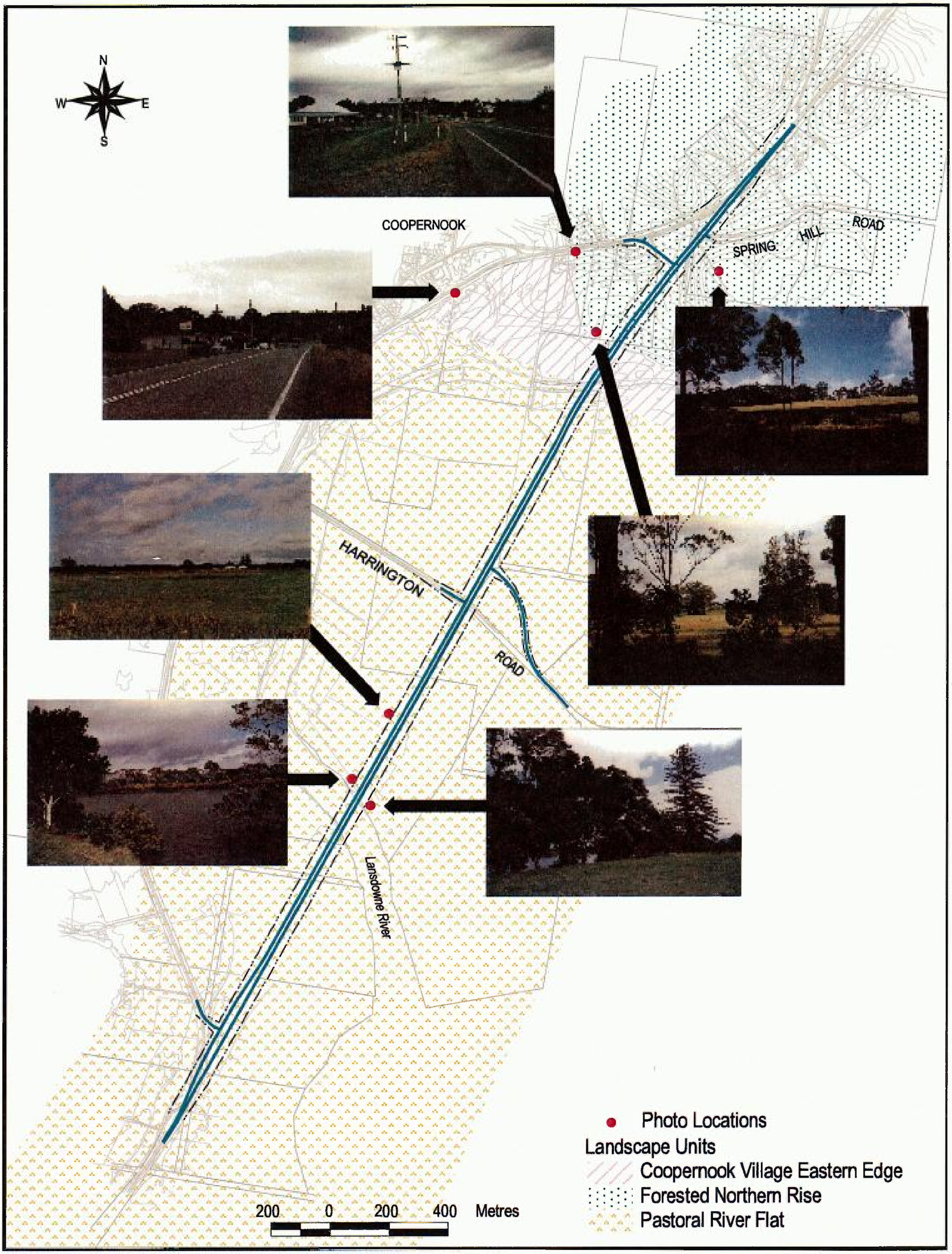
For each landscape unit a description is given and an assessment made of its visual quality and sensitivity to change. Commonly adopted visual assessment methods have been used to minimise the subjective nature of the assessment, such as those employed by the United States Forest Service (1974), Department of Planning (1988), the Forestry Commission of Tasmania (1983) and the State Pollution Control Commission (1981).

Visual Quality

Visual quality is a measure of the degree to which the visual aesthetics of a landscape is valued. Relevant studies have concluded that landscapes that are relatively natural and vegetated, and those with water features, dramatic topography and contrasting features are favoured by the viewer. Landscapes generally least preferred are those with high amounts of human disturbance and industrial landscapes, landscapes with few trees and those with flat and unvaried topography (Wright, 1973; State Pollution Control Commission, 1981; and Colleran and Gearing, 1980). In terms of the mostly rural environment of the project area, most people are likely to prefer natural bushland sites, rural settings and river views to more urbanised ones.

Visual Sensitivity

Visual sensitivity is a measure of the degree to which any visual change in the landscape is likely to affect the viewer. Locations normally most sensitive to change are those with high, fixed viewing populations and visually prominent and elevated sites. Also, the closer the viewer is to the site of change the higher the potential for impact. Usually, foreground views (less than 0.5km) are more sensitive than midground views (0.5 to 6.5km), and background or distant views (over 6.5km) are the least sensitive (United States Forest Service, 1994; Department of Conservation, Forests and Lands, undated).



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure : 6.12
EXISTING LANDSCAPE UNITS AND VISUAL ANALYSIS

Landscape and Visual Impact

In addition to visual quality and sensitivity considerations, the type and severity of landscape change and the extent which a landscape is represented in the district are also relevant. Aspects of this can include changes in landscape topography, the effect of introducing new elements into the landscape, visual separation or view prevention and landscape segregation.

6.7.2 Site Context

The site lies alongside the Lansdowne River, some 20km north of Taree. It is within the northern coastal landscape region of NSW, a landscape described as consisting of "mountain ranges with dense forests and cleared broad valleys" (Thorvaldson, 1996). The site itself is a predominantly rural setting, characterised by a mostly flat landscape that forms part of the wider river floodplain. The small village of Coopernook is located just north of the existing narrow bridge. North of the town the topography rises towards a forested hill that marks the northern extent of the visual catchment.

The countryside to the east is comprised of mostly pastoral properties and some smaller holdings. Crossing this area is Harrington Road, the main access road to the small coastal towns of Harrington and Crowdy Head. Directly west of Coopernook village is a low ridge which visually separates the town and project site from views in this direction. In general, the site has a pleasant visual environment, with its visual quality rating as moderate in relationship to the surrounding north coast region. While not having any dramatic features, the river itself and its pastoral setting, serve to present a landscape generally appreciated for its visual value.

6.7.3 Proposed Visual Changes

This proposed Coopernook Bypass would create a new section of dual carriageway highway to the east of the town. It would cross the wide river flat and smaller hilly section to the north, and require a new and larger bridge over the Lansdowne River. The removal of the existing bridge south of Coopernook would be part of the proposal and the old section of Highway would be terminated at both abutments to the bridge.

The proposed dual carriageway design reaches a maximum width of between 47m and 60m (including all earthworks), with 10.5m wide two lane carriageways in each direction, separated by a 9m wide median. It would be constructed mainly on an elevated embankment approximately 2m above the surrounding river flat. A small section of cutting, reaching 2m high, would be required at its northern end between Spring Hill Road and Two Mile Creek Road. The two new concrete bridges would be about 10.65m wide, 150m in length, with four supporting piers, and low safety railings on both sides.

The bypass section would be wider than the current highway. At some time in the future it is likely that the entire Pacific Highway between Taree and Port Macquarie will be completed to a similar dual carriageway standard.

6.7.4 Landscape Strategic Plan

A landscape strategic plan has been developed for the site (refer Figure 5.13) and cross sections (refer Figure 5.14), and described in Section 5.4. Photomontage illustrations of the proposed bypass are also provided in Figures 5.10 to 5.12.

6.7.5 Existing Visual Environmental and Visual Impact Assessment

As a result of an analysis of the existing landscape, the project area has been divided into three units as described below. These units are indicated on Figure 6.12, and typical photographs of the different landscapes are also included. Coopernook village itself is assessed separately following the site assessment.

The impact assessment takes into account both the visual impacts in the shorter term (during, and in about the first three years following construction) and in the longer term (between five and ten years after its opening), so as to assess the impacts before and after the landscape works have had time to mature. In particular, the impacts to local residents within the visual catchment of the bypass are addressed.

Landscape Unit 1 - Pastoral River Flat

Existing Visual Environment

This unit (refer Figure 6.12) incorporates the majority of the site, covering the section from the southern end to where the topography begins to rise in the northern section and includes the Lansdowne River. The river flat is characterised by its pastoral landscape, comprised of wide expanses of grass supporting some dairy cattle, and quite large groupings of native trees. These pastoral holdings are generally of a small to moderate size, and most include older style country houses. Several of these residences are located very close to the river itself to take advantage of the pleasant river setting.

The Lansdowne River is approximately 75 metres wide in the vicinity of the proposed river crossing. This site is relatively clear of trees, apart from some mangroves and a large Norfolk Island Pine which has some landscape value (refer Figure 6.12).

At the most southern end of the proposed highway is another prominent tree (a large Fig). This tree currently forms an integral part of an informal roadside rest area, and it is visually important due to its size and historical association with the highway.

Views from within this pastoral river flat unit are fairly confined due to the low lying nature of the topography and the many stands of intervening vegetation. In the northern section, north of Harrington Road, distant views are limited to the west by a low ridge which separates the main town of Coopernook, and to the east by a large stand of Casuarinas. Northern views are defined by the northern hill and forest with views available over the hill of distant mountains. South of Harrington Road there are some opportunities for wider views of sections of the pastoral landscape.

This unit has a moderate visual quality, with the less subdivided southern section, and particularly the area immediately around the river, having a slightly higher rating. Visual exposure is currently quite low, with few houses present, especially within the southern half.

Visual Impact Assessment

Across this unit the roadway would be on an embankment approximately 2m high, and at the river crossing a new bridge would be constructed from an elevated embankment up to 5m above the floodplain. The bridge deck would reach a height of between 6 and 7m to allow navigational clearance at high tide.

Two houses would be significantly impacted by the road construction located immediately to the west and east of the proposed bridge. The western house (about 250m away in the Birkett property) is protected to some extent by the amount of tall vegetation that surrounds the house, especially along the river edge. The western house is occupied by its owners, and therefore the visual impact would be high. From the house, close views would be available of the new bridge, which would also block attractive views along the river to the east. The elevated embankment would also prevent pleasant foreground pastoral views across the river flat to the east and continuing around to the north, and some midground views across the river to the south.

Residents of the leased house to the east (approximately 120m away in the Sheather property) would also experience close views of the road and bridge, and pastoral views to the west would be blocked.

Three other houses would have foreground views of the road from the west (ie views closer than 500m) within this unit. Road users on Harrington Road would also have direct views of the elevated embankment, and more distant views from the road would be intercepted. For road users on the new roadway there would be an opportunity for higher and more expansive views over this pastoral setting.

Some small Mangroves and potentially a very large Norfolk Island Pine would be removed for the bridge construction. The potential removal of the pine would be a loss to the local landscape. It is proposed that the large Moreton Bay Fig at the southern end of the project would not be disturbed.

The twin concrete bridges proposed across the river would be simple structures that would be visually prominent but not obtrusive.

Landscape Unit 2 - Coopernook Village Eastern Edge

Existing Visual Environment

This unit covers the eastern edge of the Coopernook village that is within the visual catchment of the proposed bypass, and includes the majority of the existing Pacific Highway edge north of Harrington Road (refer Figure 6.12). The landscape here becomes slightly undulating and rises as one moves east and is comprised of open pasture and houses on several small rural holdings. Most of these houses are located along the existing highway edge including some on the adjacent eastern side (Pullen, GM Gibson, Chapman) with a few situated further down the slope some distance from the highway. Those closest to the highway have direct road views, with residents on the western highway side having glimpses of the eastern pastoral area. Residents on the eastern highway edge also have views over the pastoral landscape to the east with northern views blocked by Spring Hill and distant southern views by intervening vegetation. Houses further to the east, at a lower elevation, (RJ Gibson, GR Gillogly) have most views blocked by topography and vegetation and therefore less expansive views across the river flat.

This unit has a moderate visual quality with some pleasant views available. Houses along the existing highway have some fairly low quality views of that roadway although their elevated location provides them with fairly extensive rural views to the east. Visual exposure is somewhat higher than the other units due to a slightly higher density of houses and its elevation.

Visual Impact Assessment

The new bypass would also be on an elevated embankment through this unit. There would be eight houses with foreground views of the roadway and up to four houses on the western side of the existing Highway that would have more screened views. The proposed establishment of dense tree planting adjacent to the bypass through this area would greatly reduce this impact.

The higher residents on the western side of the bypass (Pullen, GM Gibson, Chapman) generally have their backyard areas orientated to overlook the pleasant views of the river flat. The bypass would prevent these views and residents would instead have close views (two are about 100m away) of the roadway in the initial period and eventually a dense tree screen. There are two houses (JR Gillogly, RJ Gibson) on the eastern side of the bypass site in close proximity (within 100m) and their residents would have direct close views of the road and eventually the established landscaped trees.

Most residents within this unit would be likely to perceive the bypass as a visually intrusive element and their overall landscape amenity would be noticeably reduced. For most residents, and especially those properties off Spring Hill Road to the east, the visual and landscape separation created by the new road is likely to be strongly perceived.

Highway users along this section would experience enclosed views due to the screen trees proposed, with wider rural views opening up as one moves south.

Landscape Unit 3 - Forested Northern Rise

Existing Visual Environment

This northern unit represents a distinct landscape change to a more hilly, vegetated environment that continues for some distance to the north along the Highway (refer Figure 6.12).

The lots are small semi-rural or rural residential holdings generally incorporating many native trees. Views from the houses are more limited with immediate foreground views the most common and more distant views only filtered through the trees. On the southern side of Spring Hill all views to the north are obviously blocked and those on the northern hill side have no views to the south and hence the majority of the highway site.

The visual quality of this unit is slightly higher than moderate, with the tall native trees at this location creating an attractive but less expansive environment. Visual exposure is currently quite low due to the vegetation and the hilly topography.

Visual Impact Assessment

The short section of road within this unit would be in a cutting approximately 2m high opposite Spring Hill Road, levelling out to a small embankment to the north as it meets the existing Highway. Several residents within this unit would be in close proximity to the new road (McElwee James, Stimson, Myer), however the intervening topography and existing tall trees as well as the proposed landscape planting would obscure most views of the bypass.

Residents at two elevated houses east of the proposed road would initially have views of it, one less than 100m away (JR Gillogly), and the other less than 300m (GR Gillogly) with these being reduced over time as the landscape works mature. A third and more distant resident along Spring Hill Road (Cotter) would also have initial limited glimpses.

The Shady Acres Worm Farm (McElwee/James property) at the far northern end would be affected by a slightly closer roadway as the new section intersects with the existing Highway. Some trees would require removal for the Bypass through this unit and also to construct the new entrance necessary to the cemetery opposite. The old remaining section and the remnant section of northern Highway would be rehabilitated to bushland where this is not required for the access to the cemetery or Gosling property.

Highway users would experience quite enclosed views along this short road section due to the existing trees and others that would be planted. This enclosed feeling would emphasise the more expansive views that would open up over the rural area as one moves south. The trees would both screen the roadway from nearby residents and also create visual interest for drivers.

Coopernook Village - Existing Visual Environment and Visual Impact Assessment

Existing Visual Environment

Coopernook village is one of many river associated settlements common throughout the north coast that contribute to the character and visual diversity of the region. Its most important visual feature is its distinct southern gateway created by the special combination of the narrow steel lattice bridge and historic Coopernook Hotel on the northern bank (refer Figure 6.16). These features visually benefit from each other and the river setting, together forming a well-known entrance to Coopernook.

The remainder of Coopernook is somewhat less visually distinct, with the small commercial centre located away from the Pacific Highway (refer Figure 6.12). Adjacent to the Highway itself are a scattered group of roadside businesses and some houses and a playing field area. Above the town, on its western side, is a low ridge with a high knoll which is the site of an historic homestead that overlooks the village. Apart from this vantage point, the site of the proposed bypass is visually separated from Coopernook by the low eastern ridge.

Araucaria pine species such as Norfolk Island Pines, Bunya and Hoop Pines are prominent and common trees planted around Coopernook. These trees often occur around the local rural homes, probably acting as natural markers, and there are a large number throughout Coopernook village and along its western ridge.

Visual Impact Assessment

Coopernook itself would improve in terms of landscape amenity with the removal of the regional transport role from the existing Highway. The current separation created by the Highway would largely be reduced and there would be an immediate improvement in the ease and safety of pedestrian and local vehicle movement across the highway to each of its sites including the oval. The reduction of the busy nature of the current Highway would, however, be likely to be felt in the short term as the residents become accustomed to a quieter environment.

With the removal of the highway function would come an opportunity to enhance the visual and landscape amenity of Coopernook and improve its landscape value. This could include the establishment of pedestrian thoroughfares and safe road crossings, as well as street tree planting and other landscape improvements. Although not documented here, as part of the detailed design phase of the proposal, it is recommended that a landscape plan be developed for the bypassed highway in consultation with the local community. Such landscape works should highlight the local context of the site, and the possible use of some Araucaria pine and fig species would be appropriate for the town entrance design (refer Figure 5.15).

The bypassing of the Coopernook bridge, and the closely associated Coopernook Hotel, would be a visual impact to Coopernook and highway users due to the removal of the towns distinct southern entrance. The proposed new concrete bridge would not visually replace this existing setting, and the loss of this entrance would visually detract from both Coopernook and the visual variety of the highway landscape. A characteristic new town entrance landscape feature is proposed to be designed in consultation with the community as discussed in Section 5.4.

This removal of distinct structures and local character features is occurring on a broadscale along the entire length of the highway, making the incremental loss of this landscape feature even more important. Other such town entrance bridges occur along the highway, such as similar steel lattice bridges at Taree and Kempsey, which contribute greatly to the identity of local towns and the highway landscape experience of the road users. The nearby Manning Bridge and Taree Bridge are also soon to be bypassed with new concrete structures along the new section of highway. Evidence of the visual importance which such a bridge is likely to have for local residents is provided by a recent townscape study in Mooloolaba, Queensland (Thomas, 1996). This study concluded that the town's residents suffered a sense of loss and town identity when their town entrance bridge was replaced by an "anonymous precast concrete structure". It is recommended that a town entrance feature be recreated with input from the local community to address this potential impact.

The demolition of the existing bridge is proposed due to its condition and maintenance costs and it is noted that the Coopernook Hotel would visually suffer from this loss and association notwithstanding reduced noise and improved safety. A landscape concept has been prepared in Figure 5.15 for a feature entrance to Coopernook at the Harrington Road intersection. This would partly mitigate the visual impact of the removal of the existing bridge.

In landscape terms, one main advantage of the existing bridge demolition would be improved navigational clearance from 2.4m to 5m at MHW. This would open up an opportunity for launches and houseboats to access the section of the Lansdowne River above the bridge. Such boats are commonly leased to tourists for access to the local river system, and hence users of the boats would benefit from being able to view the attractive upper reaches of the river for some 8km upstream from Coopernook.

6.7.6 Detailed Landscape Design

Community interaction should occur during the detailed design phase of the landscape works, particularly in regard to the final bridge design, town entrance at Harrington Road and any improvement works throughout the village associated with the transformation of the existing highway to a local road. This will ensure that the entire bypass and other changes to Coopernook take into account the needs of the local community, and that the final design reflects the local landscape character and values of its residents.

This community participation should be encouraged early in the design process, with informal workshops possibly held in the village to give access to the greatest range of residents. Such participation in other road and townscape design processes have proved they generally lead to a greater satisfaction by the community in the final outcome.

6.7.7 Conclusion

The proposed road would create an intrusive road feature into a currently common pastoral environment. For the large part, however, it would not be within close proximity to many houses, and this would ameliorate its impact to some extent as would the extensive landscape plantings that would be incorporated. Where it would be near residents these people would be negatively impacted in visual and landscape terms experiencing in most cases a loss of pastoral views and rural character and some visual and landscape segregation from adjacent properties and Coopernook.

Gradual familiarity with the new road and the maturing of the proposed landscape works would reduce the visual impact of the bypass over time. There would also be some real landscape benefits to the majority of Coopernook residents with an increased landscape and neighbourhood amenity within their town due to reduced traffic and improved amenity due to reduced noise, improved safety and the opportunity for landscape enhancement of the existing highway. Should the project proceed it should ensure the visual impacts are addressed through the implementation of the landscape concept plan and town entrance feature.

6.8 Traffic and Local Access

6.8.1 Introduction

The existing Pacific Highway section in the vicinity of Coopernook, 21km north of Taree has a poor alignment with narrow lanes, shoulders and a narrow bridge at Lansdowne River. Speed limits vary between 100km/hr and 80 km/hr and overtaking opportunities are limited. Daily traffic volumes are expected to increase from 9,366 vehicles per day in 1996 to 15,173 per day in 2016.

The Highway intersects with a number of rural roads namely Moto Road, Harrington Road and Two Mile Creek Road, as well as a number of residential streets in Coopernook namely Macquarie, Henry and Ridge Streets and Spring Hill Road. There are also a number of private access roads to farms, small holdings and businesses.

The proposed traffic relief route will consist of a high standard dual carriageway highway with restricted access to minimise traffic conflict between local and through traffic. The design speed for the proposed route would be consistent and higher (100 km/hr).

Two T-junctions are proposed for the southern and northern connections with the existing Highway while a staggered T-junction has been proposed for the Harrington Road intersection.

6.8.2 Assessment of Key Intersections

Southern T-junction

With the proposed closure of the Lansdowne River Bridge it is expected that the traffic to and from Moto Road will use this junction. Currently approximately 11 vehicles turn in and out of Moto Road during the morning peak and 18 vehicles in and out of Moto Road during the afternoon peak. It is expected that similar movement patterns would be experienced at the proposed southern T-junction, which would be designed with improved and safer turning facilities.

Provisions are made at the proposed T-junction on the proposed relief route to allow for safer turning movements against oncoming traffic. There is ample spare capacity in Moto Road.

Harrington Road

The current Harrington Road and Pacific Highway intersection consists of a T-junction. Approximately 100 vehicles turn from Harrington Road into the existing Highway during the morning peak with about 75% turning in a southbound direction and 25% in the northbound direction. Approximately 50 vehicles turn from the existing Highway into Harrington Road during the morning peak with about a 50:50 split from both directions. During the evening peak the reverse movements occur with the larger percentage of vehicles turning into Harrington Road from the southern direction. The absence of turning lanes causes disruptions in the through traffic flows.

The construction of the proposed traffic relief route and the closure of the Lansdowne River bridge will significantly reduce the north-south traffic movements on the existing Pacific Highway and reduce traffic conflict with vehicles turning into and from Harrington Road to the existing Highway. The staggered T-junction proposed at the Harrington Road and proposed traffic relief route intersection will provide a safe option for turning traffic and will reduce disruption of through traffic flows.

The construction of the proposed traffic relief route will have no significant impact on the capacity of Harrington Road east of the proposed highway, as the total peak period and daily traffic flows would remain well below the desirable limit for a rural road of this nature. Harrington Road would be upgraded with a new permanent surface to cater for additional traffic between the proposed highway and the existing highway as this link would be the major access to Coopernook.

Northern T-junction

It is expected that about 40 vehicles per day would be using the proposed T-junction at the northern end of the proposed traffic relief route. This volume of traffic is expected to have no significant impact on through traffic movements. The proposed T-junction includes appropriate turning facilities to allow safe access to and from the new road.

Other Roads

Access to local streets (Macquarie, Henry and Ridge Streets) and properties with direct access to the existing highway are expected to improve significantly due to the lower traffic volumes expected on the existing highway. Traffic volumes on these roads are low with ample spare capacity available.

6.8.3 Conclusions

The construction of the proposed traffic relief route is expected to reduce traffic on the existing highway significantly. This will result in a reduction in conflict of current traffic movements. No significant capacity additions to local roads are expected. Intersections with the proposed traffic relief route will be designed to cater for safer and more efficient turning movements.

6.9 Social and Business Effects

6.9.1 Introduction

The direct impact of the proposed bypass on local businesses in terms of their gross annual turnover, employment, the extent of changes to business operations including the potential for closures of local businesses resulting from the opening of the bypass, have been studied in detail.

An overview of the business sector and employment in Coopernook as well as in the context of the Greater Taree Council area was undertaken. The current level of business activities and employment in Coopernook were assessed in terms of local trade and trade associated with through traffic. To assess the impact of the proposed bypass on current business activities and employment within Coopernook a survey of individual business operators was conducted. A customer survey was also conducted concurrently to compliment and validate the survey of the individual businesses. The results of the survey were compared with prior studies undertaken at the rural towns of Yass, Goulburn and Gunning (Parolin and Garner, 1997). The impacts of the Taree Bypass and proposed service centre were also considered in determining the impact of the proposed bypass at Coopernook. In conclusion a number of possible mitigation measures are discussed.

6.9.2 Social and Economic Structure

Community Profile

The village of Coopernook was first settled in 1885 to serve the timber and shipbuilding industries. By 1896, Coopernook supported a sawmill, shipyard and creamery (GTCC, 1996). None of these earlier businesses are currently evident in Coopernook.

A community profile for the village of Coopernook and its immediate environs has been prepared from a summary of the most recent available 1991 Census data for the relevant census Collection District (CD 091004) which extends from Coopernook village to include adjacent rural properties up to 1km to the north.

Population and Age Profile

The population of Coopernook is currently estimated at 440 persons and is projected to grow at a rate of around 1-1.5% per annum reaching 520 by 2011 (ABS, 1991). Coopernook represents about 1% of the population of the Greater Taree Council area (45,000).

The highest proportion of people in Coopernook fall into the age bracket of 50 to 65 indicating the town's population is skewed towards older age brackets. Families with young children also form a significant portion of the population, while older children and young adult age groups are less represented. Both sexes are almost equally represented in most age classes with the exception of the teenage years where there are fewer males and the late twenties where females are over represented. The age profile of the Coopernook (ABS, 1991) is provided in Table 6.21.

Table 6.21: Coopernook Age Profile 1991

Age Bracket	Total Persons	% of Population
0 - 4	36	12.5
5 - 14	14	5
15 - 19	20	7
20 - 29	31	11
30 - 39	47	16.5
40 - 49	29	10
50 - 65	69	24
65 and over	39	14

Source : ABS, 1991.

Household Type

Couples (28%) and two parent families (38%) account for the majority of households within Coopernook. Group households and lone person households account for 16% and 18% respectively.

The majority of private dwellings are owned (56.8%) or being purchased (29.7%) with only a small portion rented (11%).

Employment

The number of males and females in employment is given in Table 6.22.

Table 6.22: Employment Status for Coopernook

Employment Status	Number Of Males	Number Of Females	Total	Percentage Of Population
Employed	64	44	108	44%
Unemployed	10	3	13	5.5%
Total Labour Force (employed + unemployed)	74	47	121	49.5%
Not In Labour Force	46	77	123	50.5%

Source: ABS: 1991

The proportion of hours worked by employed persons is provided in Table 6.23. From the table it is evident that majority (62%) of employed people are full-time workers (working 35 or more hours a week). 32% of employed people either don't work or are part-time or casual workers.

Table 6.23 : **Proportion of Hours Worked by Employed Persons**

Hours	Males	Females	Proportion (%)
0 hours	3	0	2.9
1 - 15 hours	4	8	11.8
16 - 24 hours	5	3	7.8
25 - 34 hours	3	7	9.8
35 - 39 hours	10	5	14.7
40 hours	20	8	27.5
41 hours or more	13	7	19.6
not stated	3	3	5.9

Source: ABS : 1991

Employment is predominantly in the manufacturing (23%), community services (19.2%) and wholesale and retail trade (15%). Agriculture accounts for only 5% of employment in the Coopernook area. More than 25% of all employed people are labourers or related workers. Given the limited opportunities for manufacturing, community service and trade in the local area it is apparent based on interviews with local residents that many workers commute to Taree.

Much of the population of Coopernook (440) is employed outside Coopernook, either in Taree or elsewhere. Coopernook serves as a satellite suburb of Taree with relatively lower cost housing and an attractive rural setting for commuters relying on employment opportunities in Taree.

Mode of Travel to Work

The residents of Coopernook are highly dependent on car usage for travelling to work. Approximately 70% of the population either drive or are passengers in vehicles. Around 10% ride a motor bike or walk and 20% work at home or did not go to work on the day of the 1991 census. Although a school bus and district bus service is available, public transport is not frequently used for the journey to work.

Annual Income

Slightly more than 50% of the households in Coopernook have an annual income of $5 000 to $25 000. Around 25% of households have incomes within the range of $25 000 to $40 000 while the remainder are split between those with lower or higher incomes than the stated ranges.

Business Characteristics

A recent survey conducted by the Manning-Gloucester Business Enterprises Centre (BEC, 1996) indicates that there are 21 businesses registered in Coopernook. The local economy of Coopernook is highly dependent upon retail trade, serving residents and passing trade. The retail trade includes service stations, take away food and restaurants. The service industry is limited to one hotel and one motel. The BEC employment listing indicates that approximately 51 people are employed at businesses in Coopernook. Businesses are predominantly trades and retail orientated in occupational characteristics (GTC, 1997).

Most of the retail and service businesses in Coopernook (60%) are located next to the Pacific Highway. Fast foods and restaurants mainly serve as complimentary businesses to the existing service stations rather than operating as stand alone businesses.

According to the BEC (1996), 30% of all businesses registered in Taree in 1994 are in the retail sector. Almost 50% of all new businesses commencing since 1991 were in the retail sector.

The economic growth of Coopernook may be measured in terms of the growth in trade due to local residents and growth in trade attributable to through traffic. Growth in trade resulting from local residents is largely dependent on the projected growth of the resident population of Coopernook. It is assumed that the growth in the Coopernook economy in terms of locally generated business would be consistent with modest population growth.

Through traffic contributes to the local economy by spending on fuel, food, accommodation and other small items. The projected growth in local trade due to through traffic has been based on past traffic counts. Surveys at Coopernook by RoadNet (1996) shows a 13% traffic increase over the last two years which exceeds the projected traffic growth of 3.1% per annum. The permanent RTA counting station, further south in the vicinity of Wallamba River, shows an average growth in traffic for the Highway in the order of 5.0% for the period 1970 to 1990. Traffic assignments by Connell Wagner indicate that through traffic constitutes more than 80%.

If the current market share of through traffic is maintained and traffic growth rates predicted for the Highway are realised, this portion of total trade is likely to continue to grow until the point is reached where other influences such as congestion have an opposing effect.

6.9.3 Business Survey

Method of Survey

The survey method of businesses involved personally conducted interviews with proprietors on Thursday the 24th and Friday the 25th April 1997 (ANZAC Day). The objectives of the interviews were to obtain the following information:

- the nature of the business
- the annual turnover of the business including indications of weekly and seasonal fluctuations
- employment characteristics (number of employees, sex, terms of employment, i.e, full-time, part-time or casual, and average wages)
- the perception of proprietors regarding the anticipated effect of the proposed bypass on future trade
- potential mitigation measures as proposed by the proprietors

The results of the survey are to remain confidential and as such are not reproduced for public viewing in this document.

Survey of Turnover

The businesses located adjacent to the Pacific Highway consists of three service stations (including restaurants and take-away outlets), Caravans at Coopernook, Gift shop/Orchid Nursery, the Coopernook Hotel and Coopernook Motel. The cumulative average annual turnover for the businesses located next to the Pacific Highway is between $5 - $6 million (1997$).

The only business located on the Pacific Highway north of Coopernook is Shady Acres (worm farm, kennels and herb nursery). Income from worm sales and boarding kennels are mainly derived through advertising and reputation rather than passing trade. The herb nursery is a marginal contributor to the gross turnover of this business.

Sunland Seeds and Worrall's Coopernook Store are located in Macquarie Street, Coopernook. The gross annual turnover of Sunland Seeds is derived through international and national trade throughout Australia. The business does not derive any of its income from through traffic. According to the proprietor, Worrall's Coopernook Store attracts most of its trade from residents of the village.

Survey of Employment

Most of the businesses situated along Pacific Highway employ local residents on either a full time, part time or casual basis as shown in Table 6.24. The business excluded from the table are either partially operative or do not have a significant reliance or passing trade.

Table 6.24 : Employment in Coopernook

Business	Full Time		Part Time		Casual	
	Male	Female	Male	Female	Male	Female
Bogas Service Station	1	1			1	2
Caravans at Coopemook	2					1
Coopemook Motor Inn	1	1				2
Mobil Service Station	1	1	2	4		
Coopemook Hotel	1	1			2	1
Shell Coopemook	1	1	3	2		
Wendi's Roadhouse	1	1	1	3		
TOTAL	8	6	6	9	3	6

The businesses listed in Table 6.24 employ approximately 38 employees of which 17 are male and 21 are female. Almost 37% of the employees are employed on a full time basis while 63% are employed on a part-time or casual basis. All of the full time employees are also the proprietors of the businesses.

It is expected that a significant number of Coopernook residents are employed in Taree. While most of the part-time and casual employees are from Coopernook. According to the BEC survey of 1996 there are 51 workers employed in Coopernook, almost 75% of which are employed in the retail and service industries as portrayed in Table 6.24 above.

According to the 1991 census there are approximately 13 500 workers employed in the Greater Taree Council area. Female employees account for 42% of the total workforce while males account for 58%. Employment in Coopernook provides a disproportionately low contribution to the Greater Taree workforce on the basis of population.

6.9.4 Customer Surveys

Method of Survey

Customer surveys were conducted concurrently at the three service stations and hotel located next to the Highway to obtain information on shopping patterns. Professional interviewers were used to interview customers at the three service stations and hotel on 24 and 25 April, 1997. The objective of the customer survey was to determine the following trade characteristics:

- whether trade was derived from local residents or through traffic
- the purpose of the trip
- the type of goods purchased
- the value of the goods purchased
- the frequency of stops in Coopernook

Approximately 301 customers were interviewed during the two days at the three service stations (including supplementary businesses) and the Coopernook Hotel. It is estimated that the number of customers surveyed over the two-day period accounted for approximately 60% of the total customers for that period. No customer surveys were conducted at other businesses for the following reasons:

- two of the businesses were only partially operative: Coopernook Motel (including 'The Gorilla Hut' restaurant) and 'Doo Droppe Inn', trading in caneware and craft
- two of the businesses attract irregular trade: Caravans at Coopernook and Shady Acres Worm farm, a kennels and herb nursery

The results from the customer survey were recorded on a questionnaire and transferred to a database management program. The results of the customer surveys are shown in Appendix P.

Customer Survey Results

The results of the Coopernook customer survey are as follows:

- of the total customers interviewed, approximately 14% are local residents while 86% could be contributed to through traffic
- the amount spent by customers interviewed indicate an average expenditure of $20 per interviewee
- fuel sales accounted for 66% of all sales
- almost 37% of the customers interviewed, shopped at Coopernook on a daily or weekly basis
- 70% of the customers interviewed were taking a leisure trip

6.9.5 Anticipated Business Impact of the Proposed Bypass and Mitigation

Assessment Methodology

The anticipated impacts of the proposed bypass were assessed in terms of both the perceived economic impact and the predicted economic impact. The predicted economic impact is based on the application of results of studies of bypasses at Goulburn and other centres (Parolin and Garner, 1997).

The impact of the Taree Bypass and the proposed service centre located at the bypass is also assessed based on the results of the economic impact assessment by ERM Mitchell McCotter (1995).

Perceived Local Economic Impact by Local Businesses

Proprietors of the motel, hotel, take-aways, caravan sales and restaurants all anticipated negative impacts as a result of the proposed bypass due to a significant reduction in passing trade on bypassed section of the Pacific Highway. When asked what plans proprietors have with regards to their businesses, should the bypass proceed, responses predominantly indicated that they will be forced to close their business or reduce operations significantly. However, most proprietors have adopted a 'wait and see' attitude.

Of the service station proprietors interviewed, expectations with regard the likely impacts of the proposed bypass on their business were overwhelmingly negative. Comments ranged from a significant loss of trade due to traffic being diverted to the proposed bypass to the closing down of all operations.

According to the proprietors, trade resulting from through traffic as a percentage of total trade are as shown in Table 6.25.

Table 6.25 : Stated Percentage of Turnover Based on Passing Trade

Business	% Passing Trade
Bogas Service Station	50% (normal periods) 80% (holidays)
Caravans at Coopernook	85%
Coopernook Motor Inn	50%
Mobil Service Station	70%
Coopernook Hotel	80%
Shell Coopernook	70%
Wendi's Roadhouse	90%

The only other business located on the Pacific Highway is Shady Acres (worm farm, kennels and herb nursery). According to the proprietor the construction of the bypass should have no impact on the annual turnover of the business. The only provision to continue operation of the business would be access via a local road to the main road.

Proprietors of businesses located in Macquarie Street (ie Sunland Seeds and Worrall's Coopernook Store), indicated that they would not be adversely affected by the bypass. The proprietor of Worrall's indicated that he expected some benefits from the construction of the bypass when some of the competing businesses close down. Benefits to Sunland Seeds would come from improved access and expected shorter distances and travel times.

The proprietors of the three service stations believed that with the construction of the bypass, Coopernook would be able to support one service station only to serve mostly local needs. The total estimated perceived loss in annual turnover for Coopernook when the bypass is constructed is in the order of $4.5 million per annum. Taking into account that the village could sustain at least one service station the potential loss of local employment could be in the order of four full time employees and around 7 part time or casual employees.

Businesses located next to the Pacific Highway (ie. service stations, take away) predominantly indicated that the only strategy to continue business would be to relocate to other locations in the district and elsewhere. Other strategies, increased business hours, diversification of product lines, advertising, were regarded as ineffective alternatives by proprietors. Some proprietors (motel) suggested that roadside advertising and signage might be a possible alternative.

The maintenance of the Coopernook Hotel and Coopernook Motel as viable enterprises would be related to the extent to which the proprietors would be able to exploit the amenity advantages created by the bypass. Expenditure by individual overnight stayers are generally higher than that of individuals passing through town. Expansion of the overnight stayer market could contribute significantly to the Coopernook economy and offset possible losses incurred from reduced through traffic.

Predicted Economic Impact

The estimation of the predicted economic impact is based on the results of the customer survey and consideration of studies for other rural towns with bypass roads.

Based on the results of the customer survey, more than 80% of the total trade of businesses located next to the Pacific Highway is derived from through traffic. This is substantiated by the Connell Wagner traffic assignment (Appendix D) indicating that approximately 80% of the current traffic will be diverted to the proposed bypass. The customer survey indicated that 66% of all highway traffic stopping in Coopernook does so to purchase fuel. Most vehicles stopped at the fuel retailer that offer the easiest and quickest access and that required the least effort. Fuel in Coopernook is also cheaper than in Taree and therefore attracts through traffic from Taree. It is significant that, of the total number of customers interviewed, almost 32% stop in Coopernook on a weekly basis indicating a large proportion of regular trade. It is expected that a large proportion of the regular trade at service stations could be due to the proximity of the service stations and the fact that service stations in Coopernook offer fuel at discount prices.

It is noted that even if the Lansdowne River Bridge remained open, the bypass would cause a major reduction in passing trade resulting in business effects of the same order of magnitude as those presented in this Section.

An evaluation of the economic impacts of bypasses on country towns undertaken by Parolin and Garner (1997) indicated that the actual impacts of bypasses at the towns of Goulburn, Yass, Mittagong, Gunning and Berrima were considerably less than initially anticipated. The study indicated that the reductions in gross annual turnover were 4.9% for Goulburn (1991 population 21,425) and 15.2% for Yass (1991 population 4,835). The reduction in gross annual turnover of businesses resulting from the opening of the bypass roads has been more pronounced at Yass than at Goulburn. A comparison between Goulburn and Yass indicated an increase in the impact of the bypasses in relation to the size of the population of the town.

The overall proportion of businesses reporting a reduction in gross annual turnover since the diversion of traffic is approximately 41.3% for Goulburn and 43.8% for Yass. The severity of the impact varied considerably between businesses with most businesses indicating a decrease in annual turnover of less than 10% and many businesses surveyed indicating no reduction in turnover at all.

The total number of jobs lost as a result of the diversion of traffic following the opening of bypass roads was Goulburn (58), Yass (88), Mittagong (10) and Gunning (5).

Considerably more jobs have been lost at Yass than predicted in the EIS prepared in 1987 - seven years before the opening of the bypass. The difference between the figures was largely the result of the closure of service stations that could not have been foreseen at the time the EIS was prepared. The number of jobs lost at Yass as a result of the bypass as a proportion of the total number employed at businesses surveyed was 14%. No information is available on the transfer of jobs in the local area and district.

The magnitude of the impact of bypasses on gross annual turnover and employment varied considerably according to the type of business. Businesses primarily serving the needs of transient motorists are the most affected. These businesses include service stations, restaurants and fast-food outlets. Establishments providing accommodation (motels and hotels), have not been affected to the same extent. The reduction in employment has also been the greatest at service stations, restaurants and fast-food outlets. Approximately one third of the those businesses surveyed indicated a loss of more than 30% of gross annual turnover while a number indicated losses of more than 50%. Together these accounted for 81% of the total job losses at Goulburn and almost all of the job losses in Yass (Parolin and Garner, 1997).

An examination of the travel related characteristics of motorists indicated that after the Yass Bypass opened the number of motorists stopping at the town decreased by half - (33% to 16% of the total traffic). It has been estimated that this has resulted in a nett decrease in the value of Highway trade of some $11 - $15 million annually, a 50% reduction of the estimated $22- $31 million generated from the Highway before the opening of the Yass Bypass. A comparison of through traffic and the estimated reduction in total gross turnover indicated ratios of $2.39/vehicle/annum for Goulburn and $2.37/vehicle/annum for Yass.

The impact of the proposed bypass on Coopernook is expected to be relatively more severe than that for Goulburn and Yass due to the following reasons:

- Coopernook has a much smaller local population to support local business;
- Businesses in the retail sector are predominantly located next to the Highway;
- Through traffic accounts for more than 80% of the customers surveyed at businesses located next to the Highway.

Based on the results of previous studies, the economic impacts on service stations and complimentary businesses (i.e. restaurants and fast-food outlets) will be the most severe. Impacts on the hotel and motel are expected to be of a lesser extent than indicated by the proprietors on the basis of the potential for improved amenity of village and experience from Goulburn and Yass (Parolin and Garner, 1997). Measures to market Coopernook as a tourist and stopover destination and by individual proprietors to market their own businesses may alleviate anticipated losses at the motel and hotel. The proprietors of both the hotel and motel indicated that accommodation is not utilised to its full potential. It is expected that with the reduced noise and lesser emission pollution these business have an opportunity to become more attractive to through traffic.

The retail turnover indicated by the Coopernook business proprietors, is comparable to that of Gunning, with a similar population, which was $5.6 million. Based on previous studies it is expected that the reduction in annual retail turnover for the service stations could be in the order of half existing turnover while the reduction in turnover for the motel and hotel are likely to be significantly less. Should the service stations in Coopernook continue to offer discounted fuel, it is expected that a proportion of the through traffic to and from Taree will continue to purchase fuel at Coopernook, thus reducing the potential loss in passing trades and consequent turnover to below the levels predicted.

Although the expectations of proprietors, with regard the likely impact of the proposed bypass on their businesses, were overwhelmingly negative, past studies indicate that the impacts of bypass roads on rural towns are significantly less severe.

Most highway business proprietors suggested that the only feasible solution was to relocate their businesses. However, past research has indicated that in many cases enterprises adjusted the way they conducted their business through increased promotions, signage and advertising or through diversification of their product lines. Other options available include more emphasis on customer service, longer operating hours, improvement of business appearances or reductions in advertising costs, rent, opening hours and level of service. The location of a town entrance feature and suitable signage is also important to advise motorists of the range of business services and products available in Coopernook.

From a regional perspective it is anticipated that the loss in turnover and expected job losses at Coopernook would transfer to other locations or businesses in the Taree Region. Although the anticipated loss of business in Coopernook as a result of the proposed bypass could not be directly offset against the environmental and amenity benefits derived from the diversion of traffic (i.e. less noise from trucks, less pollution, safer roadways and possibly fewer accidents), it could generally increase the attractiveness of the village. The environmental benefits derived from the diversion of traffic could induce new business opportunities and also increase the viability of Coopernook as a residential satellite of Taree.

Impact of Taree Bypass and Proposed Service Centre

Most of the proprietors interviewed anticipated an increase in retail turnover when the Taree Bypass is completed. This would however be offset by the proposed service centre at the Taree Bypass. An assessment of the impact of the proposed service centres (ERM Mitchell McCotter 1995) indicated that there would be a transfer of income and employment between the existing service stations and the proposed new centre. It is expected that the proposed new facility would generate a similar amount of jobs than those lost at existing service stations. The assessment indicated that additional jobs may be created from capturing latent demand. At Yass, the recorded job losses at service stations have been offset to a large extent by new positions created at a new service centre located at the exit from the bypass to the north of the town which became operational at the end of January 1996.

The expected additional turnover and jobs created by the proposed service centre at Taree could be a recipient of the economic activity transferred from Coopernook. Other highway businesses at Moorland and Johns River may also achieve turnover and potential employment benefits.

The assessment of the Taree Bypass also suggested that if the proposed new centre offered discounted fuel, a proportion of local customers may be attracted to purchase fuel at the new centre, further detracting from business from existing service stations. This could prove to be detrimental to service stations in Coopernook which already offer discounted fuel and attract local Taree customers.

6.9.6 Other Social Impacts

Access and Safety

The Proposed bypass would have implications for access to homes, rural properties and community facilities. In the case of Coopernook village, residences and facilities access onto the existing highway would be greatly improved due to its local road status. Severance by the highway would be reduced. Access from the village to Spring Hill and the cemetery would be more direct and significantly safer. Rural properties at Spring Hill would be able to access the proposed highway via a single intersection with improved sight distances.

Coopernook Village Amenity

The relocation of the Pacific Highway traffic some 800m east of the village would result in a significant reduction of the noise, dust, safety and visually intrusive impacts of a major highway. Coopernook Village would regain a peaceful character and an opportunity would be created to further enhance the attractiveness of the village by the joint development by the community, council and RTA of a landscape plan for the former highway (refer Section 6.7.4). Improved living conditions and attractiveness of the village would also create opportunities for increased residential growth and tourist business opportunities based on the heritage character of the village and on development opportunities east of the former highway and other areas no longer affected by traffic and potential severance such as near the Lansdowne River Bridge site. Improved upstream waterway access for vessels up to 5m clearance may also have the potential to generate tourist business activity.

Community Interaction During Construction

The construction of the proposed bypass east of the village of Coopernook would minimise disruption during construction to both residents of Coopernook and road users. Harrington Road would remain open throughout the construction of the project.

Rural residents near the construction site would be kept informed of potentially disruptive activities which would be managed under the construction stage EMP (refer Section 7.0). Should the project be approved, the RTA would commence negotiation for part or whole acquisition of land required for the highway reserve. The RTA has consulted regularly with all potentially affected landowners and a mechanism for fair resolution of property adjustment is available according to the process outlined in Section 5.2.

Community interaction would occur during the detailed design phase of the landscape works, particularly in regard to the final bridge design, town entrance at Harrington Road and any improvement works throughout the village associated with the transformation of the existing highway to a local road. This would ensure that the entire bypass and other changes to Coopernook take into account the needs of the local community, and that the final design reflects the local landscape character and values of its residents.

6.10 Agriculture

6.10.1 Introduction

An assessment of the impacts of the proposed traffic relief route was undertaken with respect to the agricultural capability of the study area and the specific effects on individual farms. This assessment is reported in full in Appendix O. The report provided information on the following aspects:

- nature of agricultural lands affected by the proposed bypass
- broadscale estimation of the land capability for potential agricultural enterprises
- current land uses, nature and extent of the properties and major agricultural enterprises
- impacts on agricultural production

The broad impacts of the proposed traffic relief route was investigated using published data sets interpreted by a qualified agronomist (R.J.Doyle, Sanders & Associates) and landowner interviews.

The affected agricultural land is zoned as 'Rural General' 1(a) which includes poorly drained land, and 'Rural Valley Agriculture' 1(b1) which is situated on the better drained and potentially more productive portions of the floodplain.

6.10.2 Agricultural Suitability and Land Capability

The majority of the affected land is regarded as Agricultural Suitability Class 3 (refer Figure 6.13) being grazing land well suited for pasture improvement and rotation of cultivation with moderate overall production levels due to environmental constraints (especially flooding, salinity and drainage). Most of land affected is below the 1:10 year flood level and soils are seasonally waterlogged. However, portions near the northern section of the floodplain are more frequently waterlogged and support wetland communities.

The majority of the land affected has the characteristics of Land Capability Class IV (Sanders & Associates, 1997). This land has a low to moderate soil erosion hazard, with the highest risk occurring during flooding. Parcels of less well drained land are classified Land Capability VI. This land can be grazed but is not suitable for cultivation. The gullies, creeks and wetland areas are classified Land Capability VII or VIII and are the least suitable for grazing.

The current land use on each property directly affected by the proposed traffic relief route was assessed through individual discussions with the owners or managers. The major production systems were dairy production (2 farms) and beef rearing/fattening (4 farms). Cultivation (other than hay) occurs on a single property at the northern edge of the floodplain which has six hectares under cultivation for watermelons and pumpkins. However, the predominant use of this property remains cattle rearing and fattening.

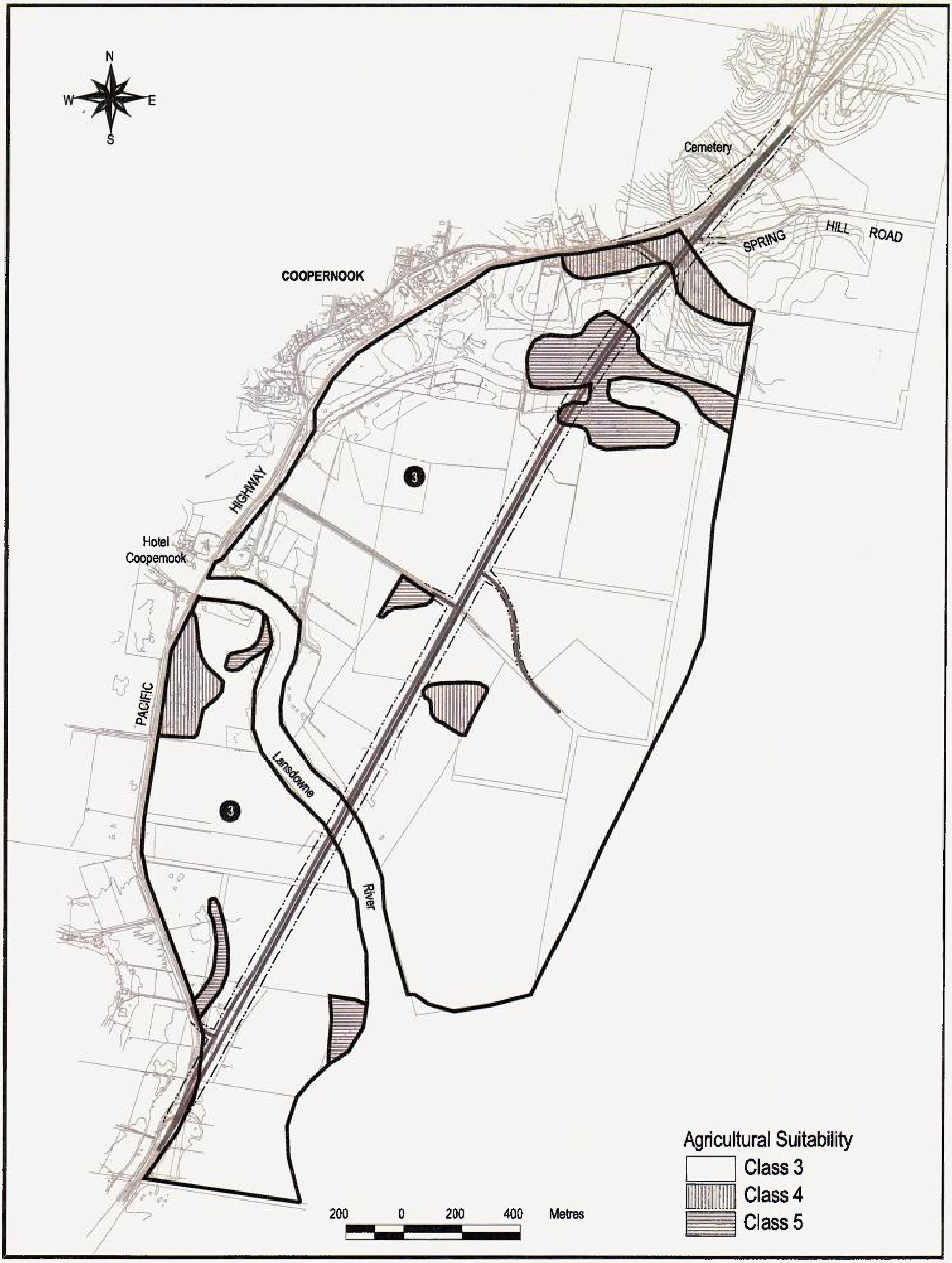
6.10.3 Impact on Agricultural Production and Land Value

The impact of the bypass options on agricultural production include:

- loss of land and productive capacity to produce income over time
- effect of land severance on management and operations
- loss of access to public roads and other parts of the farm
- loss of capital expenditure on farm improvements
- disruptions to flood strategies

The severity of the impact of the proposed bypass on agricultural land was based on the following premises:

- Direct loss of agricultural land taken up by the bypass including land deemed lost for agricultural purposes (market value at approximately $10,000/ha, which is a median value for productive agricultural land in the Coopernook floodplain area sourced from agricultural land agents in the district).
- The potential gross margin of the major farm enterprises aggregated over a period of 15 years (It was considered that this period would allow the landowner an adequate adjustment time).
- The results of the individual property assessments of a wide range of perceived impacts on the property management system including severance and stock access.



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 6.13 :
AGRICULTURAL SUITABILITY

Future trends in agricultural production are positive. Although the beef market is currently depressed, information obtained from the Australian Bureau of Agricultural Resource Economics (ABARE, 1997) indicates a recovery in beef prices forecasted for 1997/98. This is mainly due to an expected tightening of US beef supplies and an increase in Japanese import demand. The saleyard price is predicted to increase by approximately 13% while the retail price is expected to increase by around 7% in 1997/98, based on ABARE forecasts.

Australian manufacturing milk prices are forecast to rise in 1997/98 in response to an expected improvement in export returns. The manufacturing milk price is expected to increase by around 4% while the market price is expected to increase by around 3% in 1997/98.

Table 6.26 illustrates the effect of the proposed bypass on each of the affected properties in terms of direct loss of land, the major enterprise, loss in gross margin and the severity of the impact. The information has not been derived by valuation but from an overview of a variety of sources.

Table 6.26: Direct Effect of Proposed Bypass on Beef and Dairy Income and Land Value

Industry	Estimated Loss in Gross Margin (15 Years)	Estimated Loss of Land Value	Total Estimated Impact
Beef	$ 39,000	$ 179,000	$ 218,000
Dairy	$ 170,00	$ 67,000	$ 237,000
Total	**$ 209,000**	**$ 246,000**	**$ 455,000**

The estimated cost of the impact of the proposed bypass is around $450,000. This estimate includes losses related to a decrease in expected gross margin (over a 15 year period) and the value of land lost. This estimate should not be seen as an indication of compensation but as an indication of the effect of the proposed bypass on agricultural land cost and potential.

Table 6.27 overleaf illustrates the severity of the impact of the proposed bypass on each farm.

Table 6.27: Effect of Proposed Bypass on Rural Properties in the Corridor

Farm[1]	Major Enterprise	Management System	Flooding	Drainage	Loss of Land
ACEP Pty Ltd	Beef	Major severance of land due to bypass dissecting property. Change fencing layout. Replace stockyards. Stock access beneath Highway to be available.	No measurable change in flood levels	Drainage would be reinstated/ integrated with Highway drainage	7.1 ha
Birkett	Dairy	Severance caused by loss of strip of land along southern boundary. Current development programme requires direct access to land holdings north of Harrington Road.	No measurable change in flood levels	Drainage would be reinstated/ integrated with Highway drainage	4.3 ha
Sheather	Dairy	Minimal impact. Loss of a strip of land along northern property boundary. Fencing would be required.	No measurable change in flood levels	Drainage would be reinstated/ integrated with Highway drainage	2.4 ha
Bignell	Beef	Minor loss of a small portion of land along southern boundary. Refencing would be required.	No measurable change in flood levels	Drainage would be reinstated/ integrated with Highway drainage	1.5 ha
Gibson	Beef	A significant proportion of the property would be affected by the bypass. The Southeast portion of farm will be severed and lost to production as part of this farm.	No measurable change in flood levels	Drainage would be reinstated/ integrated with Highway drainage	5.1 ha
Chapman	Beef Limited horticulture (melons and pumpkins)	A significant proportion of the property would be affected by the bypass. The Southeast portion of farm will be severed and lost to production as part of this farm.	No measurable change in flood levels	Drainage would be reinstated/ integrated with Highway drainage	4.2 ha

Note [1] : Property owners identified on ownership Figure 5.9

6.10.4 Conclusion

The flood plain of the Lansdowne River comprises rich alluvium soils which are prone to regular flooding. Soils are moderately deep to deep, and have good available water capacity. Erosion damage or hazard is low to moderate. Soils have a moderate to high capacity to withstand frequent cultivation and artificial irrigation without serious damage. Economic losses caused by floods are medium to high in the long term.

The majority of the land is classified as Agricultural Suitability Class 3 which is moderate to good grazing country and may be cultivated in rotation with pasture. Where the proposed bypass crosses Coopernook Creek there is some land which is unsuitable for agriculture. The land resumed for the proposed bypass is classified Land Capability IV (land suitable for cultivation on a regular basis) except for a small section where the bypass crosses Coopernook Creek. This section is classified Land Capability VIII (land unsuitable for agricultural or pastoral uses).

The impact on the existing agricultural enterprises varies from property to property. While flooding and drainage impacts are similar for all properties, the loss of land and the loss of agricultural enterprise is specific to each property especially where property management systems are affected due to access constraints as in the case of the Birkett's property. Due to the level of the road it would not be feasible to install stock or vehicle accesses beneath the embankment other than beneath the main Lansdowne River Bridge on both sides of the river.

6.11 Planning and Land use

The permissibility of the proposal and the approvals process are described in Section 1.4 of the EIS.

A range of statutory planning controls influence land use within the study area by controlling the range of future development which is permissible in zones and by highlighting factors for consideration in the determination of future land use and development decisions (refer Section 6.11.2). Figure 4.2 illustrates the land use patterns in the study area while Figure 6.14 shows the zoning under Greater Taree City Council Local Environmental Plan (GTLEP),1995.

6.11.1 Existing and Future Land Use

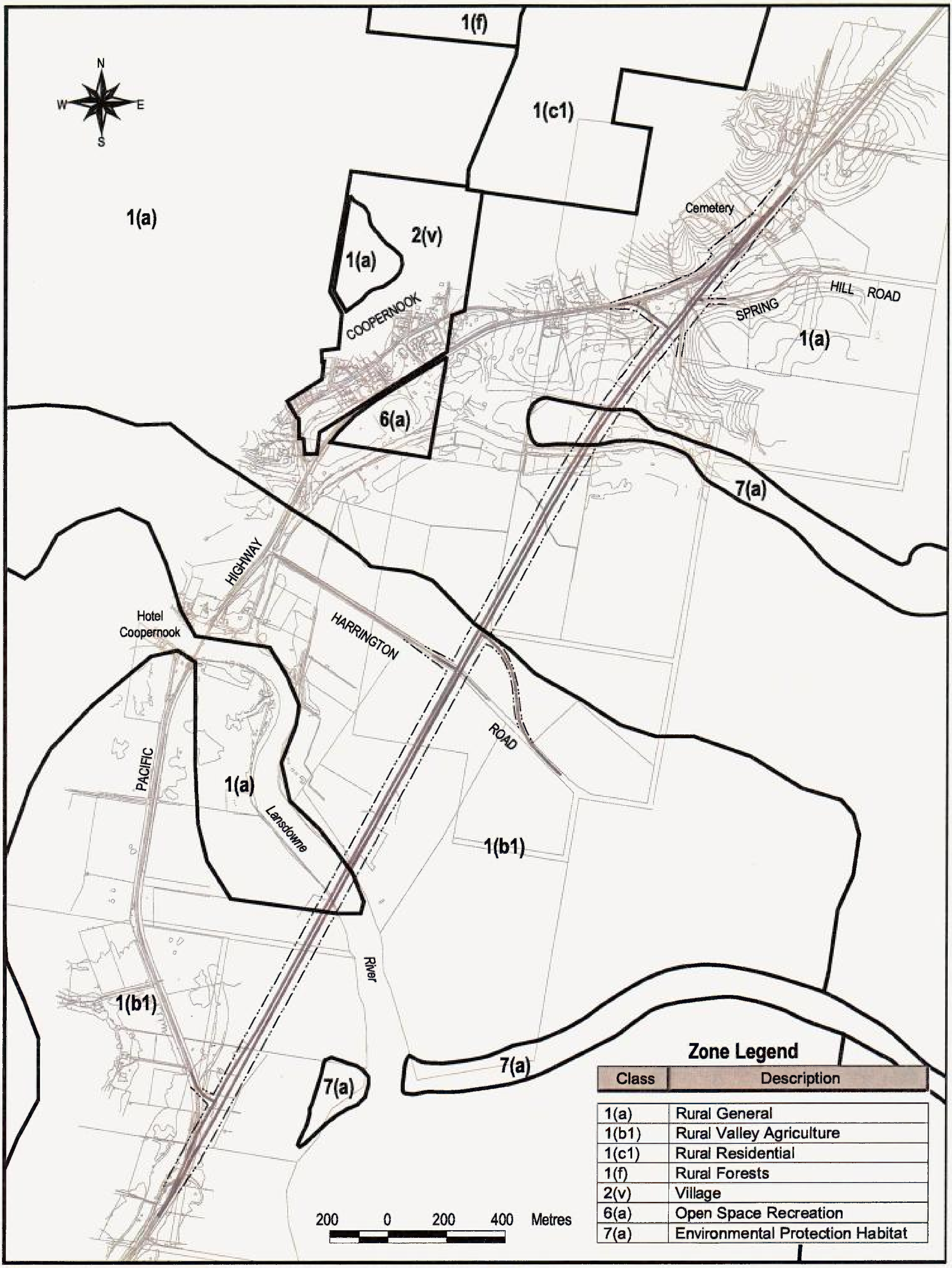
Land use within the study area is influenced by several factors including the agricultural capability of moderately to well drained and less saline portions of the fertile Lansdowne River floodplain and the suitability of the undulating land north of the floodplain for small rural lot and residential development around Coopernook.

Land use in the study area can be grouped in the following main categories:

- Coopernook Urban Area
- Rural Small Holdings
- Rural Pasture
- Native Vegetation
- Extractive Industry

Coopernook Urban Area

The township of Coopernook is located on the existing Pacific Highway alignment approximately 800m west of the proposed road. Coopernook has a population of around 440 residents and consists mostly of older style detached housing with focuses on the main street, Macquarie Road and the Pacific Highway. Highway frontage commercial activity includes service stations, a motel, hotel, caravan park/showroom and gift shop. A sports oval is located on the eastern side of the existing Pacific Highway.



Class	Description
1(a)	Rural General
1(b1)	Rural Valley Agriculture
1(c1)	Rural Residential
1(f)	Rural Forests
2(v)	Village
6(a)	Open Space Recreation
7(a)	Environmental Protection Habitat

Figure 6.14 : ZONING BOUNDARIES

The potential for minor infill development under existing zoning instruments exists on undeveloped lots within the existing village zone, however further rural residential development growth (ultimately 25 lots) is expected to the north east of Coopernook corresponding with eventual sewering of the community. The residential amenity and attractiveness of the village as a lower cost and more peaceful living place for commuters to Taree would increase with the construction of the proposed highway.

Rural Small Holdings

Small rural lots ranging from 0.4ha to 10ha occur on undulating land north and east of Coopernook above the northern edge of the Lansdowne River floodplain. The lots include rural dwellings/holding farms with small areas of gardens and cultivation, and several head of cattle.

Rural Pasture

The majority of the Lansdowne River floodplain is cleared and drained for pasture. Dairy farming occurs on improved pasture while cattle grazing occurs throughout less well drained and more saline pastures. The majority of properties are in excess of 40ha in area. An agricultural capability assessment of the study area is provided in Section 6.10 of the EIS.

Native Vegetation

A flora and habitat assessment has been undertaken as part of this study in Section 6.6. Native vegetation along the route through the floodplain is restricted to the mangrove lined banks of Lansdowne River and Casuarina lined banks of Coopernook Creek with some regrowth in poorly drained portions of the floodplain. Open forest patches occur on the uncleared hill slopes adjacent to Coopernook cemetery and on the southern foot slopes of Spring Hill.

Extractive Industry

Two existing and one abandoned quarry occurs near the northern end of the project. The quarries are used to extract fill material from Spring Hill (Gillogly and Gosling quarries)while gravel deposits have previously been extracted from the abandoned (Chapman) quarry on the margin of the floodplain immediately north of Coopernook Creek. The resource potential of these quarries is discussed in Section 5.0 with respect to sources of fill for the road construction.

Land Use and Amenity Impacts and Proposed Safeguards

An important effect of the proposal on local land use would be the improvement of the residential amenity of the village of Coopernook caused by the removal of a significant proportion of traffic on the existing Pacific Highway. The enhancement of the acoustic and visual environment as well as improved traffic and pedestrian (and equestrian) safety would revive the perception of the village as a quiet rural community. It is not possible to predict whether this factor will increase the expected rate of growth and uptake of residential/rural residential lots. However, this factor together with the planned connection of Coopernook to the sewer and reduced travel time to Taree will be influences which encourage urban growth of Coopernook.

The declassification of the existing Pacific Highway to local road status would remove a statutory constraint to direct property access. This situation may create opportunities for subdivisions adjacent to the highway which do not have alternative access. In particular, the opportunity would exist for individual property access to subdivided lots in the Pullen/GM Gibson property. Generally the relocation of the highway would remove a severance constraint to urban growth east of the Pacific Highway and assist in the reintegration of development east of the town (including the oval) with the rest of Coopernook. The construction of a high standard at-grade "staggered-T" intersection between the proposed highway and Harrington Road would alleviate a potential traffic capacity constraint to urban growth in Harrington. Also the improvement of the Spring Hill Road intersection may remove a planning constraint to higher density rural development of properties accessing this road east of the highway.

Similarly, the removal of the existing highway bridge would enhance opportunities for recreational and tourist waterway access to Coopernook and some 8-10km further upstream along the Lansdowne River. Opportunities for large vessel (eg launches and houseboats) to access upstream of Coopernook may create business opportunities at the Coopernook Hotel and its vicinity.

The increased flood immunity of the proposed highway, especially the bypassing of low points at Harrington Road intersection and immediately south of Lansdowne River bridge would contribute to a minor reduction in use of the Lansdowne flood detour route on narrow local roads. Rural communities along Lansdowne Road would benefit from less frequent diversion of highway traffic during minor floods.

As discussed in Section 6.10 the land take of approximately 26ha of mostly grazing land for the proposed road reserve, represents a marginal reduction in agricultural productivity of the local area. The alignment of the highway would necessitate property adjustments to overcome property and stock access issues and ensure that sufficiently large contiguous grazing areas are available to sustain the future viability of adjusted properties. Mitigation measures relevant to agricultural land use impacts are discussed in Section 6.10.

The acquisition of the severed residue of several properties adjacent to Coopernook Creek would create an opportunity for significant wetland habitat compensation and native landscaping. This would involve the removal of around 10ha of poorly drained low agricultural productivity grazing land from its current low intensity but potentially damaging grazing use.

The loss of a strip of agriculturally productive land and the consequent property management difficulties is the major land use impact of the proposal. This impact occurs in the context of an important shift of noise and traffic away from the village of Coopernook and consequent amenity improvements to the residents of the village. The improved amenity of the village may encourage further residential growth which may create demand for further services.

The potential loss of some highway business due to a reduction in passing trade would lead to a readjustment of highway fronting land use most likely to residential or local business uses.

It is not possible to fully mitigate the land use impacts of the proposal, however it is proposed to enhance the positive effects and dampen the extent so that the negative land use impacts are significantly reduced by:

- creating a prominent and attractive landscaped feature entrance for Coopernook at the proposed Pacific Highway intersection
- negotiating with directly affected property owners in the best manner of property adjustment and access re-arrangement as well as acquisition opportunities

- promotion of the development by the community of a former highway landscape strategy through Coopernook
- compensating the loss of wetland habitat by the rehabilitation and expansion of wetlands on residential land adjacent to Coopernook Creek
- installing appropriate signage for visitors to Coopernook (and Harrington) at key intersections
- promoting recreational watercraft access upstream of the Lansdowne River Bridge
- reinstatement of local drainage and avoidance of exacerbating flood conditions on local properties.

6.11.2 Statutory Planning Considerations

State Environmental Planning Policy No. 14 (Coastal Wetlands)

SEPP 14 was gazetted with the aim of preserving and protecting coastal wetlands. The policy applies to any development that has the potential to damage or destroy wetlands. Under SEPP 14, developments such as road construction are designated developments within the meaning of the Environmental Planning and Assessment Act and are only permitted provided consideration has been given to other feasible alternatives (refer Section 4.4), the environmental consequences of the Proposal and the intended safeguards (refer Section 6.6). Additional works to preserve or enhance surrounding wetland must also be taken into consideration, as should the consistency of the Proposal with respect to the National Conservation Strategy.

SEPP 14 wetlands are defined by a series of maps produced and periodically updated by the Department of Urban Affairs and Planning. Figure 6.14 shows the location of SEPP 14 wetlands in the study area within the 7(a) Environmental Protection Zone. Figure 6.11 is an aerial oblique photograph of the wetland crossing. Features of these wetlands and the impact of the Proposal are addressed in Section 6.6.

SEPP 14 requires that the consent of Council (Greater Taree City Council) and the concurrence of the Director of the Department of Urban Affairs and Planning must be obtained before development can occur. The development is not prohibited in this zone on the basis of the performance criteria for 7(a) Environmental Protection Habitat Zone. The assessment of that portion of the highway route which cross SEPP 14 Wetland No. 545 is undertaken according to Part IV of the EP&A Act (1979). The conclusion of this assessment is that there would only be localised direct effects on the wetland at the site of the bridge crossing that would not damage the habitat ecosystem.

State Environmental Planning Policy No. 4 (Development Without Consent)

The objective of SEPP 4 is to allow certain activities, such as roads, which are listed as being permissible only with development consent under the relevant local planning instrument to be undertaken without requiring development consent. A further discussion of the implications of SEPP 4 on the permissibility of the Proposal is included in Section 1.4.

It is noted that savings clauses are included in Greater Taree Local Environment Plan (Schedule 3, Clauses 6 and 7 GTLEP, 1995), however these clauses are not interpreted to apply to road infrastructure construction and road works within existing road reserves or zoned reservations and are not directly relevant to the proposal.

There are no other SEPP's which apply to the Proposal. In particular, the following do not apply to the proposal: SEPP 19 - Bushland in Urban Areas, SEPP 26 - Littoral Rainforests, SEPP 44 - Koala Habitat Protection and SEPP 46 - Protection and Management of Native Vegetation (as less than 2ha of native vegetation would be affected outside the SEPP 14 wetland).

Hunter Regional Environmental Plan (REP)

The Hunter Regional Environment Plan, 1989 was developed to provide a framework for integrated action between various state government authorities and councils in respect of the region which extends from Greater Taree in the north throughout the remainder of the Hunter River Catchment to the south and west.

The REP sets requirements and provides guidance to:

- Councils preparing Local Environmental Plans
- Public authorities on the likely future needs of the region
- Consent and determining authorities as to how proposals ought to be determined
- The community and business on the way regional growth and development are to be managed.

Of specific relevance to the proposal are the overall objectives of the plan and the principles and policies for control of development relating to transport, economic development and environmental protection. Relevant highway related policies which have been addressed through the EIS include:

- to ensure that traffic management techniques are utilised to optimise the use of the existing road systems
- to ensure that new or upgraded roads are constructed to meet identified demands (including bicycles) and that their impact is minimised
- to control direct access onto main roads
- to facilitate the segregation of though and local traffic in developed areas
- to restrict development accessing high speed roads
- to maintain an appropriate acoustic environment
- to ensure the development of the road system is consistent with maximising access to Newcastle as the regional centre, other employment noted and tourist destinations and residential growth areas
- to protect prime crop and pasture land from fragmentation, degradation and sterilisation
- to control development to minimise air, water and noise pollution and minimise the exposure of development to environmental hazards such as soil erosion and flooding
- to protect natural areas of interest and strictly control any reduction in the extent of important natural areas, especially wetlands.

The REP Background Report, 1989 also acknowledged that in general the provision of dual carriageways, improved alignment, town bypasses and increased overtaking lanes are warranted on the Pacific Highway throughout the region.

Hunter Coastal Urban Settlement Strategy (HCUSS) 1994

HCUSS refines the REP with respect to the management of coastal growth. The strategy identifies several centres for significant population growth in Greater Taree including Taree-

Wingham-Tinonee and Cundletown. However, Coopernook and Harrington are not identified as centres likely to show significant population growth.

Greater Taree Local Environmental Plan (LEP) 1995

The proposal is entirely within the Greater Taree Local Government Area and is subject to GTLEP, 1995 (as amended). The LEP is a performance based planning instrument which requires any development proposal to be demonstrated to be consistent with any zone objectives in order to be regarded as permissible. The proposal traverses several zones which are described in Appendix Q with respect to their objectives and influence on the proposal, they include:

- Zone 1(a) Rural General
- Zone 1(b1) Rural Valley Agriculture
- Zone 7(a) Environmental Protection Habitat

The zoning of the study area is illustrated in Figure 6.14.

The LEP identifies heritage items and areas as matters for consideration and notification to the Heritage Council in relation to any development application. Development consent is not required with respect to the removal of the Lansdowne River Bridge as it is located on and over unzoned land within the arterial road reserve (the only LEP scheduled heritage item directly affected by the proposal). Heritage issues associated with the bridge and other issues are addressed in Section 6.13 and Appendix S of the EIS.

While the LEP does not adopt the Environmental Planning and Assessment Model Provisions, 1980 the instrument does include savings provisions (Clause 7) with respect to public utility undertakings. However, road infrastructure construction is not interpreted as being a specifically identified permissible use and as a result the proposal must demonstrate consistency with the LEP objectives to demonstrate its permissibility.

The objectives of the GTLEP, 1995 are stated in a tiered manner:

- Clause 9 includes the overall aims of the LEP. These note (Clause 9(I)), that the plan generally aims to "provide for future arterial road needs"
- Clause 12 includes general rural zone objectives. These include a number of objectives which are addressed in relation to the proposal in Appendix Q
- Clause 12 also includes more specific objectives relating to environmental protection 7(a) zones (refer Appendix Q)
- Clause 24 includes more specific objectives relating to environmental protection 7(a) zones (refer Appendix Q)

Accordingly, to establish that roads are permissible with consent (and hence subject to Part V assessment), it is necessary to demonstrate using Appendix Q that they are in accordance with the general aims and objectives of the plan as expressed in Clauses 9 and 12; and that they are consistent with the more specific objectives of the particular zones as expressed in Clauses 12 and 24 to the extent that these objectives are relevant to the particular case.

The analysis of the LEP zone objectives in Appendix Q establishes that:

- The proposed deviation is consistent with the general aim of the LEP to provide for future arterial road needs.

- In relation to the general objectives for the rural zones affected, and to the specific objectives for the rural zones and the environmental protection zone affected, the proposal is consistent with relative objectives in that, while it will affect these zones, it has been planned and designed to avoid or limit impacts and it includes compensation and mitigation proposals.
- In relation to the impact of the proposal on wetlands in the environmental protection zone, the highway would not damage the habitat ecosystem of the wetland but would have only manageable local effects in addition to the potential wetland habitat compensation benefits.

6.12 Aboriginal Archaeology

6.12.1 Methodology

An Aboriginal archaeological survey of the proposed route was undertaken by Jacqueline Collins Consultant Archaeologist. The purpose of the study was to:

- identify and record all Aboriginal sites and relics within the study area
- assess the significance of the sites and/or relics
- assess the likely impact of the proposed roadworks on any identified sites
- provide appropriate management recommendations for the heritage resource within the area
- consult with the Purfleet/Taree Local Aboriginal Land Council in order to ascertain Aboriginal views relevant to the project and the study area.

The findings of this report are summarised below, the full report is contained in Appendix N.

6.12.2 Archeological Context

No Aboriginal sites have been previously reported either within or in the vicinity of the study corridor, with the closest registered site lying some 6km further downstream on the northern side of the Manning River at Harrington (#30-6-35). While 42 shell middens/open campsites have been recorded to date along the local coastline and the lower reaches of the two main river channels (Manning River and Manning River South Channel), comparatively few non-coastal sites have been discovered with only 22 having been registered within a 20km radius of Coopernook (refer Table 1, Appendix N).

In addition to the registered sites, a possible scarred (canoe) tree has been reported on the western side of Ghinni Ghinni Creek some 9km south of Coopernook (Rich, 1990), while regularly used Aboriginal campsites are said to have been situated on the crest of a low ridge near Melinga (9km west of Coopernook) and beside a small creek at Kundle Kundle (10km south-west of Coopernook). The Lansdowne River's 'Wallaby Clan' has also been reported to have camped in the caves of Cross Mountain north of the village of Lansdowne and occupational debris can be expected to remain within these caves.

6.12.3 Field Investigation and Archeological Survey Methods

Field inspection of the proposed route was carried out on foot on the 16th and 17th of April 1997. The weather was fine and lighting conducive to the detection of cultural materials. An inspection across all available surface exposures along the route was carried out. These included unformed vehicle and cattle tracks, natural erosion scours, tree root disturbances and mudflats edging the Lansdowne River as well as mechanically disturbed features such as ploughed paddocks, geotechnical test pits, road and drain cuttings, road verges and clearings. The most southerly 700m section of the corridor was excluded from the survey as it was considered to have negligible level of archaeological potential.

The survey was completed as a series of longitudinal transects with the three surveyors walking approximately 10m apart and inspecting all available ground surface within their line of sight. The effective survey coverage can viewed in Table 2 of Appendix N.

6.12.4 Archaeological Survey Results

One open campsite (CTRR 1) was recorded during the survey of the proposed route (refer Figure 6.15) The site comprised nine stone artefacts which were found on the surface of a fully exposed ploughed paddock sandwiched between the southern bank of Coopernook Creek and swamp. Given that the paddock has been ploughed and appears to have been cultivated in the recent past, the Site CTRR 1 artefacts have clearly been disturbed and there is little doubt that many further artefacts will occur within, and possibly also below, the churned topsoil layer. A description of the CTRR1 artefacts found is given in Appendix N. The site is located outside the proposed road reserve.

A potential Aboriginal area was also located within the route corridor. The dry elevated location close to the Lansdowne River and backed by former swampland, together with the natural levee on the northern bank of the river would have offered excellent conditions for the establishment of an Aboriginal campsite and there is potential for subsurface evidence of such use to occur on this feature. However, no archaeological materials were found along the tidal mudflat fronting the levee or within the cuttings of the drain which dissects it, visibility elsewhere was reduced by lush grass cover.

6.12.5 Archaeological Significance Assessment and Recommendations

On the basis of the known extent, content and condition of Site CTRR 1, it is assessed to have a low level of archaeological significance. However, depending upon its subsurface context, this site does have the potential to be more significant than it presently appears to be. As stated earlier, it is expected that further artefacts would be found beneath the surface of this site, though it is not likely that any would extend westwards to the locality which may be affected by the construction of the bridge over Coopernook Creek wetlands.

Given that this will be feasible in the construction-related context, it is recommended that the identified site area (encompassing the area from the paddock's southern boundary fence to 12m north of the southern fence line; and from the paddock's eastern boundary fence to 16m west of the eastern fence line) be spared all development disturbance to enable it to be retained in its current condition. The construction of the highway embankment would not disturb this site and salvage would not be necessary.

Recommendations for the potential Aboriginal area located on the northern river levee involve the engagement by the RTA of a suitably-qualified archaeologist to conduct a pre-detailed design subsurface investigation in those areas in which excavation would be required for the construction of the Lansdowne River Bridge to establish their archaeological context.

Implementation of the above recommendation would allow for forward planning and, if a highly significant site is located, would allow time for an alternative bridge design to be developed to enable such a site to remain *in situ.*

6.13 Non-indigenous Heritage

6.13.1 Introduction

As part of the investigations for the proposed Coopernook Traffic Relief Route, an assessment of the impact of the proposed works on the non-indigenous heritage resource within the study area has been undertaken. The assessment aims to fulfil the following objectives:

- provide a description of the historical background of the study area
- identify potential heritage items within the study area and those that are likely to be affected by the proposal
- assess the impact of the proposal on the identified heritage items
- consider the statutory implications of the proposed works in terms of the effect on heritage items
- recommend further actions to be undertaken with respect to the management of heritage items

The following activities have been undertaken in the assessment:

- review of existing literature in relation to non-indigenous heritage in the study area
- assessment of significance of heritage items using the NSW Heritage Manual guidelines
- assessment of the statutory implications of local, regional and state planning instruments

6.13.2 Historical Background of the Study Area

The study area is located within the Manning River valley. The existence of the Manning Valley was reported by John Oxley in 1818 on his overland journey southward from Port Macquarie. Settlers to the area first began to arrive in 1827 and timber getting and agricultural activities dominated the region's early economy (NSW Heritage Office, 1996).

The first settlers attempted to grow tropical crops including sugar cane but 'conventional' pastoralists soon followed. Major agricultural pursuits associated with early settlers included cattle stations and timber felling. Wheat was another early crop, but by the 1860's the success of this crop had failed and maize became an important source of revenue. By the 1870's, sugar cane was being cultivated in the region. Dairying revitalised the stagnant agricultural economy in the late 1880's. The general decline in dairying in recent years has led to the region becoming less dependant on rural activities. Beef cattle production is one of the activities still undertaken in the region (NSWHO, 1996).

The earliest settlements in the area related to pastoral activities. By the 1850's the first government towns were becoming established. A number of private towns were also developed as service centres due to their proximity to transportation routes or as a result of the establishment of sawmills or shipbuilding towns (Suters Architects Snell, 1990).

Coopernook developed as a result of the establishment of sawmilling and shipbuilding activities and was surveyed in 1885. It was typical of one of many small villages established in the lower Manning in the late nineteenth century (Suters Architects Snell, 1990). Early settlers in the region included Michael Caffrey in 1854 who ran a boat building company and managed Coopernook Station, Henry Kitz who owned the property from Macquarie Street to High Street and Thomas Hogg who owned land at Johns River and Coopernook and who was one of the earliest Justices of the Peace and Court Magistrates and who was instrumental in establishing Coopernook's Court House (Coopernook Centenary Committee, 1990).

During the early 1900's, Coopernook was the main trading centre for the areas of Moorland, Johns River, Hannam Vale and Lower Lansdowne. Businesses that existed at that time included four general stores, two hotels and two blacksmiths. A sawmill and extensive shipbuilding business also operated (Coopernook Centenary Committee, 1990).

Transportation played a major role in determining the pattern of development. Shipping was the most important transportation form into the early twentieth century, as evidenced by the remains of the timber wharf at Coopernook. The proximity of villages to the River, such as Coopernook, increased their viability as settlements. The development of the rail line and the Pacific Highway led to the easier access to the inland towns (Suters Architects Snell, 1990).

Little evidence remains of the earliest phases of development up until the 1870's. This due to the temporary nature of construction and the disappearance of centres once sources expired. Several examples of later items exist that demonstrated the scale and character of early development in the area including buildings and wharfs in both urban and rural areas (SAS, 1990).

6.13.3 Heritage Items within the Coopernook Area

The identification of heritage items within the study area has been undertaken using a variety of sources. The Coopernook village area and surrounds includes a range of items which demonstrate the scale and character of township associated with the timber industry in the late nineteenth century (SAS, 1990). The following items have been identified as being of potential heritage significance and are scheduled as heritage items in GTLEP 1995:

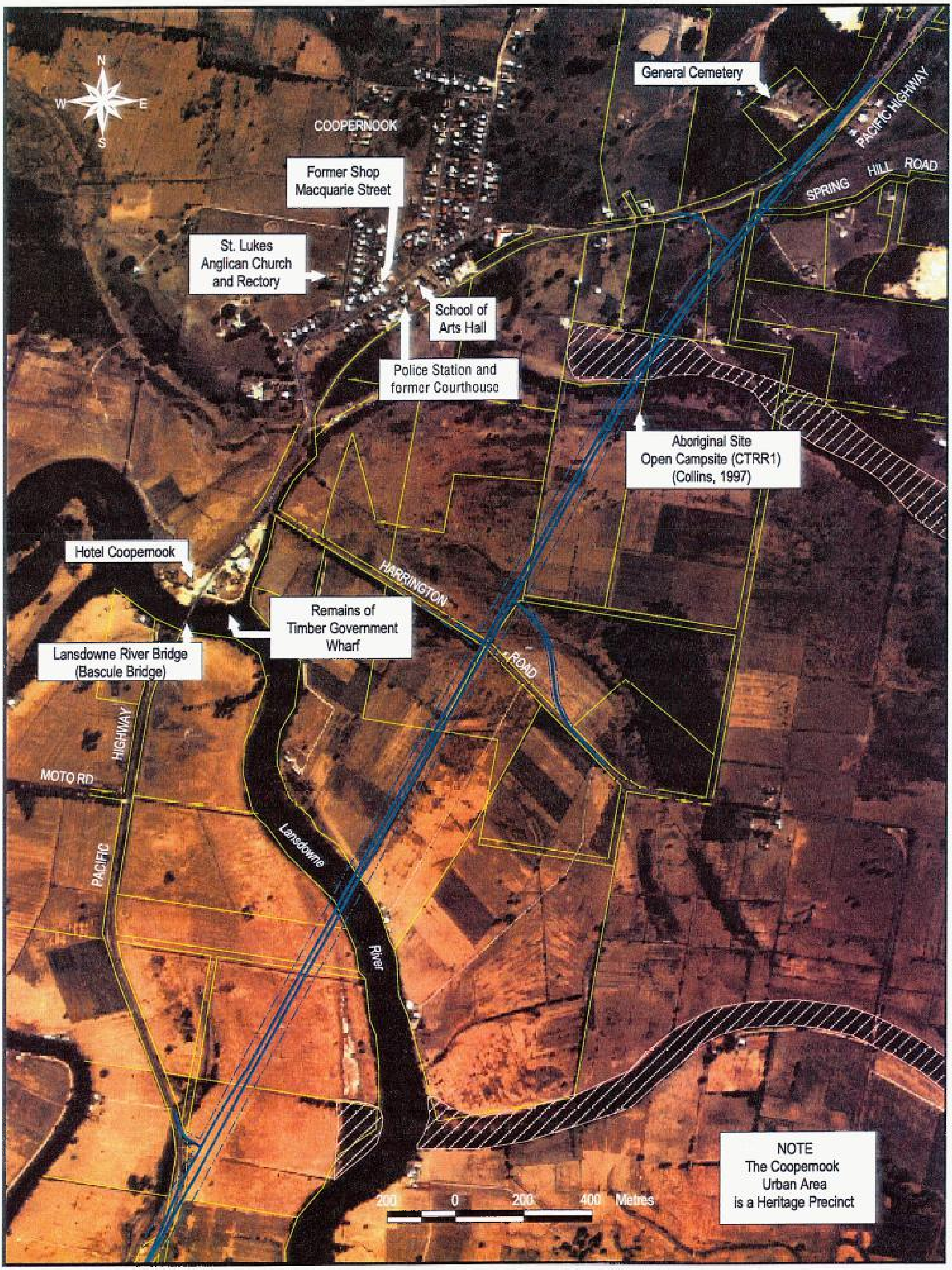
Coopernook Village Area

- Coopernook Urban Area (includes 16 dwellings including former shop and Anglican Rectory)
- Coopernook School of Arts Hall
- Coopernook Police Station and Former Courthouse
- Hotel Coopernook
- St Lukes Anglican Church
- War Memorial and Memorial Park
- Post Office
- Public School Buildings and residence
- Uniting Church Manse

Other Items

- Bascule Bridge over the Lansdowne River
- Remains of Timber Wharf
- General Cemetery

The location of these items is shown on Figure 6.15.



Connell Wagner
COOPERNOOK EIS
5606.01.CE

**Figure 6.15 :
HERITAGE ITEMS
Recorded by GTLEP, 1995**

6.13.4 Description of Proposed Works

This section aims to provide a description of the proposed works with emphasis on the activities that will affect the heritage items discussed above. A detailed description of the proposed works is provided in Section 5.0 of the EIS.

The proposed works involve the development of a bypass of the Pacific Highway around the village of Coopernook. The proposal involves the construction of a new bridge over the Lansdowne River to the south of the existing Bridge as described in Section 5.0. The existing Bridge is proposed to be dismantled and removed as discussed in Section 5.1 of the EIS.

There would be no direct impact on any item within the Coopernook Village area. There would be a net reduction in traffic passing through the Village which may result in some indirect impacts such as loss of passing trade for businesses and improved amenity in the Village.

There would be an indirect impact on the general cemetery as a result of safer access. There would be no effect on the remains of the timber wharf and as such no further discussion of this item is provided in this assessment.

6.13.5 Statutory Considerations

This section provides a summary of the relevant heritage legislation that may apply to the proposal and the implications for the proposed works:

NSW Heritage Act

Under the provisions of the NSW Heritage Act 1974, there are two main mechanisms for protecting items of environmental heritage. These are as follows:

- placement of interim or permanent conservation orders on items
- protection of items as 'relics' as defined under the Act

There are no interim or permanent conservation orders applicable to the Bridge.

The definition of a 'relic' according to the NSW Heritage Act is as follows:

'...any deposit, object or material evidence:
(a) which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement; and
(b) which is more than 50 years old...'

Section 139 of the Act states that without an excavation permit from the Heritage Council, *'...a person shall not disturb or excavate any land for the purpose of discovering, exposing or moving a relic...'*.

An excavation permit would be required from the Heritage Council prior to the removal of the Lansdowne River Bridge.

Greater Taree Local Environmental Plan 1995

The GTLEP lists a number of heritage items under Schedule 2. The Lansdowne River Bridge is listed on this Schedule. However, development consent would not be required from Council for any works pertaining to the Bridge as it is located on and over unzoned land within the arterial road reserve. As such, assessment of the potential impacts of the proposed works on the Bridge is undertaken under Part V of the Environmental Planning and Assessment Act, 1979. The proposed removal of the Bridge is being considered as a component of the overall activity which is the subject of this Environmental Impact Statement.

The following provisions of the GTLEP, 1995 are applicable to other heritage items located outside the existing highway reserve on zoned land within the study area:

- the consent of Council is required before development affecting a heritage item can be undertaken (Section 58)
- Council shall take into account the extent to which the proposed works would affect the heritage significance of an item before granting development consent (Section 58)
- Council consent is not required if it is of the opinion that the proposed development would not adversely affect the heritage significance of the item

The GTLEP lists a number of heritage items under Schedule 2 as listed in the previous section.

Of the listed items, only the Lansdowne River Bridge would be directly affected by the proposed works. Development consent would not be required for the proposed dismantling and removal of the bridge as the bridge is unzoned.

Hunter Regional Environmental Plan 1989 (Heritage)

- The aims and objectives of the Hunter Regional Environmental Plan (Heritage) are as follows:
  - to conserve the environmental heritage (including the historic, scientific, cultural, social, archaeological, architectural, natural and aesthetic heritage) of the Hunter Region
  - to promote the appreciation and understanding of the Hunter Region's distinctive variety of cultural heritage items and areas including significant buildings, structures, works, relics, towns, precincts and landscapes
  - to encourage the conservation of the Region's historic townscapes which contain one or more buildings or places of heritage significance or which have a character and appearance that is desirable to conserve

  The REP contains schedules of items of State, regional and local heritage significance and contains provisions for the conservation of these items. The study area is contained within the boundaries of the REP, however, there are no items in the Coopernook area listed on the schedules. Thus the REP does not apply to the proposal other than in relation to its overall objectives.

6.13.6 Assessment of Impact

In assessing the impact of the proposal on the heritage resource in the study area, the following steps have been undertaken:

- assessment of the significance of the item
- assessment of the heritage impact on the item

Bascule Bridge, Lansdowne River

An assessment of the proposed works on the heritage significance of the bascule bridge over the Lansdowne River has been undertaken and is included in Appendix S (Connell Wagner, 1997). Figure 6.16 shows the structure of the Lansdowne River Bridge.

The Lansdowne River Bridge, which was constructed in 1932, is considered to have minor local historical and social significance as it demonstrates the continuity of road transport along the Pacific Highway and within the local area having replaced a timber bridge built in 1884 which was the original crossing of the Lansdowne River. Until the 1960's, the Bridge allowed continued inland river transport by means of the then operative bascule span.

The Bridge is also considered to have some local heritage significance associated with its landmark qualities as the southern entrance to Coopernook. The Bridge is not considered to have any technical or research significance as it is considered to have little potential to demonstrate significant aspects of our cultural history. The design of the Bridge is not regarded as innovative or otherwise of special design interest.

A number of options for the future management and operation of the Bridge were assessed in the heritage assessment including the retention of the Bridge in its current state, retention of the Bridge with an operative span, permanently open span or demolition of the bridge. The assessment concluded that while the demolition of the Bridge would have an adverse impact on an item of minor local heritage significance, it was the preferred option on heritage grounds for the following reasons:

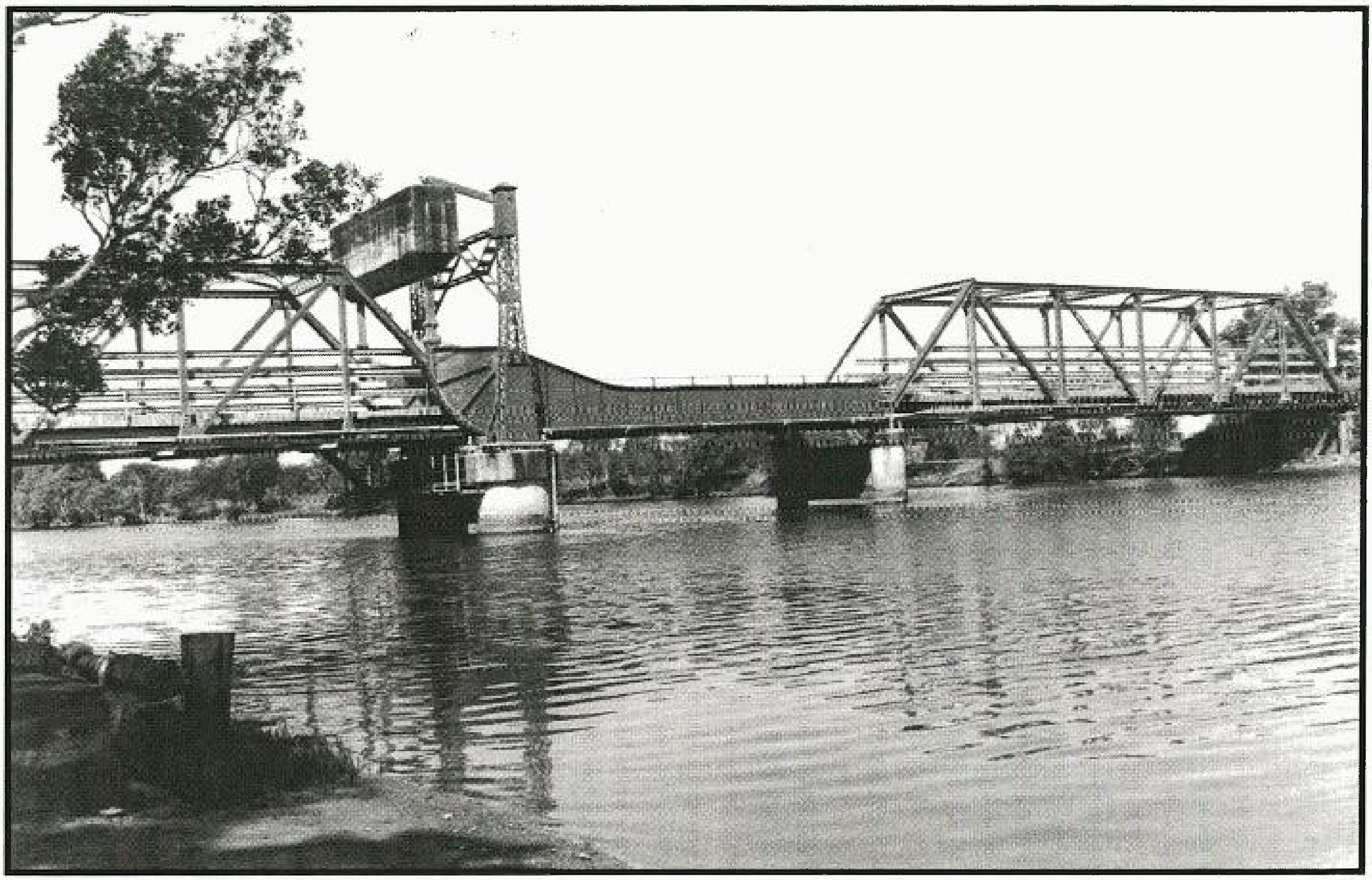
- retention of the Bridge with either an open or closed span would be economically unviable due to maintenance costs and funding sources could not be guaranteed from either the RTA or Council on the basis of the redundancy of the Bridge
- retention of the Bridge with a closed span would not fulfil the requirements for river clearance as stated by the Waterways Authority

The following mitigation measures would be put in place prior to demolition of the Bridge:

- detailed photographic recording of the existing Bridge structure should be undertaken and archived
- investigate means by which interpretation of the Bridge structure could be provided to the local community (viz. signage at Bridge site, display in local museum)

Prior to any works being undertaken, a survey of the original bridge alignment (viz. the timber bridge constructed in 1884), would be undertaken by an archaeologist to locate any existing remains of the original bridge structure and develop mitigation measures to protect any such relics during construction works.

Included in the post-construction stage Environmental Management Plan would be an assessment of the impacts of the removal of the existing Lansdowne River Bridge. Issues include containment of the lead paint flakes, water quality of the river and restricting the clearing of mangroves on the banks of the river. Further detail on the Environmental Management Plan is provided in Chapter 7.0.



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 6.16 :
LANSDOWNE RIVER BRIDGE,
COOPERNOOK

Coopernook Village Area

The Coopernook Village area comprises a number of buildings which are considered to have heritage significance both as individual items and within the context of the urban area of Coopernook. The proposal would not result in any direct effect on any of these items in terms of physical impacts. However, by providing a bypass of the village area, the proposal would have the potential to have a range of both adverse and positive indirect effects on the Coopernook Village area.

Of the heritage items within the village area, the Coopernook Hotel is the only one that is located on the Pacific Highway. The Coopernook Hotel is considered to be an architecturally unique building located on a prominent site adjacent to the bascule bridge over the Lansdowne River. The proposal would result in reduced exposure of the building to travellers along the Pacific Highway. This would have the potential to result in a reduction of use of the item in its current setting (refer Local Economic Impact Assessment Section 6.9). However, it is considered that the removal of traffic from the immediate vicinity of the hotel as a result of the bypass, would improve the amenity of the hotel (viz. reduction in noise, improved pedestrian safety) and thus lead to an overall enhancement of the heritage significance.

All other items within the village area are located on Macquarie Street away from the Pacific Highway and as such it is considered that there would be no effect on these items.

General Cemetery

There would be no direct effect of the proposal on the heritage value of the general cemetery. The proposal would result in a minor modification of the access to the cemetery (refer Section 6.8). However, it is not considered that this would have any effect on the heritage significance of the item.

6.13.7 Conclusion

There are a number of items of heritage significance within the study area. Of these, only the bascule bridge over the Lansdowne River would be directly affected by the proposed works. It is considered that the local heritage significance of the Bridge is not sufficient to be regarded as the overriding constraint on the consideration of future options for the management of the redundant Bridge. On the basis of the full range of heritage, visual, costs and management considerations it is proposed to remove the existing Bridge. A number of mitigation measures to minimise the impact of the removal of the Bridge are also proposed.

The following mitigation measures would be put in place prior to the works being undertaken:

- detailed photographic recording of the existing Bridge structure should be undertaken and archived
- investigate means by which interpretation of the Bridge structure could be provided to the local community (viz. signage at the Bridge site, display in local museum)

Prior to any works being undertaken, a survey of the original bridge alignment would be undertaken by an archaeologist to locate any existing remains of the original bridge structure and develop mitigation strategies to protect any remains during the disassembly works. Items would be assessed and included on the RTA's Section 170 register if applicable.

6.14 Hazard and Risk Assessment

The most significant risk factor on any road is that of traffic accidents causing injuries and loss of life. The issue of road safety is addressed elsewhere in the EIS (Section 3.3).

The remaining significant hazards are those resulting from the transport of dangerous goods. The large majority of these materials are transported by heavy vehicles including semi-trailers. The conditions of transport of dangerous goods is controlled by the provisions of "Transports of Dangerous Goods by Road and Rail" which defines the categories of dangerous goods, their labelling, type of packaging for transport and compatibility with each other.

Specifications for the packaging containers to provide adequate strength in falling and collision incidents are also provided. Common dangerous goods include flammable and combustible liquids (usually petrol and diesel fuels), liquefied petroleum gases (LPG), flammable gases, toxic materials and reactive materials. Only a small proportion of heavy vehicles will be carrying a partial or whole load of dangerous goods and this proportion of vehicles will not be affected by the road realignment. During the construction phase, storage and containment protocols for hazardous goods will be implemented through the EMP (Section 7.0).

The new road alignment will improve the safety of the highway and the town of Coopernook. The new alignment will:

- remove dangerous goods vehicles from the town and bridge (except for any deliveries to Coopernook)
- provide an improved road subject to less traffic problems thereby reducing the risk of a dangerous goods vehicle being involved in an accident
- provide gross pollutant traps at those identified environmentally sensitive locations (Coopernook Creek, Lansdowne River) which, in the event of a dangerous liquid good spilling onto the road, will provide containment for the dangerous goods until the Fire Brigade and owners can recover the material.

The EPA provides a "Chemical Responses Manual" which details procedures for a coordinated response to dangerous goods incidents by all State Government Authorities.

The Fire Brigade is the body responsible for site coordination where fire or chemical incidents are involved. The Brigade's functions include containing and suppressing any chemical fire, spillage or other incident. The EPA is often called upon for advice on treatment of chemical spillages including the cleanup to return the road to a serviceable condition.

The most significant risk factor on any road is that of traffic accidents causing injuries and loss of life. The issue of road safety is addressed as a design issue elsewhere in the EIS (Section 5.0).

6.15 Energy Statement

6.15.1 Energy Consumed during Construction

The major usage of energy during construction will be for earth moving to provide the necessary fill for the embankments across the flood plain. This fill would be provided from the Taree Bypass project which can supply up to 90% of the fill requirement of approximately 240,000 m^3. This material will have to be transported the 25km from the Taree site. This operation will require some 1800 semitrailer truck movements. Fuel usage would be approximately 30,000 L based on a 25km one way trip and 34 L of diesel fuel per 100km.

The actual construction of the bypass road and its associated bridges will require a range of construction equipment including bulldozers, graders, rollers, road construction machinery. For a typical spread of plant and a two year construction period the estimated overall fuel usage would be approximately 3 million litres of diesel fuel and some 60,000 litres of petrol for small vehicles.

6.15.2 Energy Usage for Operations

The route of the proposed bypass is some 725 metres shorter than the existing road, also through traffic will be much less congested by avoiding the existing narrow bridge over the river. Travel times can therefore be expected to be less from both causes. Using the AADT figures for the road and based on 17% of movements being heavy vehicles. Table 6.28 below shows the predicted energy usage during operation of the bypass.

Table 6.28: Energy Usage during Operation of Bypass

Year	1996	2016
Cars AADT	7,774	12,580
Fuel saved/years at 16L/100km	247,000	400,000
Trucks AADT	1,592	2,577
Fuel saved/years at 34L/100km	143,000	232,000

A further minimal amount of fuel will also be used for road maintenance.

6.16 Current Ecological Issues

The NSW Government is currently a signatory to the *Intergovernmental Agreement on the Environment* (1992). As a public authority in NSW, the RTA is subject to this agreement, and as such the current EIS has given consideration to issues raised in the agreement. Issues relevant to the Proposal include:

- Greenhouse Effect
- Ecologically Sustainable Development (ESD)

6.16.1 Greenhouse Issues

The temperature of the earth's atmosphere is determined by the balance between incoming solar radiation and the loss of heat energy by radiation from the earth and atmosphere to outer space. This balance is in turn affected by a complex set of processes, acting on a global scale, which control the way in which heat is transported around the earth by winds and ocean currents, and by the quantities of energy that are reflected and absorbed by the earth's surface. While the broad principles of the way in which these processes work to control the temperature of the earth's atmosphere are understood, the details, which may well be very important in determining the final temperature which is achieved at the earth's surface, are still the subject of scientific research.

One of the important factors in determining the amount of radiant energy absorbed in the atmosphere is the concentration of carbon dioxide. Changes in this concentration are likely to cause changes in the temperature of the earth's atmosphere near the earth's surface. Increases in carbon dioxide concentration are expected to cause increases in temperature.

Australia is signatory to the "International Framework Convention on Climate Change" (Rio Convention), which commits Australia to programs of monitoring and reporting on greenhouse gas emissions. A target of the Rio Convention is that signatory countries should attempt to reduce greenhouse gas emissions to the levels that applied in 1990.

The RTA is committed to ensuring that its environmental goals and policies are consistent with those outlined in the 1992 Intergovernmental Agreement on the Environment. This agreement addresses a number of globally important environmental issues including the greenhouse effect. This commitment is facilitated through the RTA's environmental vision which addresses greenhouse gas emissions and also energy consumption.

Approximately 21% of NSW's total carbon dioxide emissions are estimated to come from the transport sector (EPA, 1995). At a broad level, the RTA has been involved in and implemented several strategic initiatives to address the issue of road transport related greenhouse gas emissions. These are:

- *National Greenhouse Response Strategy*

  This strategy was adopted by the Council of Australian Governments in 1992 and aims to contribute to the national commitment to the National Strategy for Ecologically Sustainable Development. The RTA contributed to the development of this strategy and is the NSW representative on the Transport Working Group for the development of a greenhouse gas inventory. With respect to transport, the response strategies include reducing fuel consumption in motorised transport; improving the technical and economic efficiency of operation of the road network and traffic management; and to encourage the use of bicycles. This Proposal contributes to these initiatives.

- *RTA Greenhouse Reduction Plan*

  The RTA has prepared a plan at a strategic level to address and provide policy in relation to greenhouse gas emissions resulting from its activities. A greenhouse emissions inventory of RTA activities has been carried out (Beer et al, 1996) and the findings will be incorporated into the greenhouse plan with the aim of minimising emissions.

Emissions of carbon dioxide from motor vehicles are directly proportional to fuel consumption. They cannot be reduced by emission control technologies except where they result in an improvement in fuel consumption. RTA programs, such as the one mentioned above, which encourage better vehicle maintenance and hance better fuel economy will be beneficial.

The RTA also continues to engage in other strategies to encourage the tightening of vehicle emissions standards. These include:

- working with the EPA to implement the State's Motor Vehicle Maintenance Programme for lowering emissions, and on the introduction of vehicle emissions testing;
- enhancing the State's vehicle emissions enforcement resources; and,

- continuing its role on ACVEN (Advisory Committee on Vehicle Emissions and Noise) to encourage the early implementation of more stringent Australian Design Rules, including the revision of ADR-37/OX to tighten current light vehicle emission standards. A revision of ADR-70, is also in progress. This will also contribute to controlling emissions from diesel vehicles, which will be particularly important for NO_x and particulate matter emissions.

The proposed bypass would result in reduced emissions per vehicle per kilometre compared with the existing Pacific Highway through reductions in travel time and greater efficiency in fuel consumption as a result of the smooth surface and better road alignment of the bypass. Therefore it is not expected that the bypass would contribute to an increase in greenhouse gas emissions.

6.16.2 Ecologically Sustainable Development

The Australian National Strategy for Ecologically Sustainable Development (ESD) (1992) states that:

"Ecologically Sustainable Development is using, conserving and enhancing the communities resources so that the ecological processes on which life depends, are maintained, and the total quality of life now and in the future, can be increased".

In assessing the impacts of the bypass on ESD principles the following reports were reviewed: Commonwealth "Ecologically Sustainable Development Working Groups Final Report - Transport"; AUSTROADS "Strategy for Ecologically Sustainable Development"; and Australian Road Research Board LTD Report No 257 "Ecologically Sustainable Development".

Under Schedule 2 of the Environmental Planning and Assessment Regulation (1994), the following principles of ESD have been taken into account throughout the assessment of the Proposal.

Precautionary Principle

The Precautionary Principle has been to be applied to the current Proposal. The Precautionary Principle states that:

"if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation".

This principle has been applied by reliance on comprehensive scientific data throughout the planning and assessment of the Proposal including the route selection, impact assessment and development of mitigation measures and environmental safeguards for the Proposal. Whenever a potential impact has been identified, mitigation measures have been proposed to reduce the impact as far as practicable.

Examples of the application of this principle are the adoption of compensatory habitats in excess of the disturbed by the road and the viaducting of the highway over the SEPP 14 wetland to avoid unanticipated ecological and water resource impacts.

Inter-generational Equity

The construction of the proposed bypass would have long term benefits for future generations by providing improved access and safer travelling conditions.

A large population living in proximity to the existing Pacific Highway would directly benefit as a result of the proposed bypass and the consequent improvement in residential amenities.

Conservation of Biological Diversity and Ecological Integrity

Biodiversity is the variety of life forms, the different plants, animals and micro-organisms, the genes they contain, and the ecosystems they form (NPWS, 1997). As a signatory to Agenda 21, Rio Earth Summit, the Australian Government is bound by international agreement to conserve biological diversity through the prevention of species extinctions and promotion of habitat conservation.

In terms of environmental impact assessment, Agenda 21 specifies that appropriate procedures should be introduced for proposed projects likely to have significant impacts upon biological diversity, and such assessment should include suitable information for public participation. The potential impacts of the current Proposal on the viability of flora and fauna communities in the study area and the integrity of the ecological systems have been previously discussed in Section 6.6. This included details of the strategies that would be implemented to mitigate adverse biological impacts and to enhance key ecosystems along and near the corridor. In this regard, the safeguards and management strategies contained within this document fulfills the obligations of Agenda 21. In particular, the provision of compensatory habitat and major avoidance of disturbance of significant habitats in the wetland would result in the concentration of biodiversity. The National Biodiversity Strategy has been considered in detail in Section 6.6.

Improved Valuation and Pricing of Environmental Resources

Section 3 of this EIS provides an analysis and comparison of the preferred and alternative highway options with respect to their economic performance in relation to the road user. The economic indices presented reflect the discounted value of the road in relation to travel time, accidents and other operational issues. These factors are compared to the construction and discounted maintenance costs of the road over the life of the project. However, the road user economic analysis is only one aspect of the valuation and pricing of environmental resources, other aspects include the assessment of descriptive economic inputs on farm properties and businesses at Coopernook (refer Sections 6.9 and 6.10), and agency input and community involvement resulting in allocation of scarce resources to modifications to the proposal, design features or mitigation measures. These aspects of environmental valuation are summarised below with reference to the imputed value that a resource allocation preference places on an aspect of the environment:

- *Multi-criteria Analysis*

  A broad range of social, environmental and design factors was used to assess the suitability of different highway route options (Section 5.1). The performance of each option was rated for each factor, where possible using quantitative means such as the hectares of habitat affected or the number of houses in close proximity to the road. For other factors, a qualitative assessment was applied based on community feedback on the results of the specialist studies. While the analysis did not use a monetary unit, the relative performance of the various options was a transparent attempt at valuing or measuring the environment that would be affected by each option. Multi-criteria analysis used in this way has as its basis a central tenet of economic theory, being the effective allocation of scarce resources.

- *Community Role in Multi-criteria Analysis Factor Weightings*

  Section 4.5 describes the key role of different community and agency forums (eg focus groups, community meetings, exit survey and value management workshop) in establishing the level of importance (or value) to ascribe to each factor to reach a decision on the preferred option. This process demonstrates the way in which the community's valuation of environmental resources is reflected in the selection of the preferred option.

- *Highway Option Selection*

  The decision to adopt the highest cost route option was obviously not only based on construction cost. The community, through the study team, determined that an economically higher environmental cost should be attributed to the other options based on their performance with respect to both road user economic indicators and the environmental valuation implicit in the multi-criteria analysis. In essence, the cost differential between the preferred option and the lower cost options of up to $1.5M, is a proxy valuation of the relative environmental benefits of the preferred option.

- *SEPP 14 Wetland Protection Measures*

  On the basis of community and agency feedback, the study team recommended a low impact 170m bridge crossing of SEPP 14 Wetland No 545 in favour of a culvert structure and fill embankment. The cost differential of up to $2M reflects the value ascribed to the wetland to justify its greater protection by the proposed bridge.

- *Other Mitigation Measures*

  Examples of mitigation measures include compensatory habitat, landscaping measures, pollution controls and flood structures. These measures have an economic justification that their implementation reduces the environmental cost of the project to an acceptable level. The recommendation of these proposed measures, costing in total in excess of $1M, also reflects the imputed value of the environment which would otherwise be more seriously affected.

In each case summarised above, a decision was reached in relation to resource allocation with respect to the environment. While in most cases a clear monetary quantification was not appropriate, the decision reached was derived from the logic of resource allocation as expressed through the community or agency involvement process. This illustrates improved environmental valuation in the economic appraisal of major projects consistent with ESD guidelines.

6.17 Cumulative Impacts

Many of the implications of the construction and operation of the proposed Coopernook Bypass do not act in isolation and should be considered in the context of relevant local and regional changes in land use, transport, business and social structure.

The RTA has acknowledged the potential for network wide impacts of its overall reconstruction program for the Pacific Highway by recently commissioning a Cumulative Impact Study for the Pacific Highway. This would build on the RTA's State Road Network Strategy (1995) and North Coast Roads Network Strategy (1992) (refer Section 3.1).

The Department of Urban Affairs and Planning and local councils have also sought to manage local and regional development through planning instruments including Greater Taree City Council LEP 1995, Hunter REP 1989 and State Environmental Planning Policies (i.e SEPP 14).

The major issues, developments and policies with which the proposal would interact are described below:

- The combined effect of upgrading of the Pacific Highway on the mid-north coast, as described in the RTA's Ten Year Pacific Highway Reconstruction Programme (1997) would include an improvement in road safety, congestion, travel time and level of service for the corridor. The proposal, together with nearby projects including the Taree Bypass and potential upgrading of the highway from Cundletown to Moorland, represents a major enhancement of vital infrastructure in the region which would facilitate continued economic and social changes for the Manning Valley and broader mid north coast district generally.

- The construction of Pacific Highway Upgrade projects on either side of the Coopernook Bypass between Cundletown and Moorland would have a cumulative effect in relation to disruption during their construction. Depending on construction staging it is possible that work could occur successively over several years for this section of the highway. Where construction would occur on the existing alignment, traffic disruption would be exacerbated. The visual, noise and traffic disruption impacts to locals and highway users could become a source of frustration and increasing nuisance the longer the overall period of construction work. The construction of the Coopernook Bypass offline would minimise disruption during construction for most highway users.

- The cumulative operational effects of the highway upgrades between the Taree Bypass and Moorland may include a marginal increase and extension of weekend and holiday traffic north from Sydney and Newcastle due to reduced travel times. Such an effect could have an impact on tourist services and accommodation as well as placing further demands on local services and the environment. These implications would be addressed through the strategic planning policies of State and Local Government.

- The opening of the Taree Bypass in 1998 would provide significant safety and travel time savings. However, it is likely that turnover from passing trade would be reduced in Taree. There would be the potential for Coopernook, other highway centres and especially the proposed highway service centre near Purfleet, to capture a proportion of this highway trade as business potentially lost from Taree may be gained elsewhere.

- Greater Taree Council advise that there is significant potential for population growth associated with new subdivision areas in the village of Harrington. The potential opening of a tourist road connection from Crowdy Head to Laurieton and enhanced waterway conditions and facilities on the Manning estuary (see below), all indicate the potential for strong growth at Harrington and consequently higher traffic volumes on

Harrington Road. The proposed highway intersection arrangements have been designed to take account of high growth scenarios recognising both the regular school/commuters and holiday traffic using the intersection.

- Improved waterway access throughout the Manning estuary due to proposed entrance works, residential and tourist development at Harrington and the proposed removal of navigation constraints such as the existing (non-functional) Lansdowne River Bridge would promote recreational use of the Manning and Lansdowne Rivers. Consequent effects would include the movement of larger vessels upstream of Coopernook and increased waterway traffic generally. The cumulative environmental effects of increased waterway use by larger vessels upstream of Coopernook would include marginal effects in relation to water pollution and fishery resources.

- The proposed bypass of Coopernook would influence the social structure, rate of growth and land use in the village in conjunction with a range of other factors. As noted within, key changes to Coopernook related to the proposal are likely to be an improvement in residential amenity due to reduced traffic and noise. The proposed sewering of Coopernook would remove a servicing constraint to urban growth of Coopernook which may be stimulated by the amenity effects of the proposal. Council would need to monitor and plan for such land use changes through their planning instruments.

- The bypassing of Coopernook would not extinguish demand for highway services currently met at Coopernook but would shift this demand to towns, roadside stalls or service centres along the highway to the north and south (ie. Moorland, Johns River and the proposed Taree Service Centre).

- While the loss of less than 20 ha of productive agricultural land is considerable this effect is minimised by the proposed alignment of the highway, where possible along property boundaries. The GTLEP, 1995 zone objectives protect high value agricultural land from an accumulation of small impacts which may reduce the extent of this land resource. However, these considerations should also be viewed in the context of the overall benefits to rural production of an improved regional transport network.

- The impact of the loss of wetland habitat as a result of the proposal is reduced due to its poor condition and the representation and protection afforded to comparable adjoining wetlands included in SEPP 14. These extend for more than 20 km into Crowdy Bay National Park. The crossing of the Coopernook Creek wetland does not represent severance of this habitat and hence its impacts are localised to that habitat which is disturbed beneath the wetland bridges. The opportunity to create compensatory wetlands is also highlighted in the EIS.

- The cumulative flooding effects associated with raising the remaining portions of the Pacific Highway route to the 1 in 20 years flood level across the Manning floodplain will be minimised by construction of numerous waterway openings along the route. It is considered that with appropriately sized flood relief structures, the cumulative hydraulic effects of the highway would not be significant (refer Section 6.3).

In summary, the proposed Coopernook bypass is generally consistent with State, Regional and Local land use planning and transport policies and is a key component of the RTA North Coast Road Strategy.

The EIS recognises that the proposal and developments with which it interacts will have important environmental consequences in excess of the direct impacts of the proposal. To manage these effects, the EIS has adopted the "precautionary principle" in the identification of compensatory habitat, the viaducting of the wetland, flood relief structures, the provision of water pollution and noise control measures and a range of controls described in Sections 6.0 and 7.0 of the EIS.

6.18 Summary of Mitigation Measures

Table 6.29: Summary of Mitigation Measures

Impact	Mitigation Measure
All Construction and Operational Impacts	• Preparation of construction and operational phase Environmental Management Plans incorporating obligations of EIS and condition of approval to ensure implementation of mitigation measures
Potential Acid Sulphate Soils - excavation of organic soils - excavation for water retaining structures - excavation for toe drains - importation of filling materials	• Adoption of principles outlined in the Acid Sulphate Soils Guidelines (RTA, 1996), including: - avoid land management activities that disturb PASS - prevent oxidation of PASS - neutralise ASS or acid produced in PASS - oxidise and leach PASS - remove pyritic material • Adoption of preliminary Acid Sulphate Management Plan (Appendix J)
Dust Generation During Construction	• Watering of unsealed and disturbed areas • Minimising the area disturbed at any one time • Revegetating or otherwise stabilising disturbed areas as soon as practically possible • Confining vehicle movement to designated areas
Drainage Network	• Alteration of drainage network as shown in Figure 6.8 • Re-routing of some drains along the bypass
Water Quality - runoff during construction	• Buffer strips of 20m width to be maintained and fenced off adjacent to Lansdowne River, Coopernook Creek and other waterways • Implementation of an Erosion and Sedimentation Control Plan incorporating: • Diversion banks and channels to accommodate runoff from disturbed areas into waterways • Sediments basins at the receiving end of the diversion banks to intercept and retain sediment from runoff • Silt curtains around bridge piers • Revegetation of channels to prevent erosion • Treatment of water prior to discharge to ensure water quality is acceptable • Establishment of water quality baseline and ongoing monitoring during construction according to EMP • Containment of runoff and spillage in Water Pollution Control Ponds at sensitive locations (Coopernook Creek and Lansdowne River) consistent with RTA Water Policy

Impact	Mitigation Measure
Noise and Vibration - unacceptable noise levels in some areas - ground vibration during construction	• Consideration of noise attenuation measures at location R1 and R8 based on cost effectiveness • Incorporation of a construction noise and vibration control plan in the construction stage EMP • Selection of plant and equipment where practical on acoustic performance • Implementation of a noise and vibration monitoring program to ensure best possible practices are being employed • Restricted times of operation for construction plant and equipment • Initiation of an information program to inform the local residents of the construction program and time periods when noise levels could exceed the recommended assessment guidelines
Flora and Fauna - impact on SEPP 14 wetland - impact on fauna habitat - barrier effects	• Bridging of SEPP 14 Wetland • Acquisition of land by the RTA for provision of compensatory habitat for both open forest and wetland communities • Preparation of Management Plan for compensatory habitat areas • Mesh fencing of the construction easement across the wetland to limit disturbance beyond road • Construction methods to limit movement of machinery in wetland area • Placement of a geotextile silt fence around the construction site to prevent alteration of water quality • Surface stabilisation and progressive revegetation using wetland species alongside and beneath of bridge structures • By overlaying a section of the bypass on the existing highway, the cumulative barrier to fauna movement across the open forest remnants at the northern end of the alignment is reduced
Visual Environment - landscape segregation - visual separation - view prevention	• Dense tree planting in affected areas adjacent to the Highway to act as a screen or filter • Visually prominent town entrance at Coopernook • Regeneration of road reserve according to a Landscape Plan
Social and Business Effects - gross annual turnover - employment	• Visually prominent landscape town entrance at Coopernook to attract through traffic into the town • Signage of town facilities at Highway intersections • Improved amenity of Coopernook due to bypass could be enhanced by the development of a landscape strategy for the former Pacific Highway

Impact	Mitigation Measure
Heritage and Archaeology - Coopernook Hotel -removal of existing bridge	• Removal of traffic from the immediate vicinity of the hotel as a result of the bypass would improve the amenity of the hotel and lead to an overall enhancement of heritage significance • Detailed photographic recording of the existing Bridge structure to be undertaken and archived • Investigative means by which interpretation of the Bridge structure could be provided to the community (viz. signage at the Bridge site, display in local museum). • Pre construction sub-surface investigation of bridge pier excavation for archaeological site • Fencing of aboriginal archaeological site during construction

7

ENVIRONMENTAL MANAGEMENT

7. ENVIRONMENTAL MANAGEMENT

Safeguards described in the EIS have been designed to minimise as far as practical the potential negative environmental, economic and social impacts of the Proposal and to maximise the positive aspects of its implementation. The implementation of many of the actions which are not design related and require ongoing action by the RTA and other parties will occur both during and post construction.

Detailed design and specification of all environmental safeguards and management actions are beyond the scope of this EIS. The objective of this EIS is to demonstrate the environmental feasibility of the project. Should approval be given for the project to proceed, then detailed design would be prepared. In conjunction with this, an Environmental Management Plan (EMP) would be prepared to detail the procedures to be carried out, prior and during construction, in addition to the construction of physical works in order to minimise potential negative environmental and social impacts. The EMP would identify parties to be responsible for all required actions and would form an important part of the quality plan that would be required of the Contractor(s) appointed to construct the project. The EIS provides the basis for the preparation of the EMP by identifying the issues to be addressed (refer Section 7.4).

7.1 RTA Environmental Policy

In its 1995 "State Road Network Strategy", the RTA identified a range of proposed strategies which aim for substantial progress in the area of environmental management during inter-alia, network development.

Specific strategies relevant to any implementation of a proposal of this nature should:

- work towards achievement of ecologically sustainable development (ESD) objectives by developing a corporate position to guide all RTA activities and assessments
- further develop the environmental management system to improve environmental performance
- examine, develop and support cost-effective means of improving energy efficiency, reducing fuel consumption and reducing 'greenhouse gas' emissions
- utilise renewable resources wherever practical

7.2 If the Project is Approved

Should the project be approved, the following activities would be carried out by the RTA:

- The local community would be notified of the decision via correspondence, newspaper notices and/or newsletters. This would include an indication of the anticipated timing and staging of construction works and contact details for the RTA.
- Affected property owners would be notified of the decision, with contact soon after to clarify the likely impacts on individual properties, the anticipated timing and staging of any highway construction and to explain the process for any property acquisition. Owners would be kept informed and consulted during all stages of the design and construction process to minimise any hardships. During the detailed design phase, negotiations would be held to address the owners' concerns and formalise any property adjustments.

- A detailed EMP would be prepared by or on behalf of the RTA for both the construction and post construction phases of the project. The following documentation would also be prepared together with the EMP to ensure compatibility:
    - acid sulphate soil management plan
    - community consultation plan during construction
    - landscape plan for town entrance in consultation with Coopernook community and Greater Taree City Council
    - erosion and sedimentation control plan for construction in consultation with the Soil Conservation Service (DLWC)
    - management plan for potential compensatory habitat areas

7.3 Content and Structure of the EMP

The EMP would become the reference document that ensures the commitments for environmental protection and management given in this EIS and subsequent approvals are fully implemented by the RTA and its agents. It also serves as the framework for confirming the accuracy of impact predictions in this EIS and for measuring the effectiveness of these actions and procedures. The EMP would be prepared to be relevant to the key stages of construction, dealing with specific areas and/or management issues as priorities dictate. An EMP would also be required to be subsequently prepared for the operation of the highway and to co-ordinate ongoing monitoring and maintenance.

The main features of the EMP would include:

- Obligations - a full account of the statutory and other obligations which the RTA would be required to fulfil during the project implementation including all approvals and consultations required with authorities and their stakeholders. The draft EMP would be issued to relevant authorities for endorsement before final adoption by the RTA.
- Environmental Monitoring - a regime of inspections, monitoring and testing would be carried out in accordance with the EMP. For each main element of the management system (eg Acid Sulphate Soils - refer Section 7.4) the EMP would define the performance criteria associated with each management objective, the specific tests and protocols, their frequency and location.
- Audits - to be assured that the environmental management system is working, a qualified and independent person would conduct audits in accordance with the schedule nominated in the EMP
- Reporting - this is an important part of any quality system and requirements would be included in the EMP
- Communications and Environmental Training- workforce awareness and responsibilities for environmental management would demand suitable induction and training for all contractors and RTA employees. This would be part of the system along with procedures for communication with project stakeholders. The RTA would determine the need for a Community Consultative Committee(s) as part of the Environmental Management Plan.

7.4 Environmental Management Principles

The EMP would be based on the environmental management principles and objectives identified below for each of the main system elements:

Landform, Geology and Soils

- Investigations have revealed potential acid sulphate soils in the vicinity of Coopernook Creek and Lansdowne River. An outline acid sulphate soils management plan has been prepared for the project in accordance with the guidelines of the RTA (1996) to avoid the acidification of surface soils and drainage (refer Appendix J). No potential acid-sulphate soil would be imported to the site for use as fill material.
- Cut and fill batters would be designed on the basis of detailed geotechnical investigations so that stability would be provided by a combination of restricting the steepness of slopes, vegetation, rock batters or retaining walls, and if necessary, specialised drainage systems.
- Comprehensive erosion and sediment control measures would be undertaken in accordance with the detailed erosion and sedimentation control plan. The concept erosion and sedimentation control plan attached as Figure 7.1 would form the basis for this plan.

Acid Sulphate Soils

A strategy for acid sulphate soil management is outlined in Section 5.3.2 of Appendix J. This would form the basis of a Management Plan to control the potential for acid leachate and runoff. Control of the impacts of the key activities are discussed below:

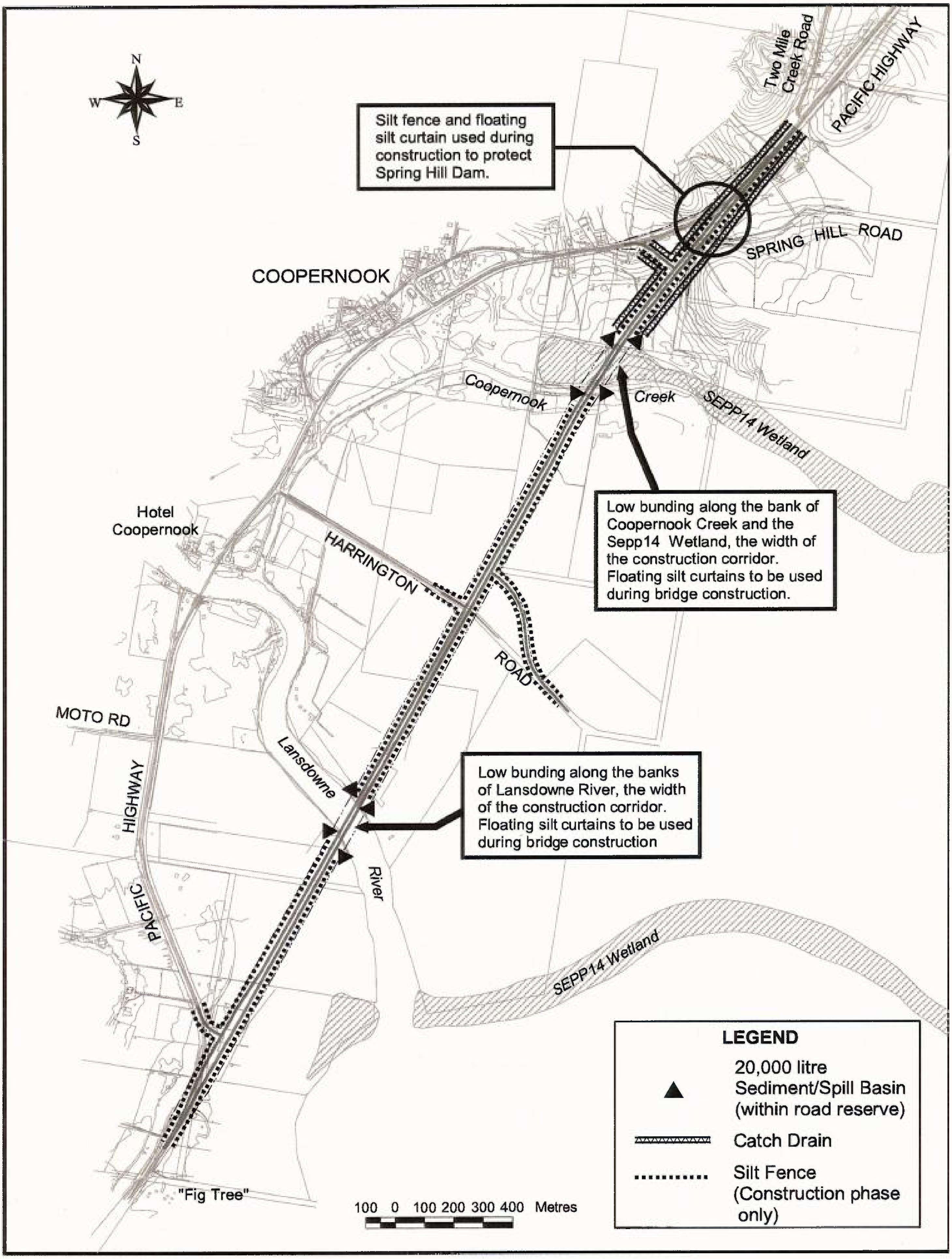
- Soils from excavations: Any excavated soils should be placed in a bunded area to restrict runoff. The soil should be neutralised by dosing with lime based on an amount calculated using the POSA results. Once neutralised the soil may be removed from the bunded area and used for any suitable purpose.
- Surface water control: Where toe drains are found to contain acidic water they should be lined with crushed limestone to neutralise any acidic water. Weirs should be placed so that water will be detained long enough to be neutralised. Alternatively, all water should be collected and treated by the addition of lime to achieve neutralisation prior to disposal.
- Imported material: All imported fill material to be used at the site should be assessed for acid sulphate potential. Such material should be stored in a bunded area before use unless prior testing has been undertaking.

Hydrology and Flooding

- Culverts and bridges would be designed such that downstream erosion and sedimentation and scour would be avoided. Monitoring of scour would be required to determine the need for further protection.
- Drainage design would ensure no adverse drainage impacts on properties upstream or downstream of the project.
- Channel diversions/works would be designed so as to minimise disturbance, and affected areas would be stabilised and re-vegetated as soon as possible.

Flora and Fauna

- Erosion and sedimentation control measures would be implemented prior to and during construction to minimise contaminated flow into watercourses and also the spread of weeds.



Connell Wagner
COOPERNOOK EIS
5606.01.CE

Figure 7.1 : CONCEPT EROSION AND SEDIMENTATION CONTROL PLAN

- Weeds would be removed from the road reserve on a regular basis and landscape works would be staged so they are established as quickly as possible to reduce erosion and weed invasion.
- Plant species endemic to the local area would be used wherever possible to minimise the introduction of new species and to increase local plant population numbers.
- Establishment of natural habitat areas in compensatory sites adjacent to the proposed highway would be managed in accordance with a specific management plan.

Water Quality

A range of measures would be used to minimise soil erosion from the road corridor and consequent downstream sediment pollution arising from construction activities. These would include measures to minimise disturbed areas through silt fences and sediment control ponds, retention of vegetation around drainage lines or replanting works if required and re-use of contaminated water on-site or treatment of excess water (to a standard suitable for release) if necessary. Other measure include:

- Control of turbidity associated with bridge pier construction and bridge demolition using silt curtains.
- Any required concrete batching plants would incorporate environmental controls in accordance with Department of Urban Affairs and Planning Guidelines (1991) and EPA requirements.
- Water quality would be monitored to verify the effectiveness of control measures according to a baseline established by this EIS and subsequent monitoring.
- 3 month water quality monitoring program.

To mitigate the potential adverse long term impacts of pollution from road runoff, spillage and erosion and sedimentation, operational stage mitigation measures would also be implemented. Road drainage and permanent water quality control basins would be established to capture all runoff and spillage up to 20KL to prevent the possibility of pollution of the wetland or Lansdowne River. These would, where appropriate, be based on the construction stage detention and sedimentation basins located along the proposed route. Proposed locations include either side of both Lansdowne River and the Coopernook Creek wetlands. The RTA Water Policy does not require full containment for the entire route and the primary aim in planning water quality control ponds would be so that only those sections of the proposed bypass located in environmentally sensitive areas would drain to the ponds which provide ongoing protection of water quality by:

- Helping remove sediments, nutrients and pollutants in stormwater from the bypass. These basins/wetlands would have the capacity to contain the first flush from a 1 in 10 year storm to ensure they would not release accumulated pollutants into the surrounding environment.
- Lining of ponds to prevent pollution of the groundwater in the event of a spill.
- Provision of vehicular access to allow removal of accumulated sediment in the ponds at appropriate times to ensure the basins maintain adequate capacity.
- Long term stabilisation of pond batters would be undertaken using native species.
- Use of grassed verges and stormwater gutters feeding to the ponds.
- Fitting the ponds with outflow baffles to prevent the discharge of oil and grease products which settle on the road pavement.
- Containing accidental spills up to 20KL capacity from vehicles on the route.

As previously noted, a water quality monitoring program would extend into the post-construction phase of the bypass to ensure that water quality goals are being met.

Meteorology and Air Quality

- Dust generation would be controlled by minimising the area disturbed at any one time and watering of construction areas as necessary.

Landscape and Visual Environment

- Roadside planting and screening works would be designed to reduce negative visual impacts for viewers outside the corridor and to form a pleasant outlook for road users.
- Landscaping or screening would be established around compound areas and stockpiles.
- Indigenous plant species would be used wherever possible in landscape works.
- All landscape works would be regularly maintained over a twelve month period to ensure successful propagation.
- Community involvement would be sought in establishing a landscape concept for the town entrance and appropriate signage.

Noise and Vibration

- Construction activities would be generally limited to daylight hours. High noise activities would be scheduled during the least sensitive times in consultation with the EPA.
- Owners of properties likely to be affected by construction noise would be consulted and given notice prior to works being carried out. Noise monitoring would be conducted at three representative noise locations during construction, and any excessive noise or noise complaints would be addressed immediately.
- Construction equipment would be fitted with appropriate noise reduction devices and limited in their hours of operation.
- Vibration monitoring at the Shady Acres Worm Farm dwelling is recommended during key stages of construction (refer Section 6.5).

Heritage and Archaeology

- Detailed photographic recording of the existing Bridge structure would be undertaken and archived prior to demolition.
- Investigate means by which interpretation of the Bridge structure could be provided to the local community (viz. signage at Bridge site, display in local museum) would be undertaken.
- Any unreported heritage sites found during construction would be reported to the relevant party (eg NPWS, Purfleet/Taree Heritage Office, LALC) to determine appropriate management and if owned or controlled by the RTA, entered onto the RTA Corporate Heritage Register under Section 170 of the Heritage Act.
- The aboriginal archaeological site identified near Coopernook Creek would be protectively fenced to prevent disturbance during construction.

Traffic

- Public notices and signposted information would be provided to inform drivers of changed access arrangements, anticipated construction duration and RTA contact details.
- Individual property owners would be consulted regarding temporary access arrangements to properties during construction.

Spoil, Waste and Hazardous Material Handling

- Storage areas for fuels, oils and chemicals used in construction would be surrounded by bund walls to retain any spills of more than 110% of the volume of the largest container.
- Following salvage of any millable timber, removed vegetation would be re-used as much as possible as woodchip/mulch in the revegetation works. Solid waste would be disposed of at an approved location.
- A hazard and risk management plan would be prepared in case of emergency events such as accidents, bushfires and chemical spills.
- Controlled sanitary and washdown facilities would be installed at appropriate non-sensitive locations.

7.5 Post-Construction Environmental Management

The EMP would also include provisions for environmental management post-construction. The following environmental management controls, monitoring and auditing would be undertaken for a minimum period of 12 months following the conclusion of each stage of works and also at the conclusion of the entire works:

- Noise monitoring and a coordinated traffic count (within 12 months of opening) would be undertaken post-construction over a seven day period outside school holidays to ensure the required noise levels are achieved. Monitoring would be conducted at the same locations monitored during the construction phase and would be timed to coincide with traffic classification counts incorporating hourly traffic and hourly average speed monitoring.
- Water quality monitoring would be continued to assess residual impacts in the first 1-2 years after opening.
- Landscaped areas would be monitored and maintained to ensure successful results are achieved.
- Consultation with individual property owners to ensure impacts are minimised and that the environmental management activities are proceeding satisfactorily.
- Management and regeneration of compensatory wetland habitats according to a plan of management.
- Post construction demolition of the existing Lansdowne River Bridge would require containment of lead paint flakes in accordance with relevant guidelines.

In the longer term, environmental management of the road and in particular the condition of drainage, water quality ponds and erosion control features and roadside landscape would come under the RTA's road maintenance program. As indicated, the continuing development and maintenance of habitat compensation/regeneration areas may become the responsibility of an appropriate body, on behalf of the RTA. In this case a management plan for the conservation and rehabilitation of compensatory habitat areas would be established.

8

CONCLUSION AND JUSTIFICATION

8. CONCLUSION AND JUSTIFICATION

8.1 Justification

The proposal can be justified on biophysical, economic and social grounds and with respect to the application of ESD principles.

The preferred option was chosen to minimise its impact on the ground surface, hydrology and water balance of the floodplain and the wetland. The proposal has been designed with sufficient hydraulic structures to avoid exacerbating existing flood conditions. The route has been located to avoid severing undisturbed wetland, while the entire SEPP 14 wetland crossing would be bridged in order to minimise biological and hydrological impacts. Compensatory habitat is proposed to counter balance the destruction of small areas of native vegetation affected by the road embankment. The proposal is justified on the basis that it has been developed and would be managed in accordance with the stated project objective of minimising the impact of the proposal on the biological environment.

The project is justified in economic terms with respect to the road user, having a calculated net present benefit in excess of its discounted costs. The imputed valuation of the environmental attributes of the proposal, derived through community participation in weighting and assessment of highway options and input to the development of mitigation measures, provides further justification of the proposal in terms of the appropriate allocation of scarce environmental resources.

The highway proposal has a broad social justification in more effectively and safely meeting the transport needs generated by increasing activity along the Pacific Highway Corridor on the mid-north coast. On a local level, the highway bypass would provide improved residential amenity in the village of Coopernook while simultaneously denying several highway businesses of a source of passing trade and having a direct effect on the production capacity of several rural properties traversed by the proposed highway. Amelioration measures have been proposed to maintain access between the proposed and existing highways and to provide a landscaped and signed entrance feature for Coopernook to maintain access to and awareness of bypassed businesses. Severance of rural properties has been minimised by the adopted alignment, however, where access and property management arrangements are not feasible, acquisition of property would be considered.

The principles of Ecologically Sustainable Development have been central to the justification of the corridor selection and development and assessment of the preferred route. Section 6.16 summarises the ways in which the project has been influenced by the application of: the precautionary principle, maintenance of intergenerational equity, valuation of environmental resources and the conservation of biodiversity.

8.2 Conclusion

The proposal would satisfy a range of objectives for the upgrade of the Pacific Highway at Coopernook as set out in Section 3.5. The proposal is compatible with strategic land use, economic and transport planning directions that have been established for the Greater Taree LGA, Hunter Region and Pacific Highway Corridor on the mid-North Coast of NSW. With ongoing access control, the proposal would provide a safer and more efficient transport route for the Pacific Highway near Coopernook and would be consistent with the eventual upgrading of the highway to the north and south of this section.

The major adverse impacts of the proposal are the property effects, effects on highway businesses, visual intrusion of the road and removal of wetland habitat. A number of mitigation measures are proposed to protect the environment and control impacts to acceptable levels. An Environmental Management Plan would be prepared to ensure that the proposed controls are implemented during construction and operation of the highway.

While several of the adverse impacts of the proposal are significant, the mitigating and compensatory measures are appropriate and achievable and the net impacts are considered to be acceptable when the overall community benefits are balanced.

9

REFERENCES

9. REFERENCES

AGPS (1991) Ecologically Sustainable Development Working Group: Final Report- Transport.

ANZECC [Australian and New Zealand Environment and Conservation Council] (1992) Australian Water Quality Guidelines for Fresh and Marine Waters.

Australian Bureau of Agricultural and Resource Economics [ABARE] (1997) Australian Commodities VOL 4 No 1, pp 26-31. Barton, Canberra.

Australian Bureau of Statistics (1991) Census Data..

AUSTROADS (1995) Strategy for Ecologically Sustainable Development.

Baur, G.N. (1979) Forest Types in New South Wales. Forestry Commission of NSW Research Note No.17.

Beer, T., Week, I., Gipps, P. and Gu, K. (1996) Greenhouse Gas Inventory NSW RTA. CSIRO Australia, June 1996.

Binns, D. and Chapman, W. (1992) Flora Survey of the Wingham Management Area, Port Macquarie Region. Forestry Comission of NSW.

Business Enterprise Centre (BEC) (1996) [Data Provided].

Colleran, JR & Gearing, D (1980) A Visual Assessment Method for Botany Bay. In Landscape Australia, 3/1980, August

Coopernook Centenary Committee (1990) Coopernook Village Centenary 1890-1990

Department of Conservation, Forests and Lands, Division of Forests (undated). Summary of the Visual Management System

Department of Planning (1989) Hunter Regional Environmental Plan 1989 - Heritage

Department of Planning (1980) Rural Land Evaluation Manual

Emery, K.A. (1985) Rural Land Capability Mapping. Soil Conservation Service, NSW.

EPA (1995) NSW Greenhouse Gas Inventory Report - Estimate for 1990 and 2000. Prepared by the NSW EPA. ISBN 0 7310 377 07.

ERM Mitchell McCotter (1995) Taree Service Centre Study - Part B 'Economic Impact Assessment'.

Farmar-Bowers, Q. (1994) Ecologically Sustainable Development - Research Report ARR 257. Australian Road Research Board, Ltd.

Forestry Commission of NSW (1985) Management Plan for Taree Management Area.

Forestry Commission of Tasmania (1983) Visual Management System

Greater Taree Council (1997) Greater Taree - Facts and Figures

Hagar, T.C. and Benson, J.S. (1994) Review of the Conservation Status of Vegetation Communities in NSW. Part 3 Assessment of Conservation Status of Forest Plant Communities in North Eastern NSW. Report to the Australian Heritage Commission.

Lansdowne River Bridge, Coopernook Main Roads, Volume IV, No 8, April 1993 (pp111-114)

NPWS (1997) Draft NSW Biodiversity Strategy.

NSW Heritage Office (1996) NSW Heritage Manual

NSW Heritage Office (1996) Regional Histories of NSW

NSW Planning and Environment Commission (1977) Hunter Regional Plan, Working Paper No 22, Visual Analysis and Visual Preference Survey

Parolin, B. and Garner, B. (1997) Evaluation of the Economic Impacts of Bypass Roads on Country Towns. (RTA R & D Project TEP 93/6)

Rich, E. (1990) Pacific Highway S.H. No 10 - Taree Traffic Relief Route: archaeological survey for Aboriginal sites. Report to Gutteridge, Haskins & Davey Pty Ltd.

RTA (1988) Road Design Guide (Last updated August 1996).

RTA (1992) North Coast Road Strategy

RTA (1995) RTA's Plan for Reducing Motor Vehicle Emissions. RTA, The Environment and Community Impact Branch. ISBN 0731049381.

RTA NSW (1995) Roadside Environment Strategic Plan

RTA (1995) State Road Network Strategy

RTA (1996) Acid Sulphate Soil - Guidelines

RTA (1997) Pacific Highway Ten-Year Reconstruction Programme

State Pollution Control Commission (1981). Guidelines for Visual Assessment and Management of Coastal Landscapes

Suters Architects Snell (1990) Greater Taree City Council Heritage Study - Final Report Volumes 1, 2 and 3. Prepared for Greater Taree City Council

Thomas, GS (1996) Working with Community Groups in Managing the Cultural Landscape. In Landscape Australia 3/1996

Thorvaldson, F (1996) Characteristic Landscapes and Visual Landscape Regions of New South Wales. In Landscape Australia, 4/1996

Transportation Research Board (1985) US Highway Capacity Manual Special Report 209. Washington.

United States Forest Services, United States Department of Agriculture (1974). National Forest Landscape Management Agriculture Handbook Number 462. Chapter 1 - The Visual Management System

Wright, G (1973) Landscape Quality: A Method of Appraisal. In Royal Australian Planning Institute Journal. October 1973.