

Plates



Plate 1: Quadrat 1 (northern wetland)



Plate 2: Quadrat 2 (northern wetland)



Plate 3: Quadrat 3 (southern wetland)



Plate 4: Quadrat 4 (northern wetland)

Appendix A

Curricula vitae of project team

Appendix A: Curricula Vitae of project team

This appendix details the qualifications and experience of team members involved in the current project.

SELGA HARRINGTON

Botanist

Years of Experience

6 (1 with PB, 5 with others)

Education

Bachelor of Science (Hons) University of Sydney 2000

Professional Affiliations

Member, Australian Systematic Botany Society; Member, Royal Zoological Society of NSW; Member, Australian Plant Society

Key Qualifications

Selga has over six years experience in ecological surveys, ecological and systematic research, herbarium curation and bush regeneration. Her field experience covers a range of habitats from eastern Australia to arid regions of Queensland, New South Wales and South Australia. This work has encompassed a variety of habitats including rainforest, heath, sclerophyll forest, mallee, swamps, wetlands and coastal dunes. Selga is experienced in the assessment of vegetation communities, flora habitat, conservation significance, long-term monitoring, impacts and mitigation. Selga is skilled in the application of Federal and State environmental legislation including the *Environment Protection and Biodiversity Conservation Act 1999*, the *Threatened Species Conservation Act 1995* and the *Environmental Planning and Assessment Act 1979*.

PB Experience

Options, Constraints and Planning Studies

- Flora and fauna assessment of Hornsby Quarry, NSW, Hornsby Council. Botanist. Determined the options and constraints for development associated with the terrestrial flora and fauna of Hornsby Quarry.
- Flora and Fauna Constraints Assessment of Proposed Electricity Transmission Route Options at Riverstone, Integral. Botanist. Undertook a route selection study and environment impact assessment including a comparison of potential ecological impacts along nine electricity transmission line route options in the suburbs of Riverstone, Vineyard and Schofields.
- Preliminary assessment of the ecological constraints of a windfarm at Paling Yards, Gamesa Energy Australia and TME Australia. Ecologist. Assessed the options and ecological constraints for the development of a windfarm within the site.
- Flora and fauna constraints assessment of a possible school site in Foxall Road, Kellyville, Parramatta Diocese. Botanist. Flora and fauna assessment of a site in Kellyville. The site contains an endangered ecological community listed on both the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999*. The options and constraints of the site were assessed and the legislative requirements for future development of the site were outlined.
- Identification of potential sites for future subdivision, Landcom. Ecologist. Identification of potential sites for future subdivision and assessment of the ecological constraints of these sites.

- Preliminary flora and fauna constraints assessment of the Wyong Gas Project, Sydney Gas. Ecologist. Assessed the ecological options and constraints of the construction of gas extraction wells, connective pipeline system and gas processing station in Wyong Shire.
- Flora and fauna assessment of proposed development in Empire Bay NSW, Phillips and Marler Architects. Project Manager/Botanist. Determined the options and constraints associated with the terrestrial flora and fauna of a proposed Childcare Centre in Empire Bay in the Central Coast.

Environmental Management Plans and Ecological Monitoring

- Flora and fauna assessment and management plans for TransGrid substations in the Central District, NSW, TransGrid. Ecologist. Undertook surveys for threatened flora and fauna within four TransGrid substations in the Central district. Management actions were provided for each of the substations. Issues included areas of significant weed invasion, the presence of endangered ecological communities (Sydney Turpentine Ironbark Forest, Illawarra Lowlands Grassy Woodland, Cumberland Plain Woodland), threatened species (*Epacris purpurascens* var *purpurascens* and *Pterostylis gibbosa*) and a threatened population (*Chorizema parviflora*).
- Terrestrial ecology surveys of riparian areas within Liverpool Military Area, NSW, DMM. Ecologist. Assessed the condition of riparian vegetation and habitats within Liverpool Military Area with particular reference to areas surrounding gabion weirs. Provided management recommendations. Data collected will be used as baseline data for future monitoring programs.
- Flora and fauna management plan for the decommissioning of a former Caltex Petroleum site at Ballast Point, Birchgrove, Sydney Harbour Foreshore Authority. Ecologist. Development of a flora and fauna management plan for the decommissioning of a former Caltex Petroleum and subsequent development into public open space as a harbourside park.

Impact Assessment

- Flora, Fauna and Archaeological Assessment of Wollar Switching Station, TransGrid. Project Manager/Botanist. Undertook a flora, fauna and archaeological conservation and impact assessment of the proposed switching station and associated access track at Wollar.
- Terrestrial Flora and Fauna Assessment of Brunswick Area Sewerage Scheme Augmentation, NSW Department of Commerce. Botanist. Undertook the terrestrial ecological component of the environmental impact statement for the proposed Brunswick Area Sewerage Scheme Augmentation project.
- Flora and fauna assessment of a proposed windfarm in Ben Lomond, NSW, Wind Development Australia. Botanist.
- Flora and fauna assessment of a former Caltex Petroleum site at Ballast Point, Birchgrove, Sydney Harbour Foreshore Authority. Ecologist. Assessment of potential impacts of the decommissioning of a former Caltex Petroleum site on flora and fauna as a component of the State of Environmental Effects.
- Flora and Fauna Assessment of upgrade of RANSSSS training facilities at HMAS Cresswell, Jervis Bay, Department of Defence. Botanist. Undertook the flora and fauna component of an environmental impact assessment to assess the potential environmental implications associated with the proposed refurbishment of the RAN School of Survivability and Ship Safety.
- Flora and fauna assessment for rezoning application in Galston, NSW, Hornsby Council. Ecologist.
- Flora and fauna assessment of the proposed water storage dam at Muswellbrook Coal, Roads and Traffic Authority. Botanist. Assessed the impacts of the proposed dam on flora and fauna.
- Berowra Platform 3 Review of Environmental Effects, Rail Corp. Ecologist. Assessed the existing natural environment and likely impacts of the construction of a new platform and associated development on plants and animals of the area and in particular threatened species, populations, and communities listed under the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*.

Roads and Infrastructure

- Review of Environmental Factors for Junction Hill Sewage transfer system, NSW, NSW Department of Energy, Utilities and Sustainability and Clarence Valley Council. Environmental Scientist. Prepared a Review of Environmental Factors for the proposed upgrade of the sewage transfer system at Junction Hill.
- Flora and fauna assessment of Bangalow Sewage Treatment Plant Augmentation and Effluent Reuse Scheme, NSW, NSW Department of Commerce & Byron Shire Council. Ecologist. Ecological assessment of the proposed upgrade of Bangalow Sewage treatment plant and mop top trials.
- Assessment of the existing ecological condition of the Windale/ Gateshead Wastewater System, NSW, Hunter Water. Botanist. Assessed the existing ecological condition of the vegetation in the vicinity of the Windale/ Gateshead Wastewater System and the condition of Jewells Swamp and its catchment due to overflows.
- Environmental Impact Statement for a proposed sewage transfer system in Brunswick Heads and Mullumbimby, NSW, Byron Shire Council. Ecologist.
- Flora and fauna surveys including Koala surveys for a proposed road network and subdivision in Anna Bay, NSW, Port Stephens Council. Ecologist. Confirmed the boundaries of vegetation communities and preferred Koala habitat within the site and mapped individual Koala feed trees outside the preferred koala habitat. Undertook surveys for threatened species and their habitats. Identified terrestrial flora and fauna issues.
- Flora and fauna assessment of proposed augmentation of the North West Sector Feeder in Riverstone, NSW, Integral Energy. Botanist. The potential impacts of the proposed upgrade on terrestrial flora and fauna were assessed including an impact assessment for two endangered communities (Cumberland Plain Woodland and Shale Gravel Transition Forest) and a threatened species (*Dillwynia tenuifolia*) found within the site.

Mining

- Preliminary flora and fauna assessment of Stage 2 of the PF Formations Hornsby Sand Mine, NSW, P.F. Formations. Ecologist. Undertook a preliminary survey of the Stage 2 of the Hornsby Sand Mine to determine the conservation significance of the site and the options and constraints for future mining within the area. The site included a significant population of *Tetratheca glandulosa*, a threatened species listed on both the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999*.
- Targeted surveys for *Tetratheca glandulosa* within Stage 2 of the PF Formations Hornsby Sand Mine, NSW, P.F. Formations. Project Manager/Ecologist. Undertook *targeted surveys within the site for Tetratheca glandulosa, a threatened species listed on both the Threatened Species Conservation Act 1995 and Environment Protection and Biodiversity Conservation Act 1999*. Estimated the size and distribution of this species within the site. Outlined the options and constraints for future mining within the area.
- Flora and Fauna Assessment of the Sand Extraction and Rehabilitation Project at Hitchcock Road, Maroota, P.F. Formations. Ecologist. Assessed the ecological impacts of the proposed sand extraction at Hitchcock Road, Maroota.
- Flora and Fauna Assessment of the Sand Extraction and Rehabilitation Project of Lot 198, Maroota, P.F. Formations. Ecologist. Assessed the ecological impacts of the proposed sand extraction at of Lot 198, Maroota.

Previous Experience

Options, Constraints and Planning Studies

- Flora and fauna assessment of proposed subdivision at Winston Hills, NSW, Manidis Roberts Consultants. Project Manager/Botanist. Determined the options and constraints associated with the terrestrial flora and fauna of a proposed subdivision at Winston Hills.

- Warriewood Masterplan Flora and Fauna Assessment, Warriewood, NSW, Lean and Hayward. Botanist. Determined options and constraints for a major land release at Warriewood and provided advice on mitigation strategies to avoid impacts on threatened species, populations and communities.
- Flora and fauna assessment - Toll Ipec Moorebank Ave development, Sydney, NSW, urbis. Botanist. Assessed the impacts of development on flora and fauna at a large industrial development site.
- Natural and cultural heritage and bushfire assessment, Sydney Water Bundanoon Road property, Sydney, NSW, Sydney Water/urbis. Botanist. Determined options and constraints of a site proposed by Sydney Water for future development.
- Flora and fauna assessment McRoss Developments land, Appin, Appin, NSW, McRoss Developments. Botanist. Determined the options and constraints associated with the terrestrial ecology of a proposed residential subdivision at Appin.
- Flora and fauna assessment of a potential school site, Central Coast, NSW, Department of Public Works and Services. Project Manager/Botanist. The options and constraints of the study site for future rezoning and development was investigated. This included targeted flora and fauna surveys and impact assessment.
- Natural heritage and bushfire assessment, CSR Hornsby Quarry property, Hornsby, NSW, CSR. Botanist. Investigated options and constraints for development of Hornsby Quarry.

Conservation Planning

- Kurri Sand Swamp Woodland Recovery Assessment, Lower Hunter, NSW, NPWS/RTA. Botanist. Assessed the recovery of the endangered ecological community found in the Lower Hunter Region and the likely impacts of a major road development in the area.
- Western Coastal Open Space Scheme (COSS) Assessment, Gosford, NSW, Gosford City Council. Botanist. Identified the ecological values occurring on private lands and prioritised land for inclusion in the Gosford City Council reserve system, Gosford.
- Flora and fauna assessment of Flood Reserve Bankstown, Bankstown, NSW, Bankstown City Council. Botanist. Determined the effectiveness of a 'no mow' regime within a council reserve, with particular reference to the establishment of threatened species. Recommended a future monitoring program for the site.

Environmental Management Plans and Ecological Monitoring

- Dendrobium Coalmine terrestrial and aquatic flora and fauna monitoring program, Illawarra, NSW, BHP Billiton. Ecologist. Set up the long term monitoring sites and undertook the first stage of the pre-mining terrestrial flora and invertebrate surveys.
- Monitoring the potential impacts of subsidence on upland swamp communities on the Woronora Plateau, Illawarra, NSW, BHP Billiton. Botanist. Designed the monitoring program to detect potential impacts of subsidence on upland swamps, set up the long term monitoring sites and undertook the first stage of the pre-mining terrestrial flora survey.
- Flora and fauna survey along water pipeline, Blue Mountains, NSW, Sydney Catchment Authority. Ecologist. This survey involved the identification of terrestrial ecological issues for future monitoring. Targeted surveys for four threatened flora species and two threatened frog species were undertaken within hanging swamps as well as vegetation mapping and assessment of flora and fauna issues along water pipeline between Katoomba and Wentworth Falls in the Blue Mountains.

Impact Assessment

- Species Impact Statement, Johnson Ave, Kurri Kurri, NSW, NET Pty Ltd. Ecologist. Conducted a Species Impact Statement of a proposed industrial site in Kurri Kurri, containing an endangered ecological community and an endangered plant species. This project included targeted surveys

for threatened flora and fauna and mapping of the threatened species and community within the site.

- Twofold Bay targeted surveys and impact assessment, Eden, NSW, GHD/Department of Defence. Ecologist. Carried out targeted surveys for two threatened orchids, Red Crowned Toadlet and Giant Burrowing Frogs for the proposed Twofold Bay ammunition facilities and associated infrastructure.
- Flora and fauna assessment of a proposed shopping centre at Bonnyrigg, Sydney, NSW, Giles Tribe Architects. Project Manager/Botanist. The potential impacts of a proposed shopping centre on terrestrial flora and fauna were assessed including an impact assessment for an endangered ecological community found within the site.
- Flora and fauna assessment of a proposed residential development at Hammondville, Sydney, NSW. Burns Bridge. Project Manager/Botanist.
- Flora and fauna assessment of a proposed ecotourism resort in Pokolbin, Lower Hunter, NSW, TreeTops Pty Ltd. Project Manager/Ecologist. Targeted surveys for threatened flora and fauna and Eight Part Tests.
- Flora and fauna assessment of a proposed development in Bardwell Park, Sydney, NSW, Paynter Dixon. Project Manager/Ecologist.
- Flora assessment of proposed defensive positions in Holsworthy, Sydney, NSW, Department of Defence. Project Manager/Botanist.
- Flora and fauna assessment of a proposed wetland site in Georges Hall, Sydney, NSW, Storm Consulting. Project Manager/Botanist. This project included impact assessments for threatened species and an endangered ecological community, as well as the provision of flora and fauna recommendations and weed advice.
- Terrestrial flora and fauna assessment of a proposed wetland site in McCoy Park, Sydney, NSW, Storm Consulting. Project Manager/Botanist. This project included targeted surveys for threatened species and the provision of flora and fauna recommendations and weed advice.
- Flora assessment of a proposed industrial development at Port Botany, NSW, Sydney Ports Authority. Project manager/Botanist. This project involved targeted flora survey, vegetation community mapping and assessment of the impact of a proposed development on an Endangered Ecological Community, Eastern Suburbs Banksia Scrub.
- Flora and fauna assessment for a rezoning application in Greystanes, Sydney, NSW, GHD. This project included impact assessments for Cumberland Plain Woodland and *Acacia pubescens* which was planted on site.
- Flora and fauna assessment of nine proposed school sites from Wyong to Shell Harbour, NSW, Department of Public Works and Services. Botanist. This project included targeted searches for threatened species, populations and communities and Impact Assessments where required.
- Flora and Fauna assessment and management plan of a proposed industrial development at Yennora, Sydney, NSW, urbis. Botanist.
- Flora and fauna assessment of a proposed wetland in Picnic Point, Sydney, NSW, Mather and Associates Pty Ltd. Project Manager/Botanist. Undertook targeted surveys and impact assessments for threatened flora and fauna.
- A flora and fauna assessment of a proposed boardwalk along the Georges River at Liverpool, NSW, Patterson Britton & Partners Pty Ltd Patterson. Project Manager/Botanist.
- Flora and fauna assessment of a proposed development site, Minto, NSW, McRoss Developments Pty Ltd.

Roads and Infrastructure

- Pacific Highway Upgrade Moorlands to Herons Creek Environmental Impact Statement - Terrestrial Flora and Fauna Report, Port Macquarie, NSW, arup/RTA. Botanist. Assessed the likely impacts of the Pacific Highway Upgrade on terrestrial flora and fauna.
- Targeted surveys for threatened species associated with the F3 to Branxton National Highway Link, Lower Hunter, NSW, RTA. Botanist. Undertook targeted surveys and impact assessments for threatened species of plant and animal over an area of 94 square kilometres.
- National Highway Link F3 to Branxton Compensatory Habitat Assessment, Lower Hunter, NSW, RTA. Botanist. Assessed the ecological suitability of candidate compensatory habitat associated with a major road development in the Lower Hunter in order to develop the most suitable package of compensatory habitat.
- Flora and fauna assessment of proposed Duplication of Entrance Road in Erina, NSW, RTA. Botanist. This project included targeted surveys and mapping of threatened *Melaleuca biconvexa* and impact assessments for threatened flora and fauna.

Mining

- Dendrobium Coalmine terrestrial and aquatic flora and fauna monitoring program, Illawarra, NSW, BHP Billiton. Ecologist. Set up the long term monitoring sites and undertook the first stage of the pre-mining terrestrial flora and invertebrate surveys.
- Monitoring the potential impacts of subsidence on upland swamp communities on the Woronora Plateau, Illawarra, NSW, BHP Billiton. Botanist. Designed the monitoring program to detect potential impacts of subsidence on upland swamps, set up the long term monitoring sites and undertook the first stage of the pre-mining terrestrial flora survey.
- Baseline terrestrial flora and fauna survey of Elouera Colliery Longwalls 9 and 10, Illawarra, NSW, BHP Billiton. Project Manager/Botanist. Baseline terrestrial flora and fauna survey above two proposed Longwalls.
- Terrestrial flora and fauna surveys of four upland swamps, Illawarra, NSW, BHP Billiton. Baseline terrestrial flora and fauna survey prior to mining of four upland swamps. Subsequent surveys undertaken following the commencement and completion of mining beneath each of the swamps.
- Dendrobium coal project: likely impacts of subsidence on terrestrial ecology, Illawarra, NSW, BHP Billiton. Botanist. Field assessment of the likely impacts of subsidence on the terrestrial ecology of the areas above the Dendrobium Mine, including areas within the Sydney Water Special Areas.
- Targeted surveys for *Acacia bynoeana* along a seismic line associated with West Cliff Colliery near Appin, NSW, BHP Billiton. Botanist.
- Flora and fauna surveys of proposed borehole sites, Appin, NSW, BHP Billiton. Project Manager/Botanist. Impact assessment of proposed boreholes.
- Review of Environmental Factors for Ground Water Monitoring Bores within Upland Swamps, Illawarra, NSW, BHP Billiton. Botanist.
- Assessment of potential impacts of subsidence on riparian vegetation and fauna habitats at Cataract Creek and Ousedale Creek above workings of the West Cliff Colliery, Illawarra, NSW. Project Manager/Botanist.
- Rehabilitation advice for a decommissioned vent site, Illawarra, NSW, BHP Billiton. Botanist. Provided advice regarding revegetation of a decommissioned site including suitable species and methodology.

Professional History

2004 – present Parsons Brinckerhoff (PB)
2001 – 2004 Bios Research Pty Ltd
2000 – 2001 Plant Ecology, University of Sydney
1999 – 2000 John Ray Herbarium

NICHOLAS CORKISH

Ecologist

Years of Experience

9 (6 months with PB, 9 years with others)

Education

Bachelor of Forest Science, University of Melbourne; Graduate Diploma in Science (Biological Science), University of Wollongong (currently enrolled)

Professional Affiliations

Ecological Society of Australia, Member

Key Qualifications

Nick has the equivalent over nine fulltime years practical experience in biodiversity, soil and water conservation and management. Nick's experience covers a number of aspects of native vegetation resource use and conservation issues, especially of native forests, and he has particular knowledge of biodiversity survey and conservation management for threatened species.

A considerable portion of Nick's work over the past 10 years has engaged him in assisting, conducting and managing a number of general or targeted surveys for both vegetation and vertebrate fauna. His field experience covers a range of habitats, primarily forests and woodlands, from coastal and tablelands areas of New South Wales and Victoria. Nick maintains particular interests in botany, plant ecology and fire ecology.

Nick is experienced in the assessment and mitigation of impacts, especially from timber harvesting, clearing, roads, infrastructure development, prescribed burning and wildfires. He has comprehensive theoretical and practical understanding of the conservation significance of threatened flora, fauna and of wildlife habitat and is knowledgeable in application of Federal and State environmental legislation including the *Environment Protection and Biodiversity Conservation Act 1999*, the *Threatened Species Conservation Act 1995* and the *Environmental Planning and Assessment Act 1979*.

Nick also has considerable experience in the use of Geographic Information System products for mapping, data analysis, management, and planning purposes.

PB Experience

Impact Assessment

- Augmentation of the Northwest Sector Electricity Transmission Network, Riverstone (NW Sydney), NSW, Integral Energy. Assessed potential impacts of a number of route options on terrestrial flora and fauna and habitats, including endangered ecological communities of the Cumberland Plain. Survey for threatened flora and fauna and assessment of impacts of infrastructure proposed on preferred option.
- Terrestrial Flora and Fauna Assessment and Species Impact Statement of Proposed Bickham Coal Mine, Upper Hunter Valley, NSW, Bickham Coal Pty Ltd. Undertook and reported desktop studies, flora survey, vegetation community mapping (including definition and mapping of an endangered ecological community) and targeted terrestrial fauna surveys.
- Environmental Impact Statement for Pacific Highway Upgrade, Kempsey to Eungai, NSW, Roads and Traffic Authority. Assessed terrestrial flora and possible endangered ecological communities on floodplain and contributed to report on the likely impacts of the Pacific Highway Upgrade on terrestrial flora and fauna.
- Environmental Impact Statement for Pacific Highway Upgrade, Bulahdelah Bypass, NSW, Roads and Traffic Authority. Assessed terrestrial flora and possible endangered ecological communities on floodplain and contributed to report on the likely impacts of the Pacific Highway Upgrade on terrestrial flora and fauna.

- Environmental Impact Statement for Munmorah Gas-fired Power Station, Munmorah (Central Coast), NSW, Delta Electricity. Assessed the likely impacts of and constraints on two optional gas supply pipeline routes and associated infrastructure on terrestrial flora and fauna and habitats.
- Environmental Impact Statement for Lismore Sources Proposed Water Supply Pipeline and Associated Infrastructure, Lismore, NSW, Rous Water. Assessed the likely impacts of the proposed water supply pipeline and associated infrastructure on terrestrial flora and fauna and habitats, including lowland rainforest on floodplain, an endangered ecological community.
- Environmental Impact Statement for Waste Resource Recovery and Recycling Facility, Rutherford (Maitland), NSW, Transpacific Industries. Assessed the terrestrial flora and fauna and habitats and impacts of the proposed facilities on endangered ecological communities.

Options and Constraints Assessment

- Augmentation of the Northwest Sector Electricity Transmission Network, Riverstone (NW Sydney), NSW, Integral Energy. Assessed potential impacts of a number of route options on terrestrial flora and fauna and habitats, including endangered ecological communities of the Cumberland Plain.
- North Coast Rail Loops Preliminary Assessment and Scoping and Legislative Review, sixteen locations between Sydney and Brisbane, Australian Rail Track Corporation. Preliminary assessment of constraints from threatened flora and fauna, including endangered ecological communities, and other environmental features at sixteen proposed railway passing loops between Sydney and Brisbane.
- Preliminary Ecological Issues Assessment and Legislative Review of Proposed Freight Train Support Facility, Singleton, NSW, Queensland Rail. Preliminary flora and fauna habitat assessment, including identification of endangered ecological communities.
- Environmental Impact Statement for Lismore Sources Proposed Water Supply Pipeline and Associated Infrastructure, Lismore, NSW, Rous Water. Assessed the likely impacts of and constraints on the proposed water supply pipeline and associated infrastructure on terrestrial flora and fauna and habitats, including lowland rainforest on floodplain, an endangered ecological community.
- Environmental Impact Statement for Munmorah Gas-fired Power Station, Munmorah (Central Coast), NSW, Delta Electricity. Assessed the terrestrial flora and fauna constraints on and options for gas supply pipeline routes and associated infrastructure.

Management Planning, Conservation Planning

- Boggabri Coal Project Flora and Fauna Management Plan, Western NSW, Idemitsu Boggabri Coal Pty Ltd. Reviewed previous rehabilitation trials and researched information for a comprehensive flora and fauna management plan for the construction and operation of an open cut coal mine located within a State forest. Issues dealt with included threatened species and communities, weeds and pests, and rehabilitation. A monitoring program and baseline assessment was included in the plan.

Previous Experience

Ecological Monitoring

- Ecological Monitoring, NSW Mid-North Coast area, State Forests of NSW. Ecologist. Contributed to the development and implementation of projects to monitor impacts of native forest harvesting and associated road construction and prescribed burning activities on threatened flora species and the effectiveness of mitigation measures.

Conservation Planning and Impact Assessment

- Recovery Planning, NSW National Parks and Wildlife Service, Central Threatened Species Unit. Prepared separate recovery plans for threatened plant species *Zieria involucreata* and *Prostanthera askania* to meet requirements of both the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and NSW Threatened Species Conservation Act 1995.

- Vegetation Survey and Mapping, Warragamba Catchment, NSW National Parks and Wildlife Service, Conservation Assessment and Data Unit and Sydney Catchment Authority. Assisted the planning of, coordinated and implemented vegetation surveys with contract botanists.
- Vertebrate Fauna Survey, Avisford and Munghorn Nature Reserves, Mudgee Area, NSW National Parks and Wildlife Service, Conservation Assessment and Data Unit. Planned systematic vertebrate fauna surveys; participated with a small team of fauna surveyors and other field staff to carry them out; compiled, audited and managed the collected data; analysed, mapped and reported results of surveys.
- Vertebrate Fauna Survey, Warragamba Catchment, NSW National Parks and Wildlife Service, Conservation Assessment and Data Unit and Sydney Catchment Authority. Planned systematic vertebrate fauna surveys; led and coordinated a small team of specialist fauna surveyors and other field staff to carry them out; compiled, audited and managed the collected data.
- On-Ground Implementation of Conservation Measures in Timber Harvesting Areas. Bombala, Urunga and Mid-North Coast areas, State Forests of NSW. Forester/Ecologist. Oversaw the on-ground implementation in timber harvesting areas of conservation measures.
- Development and Implementation of Biodiversity Management Policies and Practices, Bombala, Urunga and Mid-North Coast areas, State Forests of NSW. Forester/Ecologist. Liaised and negotiated with external and internal stakeholders regarding the development and implementation of biodiversity management policies and practices.
- Vegetation and Threatened Flora and Fauna Surveys, Bombala, Urunga and Mid-North Coast areas, State Forests of NSW. Forester/Ecologist. Planned, coordinated and implemented vegetation and fauna surveys, assessed and reported results and ensured their incorporation into forest management.
- Timber harvesting planning, Bombala, Urunga and Mid-North Coast areas of NSW, State Forests of NSW. Forester/Ecologist. Collected baseline data on abiotic factors affecting or on biota affected by proposed timber harvesting operations; prepared detailed harvesting and road construction plans conforming to strict standards required for best practice and to meet regulatory and legislative requirements.

Publications

- Recovery plan for *Zieria involucreata*. Dept. of Environment and Conservation (NSW), 2004
- Recovery plan for *Prostanthera askania*. Dept. of Environment and Conservation (NSW), 2004.
- Fauna of the Munghorn Gap Nature Reserve. NSW National Parks and Wildlife Service, Central Directorate Conservation Assessment and Data Unit, 2003.
- Fauna of the Avisford Nature Reserve. NSW National Parks and Wildlife Service, Central Directorate Conservation Assessment and Data Unit, 2003.
- Co-author. Fire hazard and prescribed burning of thinning slash in eucalypt regrowth forest. Management of Eucalypt Regrowth in East Gippsland Technical Report No.16. Dept. of Conservation and Environment, Victoria and CSIRO Division of Forestry and Forest Products, ACT, 1991.

Professional History

2005 – present Parsons Brinckerhoff Australia Pty. Ltd.

2001 – 2004 NSW National Parks and Wildlife Service/ Dept. of Environment and Conservation (NSW)

1993 – 2000 State Forests of New South Wales

1988 – 1990 Dept. of Conservation and Environment, Victoria

Appendix B

Quadrat Datasheet

NPWS CENTRAL Directorate

Project Title:

CENTRAL

PO Box 1967

Huirsville 2220

Tel: (02) 9585 6676

Fax: (02) 9585 6442

Site Code

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Date

8 0 6 0 5

Site 1

SITE ATTRIBUTE 1:

VEGETATION SURVEY PROFORMA

RECORDERS

S. Harrington
N. Carlisle

LOCALITY DESCRIPTION:

Bulahdelah Bypass

- Quadrat 1

Ireland property

MAP CODE:

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MAP NAME:

AMG

(1:25,000 Map)

GPS

READING

(centre of plot)

WPO98

ZONE

--	--

EASTING

--	--	--	--	--	--	--	--

NORTHING

--	--	--	--	--	--	--	--

Quadrat size

50 m X 20 m

S	G
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4	2	5	3	9	5
---	---	---	---	---	---

6	4	1	2	4	1	5
---	---	---	---	---	---	---

Cover scale used

1-7

Grid type used

AMG

--

GDA

--

No. of satellites

--

STRATIFICATION:

Wet Meadow

LAND TENURE

P P

PHYSICAL DETAILS

Erosion: geomorph. action
agent

TOPOGRAPHIC POSITION

Altitude

			2
--	--	--	---

(m)

Slope

	0
--	---

°

Aspect

--	--	--

°

Morphoterrain

C

Pattern (within 300m)

N	F	L
---	---	---

Element (within 20m)

S	W	P
---	---	---

HORIZON ELEVATION (Azimuth)

±	N	±	NE	±	E	±	SE	±	S	±	SW	±	W	±	NW

Outcropping %

0

Open water %

25

Surface rock %

0

Mapped Geology

--

Field Geology

--

No. Photo

--

Film No.

--

Print No.

646-648

Runoff

NS

Horizon
Visibility

--

DISTURBANCE HISTORY

	Time since last	Accuracy	Severity	Basis of assessment
Fire	—			
Logging	—			
Clearing				cleared to banks
Grazing	current		heavy	
Weeds			high	
Other				

Soil

Type:

1

Depth:

1

Site

Condition:

P-A

G-Good

A-Average

P-Poor

Distance to nearest
water course (m)

~250m

Name of watercourse

Myall River

Notes:

partially inundated, part raised/dry

Appendix C

Plants recorded on site

Appendix C: Plants recorded within the site

This appendix details the plants recorded on site during the current surveys.

Family	Scientific Name	Common Name	Native	Quadrat				Recorded within site ¹
				1	2	3	4	
Apiaceae	<i>Hydrocotyle bonariensis</i>		N	-	-	-	Y	Y
Asteraceae	<i>Aster subulatus</i>	Wild Aster	N	-	-	Y	Y	Y
Azollaceae	<i>Azolla pinnata</i>		Y	Y	Y	Y	-	Y
Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak	Y	-	-	-	-	Y
Cyperaceae	<i>Carex appressa</i>		Y	-	-	-	-	Y
	<i>Carex gaudichaudiana</i>		Y	L	-	-	-	Y
	<i>Carex sp.</i>		Y	Y	Y	Y	Y	Y
	<i>Cyperus brevifolius</i>		N	Y	-	-	Y	Y
	<i>Cyperus eragrostis</i>	Umbrella Sedge	N	-	-	-	-	Y
	<i>Cyperus exaltatus</i>		Y	Y	-	Y	-	Y
	<i>Cyperus polystachyos</i>		Y	Y	-	Y	-	Y
	<i>Eleocharis cylindrostachys</i>		Y	-	-	Y	-	Y
	<i>Eleocharis sphacelata</i>	Tall Spike Rush	Y	-	-	-	-	Y
	<i>Fimbristylis dichotoma</i>		Y	-	-	-	-	Y
	<i>Isolepis inundata</i>		Y	Y	-	-	-	Y
	<i>Schoenoplectus mucronatus</i>		Y	-	-	Y	-	Y
Fabaceae (Faboideae)	<i>Trifolium pratense</i>	Red Clover	N	-	-	-	Y	Y
Haloragaceae	<i>Myriophyllum aquaticum</i>	Parrots Feathers	N	Y	Y	-	-	Y
Juncaceae	<i>Juncus cognatus</i>		N	Y	Y	-	Y	Y
	<i>Juncus microcephalus</i>		N	Y	Y	-	Y	Y
	<i>Juncus prismatocarpus</i>		Y	Y	Y	-	Y	Y
	<i>Juncus sp.</i>		Y	-	-	-	-	Y
	<i>Juncus usitatus</i>		Y	Y	Y	Y	Y	Y
Juncaginaceae	<i>Triglochin procerum</i>	Water Ribbons	Y	Y	-	-	-	Y
Lentibulariaceae	<i>Utricularia sp.</i>		Y	Y	Y	-	-	Y
Myrtaceae	<i>Eucalyptus robusta</i>	Swamp Mahogany	Y	-	-	-	-	Y
	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Y	-	-	-	-	Y
Onagraceae	<i>Ludwigia peploides ssp. montevidensis</i>	Water Primrose	Y	Y	Y	Y	Y	Y
Philydraceae	<i>Philydrum lanuginosum</i>	Frogsmouth	Y	Y	-	-	-	Y

Family	Scientific Name	Common Name	Native	Quadrat				Recorded within site ¹
				1	2	3	4	
Poaceae	<i>Agrostis avenacea</i> var. <i>avenacea</i>		Y	-	-	-	-	Y
		Narrow-leaved Carpet						
	<i>Axonopus affinis</i>	Grass Common	N	Y	Y	Y	Y	Y
	<i>Cynodon dactylon</i>	Couch	Y	-	-	-	-	Y
	<i>Hemarthria uncinata</i>	Matgrass	Y	-	-	-	Y	Y
	<i>Oplismenus aemulus</i>		Y	-	-	-	-	Y
	<i>Paspalum dilatatum</i>	Paspalum Water	N	-	-	-	-	Y
	<i>Paspalum distichum</i>	Couch Kikuyu	Y	Y	Y	-	Y	Y
	<i>Pennisetum clandestinum</i>	Grass Unknown	N	-	-	Y	-	Y
	<i>Poaceae</i> sp.	Grass Species	?	-	Y	Y	-	Y
Polygonaceae	<i>Persicaria hydropiper</i>	Water Pepper	Y	-	-	Y	-	Y
	<i>Persicaria orientalis</i>	Princes Feathers	N	-	-	Y	-	Y
	<i>Persicaria</i> sp.		Y	-	-	-	-	Y
	<i>Persicaria strigosa</i>		N	Y	Y	Y	Y	Y
Potamogetonaceae	<i>Potamogeton javanicus</i>		Y	Y	-	-	-	Y
Ranunculaceae	<i>Ranunculus inundatus</i>		Y	Y	Y	Y	Y	Y
	<i>Ranunculus lappaceus</i>	Common Buttercup	Y	-	-	-	-	Y
?	Unknown Aquatic Species		Y	-	Y	Y	Y	Y

Key: Y= Yes N= No

1) Recorded within freshwater wetlands in the site during current surveys and/or during the Ecological Assessment and Species Impact Statement (Parsons Brinckerhoff 2004)

Appendix C

Agency and Stakeholder Correspondence

10/410.1905 IP:ST
Mr Roger Fenner (02) 6640 1026
Pacific Highway Office
Roger_fenner@rta.nsw.gov.au

Ms Anne-Marie Delahunt
Assistant Secretary
Environmental Assessment Branch
Department of Environment and Heritage
GPO Box 787
CANBERRA ACT 2601

STATE HIGHWAY NO 10 – PACIFIC HIGHWAY. PACIFIC HIGHWAY UPGRADING PROGRAM. BULAHDELAH UPGRADE. REFERRAL UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999.

Dear Ms Delahunt

I am writing in relation to the proposed Bulahdelah Upgrade project on the Pacific Highway in New South Wales. As you are aware, a Decision on Assessment Approach was issued in relation to this proposal on 2 March 2004 by the Assistant Secretary, Environment Assessment and Approvals Branch, in accordance with Section 87 of the *Environment Protection and Biodiversity Conservation Act 1999*. That Decision noted that the approach that must be used for assessment of the relevant impacts of the proposal was an Environmental Impact Statement under Part 5 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). A copy of the Decision is attached for your convenience.

On 1 August 2005, a number of changes to the EP&A Act and Regulation commenced operation. Amongst other matters, these introduced an amended environmental assessment regime for projects considered likely to have significant environmental impacts. After that date, environmental assessment under a new Part 3A of the EP&A Act will be required.

The changes to the EP&A Act and Regulation included transitional provisions for projects such as the proposed Bulahdelah Upgrade project, which are well advanced under the provisions of Part 5 but have not yet progressed to approval. In accordance with those transitional provisions, the RTA has received advice from the NSW Department of Planning that, *inter alia*, it accepts the Part 5 Environmental Impact Statement published in respect of this project in November 2004 as satisfying requirements under Part 3A.

A copy of the letter from the Department of Planning is attached for your information.

Accordingly, the RTA proposes to proceed in accordance with the Decision on Assessment Approach issued on 2 March 2004, unless otherwise advised by the Department of Environment and Heritage.

Please contact me on (02) 6640 1026 if you require further information in regard to this matter.

Yours faithfully



Roger Fenner
Project Development Manager
encl

16 DEC 2005

CC: Bruce McNamara, Environment Branch

Mark Keogh
Parsons Brinckerhoff
Locked Bag 248
RHODES NSW 2138

Ms Lisa Mitchell
Department of Planning
GPO Box 39
SYDNEY NSW 2000

Kelly Roche
NPWS
Locked Bag 914
COFFS HARBOUR NSW 2450



Australian Government

Department of the Environment and Heritage

Mr Roger Fenner
Project Development Manager
Pacific Highway Office
Road and Traffic Authority
PO Box 546
GRAFTON NSW 2460

Dear Mr Fenner

**Pacific Highway, Bulahdelah Upgrade - NSW Roads and Traffic Authority
(EPBC Reference: 2003/1174)**

On 22 September 2003, a delegate to the Minister for the Environment and Heritage, the Hon Dr David Kemp MP, made a decision that approval was required for the above action. Preliminary information for the action was received under section 86 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 22 January 2004, for decision on assessment approach under Part 8 of the EPBC Act.

The assessment approach for the action has now been considered under the EPBC Act and I have decided that assessment by an accredited process must be conducted.

The accredited assessment process to be used is the Environmental Impact Statement process under Part 5 of the New South Wales *Environmental Planning and Assessment Act 1979*. Once assessment under the Environmental Impact Statement is complete, the NSW Department of Infrastructure, Planning and Natural Resources will provide the Commonwealth Environment Minister with an assessment report on the impacts of the action in order for the decision on approval process to commence.

Yours sincerely

Malcolm Forbes
Assistant Secretary
Environment Assessment and Approvals Branch

*Noted
Copy to PB 8/3/04
AF*

2 March 2004

COMMONWEALTH OF AUSTRALIA

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

DECISION ON ASSESSMENT APPROACH

I, MALCOLM ANDREW FORBES, Assistant Secretary, Environment Assessment and Approvals Branch, Department of the Environment and Heritage, hereby decide that under section 87 of the *Environment Protection and Biodiversity Conservation Act 1999*, the approach that must be used for assessment of the relevant impacts of the action described in the schedule is assessment by an accredited process.

SCHEDULE

The proposed action to construct and operate the Bulahdelah Upgrade of the Pacific Highway for a distance of approximately 8 kilometres between Booral Road and Wootton Road near Bulahdelah, New South Wales (EPBC Reference: 2003/1174).

The accredited process is the 'Environmental Impact Statement' under Part 5 of the New South Wales *Environmental Planning and Assessment Act 1979*.

Dated this 2nd day of March 2004

(SIGNED)

.....

MALCOLM FORBES

ASSISTANT SECRETARY

ENVIRONMENT ASSESSMENT AND APPROVALS BRANCH



COPY

Mr Paul Forward
Chief Executive
PO Box K198
HAYMARKET NSW 1238

DGC05/1960
DGC05/1961

Dear Mr Forward

Subject: Bulahdelah Bypass Pacific Highway Upgrade Environmental Assessment Requirements

I refer to your correspondence dated 19 September 2005 and the application under Part 3A of the *Environmental Planning and Assessment Act, 1979* (EP&A Act).

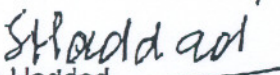
The Roads and Traffic Authority has decided that the project requires an environmental impact statement to be obtained within the meaning of Division 4, Part 5 of the EP&A Act and, by order of the Minister, is now subject to Part 3A. The Minister is the relevant approval authority.

Director-General's requirements (DGRs) for an Environmental Impact Statement (now an 'Environmental Assessment' under Part 3A) were previously issued. Pursuant to Clause 8J of the Environmental Planning and Assessment Amendment (Infrastructure and Other Planning Reform) Regulation 2005, the Director-General adopts the previously issued DGRs as environmental assessment requirements, the EIS and the public exhibition period for the EIS for the purposes of Part 3A for the Bulahdelah Bypass. This is provided that the proposal remains essentially the same as at the time the DGRs were issued and will avoid unnecessary duplication.

Please note that Part 3A enables the Director General to require a Statement of Commitments (for environmental management and mitigation measures) to be included in the Environmental Assessment. It is agreed that the RTA should prepare Submissions Reports for each of the projects, including a Statement of Commitments and a Preferred Project Report as necessary.

Please contact Lisa Mitchell (9228 6354) or Mark Hather (9228 6346) if you would like to discuss this matter.

Yours sincerely


Sam Haddad
Deputy Director-General
Sustainable Development Assessment and Approvals

1/10/2005



Karuah Local Aboriginal Land Council

Tuesday, November 15, 2005

Mr Roger Fenner
RTA Project Development Manager
PO Box 546
Grafton NSW 2460

Dear Mr Fenner,

Report by the Karuah Local Aboriginal Land Council on the management of Aboriginal sites and cultural values which may be impacted by the Pacific Highway Bulahdelah Bypass

The Karuah Local Aboriginal Land Council (LALC) would like to thank the RTA for the opportunity to report on the cultural values and management of Aboriginal sites which may be impacted by the Bulahdelah Pacific Highway Bypass project. The Karuah LALC have received a copy of the Environmental Impact Statement for the project and have had the benefit of additional summary and other information provided by Navin Officer Heritage Consultants.

A representative of the Land Council was present at previous Aboriginal Liaison Group meetings convened by the RTA for the project. From these meetings, the Land Council is aware of the range of views held by the Aboriginal organisations and communities represented in that group.

The Bypass project and its impact on Aboriginal sites was discussed, and relevant information presented and tabled, at a meeting of the Karuah LALC held on the 8 November 2005.

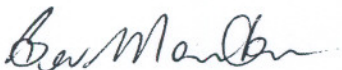
The Karuah LALC make the following points and recommendations to the RTA, based on the discussion and motions passed at this meeting:

- The Karuah LALC appoint Ms Bev Manton to negotiate on its behalf regarding the management of Aboriginal sites and cultural values subject to impact by the project.
- The Karuah LALC is in agreement with the recommendations for the management of Aboriginal archaeological sites presented in the EIS document. These recommendations state that sites will be avoided where practical, and for those sites which will be impacted, surface artefacts will be collected, and salvage excavations will be conducted at identified potential archaeological deposits (PADs).

- Representatives of the Karuah LALC must be included in all salvage and collection actions involving Aboriginal sites, and be consulted about any management decisions arising from the results of the PAD excavations.
- The Karuah LALC also require representatives of the Land Council to monitor the stripping of top soil in the area of all recorded Aboriginal sites and potential archaeological deposits. The purpose of the monitoring is to recover any artefacts exposed by these works.
- The Karuah LALC require all salvaged artefacts (after analysis) to be stored permanently at a community controlled Keeping Place which is currently proposed to be established at Karuah. The Land Council request from the RTA an appropriate level of funding to establish the storage of the salvage collection and the display of representative examples of artefacts.
- With regard to the Healing Stream, the Karuah LALC support the RTA proposal to direct the flow of this stream across the highway corridor through a culvert. The design of the culvert, including associated energy dissipater features, should minimise the size of the area affected by construction works, and the potential for erosion downstream.
- The Karuah LALC require that the Aboriginal cultural tradition of healing associated with Alum Mountain and its waters be acknowledged with an appropriately worded sign, to be erected close to the stream. This sign could form part of walking trail and visitor facilities for the Mountain Park area. The location, form and content of the sign should be developed in consultation with the Karuah LALC and be subject to the Land Council's final approval.
- With regard to the reported Guardian Tree, the Karuah LALC do not consider this tree to have significance according to the cultural traditions of its members, the Karuah Aboriginal community, or the Alum Mountain. In order to respect the views of those with a different view, the Karuah LALC request that a section of the tree trunk containing the burl be salvaged and set aside in an appropriate local area, such as the Mountain Park or adjacent crown land. The relocation of the trunk section should give consideration to reducing the risk of fire and termite damage.
- The Karuah LALC request that the Aboriginal cultural significance of the Alum Mountain be acknowledged in signs and visitor facilities at Mountain Park. The location, form and content of these signs should be developed in consultation with the Karuah LALC and be subject to the Land Council's final approval.

I can be contacted on 02 4997 5733 for any further information.

Yours truly,



Bev Manton
Coordinator
Karuah Local Aboriginal Land Council

Appendix D

Responses to Issues Raised by the then DIPNR



10/410.1916 IJP:ST
Mr Greg Baird (02) 49240242
Pacific Highway Office
Greg _J_ Baird@rta.nsw.gov.au

Ms Lisa Mitchell
A/Manager Transport
Major Infrastructure Assessments Branch
Department of Planning
GPO Box 39
SYDNEY NSW 2000

Dear Ms Mitchell

**HIGHWAY No10 – PACIFIC HIGHWAY. GREAT LAKES COUNCIL. BULAHDELAH UPGRADE PROJECT
RESPONSE TO ISSUES RAISED BY PLANNING:**

I refer to the comments provided by your Department on the Environmental Impact Statement (EIS) and Species Impact Statement (SIS) prepared for the Bulahdelah Upgrade project and received by the Pacific Highway Office in February 2005.

We have reviewed your comments and provide the RTA's response to those comments in the attached document – *"Responses to Department of Planning comments on the EIS / SIS for the Pacific Highway Upgrade at Bulahdelah (letter dated 1 February 2005)"*.

Thankyou for your assistance during the development and assessment of the EIS and SIS for this project. Please contact Mr Irwin Perring, Project Development Officer, on (02) 66402870 or myself if you need any further information regarding these responses.

Yours sincerely

Greg Baird
Project Development Manager
Pacific Highway Office

13/02/2006



Responses to Department of Planning comments on the EIS/SIS for the Pacific Highway Upgrade at Bulahdelah (letter dated 1 February 2005)

Questions from the Main Report

1. p. 1.14 - figure 1.7 doesn't make sense (x axis is supposed to be years).

It is acknowledged that there are errors in the numerals shown in *Figure 1.7* on page 1.17 of the printed version of the *Main Volume* of the EIS. A correct version of Figure 1.7 can be seen in the on-line version of the EIS, at www.rta.nsw.gov.au and on the CD distributed. A correct version of this figure is also shown as Figure S.2 in the Summary document.

2. p. 2.2 - Commonwealth has determined proposal is a controlled action and has accredited the NSW assessment process (see DEH correspondence 7.5.04)

It is acknowledged that on 22 September 2003, the Commonwealth determined that the proposal is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999*, and on 2 March 2004 determined under section 87 of the Act to accredit the NSW assessment process.

3. p.2.7 - is revocation of the State Forest land required prior to approval being granted? What is the process here? Is it similar to the revocation process from National Parks?

The transfer of lands between Govt agencies is controlled by Treasury Direction (TD) 469.03. The TD provides that when an authority acquires land already in Government ownership the authority shall be required to pay compensation on the basis of:

- Current market values agreed between the parties, or if agreement can not be reached,
- Compensation as determined by the Valuer General (VG).

TD 469.03 applies to all agencies listed in Schedules 2 & 3 to the *Public Finance and Audit Act 1983* together to any entities they control, and, (2) to State Owned Corporations listed in Schedule 1 & 5 to the *State Owned Corporations Act 1989*.

In relation to State Forests the RTA negotiate with a view to gaining an agreement, or, if preferred by the State Forests, both parties request the VG to provide a determination of compensation as part of an agreed compulsory acquisition process. 'Revocation' from a State Forest is not required prior to purchase.

National Parks are somewhat different. 'Revocation' from the National Park is required by an Act of Parliament specifying the land. The land is then held by the government agency currently in control of the administration of National Parks. The RTA can then purchase the land in accordance with TD 469.03

4. p. 4.14 - the selection of Option E over all other options, in particular Option A is not especially clear/obvious (either in the main volume or Technical Paper 3) as there seem to be different strengths and weaknesses of each and it's not clear why E was chosen as the preferred option. Further clarification of how this decision was reached is requested.

The selection of the preferred route is described in detail in *Chapter 4* of the *Main Volume* of the EIS, and in *Technical Paper 3 – Need and Route Evaluation*. It is acknowledged that Option E and Option A were very close in meeting a range of project objectives, assessment criteria and performance measures. The selection of Option E was based in part on consultation with the community and other stakeholders, as well as the assessment of a wide

range of issues including ecological, heritage, social, economic, land use, traffic and engineering. Section 4.1.3 of the *Main Volume* of the EIS listed the key advantages of Option E. Option E:

- is closer to town, providing enhanced opportunities to attract passing trade and visitors, and supporting the concept of Bulahdelah as a highway service town;
- provides opportunities to improve town drainage;
- provides opportunities for a whole-of-town focus and urban design enhancement;
- is shorter, which has construction program benefits and reduced impact on the natural environment;
- incorporates the new road infrastructure to the north;
- has a higher road user benefit–cost ratio;
- has fewer impacts on potential sites of Aboriginal cultural significance;
- has fewer impacts on prime agricultural land and rural enterprises; and
- minimises potential environmental impacts on local drinking water catchment.

It is also important to note that some of the key stakeholders such as the Karuah Local Aboriginal Land Council and DEC indicated a preference against the development of the western route options (including Option A) during the route evaluation phase. This preference was related to ecological and heritage issues identified in those areas during the earlier phase of the project or would potentially be identified in the detailed assessment phase if a western route was chosen as the preferred route option.

5. pp. 4.14 to 4.17 - interchange design identification. These are all based on apparent impacts and benefits of the considered options however there is no discussion anywhere of the relative merits of the options put-forward. Please clarify the impacts and benefits on which tables 4-10, 4-11 and 4-12 are based.

Section 4.2.2 Configuration of Links to the Town within the *Main Volume* of the EIS is a summary of the discussion contained in *Section 3.2.1 of Technical Paper 4 – The Proposal*. The impacts and benefits of the interchange locations and arrangements are given in more detail within this section of the Technical Paper.

6. It is noted that incorporation of the northern roundabout into the design was a result of community input. Could you please provide further information regarding this design? What other alternatives were considered? What is the need for the interchange to be so large? Is it possible to reduce the footprint further possibly by combining some of the legs? It is understood that priority to traffic exiting from the highway is desirable.

The design alternatives considered at the northern interchange are summarised in *Section 4.2.4*. More detail is given in *Section 3.2.3 of Technical Paper 4 – The Proposal*.

The design of the northern interchange was subject to detailed assessment by the design team and the RTA. There were a number of engineering, environmental, social and economic constraints that influenced the concept design development. Options to reduce the footprint of the interchange were assessed, including a rationalisation of access roads leading from the roundabout. However, the current concept design was selected because of better standards of design, signage and safety. There was improved access to and from Bulahdelah, and improved grades at Lee Street, an important access for heavy vehicles from the north of the town. In addition, the proposed concept design was preferred by the community and Great Lakes Council.

It should also be noted that the more standard full diamond interchange treatment was found to be ineffective and unsafe because of the number of traffic movements that had to be dealt with. The footprint impact of this option was also found to be greater, with substantial reconstruction of a greater length of Lee Street. Importantly greater property and access impacts were also identified, directly affecting land with the potential for future urban subdivision and the access to a transport company facility that would be virtually impossible to reinstate.

7. p. 5.3 - note reference to steep rock cuts up to 24 m deep for 500m length through mountain - what are the visual impacts for the town? Whilst later the document discusses general visual impacts of the proposal, there is no reference to any views of the cutting. All cross sections seem to be to areas where the proposal is largely at current surface levels. Please provide cross sections towards the major cutting.

Technical Paper 12 – Visual provides a detailed assessment of the visual impact of the proposal. *Appendix A* of *Technical Paper 12* provides a visual assessment that considers in detail views to the cutting from the town. Section A2 provides a discussion and cross-sections that examine visual impacts of the road cutting. This assessment took account of both the views from the town to the aspects of the project that would be visible and also general views to key areas of the project such as the major cutting to the north of Anne Street.

8. Fig 5.2 - has the impact assessment considered locations of both proposed and alternative basins? Fig5.2f shows a lot of fill and likely visual impact of interchange and northbound off ramp. There is little if any discussion/justification of the northbound off ramp. The information provided suggests that there is little need for this exit (for relatively few users (access to golf course and waste facility and STP)). Similarly, there is little assessment of the visual impacts. Provide justification for scale of design and whether consolidation is possible

All basin locations are within the approximate extent of construction shown in *Figure 5.18*, which was assessed.

Assessment of the visual impacts is found in *Technical Paper 12 – Visual Assessment*, specifically in section 4.5.3. This section acknowledges that the northern interchange would be very visible from adjacent locations.

Justification for the scale of design is provided in *Section 3.2.3* of *Technical Paper 4 – The Proposal*, where two different options are considered. It is acknowledged that the interchange footprint is large, but it should be noted that the design has been reviewed several times by the project team and the RTA. The selected design was the preferred option of the Council and community, as detailed in *Section 3.2.3* of *Technical Paper 4*.

The northbound offload ramp was located to help reduce the complexity and effective footprint of the interchange, in addition to improving the safety of the layout. The land occupied by this ramp is in the main, residue land that would be isolated between the new and existing highway and would have had no real functional value as a result, regardless of whether the offload ramp was placed in this area or not.

The inclusion of this northbound offload ramp was a major consideration in the community request for the design and purpose of this interchange. Its function is primarily to remove northbound heavy vehicle traffic from the residential areas of Bulahdelah (an issue of considerable concern to the residents, the trucking industry and Council in recent years). It also functions as a direct access point for the north-western area of Bulahdelah and a second chance access point for the northbound traffic movement that is considered to be the main highway contributor to commercial activity in the town.

It should also be noted that the northern interchange may ultimately become the grade separated connection for Wootton Road and the Lakes Way further to the north, as traffic volumes and safety problems increase for these at-grade intersections. The current concept

design provides for maximum flexibility in this regard, as it is both important and cost effective to allow latitude for future requirements where possible in the current design.

9. p. 5.23 - does Great Lakes Council have any street improvement plan/masterplan for Bulahdelah which may provide guidance for works to be undertaken on the existing highway following construction of the bypass? There has been discussion of removing the median barrier on the highway (between approx. Crawford and Blanch Sts) but no commitment is given. Will existing traffic lights within the town remain?

The town improvements that the RTA has agreed to are outlined in *Section 5.7* of the *Main Volume*. Specifically, town improvements that have been developed in consultation with Great Lakes Council and the community include:

- relocation of the rest area toilet facilities currently located adjacent to the golf course to a suitable location in Bulahdelah (residual land could be offered to the golf club);
- improved access (vehicular and pedestrian) to the public reserve located to the south-west of the existing Myall River bridge;
- provision of limited on-street heavy vehicle parking facilities on the existing highway near the centrally located service stations; and
- a streetscape scheme for the existing highway, including some minor landscaping and traffic calming facilities.

The RTA is not aware of any Council street improvement plan or landscaping masterplan for Bulahdelah. The RTA has included in their commitments a contribution for the items mentioned above for aspects directly related to the functionality of the new highway (to both reinstate rest area facilities and improve Stop, Revive, Survive facilities), as well as for aspects to cater for the new function of the existing highway as the main town access path (including minor traffic calming facilities). It is likely that most of this work would be done by Great Lakes Council, with funding and agreement by the RTA.

Aspects such as the adjustment of the Bulahdelah Mountain Park picnic area and reinstatement of vehicular and pedestrian access to Bulahdelah (Alum) Mountain will be undertaken as direct work under the project. Other aspects such as the adjustment of existing signposting and the conditions of the existing highway facilities to be handed over to Council control would be subject to a handover agreement that would be negotiated with Council following the approval of the project. The removal of central concrete safety barriers would be an important part of the re-unification of Bulahdelah when the highway traffic is removed from the town and would be included as part of that handover agreement. The work covered by the handover package is normally agreed by both parties, funded by the RTA and undertaken by Council.

10. p. 5.25 - have any safety concerns been raised by residents or the school of locating an underpass near the primary school?

Technical Paper 1 – Community and Stakeholder Involvement details the concerns raised by residents. There have been no records of concerns raised about safety in relation to the Stuart Street underpass located adjacent to St Josephs Primary School. It should be noted that this underpass is being provided to reinstate an existing pedestrian/vehicular access track that is widely used by the community to access the Bulahdelah (Alum) Mountain area. This will also be an important access point for emergency services,

11. p. 5.28 - note council to undertake street improvements within Bulahdelah. What opportunities are there for RTA to provide?

The RTA is responsible for either undertaking or funding activities that are directly attributable to the highway upgrading project such as those discussed in response 9 above. It is generally found to be more effective and practical for Council to undertake the subsidiary activities that are associated with the project but located clear of the project footprint, especially in urban areas under the direct control of Council. Great Lakes Council would be

responsible for funding and undertaking other activities such as general street improvement programs that are not directly related to the highway upgrade project.

The general nature of the town improvement and streetscape work for the existing highway associated with the highway upgrade project has been generally discussed with Council. However, the details of the extent and value of this work would be subject to further negotiation and agreement between the RTA and Great Lakes Council following the approval of the project.

12. p. 5.30 - note that the captions/labelling on Figure 5.12a is in code. Please forward revised figures.

It is acknowledged that there are errors in the numerals shown in *Figure 5.12* on page 5.30 of the printed version of the *Main Volume* of the EIS. A correct version of *Figure 5.12a* can be seen in *Technical Paper 4* (p 5.3), in the on-line version of the EIS, at www.rta.nsw.gov.au and on the CD distributed.

13. p. 5.38 - note reference to storage of spoil from Karuah to Bulahdelah for Myall River Bridge embankments or pre-loading.

Is it likely that this will be available prior to anticipated approval of this project? Need to consider potential timing issues (note reference to this occurring prior to or as part of Stage 1 construction works).

What contingencies are in place? Will Karuah-Bulahdelah provide sufficient material for the needs of this project? What other sources of material have been identified? Need also to consider other associated impacts such as traffic movement - has this been included as part of this proposal?

The original design for both the Karuah to Bulahdelah and the Bulahdelah Upgrade projects were based on the utilisation of up to 200,000 cubic metres of spoil material from Karuah to Bulahdelah in the Bulahdelah project. However, a range of potential contractual problems have since been identified with this proposal such as quality of the material, timing and cost of incorporating this material into the Bulahdelah project. A number of options are available to the Contractor who is awarded the construction contract for the Bulahdelah project, including sourcing the material from the Karuah to Bulahdelah project, using material from other quarries and refinement of the concept design to minimise or remove the need for additional material.

The final design for Karuah to Bulahdelah (Stage 2 and 3) has therefore been adjusted to provide balanced earthworks without any excess spoil material. However, an area has been identified within the road reserve for this project where a quantity of up to 200,000 cubic metres of material could be sourced as a separate borrow activity under the Bulahdelah Upgrade project if required.

The decision on the most suitable method of resolving any fill material shortfall would be the responsibility of the Contractor chosen for the Bulahdelah Upgrade project. Any decision to reduce the fill material shortfall by design refinement would be accompanied by a restriction on any form of increase in the footprint or level of environmental impact of the project. Decisions to source fill material from "off site" locations would also include a requirement for the contractor to undertake a separate assessment and gain any approvals necessary with regard to the environmental, traffic and safety impacts of the activity.

For further information on material requirements please refer to section 5.9.6 in the *Main Volume* or *Section 7.2* in *Technical Paper 4 – The Proposal*.

It is expected that all of the select subgrade material would be derived from the cuttings within the project. *Table 7.5* in *Technical Paper 4* (p.7.29) provides details of the project materials that may need to be imported, and the potential sources for these materials.

Associated impacts such as traffic movement and construction related traffic issues are discussed in *Section 7* of *Technical Paper 4 – The Proposal*.

14. p. 5.48 - what is the level of commitment to the impact minimisation measures noted for Myall River Bridge construction works (i.e. use of barge, avoidance of trees, relocation of debris)?

The RTA is committed to the implementation of impact minimisation measures to a level similar to those set out in the EIS for issues such as the impact on the river and riverbank environs during construction of the Myall River bridge as detailed in *Section 7.4.2 of Technical Paper 4 – The Proposal*. The measures discussed in the EIS do not necessarily represent the actual methodology that would be implemented, but are rather indicative of the minimum level of protection that the RTA would require the Contractor to achieve when undertaking the work.

15. p. 5.51 - where will the material identified in Table 5.6 be sourced from?

Table 7.5 in *Technical Paper 4* (p.7.29) details the potential sources of the major materials to be imported. This table appears below for your information.

Table 7.5: Potential Sources of Material

Material	Possible Source	Location	Approximate Distance (kilometres)
General fill (CBR > 3%)	Karuah to Bulahdelah Upgrade	Pacific Highway	5–10
Select subgrade material	Mountain Industries	Karuah and Tea Gardens	45–55
Aggregate	Boral Quarry	Seaham	100
Sand	Various suppliers	Local region	35–60
Cement	Various suppliers	Sydney	250
Crushed rock/gravel	Boral Quarry	Seaham	100
	Mountain Industries	Karuah and Tea Gardens	45–55
Asphalt	Boral	Newcastle	85
Concrete pipes and box culverts	Pioneer	Sydney/Newcastle	80–250
	CSR Humes		
Bridge deck units and piles	Various suppliers	Sydney/Newcastle	80–250
Reinforcing steel	Various suppliers	Newcastle	85
Wire rope safety fence	Various suppliers	Newcastle	85
Guardrail	Various suppliers	Newcastle	85
Concrete barrier units	Various suppliers	Newcastle	85
Other fencing	Various suppliers	Newcastle	85

16. p. 5.54 – why couldn't sites 4 or 6 (Fig 5.22a) include a batch plant? Note that site 8 is immediately adjacent to the river though it is stated elsewhere that these would be kept away from the riverbanks. Further information is requested.

Sites 4 and 6 have not been nominated as potential sites for batch plants at the time of the EIA as they are within 250 metres of a residence. Location criteria for ancillary construction facilities are provided in *Table 7.6, Section 7.9.1 of Technical Paper 4 – The Proposal*. Several potential sites for ancillary construction facilities have been identified based on these criteria. Construction concrete batching plants, chemical storage facilities and site compounds would be located prior to the start of construction, taking account of criteria included in COA database condition no 66.

17. p. 5.61 - note that there are 5 detention basins through the area identified as *Cryptostylis hunteriana* habitat. Can these (or at least some) be relocated to less sensitive areas?

Five detention areas are identified in *Figure 4.11b* of *Technical Paper 4 – The Proposal*. It should be noted that these are not detention basins, but are areas where, in heavy rainfall, water is detained for a short period adjacent to the highway embankment and released in a controlled way through culverts. The purpose of these detention areas is to reduce in-town flooding that currently occurs during storm events. It is expected that inundation in these areas would be intermittent and for short durations. These detention areas are further described and discussed in *Technical Paper 8 – Water*.

These detention areas are within *Cryptostylis hunteriana* habitat. It is expected that the areas that would be inundated would already be disturbed during construction and these impacts are accounted for in *Technical Paper 7 - Ecological Assessment and Species Impact Statement*.

18. p. 5-63 - note that none of the potential measures to facilitate fauna movement are designed specifically for fauna (mostly for drainage and may have potential for fauna movement). Have any measures specifically for fauna been considered? What is the reference to the bridges as these aren't discussed in the context of fauna movement?

Technical Paper 7– Ecological Assessment and SIS, Section 6.3.1 outlines the measures that have been included to facilitate fauna movement. This section also discusses a number of other measures that were considered during the design development phase. These measures included bridges and culverts to facilitate movement of bandicoots, the Ichneumon Wasp and other fauna. It was considered at that time that these measures had uncertain efficacy and constructability, and were therefore not included as part of the concept design. Further investigation of efficacy, cost and constructability of these measures has been undertaken and it is concluded that there is little or unknown benefit resulting from the application of these measures in relation to fauna movement and protection of species or their habitats, or to maintenance of surface and sub-surface water flow.

The RTA has found that combined structures work well for native fauna in a large number of cases and are cost effective means of allowing fauna movement. Combined structures and potential fauna movement is addressed in Section 6.3.1 of the SIS.

19. p. 5-64 - when will the trial of squirrel glider movement structures be undertaken? DEC has recommended rope netting suspended between poles at mid-canopy height for Karuah Bypass project. Is there any information available from the Karuah experience?

Measures to mitigate impacts on movement of Squirrel Gliders are to be determined following analysis of results of a trial of measures adopted at Karuah. Trials of the rope bridge structures at Karuah are ongoing. There are preliminary results which show a Squirrel Glider on the ropes of one these structures. RTA and Thiess have monitored at night but it is not clear if the animals are crossing.

20. p. 6-7 - what further information has been obtained regarding the cultural status of 2 reported Aboriginal places, what potential impacts are anticipated and what (if any) mitigation measures will be implemented?

Meetings have been held with the local Aboriginal community to discuss these issues. The Karuah Local Aboriginal Land Council has consulted with the Aboriginal community to resolve the issues and has written to the RTA in a letter dated 15 November 2005 indicating that they are supportive of the mitigation measures proposed by the RTA with regard to these two sites.

The project affects both the Guardian Tree and Healing Stream sites. The mitigation measures proposed for the Face Tree involves removal of the burl from the tree prior to the commencement of construction and placing it in a suitable display location in consultation with the Karuah Local Aboriginal Land Council. The proposal with regard to the Healing Stream involves adjustment of the culvert design at this site to minimise the impact on the stream and allow for retention of as much of the stream bed as possible in its current state. It is also proposed to include a description of the heritage value of the Healing Stream in signage to be provided in the Mountain Park picnic area

21. pp. 6.11-15 - there is a 0.5 ha discrepancy in the amount of vegetation cleared to the amount of habitat. Please clarify.

The discrepancy of 0.5 hectares refers to a section of 'Open Water' that corresponds to that part of the Myall River crossed by the proposed bridge.

22. p. 6.16 - what is the status of *Corybas sp. aff. aconitiflorus*? Has this species been listed? What is the basis for the statement that it is likely that the species will be listed in TSC schedules? It does not appear that there has been a preliminary listing at this time. Please clarify.

The red helmet orchid was recently described as a new species (*Corybas dowlingii*). The species has not been listed under either the *TSC Act* or the *EPBC Act*, nor are there any preliminary listings of the species. However, it is likely that it would be given a conservation rating of 3V (Vulnerable) or 3E (Endangered) (D. Jones *pers. comm.*) and therefore would be listed as threatened on the *Threatened Species Conservation Act 1995* in the future.

23. p. 6.34 - the reference to cut and fill volumes is a little confusing. Is it saying that 922,000 cubic metres is required for fill but of the 918,000 cubic metres of cut only about 700,000 cubic metres will be suitable for fill and the additional 200,000 cubic metres will be imported? Refer also to q. 13.

Technical Paper 4 – The Proposal, section 7.4.1, gives the details for specific cut and fill volumes. Approximately 918,000 cubic metres of earthworks cut and approximately 922,000 cubic metres of earthworks fill would result from the construction of the Upgrade. With allowances for compaction and other losses, unsuitable material, and settlement across the floodplain, it is anticipated that approximately 160,000 cubic metres of borrow material would be required.

The EIS allowed for approximately 200,000 cubic metres surplus material available from the Karuah to Bulahdelah project. However, as discussed in the response to issue 13 above, the final design for Karuah to Bulahdelah (Stage 2 and 3) has been adjusted to provide balanced earthworks without any excess spoil material. The decision on the most suitable method of resolving any fill material shortfall would be the responsibility of the Contractor chosen for the Bulahdelah Upgrade project.

24. p. 6-34 - where will the additional construction materials (concrete/cement, steel and asphaltic concrete) be sourced from?

Section 7.6 (Table 7.5) of *Technical Paper 4 – The Proposal* provides information on potential sources of materials, and is provided below.

Table 7.5: Potential Sources of Material

Material	Possible Source	Location	Approximate Distance (kilometres)
General fill (CBR > 3%)	Karuah to Bulahdelah Upgrade	Pacific Highway	5–10
Select subgrade material	Mountain Industries	Karuah and Tea Gardens	45–55
Aggregate	Boral Quarry	Sesham	100
Sand	Various suppliers	Local region	35–60
Cement	Various suppliers	Sydney	250
Crushed rock/gravel	Boral Quarry	Sesham	100
	Mountain Industries	Karuah and Tea Gardens	45–55
Asphalt	Boral	Newcastle	95
Concrete pipes and box culverts	Pioneer CSR Humes	Sydney/Newcastle	90–250
Bridge deck units and piles	Various suppliers	Sydney/Newcastle	90–250
Reinforcing steel	Various suppliers	Newcastle	95
Wire rope safety fence	Various suppliers	Newcastle	95
Guardrail	Various suppliers	Newcastle	95
Concrete barrier units	Various suppliers	Newcastle	95
Other fencing	Various suppliers	Newcastle	95

25. p.7.2 - the reference to the lack of footpaths within the town is noted. Is provision of footpaths in key locations (such as along the existing highway) something that the RTA could consider providing prior to handing the highway back to council or something that could be funded at another time?

The provision of footpaths within Bulahdelah is the responsibility of Great Lakes Council. A number of other project related town improvements have been discussed with Great Lakes Council. While the proposed town improvements do not specifically include footpaths, they do include improved pedestrian access to the picnic area on the south-western bank of the Myall River, as well as a traffic calming/streetscape scheme for the existing Pacific Highway. The existing highway handover package would also include the removal of the central concrete safety barrier that would restore a direct line of pedestrian access between the eastern and central areas of Bulahdelah.

The final details of the town improvements, along with the existing highway handover package would be subject to agreement being reached between the RTA and Great Lakes Council. The town improvements are described in Section 5.7 of the *Main Volume* of the EIS.

26. p.7.15 - what is meant by 'The river would also generally remain navigable during construction'? Have any impacts on use of the river during construction been discussed with houseboat operators? What mitigation measures will be implemented if navigation is not possible at any time?

Houseboats and other watercraft would be able to use the Myall River, and pass around or beneath the proposed river bridge during construction and operation. From time to time there may be brief disruption to movement of watercraft during construction, where craft would be directed around construction zones. There have been discussions with the houseboat operators about their requirements and the impacts of the Proposal to their operations.

Boat users would be advised by signage where the path for passage would be. Local houseboat operators would be kept informed of the progress of the bridge construction, and implications to users of houseboats.

27. p.7.16 - will construction impact on potentially contaminated sites be identified? What assessment of these sites has been undertaken? How will contamination be managed if identified?

Contaminated sites are discussed in *Section 7.2.1* and *Section 7.2.2* of the *Main Volume* of the EIS and within *Technical Paper 11 – Topography, Geology and Soils*. There are several sites within Bulahdelah that could potentially contain contaminated soil that may need to be stockpiled. Stockpiles would be contained and measures to prevent runoff from these stockpiles of contaminated soils would be implemented. These measures would be outlined in the CEMP, along with the measures for treatment or disposal of the contaminated material.

Section 2.5 of *Technical Paper 11* outlines the methods of assessment of these sites. The soil sampling for the contamination assessment targeted potential land use activities identified in the desktop study. The location of sites tested for contamination is shown in *Figure 2.4*.

Soil samples were collected from boreholes, test pits and hand auger holes. All samples collected from test pits or from deeper boreholes (deeper than 0.2 metres) were collected for background analysis purposes.

For all surface soil samples, and where the potential for hydrocarbon contaminants was possible, field Photo-ionisation Detector (PID) screening was conducted. Field quality control procedures performed for this investigation included the use of standard field sampling sheets and, the use of calibrated monitoring equipment, and the collection of field duplicate samples.

28. p.7.19 - is the reference to the Pacific Highway south of Bulahdelah being flood free intended to mean the area south of the existing Booral Rd intersection? Or is it meant to say that the existing highway south of the river, presumably on embankment, is above the 100 ARI?

The existing highway south of the Myall River is on embankment above the 100 ARI.

29. p.7.22 - remedial work has been recommended for the former saw mill site on the eastern side of the proposed northern interchange. This did not appear to be a recommendation of Technical Paper 11. Please advise where this recommendation has come from.

Technical Paper 11 – Topography, Geology and Soils, Section 4.4 clarifies that as a result of testing for contamination, minor remedial work is recommended for the former saw mill site before or during construction.

30. p.7.22 - a maximum cut of 25 m and fill of 11 m on the floodplain and 12 m east of Stuart Street are stated, however in the technical documents the maximums are stated as 24 m and 11 m respectively. Please clarify.

The construction of the proposal would require road cuttings up to 25 metres deep through rock at the footslopes of Bulahdelah (Alum) Mountain, and fill embankments to the height of 11 metres on the floodplain and 12 metres to the east of Stuart Street.

31. p.7.36 - has any curtilage been identified for the Rachel Henning house (reference to RTA purchase of large area from MidCoast Water)? Has an appropriate curtilage been factored into the land acquisition and potential impacts on the Henning property? It would appear that a co-operative approach to developing a plan of management is required for this site involving RTA, MidCoast Water and Great Lakes Council.

No curtilage has been defined for the Rachel Henning house. The proposed freeway boundary is approximately 50 metres away from the site. The commitments made in relation to identifying and fencing off the site are discussed on page 7.33 of the Main Volume. The location would be noted during detailed design and construction planned so that direct impacts would be avoided. The site would be temporarily fenced for the duration of the construction phase, and management requirements conveyed to on-ground personnel.

It is noted that the site of Rachel Henning's house has considerable potential as a publicly accessible and interpreted site. To take advantage of this potential, interpretive signage and a footway would be provided on the Bombah Point Road Overbridge. The local community or Great Lakes Council may also wish to consider the provision of additional walking tracks in this area, as well as the possible integration of this site with access to the river and other tourist trails in Bulahdelah.

The property is currently owned by MidCoast Water and a large portion would be acquired by the RTA for the project. The future management of the residual part of the property containing the site of Rachel Henning's house would be further discussed with MidCoast Water and Great Lakes Council.

32. p. 7.36 - the consultants recommend that no basins or materials storage occur on BH8 (old highway) during construction and areas not directly impacted should be fenced? This differs from the commitment in the main text. Please clarify.

The main text outlines the impact and commitments to minimise these impacts, and are consistent with the recommendations within the heritage report. A portion of the old highway platform would be impacted by the proposal. Measures to reduce the level of impact would be determined during detailed design and construction planning, and would include the prohibition of materials storage. The portion of the site which would not be subject to impact would be temporarily fenced for the duration of the construction phase. The water quality basin proposed nearby would not impact the old highway.

33. p.7.37 - what is meant by a specific plan of management "may be required" for the mine site? This has been recommended by the consultants and would also require the involvement of the Heritage Office and possibly Council. Has the status of this item changed in terms of state significance or National Heritage listing?

There has been no change to the status of the mine site since the recommendations made by the heritage consultants. The site is contained within State Forests (DPI) land. The RTA can not make a commitment on behalf of State Forests, nor compel them to prepare a plan, thus the use of the term "may". A preliminary meeting has been held between State Forests and the RTA with regard to this matter. Further meetings would be arranged to facilitate the preparation of the plan of management when the project is approved.

34. p.7.43 - it is noted that in terms of actual area that property 5 is the most affected, however relative to the size of the landholding, other properties are more significantly affected. What are these properties used for and how will the proposal affect the use of the remaining land? Also, what are the severance issues?

The following table has been adapted from *Table 7.9: Properties Impacted by the Corridor* of the Main Volume of the EIS. Current land use, whether the property would experience severance issues, and the effect of severance on land use has been identified.

Ref. No.	Ownership	Total Area (hectares)	Area occupied by Corridor (hectares)	Percent of Total Property Affected	Current Land Use	Severance Issues	Affect on Use
1	Private	10.1	0.42	4.2	Vacant	None	None
2	Private	29.8	0.49	1.7	Vacant	None	None
3	Private	20.2	0.10	0.5	Vacant	None	None
4	RTA	57.0	5.98	10.5	Rural Residential	Yes	None
5	Private	304.8	23.17	7.6	Grazing	Yes	Yes*
6	Private	66.8	0.08	0.1	Agriculture	None	None
7	MidCoast Water	5.8	2.76	47.3	Disused	Yes	Yes*
8	Private	12.0	3.48	29.1	Rural Residential	Yes	None
9	State Forest	205.9	16.00	7.8	State Forest	Minimal	None*
10	Crown land	115.0	9.04	7.9	Vacant	None	None
11	Karuah Aboriginal Council Local Land	13.4	4.63	34.7	Vacant	None	None
12	Private	21.4	7.32	34.7	Mixed Use	Yes	Yes*
13	Private	0.8	0.11	14.8	Caravan Park	None	None
14	Private	103.4	2.63	2.5	Rural Residential	None	None
15	Private	0.5	0.47	100.0	Vacant	None	Yes*
16	Private	11.4	1.41	12.5	Commercial	None	None
17	Private	97.4	0.89	0.9	Golf Course	None	None
18	Private	14.9	2.08	14.0	Rural Residential	None	None
19	Private	2.7	1.04	37.4	Service Station	None	None
	TOTAL		82.11				

***See below notes**

Property 5 – The most substantial impact on a single agricultural enterprise is the acquisition requirements of property no. 5 (refer Figure 7.19a of the Main Volume of the EIS). The road corridor would occupy an area of over 23 hectares within this property, being approximately 7.6 percent of the total area of the property. Within this property, underpasses for cattle and farm machinery would be available via waterway and drainage structures.

In addition to the above structures, a 3-metre-wide by 3-metre-high box culvert would be provided in the connecting road from the southern interchange to the existing highway. This culvert would be used by the land owner of Property 5 to move livestock and machinery to higher ground in times of flood. A narrow strip of land would be provided between the existing highway and the proposal between Stations 93700 and 94300 to allow for this movement.

Given the larger size and use of this property for grazing, the loss of 7.6% of land area is not expected to significantly impact on its use or viability. However, during acquisition negotiations with the owner of Property 5, agreement may be able to be reached to transfer any residual area from Property 4, which is currently owned by the RTA, to allow for at least partial reinstatement of the land size of Property 5.

Property 7 – The road corridor would occupy approximately half of Property 7, which is owned by MidCoast Water. This land was formerly occupied by the sewage treatment plant and is currently disused. It was also the former site of a house occupied by Rachel Henning, a nineteenth century literary figure. The site would not be directly impacted by the road corridor.

Property 9 - About 16 hectares of the Bulahdelah State Forest would be occupied by the road corridor. The road corridor would also sever approximately 8 hectares of the forest. Access across the proposed Upgrade for forestry vehicles would be provided adjacent to Mountain Park. The proposal would not change the main land use of Bulahdelah State Forest.

Property 12 – The road corridor would occupy approximately 7 hectares of the total 21 hectares of Property 12. This property has a mixed use, with a residence, truck depot and some grazing. This property would be substantially impacted by the proposed Upgrade, with approximately 13 hectares of the property located on the eastern side of the Upgrade and approximately 1 hectare located on the western side. No cost-effective access can be provided across the proposed Upgrade within this property. Acquisition of a large proportion or the whole of this property may be required.

Property 15 is a small remnant of land that is unused. It is probable that this land would be totally acquired as the landholder has expressed a preference for total acquisition.

It is proposed that a number of private properties would be temporarily used for construction sites if agreement can be reached with the owners. Preliminary discussions have been held with these property owners regarding this aspect of the proposal. If the project is approved, the RTA or its contractor would seek to reach formal agreement with the property owners regarding the temporary use of the properties.

35. p.7.46 - have the proposed accesses (type and location) been discussed with the landowner of property 5?

Yes, the access arrangements and additional measures to mitigate impacts on agricultural practices have been developed in close consultation with the owner of Property 5.

36. p.7.46 - what involvement has DPI had in concept planning for Mountain Park to date?

DPI (State Forests) has been consulted as part of the concept planning for Mountain Park. Consultation with DPI (State Forests) would continue during detailed design.

37. p.7.51 - whilst landscaping of the southern interchange may block views of the actual road surface, this will still be largely visible from the surrounding floodplain and some elevated areas, particularly given the 3-4 m embankment it will be on. The embankment on the floodplain will also be difficult to landscape sympathetically to the surrounding environment given that there is little vegetation on the floodplain.

The visual impact of the proposed Upgrade is acknowledged in *Section 7.5.2*, and in *Technical Paper 12 - Visual*.

The use of pasture grasses and low shrubs on the embankments crossing the floodplain would reflect the surrounding rural landscape, which is largely cleared and under pasture. The embankment would be visible from other areas, so the landscaping in this area will be used to blend it into the surrounding viewscape as much as possible rather than trying to hide it behind a vegetation barrier that would be out of place in its surroundings. Pasture grasses and low shrubs would also allow driver views of the attractive visual setting of the proposed Upgrade across the flood plain, and to Bulahdelah (Alum) Mountain.

38. the relevant construction noise goal should be background + 5dB due to the duration of construction. How many sensitive receivers are expected to experience construction noise 5dB or more greater than background levels? What construction phase measures have been considered to minimise construction noise impacts?

Results indicate that approximately 130 residences would experience noise levels at least 5dB above the rating background noise level (RBL) at some stage during the construction works, based on the assumption of the highest noise level occurring during the earthworks phase. However, noise levels during earthworks phase will vary and may be up to 10dB lower than this maximum level at certain stages, depending on the plant in use at the time.

Maximum levels during other phases would be lower. With the exception of bridgeworks and other stationary activities, the duration of noise impacts for other construction phase activities at any residence would be less than the duration of either the earthworks or the overall construction phase.

Control measures for construction noise are discussed in *Section 5.3 of Technical Paper 14 - Noise and Vibration*. Measures include the use of the quietest available equipment, possible restrictions on construction hours, notification of residents and noise monitoring. These measures would have equal benefits for both the most and the least affected residences.

39. it appears that the construction noise assessment has not looked at the construction of the new bridges or the operation of concrete batching plants or crushing plants. These should be detailed. There is also no discussion of potential out of hours construction work which should be clarified.

There is no specific noise assessment of construction of bridges, operation of batching plants or crushing plants. Detailed assessment of construction noise impacts would be undertaken once the detailed design and construction methods are determined.

Bridges are generally located over 200 metres from residences, and noise impacts associated with piling for these bridges would be determined during the development of the Noise and Vibration Management Plan (NVMP).

The potential location/s of batch plants are shown in *Figure 5.22 of the Main Volume of the EIS*. These potential sites have been selected according a number of location criteria, outlined in *Table 7.6 of Technical Paper 4 – The Proposal*. The distance from residential uses or other activities that may be affected by noise or other impacts of the operation of a batch plant has been set at 250 metres or greater. The management of noise impacts that may result from batch plants would be determined once construction methods and batch plant locations are determined, and be included in the NVMP.

Noise monitoring is a normal requirement of construction projects and would be included at strategic locations affected by noisy areas activities such as batching and crushing plants and where bridge piles are required, This work would be included in the NVMP.

Similarly, once the location of crushing plants is determined during the development of the detailed design and construction methodology, measures to mitigate noise impacts that result from crushing would be included in the NVMP.

As discussed in *Section 7.8.2 of Technical Paper 4 – The Proposal*, construction hours would normally be limited to 7.00 a to 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturday. Work outside these hours would be discussed with those affected and the Department of Environment and Conservation (DEC). Work hours would likely be a component of any EPL issued by DEC.

Technical Paper 3 - Need and Objectives

1. p. 2-2 note that the Hunter REP includes objectives relating to the provision of bicycle facilities.

Technical Paper 4 – The Proposal, Section 4.1.10, outlines provisions made for cyclists on the upgraded highway, including shoulders with a minimum width of 2 metres and 1.2-metre-high railings on bridges. *Section 4.8.4 of Technical Paper 4* states that cycling would be permitted on the outer shoulders of the highway for the full length of the Upgrade. The outer shoulders would be 2.5 metres wide along the highway and 2 metres wide on the outer shoulder of the Myall River Bridge and on and off ramps. Suitable signage and line marking would be required for on and off ramps.

2. p. 2-12 state that further traffic analysis reveals that total traffic will increase by 4%pa while heavy vehicle traffic will increase by 2%pa - where does this information come from?

Section 4.2 in *Technical Paper 6 – Traffic and Transport* documents assumptions in relation to through traffic annual growth. Through traffic growth on the Pacific Highway was estimated based on the *Pacific Highway Cumulative Impact Study* (Scott Wilson Nairn Pty Ltd 1999). They are 4.3% between 1991 and 2006, and 2.45% between 2006 and 2021 respectively. An average growth rate of 4.3% was adopted between 2008 and 2028.

3. p. 2-16 it is stated that HV levels in Bulahdelah is 17% and expected to increase to 19% but on p. 2-12 it is stated that HV as a proportion of traffic had dropped by 1.6% between May 2001 & May 2003. It is also stated that total traffic is expected to increase by 4% but HV by only 2% (ie overall, HV proportion of traffic would be smaller). Please clarify. It is understood that there has been an increase in HV on the highway since the Yelgun to Chinderah section was opened (switching from the New England Highway).

Section 2.4.8 in *Technical Paper 6* documents implications of Yelgun-Chinderah Bypass on Pacific Highway traffic, especially for heavy vehicles (HV). Data from RTA counts at Nahiab between May 2001 and May 2003 was used to determine the level of traffic increase, especially HV, as a result of the Yelgun-Chinderah Bypass. Table 2.7 indicates the following:

- Daily HV increased from 1522 to 1786 between 2001 and 2003. This represents an additional 264 HV, or about 17% increase over the three years.
- In absolute terms, the proportion of HV to total traffic has declined from 17.9% to 16.3%. This represents a fall of about 1.6 %. The statistics indicates that the Yelgun to Chinderah bypass moved HV traffic from the New England Highway route to Pacific Highway by about 264 vehicles. However, their proportion to total traffic volumes is not increased significantly, and in fact slightly declined. This trend has been used to justify the future proportion of HV through Bulahdelah. PB assumed the HV proportion would increase from current 17% to 19% on the Pacific Highway through Bulahdelah .
- The parameters of HV proportion should not be compared to HV annual growth rate of 2.45%.

Traffic forecasting results documented in *Table 5.1 (Technical Paper 6 – Traffic and Transport)* showed similar HV traffic growth of 2.45%. The proportion of HV to total traffic would be about 19%.

4. p. 4-8 notes the reference to opportunities to provide truck stopover facilities. Is it likely that something of that scale could be (or would want to be) built in town. Is there anything currently available of that scale currently that would act as an attractor?

There are currently three service stations along the existing Pacific Highway that provide services for travellers, including truck drivers. There are no formal truck parking facilities at present, however trucks do park on the highway verges at several locations. There is adequate room to accommodate formal truck parking adjacent to the existing highway.

The local community and Council support the provision of limited parking facilities for trucks to attract visitors and mitigate impacts on highway dependent businesses in town. This has been discussed with Great Lakes Council as part of the town improvements package. The RTA would contribute towards the cost of providing a limited in-town truck parking facilities. The location, design and construction will be agreed with Council following the approval of the project and would be subject to a separate approval if required.

5. p. 4-7 it is not clear how or where the weightings are used. Please clarify.

The weightings are used as a way of emphasising the importance of criteria selected to evaluate the route options. The weightings were established by the participants at the Value Management Workshop and used in the assessment of Stage Two Route Options A to E, shown in *Figure 4.2*. The weightings are presented in *Technical Paper 3 – Need and Route*

Evaluation to show the relative importance this group placed on selection criteria. The outcomes and conclusions from the Value Management Workshop did not represent the final decision on the preferred route and were subject to further consideration and refinement by the project group. These outcomes were not given in the EIS. The workshop findings were only one of the many inputs into the process of selecting a preferred route for the Pacific Highway at Bulahdelah.

The calculations and outcomes of the Value Management Workshop are presented in the *Value Management Workshop Report* (PPK, August 2000). A copy of this report is available on request.

6. it is not clear how many of the "best overall" options or even options for quantitative measures or qualitative indicators were achieved (eg. Environmental quality and sustainability quantitative measures).

Tables 4.8, 4.9, 4.10 and 4.11 of *Technical Paper 3 – Need and Route Evaluation* present the quantitative and qualitative assessments used for comparisons between options. The information collated in this options assessment does not provide information on the extent to which the options achieve the desirable criteria. Section 4.4.4 of *Technical Paper 3* provides an overview of the Stage Two Route Options assessment, which assessed Options A, B, C, D and E against a number of selection criteria and performance measures.

Technical Paper 4 - Traffic and Transport

1. the model base traffic is based on the year 2000. This is now 4 years old. Is it still relevant? Have there been any changes since that time with other sections of the highway being built/completed e.g. Yelgun to Chinderah?

The traffic model was initially calibrated using traffic data collected in 2000. Base traffic data was estimated for 2002 taking into account the impact from Yelgun to Chinderah bypass, by using surveyed traffic data from Karuah. This was used as a basis for forecasting traffic using the proposed Upgrade at Bulahdelah between 2008 and 2028.

2. it is noted that the figures in table 2.2 are inconsistent with the information available on the RTA website. Figures for 1986, 1988, 1990 and 1992 are consistent with those on the web for 1976, 1980, 1986 and 1990. Will this have any impact on the growth rates and presumably other data used in the assessment. Please clarify.

This inconsistency is noted. The error is a typographical error. A revised *Table 2.2* is provided below. *Table 2.2* shows historical growth for context only. The error has no effect on future traffic forecasts for the proposed Upgrade as forecasting used 2002 data as the base year, and growth projections were derived from the *Pacific Highway Cumulative Impact Study* (Scott Wilson Nairn Pty Ltd 1999).

Table 2.2: Daily Traffic Volumes, Pacific Highway, North of Booral Road

Year	AADT ¹	AADV ²
1972	4,000	3,252
1976	5,060	4,114
1980	5,740	4,667
1986	7,190	5,846
1990	9,866	8,021
1995	11,634	9,459
1998	13,150	10,691
2001	13,354	10,857

1. Recorded at Station 09.909 South Bulahdelah, north of Booral Road

2. AADV figures estimated using a conversion factor of AADT/AADV=1.23

3. It is stated on p.4.1 that Council anticipates population growth in Bulahdelah to be "limited". What is the reason for the decrease in LoS if remaining traffic on the Pacific Highway after the upgrade is predominantly local traffic. Is it largely attributable to "stopping" through traffic?

The traffic analysis presented in *Section 4.3.1 of Technical Paper 6 – Traffic and Transport* compares the existing Pacific Highway (no-build - two lane through town) with the proposed Upgrade (build - four lane upgrade) to determine the anticipated Level of Service of the Pacific Highway. The proposed Upgrade would have peak hour LOS "D" by 2028 as a result of traffic growth, as shown in Figure 4.1.

The Level of Service of the existing Pacific Highway (Boolambayt Street) before and after opening is discussed in *Section 5.3*. The traffic changes on the proposed Upgrade compared to a 'no build' are detailed for 2018 and 2028. The proposal would reduce traffic on Boolambayt Street by between 80 percent and 95 percent and lead to improvements to Levels of Service of roads and intersections within the town.

4. what is the purpose of the Booral Road off-ramp? What/how many does this area service? What is the justification for its inclusion?

There was community pressure and support for the provision of either a full at-grade intersection, or at least a slip lane to Booral Road, allowing northbound access to Booral and Stroud residents via Bucketts Way. Traffic surveys in 2000 found an average of 300 vehicles daily using Booral Road. Community input at the time of the Preferred Route announcement indicated that there was a focus for residents on Booral Road in Karuah and Newcastle for work and business. The provision of a Booral Road off ramp would save northbound motorists exiting the Pacific Highway to travel to Booral Road an extra distance of approximately 4.5 kilometres compared to travelling via the off ramp at the Southern Interchange. While a full at-grade intersection could not be provided for safety reasons, the RTA agreed to the provision of the slip lane facility as it could be provided at reasonable cost, since much of the pavement is already in place.

5. on p. 5-9 it is stated that most northbound traffic wanting to access Bulahdelah would exit the highway at the southern interchange and that the northbound off ramp may not be highly used. If this is the case, why provide this separate ramp at all? Please discuss the need.

The northbound ramp at the northern interchange would provide access to the northern part of Bulahdelah, including the industrial area and Markwell Road. It is envisaged that local

heavy vehicle traffic would use this exit, and therefore remove the need for heavy vehicles to travel through Bulahdelah via the southern interchange and the town.

6. is it possible to reduce the footprint of the northern interchange roundabout? Is it possible to combine any of the local roads or ramps to minimise the footprint. This appears to be a significant sized structure with numerous separate approach roads catering for limited traffic volumes.

The design of the northern interchange has been developed to provide for a safe and efficient traffic solution, while considering impacts on the natural and social environment. Minimisation of the footprint has been considered. *Section 3.2.3 of Technical Paper 4 – The Proposal* provides an assessment of the design alternatives considered at the northern interchange. The selected concept has better standards of design, signage and overall safety. Improved standards of access to and from the town result from a free-flowing single roundabout, plus improved grades on Lee Street. The adopted concept design was preferred by both the community and Great Lakes Council.

7. pp.5.11/12 - It is not clear why LoS in peak flows would drop WITH a climbing lane rather than without one.

The climbing lane assessment is detailed in *Appendix A of Technical Paper 6 – Traffic and Transport*. One of the conclusions of the climbing lane assessment was that further assessment of peak flow periods and light and heavy vehicle traffic movements is required to determine whether the traffic mix at peak flow times would result in a drop in the level of service. Stated another way, the recommendation is that traffic be assessed after opening to verify that the traffic mix is as predicted, and the level of service projections are correct.

8. Are the emergency access points sufficient? Where are emergency services located (either within or outside of Bulahdelah)? Is it possible to provide emergency vehicle (only) access at another point (northbound) if need be?

It is considered that adequate emergency access has been provided to the proposed Upgrade. U-turn facilities are discussed in *Section 4.1.7 of Technical Paper 4 – The Proposal*. The proposed U-turn facilities have been located and will be designed in accordance with the *Road Design Guide, Section 4.9* (Roads and Traffic Authority 1998). In accordance with RTA guidelines, U-turn facilities for emergency vehicles are required at approximately three to five kilometre intervals.

The proposed interchanges, as well as the existing Lakes Way intersection to the north of this proposal, would largely satisfy this requirement. However, with only south-facing ramps at the southern interchange, an additional at-grade emergency U-turn facility would be required on the section of the proposal that is on the floodplain.

The provision of emergency service vehicle only access points is not favoured due to the difficulty in enforcing this restriction (particularly near residential areas) and the potential danger from the misuse of such a facility in a 110 kmh speed zone. There are a number of locations where emergency service vehicles could gain access either by travelling in the wrong direction on a carriageway or by breaking the motorway fence if the need arises.

The nearest emergency service facilities are located within Bulahdelah between the two interchanges. They are mainly located to the east of the existing highway near the Bulahdelah Central School, but also at the Bulahdelah District Hospital.

Technical Paper 7 - Species Impact Statement

1. It is noted that there has been no formal assessment of Freshwater Wetlands on Coastal Floodplains a final determination had not been made prior to the exhibition of the EIS. What further consideration of this community will be undertaken? Please confirm that there will be no impact on Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest for which final determinations have also been made.

Further assessment of freshwater wetlands has been undertaken. A report is discussed and included in the Submissions Report, as an addendum to the ecological assessment.

Approximately 23.1 hectares of freshwater wetlands occur on the floodplain of the Myall River within one kilometre of the proposed Upgrade of the Pacific Highway at Bulahdelah. Two of these wetlands, covering approximately 1.8 hectares (7.8 percent of the local distribution), are within the footprint of the proposal.

These wetlands have been partially cleared, are surrounded by grazed grassland and are subject to ongoing disturbance from grazing. This community is in poor condition. A Section 5A assessment of significance for this community was undertaken and concluded that the removal of 1.8 hectares of poor condition wet meadow subject to ongoing disturbance is unlikely to have a significant impact on the recovery of this community. Mitigation measures including the rehabilitation of wetland areas within the road reserve have been provided to minimise impacts.

There would be no impact on Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest.

2. Please advise why the preferred alignment has not used more of the existing transmission easement thereby reducing vegetation impacts. Has any consideration been made of putting the transmission line underground?

The proposed alignment has been investigated in detail. *Section 3.2.4 of Technical Paper 4 – The Proposal* discusses the refinement of the alignment between Bombah Point Road and Lee Street, using multiple criteria. The proposed alignment reduced overall impacts as much as possible. In particular, the proposed alignment was chosen to avoid threatened species where possible.

The option of placing the 132 kilovolt powerline underground was discussed with Transgrid. However, it was not acceptable to Transgrid, mainly due to difficulties with maintenance, ongoing management and emergency repairs of the line.

3. The conclusions state that there is a risk that "this locally significant glider population may be divided into smaller sub-populations. The smaller the population the more vulnerable it is to extinction by random events such as wildfire or drought." The proposal would appear to make the risk of division a reality. What is the likelihood of two sub-populations surviving? If it is at all likely that one or both would decline, is this a significant impact?

Every attempt has been made to minimise the impact on the local population of Squirrel Gliders. *Section 5.3 of Technical Paper 7* details that the route was modified to retain a large foraging area for the Squirrel Gliders. *Section 6.3.2* also details the mitigation measures such as rope bridges proposed to maintain the connection between the summer and winter foraging areas for the Squirrel Gliders.

Table 5.5 also outlines that in comparison to the potential impacts of urban expansion, the impacts on the local Squirrel Glider population resulting from the proposed route are minimal. As stated in *Section 8.4.7 of Technical Paper 7*, the effect of the proposal is likely to be local in its impacts on the Squirrel Glider, not regional, State or National.

4. Is there any knowledge of the movement patterns of the gliders, particularly across the existing highway?

There is no evidence to suggest that Squirrel Gliders cross the existing highway between the larger population group to the north-west and the smaller population group on Bulahdelah (Alum) Mountain. *Section 2.5.3 of Technical Paper 7* details the studies that were carried out in order to determine the movement patterns of the Squirrel Gliders. The Squirrel Glider survey comprised tree trapping and spotlighting. Twenty-five Elliot traps were placed in a 5 hectare area with traps placed at a height of 4.5 metres for 75 trap-nights. Spotlighting searches were also conducted along the corridor and within surrounding habitats for 5 hours and 45 minutes. The RTA does have information that squirrel gliders have used one of the new rope bridges at Karuah, but it is uncertain if they actually crossed at that time.

5. Are there any measures to mitigate fragmentation of the northern gliders moving across the proposal?

No measures are proposed to mitigate against the fragmentation of the north-western glider population group from the south-eastern population group as the investigations undertaken did not produce any evidence of such movements across the existing highway. Mitigation measures proposed further to the south facilitate movement across the proposal between the summer and winter foraging areas for the south-eastern population group. These mitigation measures are detailed in *Technical Paper 7, Section 6.3.2*.

While there is currently little information about the effectiveness of mitigation measures facilitating the movement of Squirrel Gliders across roads, mitigation measures are proposed. A final decision with regards to glider mitigation along the proposed Upgrade would be made pending the results of rope/wire bridge monitoring along the Karuah Bypass. Measures may comprise gliding poles, rope/wire bridges or a combination of both methods. The bridge design, configuration and height of poles and the monitoring method used would be decided in consultation with the Department of Environment and Conservation.

6. the cumulative impacts of residential development in the Village Zone (p.5.20) could lead to significantly higher direct impacts on threatened species and habitat. Was any consideration given to the purchase of these areas for conservation as security for the various specific threatened species affected by the proposal?

Future development is possible within the Village zone, although the land is provided with some protection, being either vacant crown land or land owned by the Karuah Aboriginal Land Council. Any future development would be subject to environmental assessment and planning approval, and relevant legislative controls.

The RTA has implemented a compensatory habitat package for the southern section of Pacific Highway from Hexham to Port Macquarie and agreement with the Department of Environment and Conservation has been reached on this approach. The agreed package compensates for the loss of key habitat during construction of the southern section of the Pacific Highway, including the proposed Upgrade of the Pacific Highway at Bulahdelah.

Development of the package involved agreement between the Minister for Environment and the Minister for Roads that 854 hectares of compensatory habitat would be provided to compensate for the approximately 465 hectares that would be removed and edge-affected by Pacific Highway Upgrade Projects between Hexham and Port Macquarie.

Areas of compensatory habitat relevant to the proposed Upgrade of the Pacific Highway at Bulahdelah is Mount Karuah, a forested area of 553 hectares north of the Karuah township which provides high quality habitat. These lands have already been transferred to the Department of Environment and Conservation. In addition, lands on the Bulahdelah to Coolongolook project that have reverted to State Forest and consequently to National Parks in some cases are included as a compensatory habitat corridor. A vegetation corridor has also been expanded as part of this compensatory habitat package.

7. It is understood that NPWS (DEC) has agreed to a compensatory habitat package and that this was agreed prior to locating the orchid species. What is/is there any nexus between the agreed package and findings of flora and fauna surveys which occurred subsequent to that agreement?

The agreed compensatory habitat package has a number of intrinsic conservation values and was in excess of the required compensation for the Karuah to Bulahdelah Bypass. The area of Mt Karuah has a number of threatened species and their habitats which would provide compensation for the proposed Upgrade.

The area contains known records and habitat for the Glossy Black Cockatoo, Squirrel Glider, Koala, Masked Owl, Little Bent-wing Bat and Greater Broad-nosed Bat. The site also contains the rare ironbark (*Eucalyptus fergusonii* subsp *fergusonii*).

There are some vegetation types present in the compensatory habitat package that are similar to those that are found at Bulahdelah. The area of compensatory habitat has a mixed vegetation assemblage including significant wetland communities, including Swamp Mahogany which would compensate for the loss of wetlands from the proposed Upgrade at Bulahdelah. The area also contains Grey Gum forests and Smooth-barked Apple communities.

While no records of any of the three orchid species are known from the Mt Karuah compensatory habitat package, it is possible that some of these species occur but remain undiscovered due to lack of survey.

8. During construction, important vegetation would be flagged and/or fenced. Would these areas have restricted public access? How would this be managed?

The construction zone would be fully fenced prior to the start of construction, along with areas in or near the road reserve containing important vegetation. Public access would not be allowed to either the construction zone or these sites. Every effort would be made to enforce the restrictions on public access to these areas for safety reasons, as well as for the protection of sensitive vegetation. However, this could prove to be difficult to do, taking into account the open nature of a road construction site and the presence of a residential area directly adjoining the site.

9. Constructing the bridges to allow for fauna movement is admirable but they do not appear to in key locations, particularly for threatened species. Culverts appear to be too small for bandicoots which may pollinate the underground orchid. The options for short bridge sections (p.6.13) should be investigated further and incorporated into the concept design. Please comment.

The provision of land bridges in the vicinity of threatened orchid species has been further investigated since the EIS was placed on exhibition. The efficacy of bridging at various locations to benefit surface and sub-surface flow, and movement of bandicoots and wasps was assessed, along with constructability and cost.

The key findings from this review were as follows:

- The majority of surface and sub-surface water flow paths to threatened orchids downhill of the proposed alignment are not affected by the proposed alignment.
- There are two known populations of threatened orchid species, or four plants, where flow paths would be significantly affected by the alignment.
- Of the four bridging options considered, only two options were considered to be feasible from the point of view of construction issues and level of impact on threatened orchid species. However the cost of these options was very high with a value between \$1.44M and \$1.6M.
- There is a high risk of damage and loss to at least three of the four plants due to construction works. At least three of the four plants would be located within 5 metres of the alignment of the bridge, and have been considered in the SIS as being unlikely to survive.

- There are a number of additional benefits from the bridging options, including improved passage for most terrestrial fauna species in the area, including the bandicoot (potential seed disperser of *Rhizanthella*) and the ichneumon wasp (fertilising species of *Cryptostylis*), and improved cross-fertilisation, seed dispersal and visual cues.

Due to the lack of direct and additional benefits to threatened orchid species that would be derived, and the large capital cost, the inclusion of a land bridge for the threatened orchids in the concept design can not be justified. It is considered that other management measures and initiatives that will be detailed in the Orchid Translocation and Management Plan will lead to more cost effective mitigation of impacts to threatened orchid species at Bulahdelah.

Further, it is considered that the current provisions for the movement of bandicoots at the Mountain Park overbridge, the Stuart Street underpass and drainage culverts would adequately cater for this mobile species in the area of the threatened orchids. While the movement characteristics for the ichneumon wasps are unknown, it is possible that they would be mobile.

10. The Mountain Park overpass should not be considered a fauna crossing (as proposed on s.6.12) - see figure 5.10 of the EIS. It might be used by pests attracted to the Park (e.g. due to rubbish). Are there any specifically designed/incorporated fauna overpass options?

The Mountain Park overpass is a structure that would be constructed as part of the project for access to the Bulahdelah (Alum) Mountain. It is expected that this structure would also be used as an opportunistic crossing point for mobile species such as bandicoots, macropods and native rats in a similar fashion to other drainage culverts and bridges. Fauna exclusion fencing would be constructed to link into the fencing on the overpass to encourage the use of the structure by fauna.

Mitigation measures are proposed to provide for movement of Squirrel Gliders. A final decision with regards to glider mitigation along the proposed Upgrade would be made pending the results of rope/wire bridge monitoring along the Karuah Bypass. It may comprise gliding poles, rope/wire bridges or a combination of both methods. The rope bridge design, configuration and height of poles and the monitoring method used would be decided in consultation with the Department of Environment and Conservation based on the outcomes of the monitoring of the Karuah situation.

The presence and control of pest species in the form of feral animals or uncontrolled pets in this area is the responsibility of Great Lakes Council and State Forests. While the use of fauna crossing facilities by pest species for movement or predation is a problem that is very difficult to control, this should not limit the placement of such structures for use by native species.

Technical Paper 8 - Water

1. s.2.2.1 - what is the purpose of assuming a scour hole at the proposed Myall River bridge? Is this a design element or a "natural" feature resulting from non-flood flows?

Predicted velocities under both the existing and proposed bridges are similar for the 10 year and 100 year average recurrence interval design events. This fact suggests that ultimately, the proposed bridge would naturally develop scour holes of similar magnitude to those found at the existing bridge.

2. s.2.3 - presumably the culvert widths proposed for the proposal and existing highway are total lengths (i.e. 100 m and 40 m respectively) rather than a single opening.

Yes.

3. s.2.4 - there will be "little change in the 100 yr ARI flood levels in the town and no additional impacts on residences in town": How is "little change" defined? What effect on freeboard is anticipated at the residences between the existing highway and the proposal?

Table 2.5 shows the modelled 100 year and 20 year average recurrence interval flood conditions for the proposed Upgrade. Results indicate that at locations upstream of the existing bridge and adjacent to Bulahdelah (River Stations 13870, 14480 and 14725), there will be a small decrease in both flood levels and afflux, of 0.07 metres.

Section 2.4 of *Technical Paper 8 – Water* provides an assessment of the impact of the proposal on flood behaviour at residences. There are two residences on the floodplain between the existing highway and the proposed route of the Upgrade. The floor level of one of the residences is currently approximately 770 millimetres below the 1-in-100 year flood level. The afflux that would result from the proposal at this location is 250 millimetres in a 1-in-100 year flood event, resulting in a total of 1.02 metres of flood water above the floor level. The floor level of the other residence is currently 370 mm above the 1-in-100 year flood level. With an afflux of 240 millimetres in a 1-in-100 year flood event resulting from the proposed Upgrade, the floor level would remain 130 millimetres above the flood water level.

4. table 2.5 - how do river stations relate to river chainages in Figure 2.4?

The HEC-RAS cross-section river chainages do not match those used in the MIKE 11 model, as river chainages must increase from downstream to upstream in HEC-RAS. The equivalent MIKE 11 cross-section river chainages for the HEC-RAS river chainages are highlighted in Table C.2 in *Appendix C* of *Technical Paper 8 – Water*.

5. s.2.4 - what is the range of mitigation options available for Residences 1 & 2? Are there safety/risk issues related to access or evacuation? What are these and how can they be mitigated?

The afflux resulting from the proposed Upgrade would affect two residences located between the two bridges (*Figure 2.6* of *Technical Paper 8 - Water*), namely:

Residence 1, located approximately 650 metres from the Myall River adjacent to the southern interchange, has a floor level of 3.93 metres AHD. The house is constructed on a concrete slab. Access to the property is by a road with crown level varying between approximately 3.5 metres AHD and 3.8 metres AHD.

The proposal would increase the level and frequency of flooding of the property and affect access over a range of events from less than 20 year average recurrence interval. However, flow velocity in this area is likely to remain at low, safe levels due to the relatively long distance from major flow paths. Mitigation options for the house and access arrangements will be assessed and negotiated with the property owner prior to construction.

Residence 2, located approximately 300 metres downstream of the existing road bridge and approximately 150 metres from the Myall River on the southern floodplain, has a floor level of 5.19 metres AHD. The house is of timber construction. There are no machinery sheds or other significant out buildings. Access to the property is by a road approximately 320 metres long, with crown level varying between approximately 3.1 metres AHD and 4.2 metres AHD.

The residence would remain above 100 year average recurrence interval flood levels following the construction of the proposed Upgrade. However, the proposal would increase the level and frequency of flooding over the access road.

Due to its location near the riverbank, flood flow velocities in the vicinity of this residence are high — making evacuation under existing conditions potentially hazardous. Mean floodplain velocities in the area currently range from 0.8 metres per second in the 20 year average recurrence interval event to 1.4 metres per second in the 100 year average recurrence interval event. Flood velocities would not change substantially as a result of the construction

of the proposal. Potential mitigation options would be discussed and agreed with the property owner prior to construction.

A potential mitigation measure includes raising the crown of the road so that time for evacuation is maintained.

6. s.3.3.2 - Figure 3.3 does not appear to show alternative locations of basins to collect run off from the northern and southern interchange ramps as stated. How is run-off from these locations managed?

Paragraph 4 of *Section 3.3.2* incorrectly states that alternative locations of basins, which collect run-off from interchange ramps, are given in *Figure 3.3*. This should refer to *Figure 3.4a* and *Figure 3.4b*, where alternative basins are shown adjacent to the southern and northern interchange.

Run-off from the proposed southern and northern interchange ramps and fill batters would generally not be conveyed to water quality basins during operation of the proposal. This would reduce the number of water quality basins required and therefore the footprint of the proposal. Water runoff in this case would be directed to grassy swales adjacent to the pavement. This would treat the runoff, before it flows to natural drainage lines.

7. what is the area of orchid population that would be inundated by the basin at Node 81 b during the 20 y ARI event and above? Are there any other options to avoid this impact? Drainage impacts and mitigation on the orchid population requires further resolution prior to detailed design (and prior to request for approval). Technical Paper 8 refers to the SIS and the SIS refers back to Technical Paper 8 for further information and neither document satisfactorily addresses the issue.

The orchid population adjacent to the water detention area at B1b (Station 97000) would not be inundated by rainfall events during a 20 year ARI event or the 100 year ARI.

Dyke structures perpendicular to the proposed Upgrade are proposed to prevent the areas becoming interconnected along the uphill side of the proposal. Dykes would be constructed to an elevation equivalent to the maximum water level reached in the basin during a 100 year average recurrence interval storm event.

The orchid population is at a higher elevation than the top of the dyke structure and would therefore not be impacted by stormwater held back by the structure.

8. s.3.3.4 - is it possible (or is there a need) to divert additional flows exceeding the 1 y ARI peak flow along the southbound shoulder (e.g. larger pipes)? What are the potential impacts of this?

It is proposed to divert flows in excess of the 1 year ARI in pipes along the southbound shoulder. This is to assist in reducing local flooding during storm events. Flows are constrained by the capacity of the longitudinal stormwater pipes under the southbound shoulder of the proposed Upgrade. The size of the pipes is constrained by the design of the proposed Upgrade, requiring them to pass through the deep cutting. Nevertheless, the diversion of water during storm events does produce an effective reduction in local in-town flooding.

9. can the reduction in impacts of diverting flows from sub-catchment A1b and B2b be quantified?

Table 3.4 and *Table 3.5* in *Technical Paper 8 – Water* quantifies the total flow volumes and velocities of flow diversions and the percentage difference in peak flows between the existing and proposed scenarios. The improvement in downstream flooding problems resulting from diversions within sub-catchments A1b and B2b applies to private properties near the intersection of Church and Mackenzie Streets, and on Mackenzie and Harold Streets respectively. Improvements result from a decrease in flow volumes and velocities. There are

approximately 10 properties adjacent to the intersection of Church and Mackenzie Streets which would have reduced surface flows during storm events. There are approximately 3 properties on Mackenzie and Harold Streets which would have reduced surface flows during storm events.

10. it is stated that the discharge from the longitudinal stormwater pipe would be immediately upstream of the WQ basin adjacent to Bombah Point Road. Is it intended that the discharge will flow through the basin?

Yes, water would discharge directly to the water quality basin.

11. s.3.4 - what volumes of runoff need to be managed and what volume of air space is available at the existing water quality basins?

Table 4.4 and Table 4.5 in Technical Paper 8 – Water provides catchment area, percentage of catchment area, volume, width and length of water quality basins and sediment basins proposed. As stated in *Technical Paper 4 – The Proposal*, water quality basins and dimensions would be subject to refinement at detailed design.

12. s.3.4 - what changes to surface water volumes entering the wetlands will result from the proposal? What are the hydrological and ecological impacts of this?

There would be very minor change to the volumes of water entering the wetland areas or the larger SEPP 14 wetlands approximately 1 km to the south-east on the floodplain of the Myall River as a result of the proposed Upgrade. The additional hard, impermeable surface within the catchment of the SEPP 14 wetland that would result from the proposed Upgrade would be small, and would not result in significant changes to total run-off within the whole catchment. Due to the minor nature of the changes to run-off volumes, there would be no impact to hydrological or ecological systems within the wetlands (including the SEPP 14 wetlands).

13. what are the potential safety issues related to failure of water quality basins and what are the mitigation options to minimise this risk?

The safety issues associated with potential failure of water quality basins, particularly in town catchments, would be considered during detailed design, as stated on Page 4-16 of *Technical Paper 8 – Water*. The measures in the concept design to help reduce the risks include the placement of the basins adjoining existing major drainage channels, clearance of at least 250 metres from significant urban facilities in the main town area, no residential development directly in the flow path, basins not placed directly upstream of low level pedestrian/vehicular movement paths and the provision of bypass structures to divert flows larger than 100 year average recurrence interval peak flow around the basin.

The potential safety issues associated with water basin failure are related to high volumes of water held in storage and high velocity water running through local catchments as a result of a failure, and causing direct and indirect safety risks. The direct safety issues could be associated with people and vehicles carrying people being washed away when caught unaware of sudden changes to water volumes and velocities. The indirect safety risks could arise from the undermining of property and infrastructure such as roads resulting from large volumes and velocities of water. Both the direct and indirect risks have been minimised by the measures adopted to avoid placing the water quality basins in locations where the water flow path from a failure would directly threaten areas where people, vehicles or residence are in direct and immediate danger. As stated in *Section 4.2.1 of Technical Paper 8 - Water*, if basins can not be designed safely at the sizes given, sizes would be reduced and basin numbers increased.

Technical Paper 9 – Hazard and Risk

Further information is required to enable proper assessment of the paper:

1. details on the meteorological data used in modelling

The assessment of hazards and risk demonstrates that the proposal would result in a significant lessening in risk to the residents of Bulahdelah generally. Using the full range of meteorological conditions (including wind strength and direction, atmospheric stability and rainfall) that might apply to any accident scenario is beyond the scope of the assessment and would only be required where the actual level of risk is being determined to a higher degree of accuracy than needed for this assessment.

The analysis uses typical risk factors for events such as fires, explosions and toxic releases. Meteorological conditions were unlikely to significantly disadvantage residents on one route over another and to include them in the model would be unlikely to appreciably improve the value of the results. However, the potential effect of topography was considered.

2. information on the approach taken to the modelling of the events/failure causes along the road (i.e. the length of the segment/distance between the events etc. – see also question 5)

As detailed in Section 4.3.5 of Technical Paper 9 – Hazard and Risk, it is assumed that the at-risk population is evenly distributed within a 250 m corridor along the length of the sections of road concerned. This is to simplify the risk assessment so that a manageable model can be built and the associated calculations can be made in a reasonable time. No attempt has been made to model points with greater accident risk or with higher population density. In light of the other assumptions made in completing the assessment it is not considered that attempting to include such complexity would add greatly to the accuracy of the results.

3. What acute toxic exposure criteria were chosen for the calculation of fatality from the releases of chlorine and ammonia?

A simple model has been used that will provide a reasonable representation of the relative risks for each of the project options without involving highly complex calculations. A complex model would be largely meaningless given the extremely variable conditions along the route and the difficulty in evaluating many of the factors that would influence the results.

The models used for chlorine and ammonia are based on the event trees as shown in Figures 4.3 and 4.4 in *Technical Paper 9 – Hazard and Risk* respectively. The models assume that a catastrophic failure and discharge of 17.5 tonnes of Cl_2 and 15 tonnes of NH_3 in 2018 would result in 100% fatalities up to 250 metres from the accident. A major release of 45.1 kilograms per second of Cl_2 and 33.5 kilograms per second of NH_3 would result in 100% fatalities up to 100 metres from the accident. Minor releases of 1.3 kilograms per second of either Cl_2 or NH_3 would result in no fatalities. The rates of release are those proposed as realistic and representative by the UK HSC Advisory Committee on Dangerous Substances in their report *Major Hazard Aspects of the Transport of Dangerous Substances* (Advisory Committee on Dangerous Substances 1991). The maximum effect distance of approximately 250 m is consistent with the IAEA method described in *Manual for the classification and prioritization of risks due to major accidents in process and related industries* (International Atomic Energy Agency TECDOC 727 1996) as recommended in *Multi-Level Risk Assessment* (Department of Urban Affairs and Planning 1997) for material reference numbers 31 and 32, effect categories DIII and EIII.

4. Table 4.2 Traffic Accident Data and Forecasts provided the estimated number of dangerous goods accidents per year. Please clarify how this data relates to the annual accident frequency used in the event trees.

The accident frequency shown in the event trees is the product of the rate of dangerous goods accidents shown in Table 4.2 and the fraction of dangerous goods (DG) vehicles carrying the specified goods shown in Table 4.1.

For example, in 2018 the accident rate for DG vehicles on the existing highway (without upgrade) is 0.1306 per annum. The fraction of DG vehicles carrying chlorine is estimated to be 3.8% from Table 4.1 ($0.044/1.15 \times 100$). The product of the frequency of accidents for DG vehicles and the probability that the vehicle is a chlorine tanker is thus 5×10^{-3} per annum, as shown in Figure 4.3 (allowing for rounding). All other DGs are determined in the same way.

5. The annual accident frequency used in each event tree appears to be traffic and distance dependent (i.e. it is not per vehicle km). Please explain how these frequencies have been calculated and what they represent. How have they been used in developing risks at a particular location? An example would be helpful to our understanding of the methodology used.

As in the answer to the question above, the frequencies shown in the fault trees are the frequencies of accidents involving a particular type of DG vehicle along the section of road indicated. They have been calculated using the accident rates in Table 4.2 and the probability of a particular DG being involved given in Table 4.1. As stated in section 4.3.4 it is assumed for the purpose of this assessment that accident rates are constant along each route. The risk to an individual at a given distance from any route is therefore independent of their position along the route.

The societal risk can be obtained by summing the product of the individual risk and the total number of people located at that distance from the route across all distances from the route.

$$R_s = \sum_d R_i(d) * P(d)$$

where R_s is societal risk, R_i individual risk, P the population, and d the distance from the event.

In this case, risk has been estimated at 50 metres intervals up to 250 metres from the event (see 2.3).

Technical Paper 11 - Topography, Geology and Soils

NOTE page numbering restarts after p4.9 in the document. Page numbers referenced below refer to the corrected version.

1. p.4.20 (incorrectly numbered p.4.11) - how would the Rockfall modelling change if a 10m batter height were used (or is this area likely to be unsuitable for a 10m batter)?

The area is unlikely to be suitable for a 10 metre batter due to the colluvial material.

2. what is the RTA's level of commitment to the recommendations for hazard monitoring recommendations for Cut 4? This is not clear from either the EIS or the technical paper.

This issue is addressed in *Technical Paper 11 – Topography, Geology and Soils* in relation to monitoring groundwater conditions in the colluvium area. The detailed design for the project in the colluvium area would be based on the results from both the current groundwater monitoring program (through to the detailed design phase) and detailed geotechnical

investigations. A review of the risk assessment would then be undertaken and a monitoring program for the construction and post-construction period would be developed based on the outcomes of these investigations and the actual design adopted for the colluvium area..

3. s.4.5.1 - there is a statement saying that oversize boulders will need to be screened and broken down. Does this infer that there will be a need for an on-site crushing plant? Where will this be located and has it been included in the noise assessment?

Yes, there is a need for an on-site crushing plant. Crushing would be undertaken in the deep cutting adjacent to Bulahdelah (Alum) Mountain to minimise noise impacts. There has been no specific assessment of noise from a crushing plant.

4. s.4.5.1 - it is noted that there will be a requirement for blasting Cut 2. Was this considered in the risk assessment?

This was considered in the qualitative risk assessment that can be found in *Technical Paper 9 – Hazard and Risk* as Table 3.1. It is covered under the subheading Worker Safety Risk.

5. s.4.5.3 - note reference to widening or laying back of cuttings to maximise use of spoil within the project and to minimise reliance on commercial resources. This is likely to be highly dependent on the location of the cuttings in question, the potential impacts of this and is not something that the Department would be likely to accept as common practice. The potential additional impacts of employing such a practice would require assessment if it is proposed.

The EIS itself did not contain any proposal to widen or lay back batters to maximise use of spoil, despite it being a recommendation in *Technical Paper 11 – Topography, Geology and Soils*.

6. what is the relevance of the Lane Cove Tunnel project to this proposal? To the best of my knowledge there was no' issue relating to soft soils on LCT.

The adopted pavement performance criteria are similar to those adopted on the Lane Cove Tunnel project. It is expected that the pavement performance criteria for the proposed Upgrade at Bulahdelah would be similar.

7. is surcharging proposed in areas where excess settlement is anticipated? Whilst there is some discussion of the requirements, there does not appear to be any commitment to implementation. When would this occur, what material would be used and where would it be sourced from?

As described in Section 7.4 Construction Methods in *Technical Paper 4 – The Proposal*, it is anticipated that approximately 1 metre of surcharge material would be required in soft soil areas across the floodplain, and would be subsequently removed. The surcharge period will occur in the first 12 months of earthworks and would use material obtained from cuttings. Material may also be sourced externally from commercial quarries. The decision on the most suitable method of resolving any fill material shortfall would be the responsibility of the contractor chosen for the Bulahdelah Upgrade Project.

8. s.4.7.1 (& other locations) - has the use of driven piles been considered in the noise and vibration assessment?

Technical Paper 14 – *Noise and Vibration* considers general construction noise and outlines the management strategy for construction noise. The assessment indicates potential noise impacts from some construction activities, and as such, practical construction noise mitigation would be applied for the project. The construction contractor would prepare an environmental management plan, which would incorporate a noise, vibration and blast management plan, and a community consultation program.

Construction noise mitigation would also include:

- use of regularly maintained equipment fitted with appropriate mufflers;
- notification of residents before noisy or vibration-generating activities; and
- noise monitoring to ensure best practice is being implemented.

9 .s.4.9 - how are rocks with moderate to strong acid producing potential which are exposed (but remain in situ) during excavation managed over the long term? With what certainty is mixing expected to reduce the risk of locally high concentrations of acid sulphate rock?

Technical Paper 9 – Hazard and Risk outlines in *Table 3.1* that all soil posing a risk should be identified, contained, properly treated and handled, and if necessary disposed of under licence to approved sites or facilities. The RTA has successfully managed Acid Sulphate Rock on other projects using encapsulation and lime or limestone in areas where treatment is required.

Mixing may also help to reduce concentrations. The specific details of the suitable methodology to reduce this risk would be outlined in the Acid Sulphate Soils Management Plan developed by the construction contractor.

10. s.4.10 - what is the basis of the conclusions reached regarding the need (or not) for remedial works?

The conclusions regarding the need or otherwise for remedial works are based on a desk top study completed by Parsons Brinckerhoff. The reference to the report that documents this study appears in the reference list of *Technical Paper 11 – Topography, Geology & Soils* and is:

Parsons Brinckerhoff 2002b Bulahdelah Upgrade: Geology of Northern Interchange, report to RTA, reference 2122155A PR_4259 RevA November 2002.

Technical Paper 13 - Social and Economic Impact

1. Is there any indication why the annual average growth rates for 2001-2006 is significantly lower than the previous 20 years?

The average annual growth rate of the population of the Mid North Coast between 1981 and 2001 was 2.3 per cent. Between 2001 and 2006, the average annual growth rate is projected to be 1.1 per cent. The source of the information is Department of Infrastructure, Planning and Natural Resources 2004 *New South Wales State and Regional Population Projections 2001 – 2051, 2004 Release*, Transport and Population Data Centre, May 2004.

The cited report discusses the growth rates in the context of aging populations within coastal areas, identifying the Mid North Coast as an area experiencing a change in age distribution, and a need for services to address aging populations. The report does not draw conclusions why there is a fall in average annual growth rate.

2. Note that the social and economic impact paper uses different population figures. Paper 13 refers to 1996 population as 1347 whereas the traffic paper refers to "about 1113": Please clarify.

The population figures cited in the two technical papers are from different sources and for different years. The population of 1,347 given in *Technical Paper 13 - Social and Economic* is from the Australian Bureau of Statistics 1996 *Census of Population and Housing 1996*. *Technical Paper 6 Traffic and Transport* cites a population of 1,113, which is from the 2001 census and quoted from Great Lakes Council *Great Lakes Population 2001 Census Summary Information, 2003*.

3. p. 3-3 note reference to inclusion of Bulahdelah in the Great lakes LEP as a service town which would restrict service centre developments to the interchanges. Is this something that they would want? I thought the idea was to encourage traffic into town to use existing services.

The inclusion of Bulahdelah in the Great Lake Council LEP as a service town was an initiative of Great Lakes Council and the Bulahdelah community. The purpose of this initiative is to restrict a service centre development outside the town on the new highway or on the outskirts of town, at one of the interchanges. Both Council and the community considered that a service centre on the new highway would lead to a loss of income, employment and services within Bulahdelah, by attracting travellers to that facility, and not into those facilities that already exist within the town.

4. p.3.6 & 4.26 - identifies several potential mitigation works and opportunities for the town to minimise economic impacts. The RTA should clarify whether these mitigation works form part of their proposal. What consultation has the RTA (or its consultants) had with relevant agencies, organisations and business groups in developing these opportunities?

All the measures outlined in Sections 3.4 and 4.3.3 in *Technical Paper 13 – Social and Economic* are consistent with the proposal as described in the *Main Volume* of the EIS.

There are several opportunities listed in *Section 4.3.3 of Technical Paper 13 – Social and Economic* that are not within the scope of the RTA project and are listed as opportunities for further consideration by Great Lakes Council, the local community and local business interests. These opportunities were raised or noted during consultation with the community, relevant organisations and agencies, and particularly through the project's Community Focus Group.

As stated in *Section 5.7 Ancillary Works and Town Improvements* within the *Main Volume* of the EIS, there are town improvements funded by the RTA that would be undertaken by Great Lakes Council that would be subject to separate environmental impact assessment. The town improvements that have been developed in consultation with Council and the community include:

- relocation of the rest area toilet facilities currently located adjacent to Bulahdelah golf course to a suitable location in Bulahdelah;
- improved access (vehicular and pedestrian) to the public reserve located to the south-west of the existing Myall River Bridge;
- provision of limited on-street heavy vehicle parking facilities on the existing highway near the centrally located service stations; and
- a streetscape scheme for the existing highway, including some minor landscaping and traffic calming facilities.

5. s.4.3.2 (p. 4-25) - where does the statement "Experience... elsewhere suggests that there would be an initial reduction in the number of vehicles stopping followed by a gradual return to previous levels" come from? How relevant are those other experiences to the Bulahdelah bypass situation?

Studies of other bypassed towns have been conducted along the Hume Highway. The results of these studies are discussed in the following report.

Parolin, B. P. and Garner, B. 1996 *Evaluation of the Economic Impacts of Bypass Roads on Country Towns: Final Project Report*, prepared for the NSW Roads and Traffic Authority Research and Development Project TEP/93/6.

A finding of this study is that there is an initial reduction in the number of vehicles stopping, and that the numbers of stopping traffic gradually increases. While every town has its own characteristics that affect the final result, *Table 4.7 in Technical Paper 13 – Social and Economic* provides an estimate of the time taken for stopping traffic to reach pre-bypass conditions, based on assumptions made on stopping traffic before and after opening. In this

case, it would take approximately 20 years for stopping traffic to reach pre-bypass levels in Bulahdelah.

6. s.4.3.2 - has any monitoring of impacts on Karuah been undertaken to date? What has that shown and how is it relevant to this proposal?

There has been no monitoring to date of the social or economic impacts on the township of Karuah resulting from the opening of the Karuah bypass.

7. p.6.3 - it appears that the RTA will need to maintain a key role in developing opportunities and strategies to minimise initial bypass-related impacts with relevant groups and the community.

The RTA has already taken a key role in developing opportunities and strategies to minimise the initial bypass related impacts through the consultation activities, discussions with key groups such as the Chamber of Commerce and Great Lakes Council and the actual development of the project. Measures such as the relocation of the rest area facilities from the existing highway into the town and the town improvement activities are focused on the minimisation of these impacts. It is envisaged that there will be further consultation with Great Lakes Council to finalise these aspects of the project, along with the existing highway handover. It should also be noted that the RTA has funded Council's investigations associated with the adjustment of the Great Lakes LEP in relation to Bulahdelah's status as a Service Town. There would be further opportunities for input and consultation with both Council and the community during the construction phase regarding opportunities and strategies to minimise bypass-related impacts.

Technical Paper 14 - Noise and Vibration

1. it appears that the assessment of construction noise has not looked at the construction of the new bridges, operation of batching plants or crushing plants. These should be detailed. There also is no discussion of potential out of hours construction work which should be clarified.

There is no specific noise assessment of construction of bridges, operation of batching plants or crushing plants. Detailed assessment of construction noise impacts would be undertaken once the detailed design and construction methods are determined.

Bridges are generally located over 200 metres from residences, and noise impacts associated with piling for these bridges would be determined during the development of the Noise and Vibration Management Plan (NVMP).

The potential location/s of batch plants are shown in *Figure 5.22* of the *Main Volume* of the EIS. These potential sites have been selected according a number of location criteria, outlined in *Table 7.6* of *Technical Paper 4 – The Proposal*. The distance from residential uses or other activities that may be affected by noise or other impacts of the operation of a batch plant has been set at 250 metres or greater. The management of noise impacts that may result from batch plants would be determined once construction methods and batch plant locations are determined, and be included in the NVMP.

Noise monitoring is a normal requirement of construction projects and would be included at strategic locations affected by noisy areas activities such as batching and crushing plants and where bridge piles are required, This work would be included in the NVMP.

Similarly, once the location of crushing plants is determined during the development of the detailed design and construction methodology, measures to mitigate noise impacts that result from crushing would be included in the NVMP.

As discussed in Section 7.8.2 of Technical Paper 4 – The Proposal, construction hours would normally be limited to 7.00 a to 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturday.

Work outside these hours would be discussed with those affected and the Department of Environment and Conservation (DEC). Work hours would likely be a component of any EPL issued by DEC.

2. the recommended heights of noise barriers described in this section should be reconciled by the urban design goal not to have barriers above 2.5 m tall. Have the suggested barrier locations and heights been discussed with nearby residents.

An overview of the design principles is provided in Figure 3.7 of the Main Volume of the EIS. These principles state that various methods of noise attenuation are to be investigated, and that noise barriers be preferably no higher than 3 metres. However, to achieve noise attenuation that meets guidelines, noise barriers are required in excess of 3 metres at Stations 96710 to 96830 and Stations 96980 to 97250. At these respective locations, noise reducing pavements are also proposed.

Noise wall requirements have not been specifically discussed with residents. However, noise barriers are generally some distance away from residences and concealed by native vegetation. The visual impacts are discussed in Technical Paper 12 – Visual.

Technical Paper 16 – Heritage

1. where are the guardian tree and healing stream located in relation to the proposed alignment? Are these "items" likely to be affected irrespective of their significance? Has there been any further clarification/resolution regarding these sites from the custodial Aboriginal community?

The details of the location of the guardian tree can be found in *Technical Paper 16 – Heritage* on page 30. The tree is located in a small tributary drainage line, within a minor gully on the west facing basal slopes of Bulahdelah Mountain (Plates 4.25 and 4.26). The tree trunk is 3 metres south of the creek bed. The creek line drains to the northwest. The tree is located approximately 60 metres west of a cleared 132 kilovolt powerline easement and 21 metres to the northeast of a dirt track which links the power line easement with the northern end of Mackenzie Street. The tree is within the construction zone of the proposed Upgrade.

The healing stream indicated is a small tributary which drains a narrow catchment on the western slope of Bulahdelah (Alum) Mountain. The creek crosses the proposed Upgrade, flows adjacent to the northern boundary of Mountain Park and then traverses an urban catchment within the Bulahdelah town. The proposed Upgrade traverses a section of the stream characterised by a shallow streambed traversing narrow valley floor flats. The stream traverses the proposed Upgrade. It is proposed that a drainage culvert be constructed to carry the water beneath the proposed Upgrade.

Karuah Local Aboriginal Land Council has been further consulted on both of these sites. A letter from the Land Council has now been received that supports the RTA's proposals with regard to both sites. Further information is provided within Chapter 5 of the Submissions Report.

2. p.41 - is the Karuah local Aboriginal land Council report reviewing the Navin Officer report available?

A letter from the Karuah Local Aboriginal Land Council dated 15 November 2005 has been received endorsing the recommendations of Technical Paper 16 - Heritage. Further information is provided within Chapter 5 of the Submissions Report.

3. p.73 - has the council heritage report been released as yet? If so, are there any findings relevant to this project?

A copy of the draft Great Lakes Heritage Study (May 2004) is available on the Council's website <http://www.greatlakes.nsw.gov.au/planbld/PBDownloads/GLCHeritageStudy.pdf>

The draft report has been available for public comment, with submissions closing in mid 2005. Great Lakes Council is currently planning to form a committee in mid 2006 to assess submissions received, with a view to resolving issues raised and finalising the report (R. Atchison). Once the report is finalised, a review of the Local Environment Plan would be made by Council.

4. p.102 - where is Keostfen Road?

The heritage assessment utilised historical maps to investigate relevant issues. The name Keostfen Rd comes from the 1940 Bulahdelah 1:63,360 topographic map. Since then, Keostfen Road has had its name changed to Restevenas Road. The road is a mostly unformed road that extends across the Myall River floodplain, and is shown in Figure 5.24 of Technical Paper 16 – Heritage, corresponding with the location of BH1 Post and Rail fence.

5. p.117 - it is assumed that all directly impacted sites would be subject to section 87 or 90 permits. Are there any measures which could be employed (such as minor realignments) which could avoid the need for disturbance?

The recommendations of Section 6.3 of Technical Paper 16 – *Heritage* detail the various mitigation measures recommended by Heritage experts for the directly impacted sites. Given the wide range of constraints involved and the level of refinement already undertaken, it would not be feasible to further adjust the alignment without the possibility of impacting on other issues of concern.

6. p.121 - what ownership of recommendations regarding Rachel Hennings' house has RTA taken on?

As noted in the main EIS on page 7.33, the location of Rachel Henning's house would be noted during detailed design and construction planned so that direct impacts would be avoided. The site would be temporarily fenced for the duration of the construction phase, and the location and management requirements conveyed to on-ground personnel.

As per the recommendations, the main report notes the site of Rachel Henning's house has considerable potential as a publicly accessible and interpreted site. To take advantage of this potential, interpretive signage and a footway on the Bombah Point Road Overbridge would be provided. The local community or Great Lakes Council may also wish to consider the provision of walking tracks and possible integration with access to the river and other tourist trails. The property is currently owned by MidCoast Water and a large portion would be acquired by the RTA for this project. The future ownership and management of the residual part of the property containing the site of Rachel Henning's house would be further discussed with MidCoast Water and Great Lakes Council following the approval of the project.

7. p.122 - is it possible to increase the gradient of the cut/fill batters in the vicinity of the alunite mine, in particular for the service roads?

The batter profiles recommended from geotechnical investigations are discussed in *Section 4.2.3 of Technical Paper 11 – Topography, Geology and Soils*. The alunite mine precinct is only adjacent to a large cut batter. In this technical paper, the opportunity to steepen the cut batter adjacent to the alunite mine area is discussed, where favourable geotechnical conditions allow.

There are no service roads adjacent to precinct. The road for access to Bulahdelah (Alum) Mountain follows the line of the existing access road. Tracks for pedestrian access, maintenance, emergency access and Transgrid transmission line access are generally constructed on the existing surface and require little in the way of cut or fill batters. The potential impact on the alunite mine site of these roads and tracks would be further assessed during the detailed design phase.

Appendix E

Review of Hydrology and Orchid Bridging Options

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Appendix F

Table of Contents for Orchid Management and
Translocation Plan

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Appendix G

Confidential Orchid Information
- revised Appendix K from EIS

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