LETTER REPORT

Environmental Design - Fauna Crossing Refinements

Nambucca Heads to Urunga Pacific Highway Upgrade

21 OCTOBER 2013

Document control

File name	Environmental Design Fauna Crossing Refinements rev1.doc
Revision number	1

Revision history

Revision	Date	Description	Approval
0	25/09/13	Issued to Roads and Maritime Services for review	
1	21/10/13	Issue to DoPI.	

Table of Contents

1. Introduction

1.1. Background

The Minister Conditions of Approval (MCoA) for the Nambucca Heads to Urunga project (NH2U) stipulates the incorporation of fauna crossings into the design to minimise the barrier effects and habitat fragmentation caused by the new road on local and threatened fauna within the locality.

Table 10.13 in Chapter 10 of the Environmental Assessment (EA) document provides an initial assessment of where the fauna crossings should be instated within the alignment. However, the EA also recognises that fauna crossing facilities would be further refined during the detailed design phase of the project and may vary from that nominated in the table. Further refinements of the proposed fauna underpass structures were documented in the letter to the Department of Planning and Infrastructure (DoPI) from the Roads and Maritime Services titled Pacific Highway Upgrade – Warrell Creek to Urunga Upgrade Addendum to the Submissions Report – Fauna Crossing Structures, dated 25th May 2011; and the letter titled Pacific Highway Upgrade – Warrell Creek to Urunga Upgrade Addendum to the Submissions Report – Fauna Crossing Structures, dated 1 June 2011. These letters now form part of the MCoA and are referenced in Condition A1(d).

Roads and Maritime Services further developed the concept design to clarify some ambiguity with the EA and Statement of Commitment documents to allow design and construction of the project to be priced by the those contractors invited to tender. This stage of project development included consultation with relevant agencies to consolidate the information within the letters referenced in MCoA Condition A1(d) into the Scope of Works and Technical Criteria (SWTC) to specify the required fauna passages. The table where this information was provided, will herein be referred to as Table 4.1, as it falls within the SWTC as Table 4.1 of Appendix 4 of the SWTC.

Two main types of fauna crossing are proposed within the alignment. These are:

- Culverts that are combined drainage and fauna crossings, and
- Fauna corridors under bridge structures.

This document sets out the NH2U design approaches to fulfilling the fauna passage requirements within the detailed design phase of the project, and outlines the proposed detailed design refinements to the fauna crossings which have been identified by the Roads and Maritime Services and the Roads and Maritime Contractor, Lend Lease Engineering in consultation with the project ecologist and the nominated representatives from the Environment Protection Authority (EPA) and the Department of Primary Industries (DPI).

1.2. Scope of Report

This report has been written with the primary intent of fulfilling the requirements of Ministers Condition of Approval B1, B2 and B3 of the MCoA, which are reproduced below:

> *B1. "The Proponent shall implement the fauna and waterway crossings identified in the documents listed under condition A1(d) at the locations and in accordance with the minimum design dimensions identified in the documents listed under condition A1(d), unless otherwise agreed to by the Director General."*
>
> *B2. "As part of detailed design, the Proponent shall further investigate design refinements to improve fauna connectivity between Chainages 19150 and 19820."*
>
> *B3. "All investigations into fauna crossings design undertaken during detailed design (with respect to the crossing design and locations identified in conditions B1 and B2 shall be undertaken with the input of a qualified and experienced ecologist and in consultation with EPA and DPI (Fisheries) through a process of workshops and on-site ground verification. Where detailed design refinements are made, the Proponent shall prior to the commencement of construction of the relevant crossings, submit a report to the Director General identifying the final design of the fauna crossings and demonstrating consistency with the locations and minimum design parameters identified in the documents listed under condition A1(d) or where there have been changes, how the new location and/ or design would result in a better biodiversity outcome. The report shall also clearly identify how the fauna crossings structures will work in conjunction with complementary fauna exclusion fencing measures to be implemented for the project. The report must be*

accompanied by evidence of consultation with EPA and DPI (Fisheries) in relation to the suitability of any changes to the crossings design."

Section 2 of this report provides a summary of the original Table 4.1 requirements, the proposed design refinements and the impact of these changes on the Roads and Maritime Services, Roads and Maritime Contractor, Lend Lease, the EPA, and the DPI.

Section 3 details each crossing structure, and describes in more detail the specific considerations of the individual fauna crossings.

1.3. Consultation

Detailed consultation on the design of the fauna crossings has been undertaken with representatives from both the EPA (Craig Harre) and DPI (James Sakker), on a number of occasions through specific meetings and Environmental Review Group Meetings. Correspondence demonstrating the consultation undertaken with the EPA and DPI regarding the fauna crossing designs is included in Attachment B. Ongoing consultation with the EPA and DPI will continue throughout the design and construction of the fauna crossings.

Consultation on the location and design of the fauna exclusion fence was undertaken with EPA on the 12 April 2013 and 17 September 2013, however, further detailed consultation is planned to be undertaken as detailed design progresses.

The project ecologist (Dr David Rohweder, Sandpiper Ecological Surveys) has also been consulted on the design of the fauna crossings and fauna fencing. The project ecologist's view on the proposed design refinements is provided in Table 2.1 below. Ongoing consultation with the project ecologist will continue as detailed design progresses.

2. Summary of Fauna Crossing Design Refinements

Table 2.1 below compares the fauna underpass structures, as currently proposed by the Roads and Maritime Services and the Roads and Maritime Contractor, Lend Lease, against the minimum dimensions specified in Table 4.1 of the Scope of Works and Technical Criteria (SWTC). The locations of the fauna crossings are shown in Attachment A.

A number of underpasses were originally specified to be multi-cell box culverts. However, at these locations, it was determined that by providing bridges in lieu of culverts, it would result in a better environmental outcome whilst providing greater construction efficiencies.

The Arch structure identified in SWTC has been replaced with a bridge. The primary reason for this was that arches are more complex to construct, and therefore pose a greater risk to the timely delivery and overall cost of the project. The bridge has been designed to have a minimum of 9m width between the two abutment embankments, and a minimum of 4m clearance from the ground surface to the underside of the bridge. The clear space provided by constructing the proposed bridge is comparable to that of the arch.

As demonstrated by Table 2.1 below, the proposed design refinements to the fauna crossings will provide overall positive environmental outcomes as agreed by the project ecologist, EPA and DPI. The design refinements also provide positive overall outcomes for the Roads and Maritime Services and Lend Lease.

Table 2.1 Summary of Proposed Design Refinements to Fauna Crossings

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
Chainage 61km690, Main Carriageways and Service Road	Combined	Box culvert	Minimum 5 no. x 2400 mm wide x 2100 mm high *(Lend Lease note: consists of 4 no. 2400mm x2100mm culverts for drainage & 1 no. higher level 2400mm x 2100mm culvert for fauna)*	Nil	Nil	Deleted with alternative fauna crossing provided at Bridges over North Coast Rail	Very High	Negative	Positive	Not Applicable	Positive	Neutral
Twin Bridges over North Coast Rail	Not previously included	Not previously included	Not previously included	Bridges	Provide Min 3m wide fauna passage at southern abutment, between the retaining wall and the rail corridor	Proposed as replacement for deleted culvert at 61km 690						
Twin bridges over Boggy Creek	Combined	Bridges	Minimum length 70 metres between front	Bridges	Minimum length 48 metres between front faces of bridge abutments including a	Reduced bridge length provides no	High	Positive	Neutral	Neutral	Positive	Neutral

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
			faces of bridge abutments including a minimum 6 metre wide fauna passage at each abutment between the scour protection and the mean high water level (**MHWL**)[2], or scour protection and top of bank[3] where the crossing is located above tidal influence		minimum 3m wide fauna passage at each abutment and minimum total 12 metre wide fauna passage, measured between the scour protection and the mean high water level (**MHWL**)[2], or scour protection and top of bank[3] where the crossing is located above tidal influence. Min clearance of 3m to be provided for fauna passage.	decrease in connectivity benefit						
Service Road Bridge over Boggy Creek	Not previously included	Not previously included	Not previously included	Bridge	Minimum length 48 metres between front faces of bridge abutments including a minimum 3m wide fauna passage at each abutment and	Providing a bridge, and of equal length to adjacent Twin Bridges elimates	High	Negative	Positive	Neutral	Neutral	Positive

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
					minimum total 12 metre wide fauna passage over both abutments, measured between the scour protection and the mean high water level (**MHWL**)[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence. Min clearance of 3m to be provided for fauna passage.	funnelling restriction and contributes to a greater overall connectivity result						
Twin bridges over Cow Creek and Service Road bridge over Cow Creek	Combined	Bridges	Minimum length 30 metres between front faces of bridge abutments including a minimum 6 metre wide fauna passage at each abutment between the	No change proposed	No change proposed		Currently Medium, but High Potential	Neutral	Neutral	Neutral	Neutral	Neutral

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
			scour protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence									
Twin bridges over Deep Creek	Combined	Bridges	Minimum length 90 metres between front faces of bridge abutments including a minimum 3 metre wide fauna passage at each abutment between the scour protection and the MHWL[2] , or scour protection and	No change proposed	No change proposed		Medium	Neutral	Neutral	Neutral	Neutral	Neutral

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
			top of bank[3] where the crossing is located above tidal influence									
Local Access Road C at chainage 66km180	Incidental	Box culvert	Minimum 2700 mm wide x 900 mm high	No change proposed	No change proposed		Low	Neutral	Neutral	Not Applicable	Neutral	Neutral
Chainage 67km125	Combined	Box culvert	Minimum 2400 mm wide x 2400 mm high	Pipe Culvert	Minimum 1 no. x 1350mm dia.	Change to match existing pipe that this new line connects into, eliminating funnelling / trapping potential. Embankment overlap prevents separate structures being provided.	Low	Positive	Positive	Not Applicable	Positive	Neutral
Chainage	Combined	Box	Minimum 4 no.	No	No change proposed		Low-Medium	Neutral	Neutral	Not	Neutral	Neutral

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
68km405		culvert	x 3600 mm wide x 1200 mm high plus 1 no. x 3600 mm wide x 2400 mm high	change proposed						Applicable		
Chainage 69km715	Incidental	Pipe culvert	Minimum 4 no. x 1200 mm diameter	No change proposed	No change proposed		Low	Neutral	Neutral	Not Applicable	Neutral	Neutral
Chainage 70km145	Incidental	Pipe culvert	Minimum 2 no. x 1800 mm diameter	No change proposed	No change proposed		Low	Neutral	Neutral	Not Applicable	Neutral	Neutral
Chainage 70km435	Combined	Box culvert	Minimum 3600 mm wide x 3000 mm high	No change proposed	No change proposed		Medium to High	Neutral	Neutral	Not Applicable	Neutral	Neutral
Twin bridges over McGraths Creek Floodplain No. 1	Combined	Bridges	Minimum length 70 metres between front faces of bridge abutments including a minimum 6 metre wide fauna passage at each abutment	Bridges	Minimum length 48 metres between front faces of bridge abutments including a minimum 3m wide fauna passage at each abutment and minimum total 12 metre wide fauna passage over both abutments, measured between the scour	Reduced bridge length provides no decrease in connectivity benefit	Medium	Positive	Neutral	Neutral	Positive	Neutral

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
			between the scour protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence		protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence. Min clearance of 3m to be provided for fauna passage.							
Chainage 72km720	Combined	Box culvert	Minimum 2100 mm wide x 900 mm high	No change proposed	No change proposed		Low	Neutral	Neutral	Not Applicable	Neutral	Neutral
Twin bridges over Dalhousie Creek	Combined	Bridges	Minimum length 15 metres between front faces of bridge abutments including a minimum 3 metre wide fauna passage at each abutment between the scour	Bridges	Minimum length 30 metres between front faces of bridge abutments including a minimum 3 metre wide fauna passage at each abutment between the scour protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence	Increased bridge length provides a more open fauna passage area	Very High – critical link	Neutral	Positive	Neutral	Positive	Positive

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
			protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence									
Southbound Main Carriageway at chainage 73km630	Combined	Box culvert	Minimum 2400 mm wide x 2400 mm high	Nil – remove from table	Nil – remove from table	Deleted with enhanced crossing provided at 73km780. This line to now use smaller dia RCP's to discourage fauna use. Propose to use 2x1500mm dia RCP's	Medium-High	Negative	Positive	Not Applicable	Neutral	Positive
Southbound Main Carriageway at chainage	Not previously included	Not previously included	Not previously included	Box Culvert	Minimum 2400 mm wide x 2400 mm high	Replaces 3 no. x900 dia RCP's to encourage	Medium-High					

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
73km780						fauna connectivity at this location, rather than at 73km 630.						
Northbound Main Carriageway at chainage 73km795	Combined	Box culvert	Minimum 2400 mm wide x 2400 mm high	No change proposed	No change proposed		Medium-High	Neutral	Neutral	Not Applicable	Neutral	Neutral
Chainage 74km800	Combined	Arch	Minimum 4metres high x 9 metres wide	Bridge	Minimum length 25 metres between front faces of bridge abutments including a minimum 9m width between intersection of batter treatments and finished ground level.		Critical High	Neutral	Positive	Not Applicable	Positive	Positive
Chainage 75km275	Incidental	Box culvert	Minimum 3000 mm wide x 2400 mm high	Box culvert	Minimum 3000 mm wide x 3000 mm high		High	Negative	Positive	Not Applicable	Neutral	Positive
Chainage 75km825	Incidental	Box culvert	Minimum 2400 mm wide x 1200 mm high	Box culvert	Minimum 3000 mm wide x 3000 mm high		High	Negative	Positive	Not Applicable	Neutral	Positive

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
Chainage 76km320	Combined	Box culvert	Minimum 3600 mm wide x 3600 mm high	No change proposed	No change proposed		Medium - High	Neutral	Neutral	Not Applicable	Neutral	Neutral
Chainage 76km560	Incidental	Box culvert	Minimum 3600 mm wide x 2100 mm high	Box culvert	Minimum 3600 mm wide x 3000 mm high		Low - Medium	Negative	Positve	Not Applicable	Neutral	Positive
Chainage 76km990	Combined	Box culvert	Minimum 23 no. x 3600 mm wide x 3000 mm high	Bridges	Minimum length 89 metres between front faces of bridge abutments including a minimum 3 metre wide by 3 metre high fauna passage at each abutment between the scour protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence		Low	Neutral	Positive	Not Applicable	Positive	Positive
Chainage 78km795	Combined	Box culvert	Minimum 2 no. x 2400 mm wide x 1200 mm high	Box culvert	Minimum 2 No 2400mm wide x 3000mm high		High	Negative	Positive	Not Applicable	Neutral	Positive
Twin bridges, northbound at chainage	Combined	Bridges	Minimum length 15 metres	Bridges	Minimum length 29 metres between front faces of bridge		Very High	Neutral	Postive	Postive	Positive	Positive

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
79km865 and southbound at chainage 79km930			between front faces of bridge abutments including a minimum 3 metre wide by 3 metre high fauna passage at each abutment between the scour protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence		abutments including a minimum 3 metre wide by 3 metre high fauna passage at each abutment between the scour protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence							
Chainage 80km220	Combined	Box culvert	Minimum 2 no. x 3000 mm wide x 1500 mm high	Box culvert	Minimum 2 no. x 3000 mm wide x 2100 mm high		Very High	Negative	Positive	Not Applicable	Neutral	Positive
Chainage 81km885	Incidental	Box culvert	Minimum 17 no. x 3300 mm wide x 2100	Bridges	Minimum length 13.6 metres between front faces of bridge		Very Low	Positive	Positive	Not Applicable	Positive	Positive

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
			mm high		abutments, with 2.1 metre high fauna passage at each abutment between the scour protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence. Dry Passage will be provided only where existing conditions facilitiate .							
Chainage 82km405, Main Carriageways and Service Road[4]	Incidental	Box culvert	Minimum 9 no. x 3000 mm wide x 2100 mm high	Bridges	Minimum length 16.6 metres between front faces of bridge abutments, with 2.1 metre high fauna passage at each abutment between the scour protection and the MHWL[2] , or scour protection and top of bank[3] where the crossing is located above tidal influence. Dry Passage will be	Will be changed to *Incidental* Crossing Type	Low	Positive	Positive	Not Applicable	Positive	Positive

Location	Current Table 4.1 Fauna Crossing Type	Current Table 4.1 Structure Form[1]	Current Table 4.1 Dimensions	Proposed Table 4.1 Structure Form	Proposed Table 4.1 Dimensions	Comments	Connectivity Value	Lend Lease Impact	EPA Impact	DPI (F) Impact	Roads and Maritime Services Impact	Project Ecologist View
					provided only where existing conditions facilitiate .							
							Net Overall Result	**Positive**	**Positive**	**Neutral**	**Positive**	**Positive**

3. Detailed Description of Fauna Crossing Design Refinements

The following section describes the proposals that have been progressed through design development, detailing the existing structures, the proposed design and fauna habitat considerations for each of the proposed fauna crossings specified within the proposed amended Table 4.1 of the SWTC.

Fauna exclusion fence provisions are also discussed for each fauna crossing. Note that the fauna fence provisions are currently at 85% design development and hence will be subject to further consultation with the EPA as design progresses. In addition, where fauna passage is proposed under bridges, fauna fence will be installed between the bridge abutments to exclude fauna from accessing the median areas.

3.1 Drainage culvert at Station 61km690

Station:	**61km690**
Crossing type:	Combined Drainage and Fauna
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 5 no. 2.4m wide x 2.1m high
Connectivity value	Very high
Lend Lease's proposed crossing type	Nil at this location. An alternative fauna crossing has been provided at Bridges over North Coast Rail (details provided below in section 3.2). Culverts will remain at this location for hydraulic purposes, which could still act as an incidental crossing point.
Reason for design change	Original crossing has been deleted. A superior alternative fauna crossing has been provided at Bridges over North Coast Rail
Engineering considerations:	Due to the engineering constraints in this location an alternative was investigated and proposed to the EPA as outlined below. The existing culvert under the current Pacific Highway is a three cell 3m wide x 2.1m high structure, and therefore to utilise the retained infrastructure it was originally proposed to divert the water through a three cell culvert and provide a single dedicated fauna culvert at a higher level than that of the drainage culvert. However, the installation of the dedicated fauna culvert either required the current Pacific Highway to be closed after the new highway was opened or the culvert to be pipe jacked under the existing highway, which would result in construction program and cost inefficiencies. In addition, due to the location of the new highway embankment and the existing highway embankment, clear space could not be provided between the two road embankments thus making the proposed fauna culvert long and not ideal for fauna. EPA's preference for a 3m high fauna culvert at this location was also unachievable. Through consultation with the EPA and DPI it was agreed that due to the above concerns, the proposed 2.4m wide x 2.1m high culvert was not the preferred option. It was agreed to extend the bridge over the North Coast Railway to provide for fauna passage underneath the bridge, thus providing a more positive ecological outcome.

Ecological outcome:	Positive biodiversity outcome when considering alternative crossing provided at North Coast Railway.
Fauna exclusion fencing provisions	Fauna fence will be located over the top of the headwall of the proposed drainage culvert on the western side of the proposed highway, thus still allowing this culvert to be used as an incidental crossing by fauna. The fauna fence in proposed to be located in between the proposed highway and the future service road to ensure fauna cannot access the main highway. Double drop down structures will be provided in locations in close proximity to the underpass, as agreed with EPA.
Comment	The investigation and active consultation with the EPA and DPI in relation to this fauna crossing provision fulfils the requirement of Condition B2 of the MCoA. Note Roads and Maritime Services will discuss with EPA further fauna crossing options for the WC2N section of the project.

3.2 Twin Bridges over North Coast Rail

Station:	**61km800**
Crossing type:	Bridges
Original Table 4.1 Structure form	Not previously included
Original Table 4.1 dimensions	Not previously included
Connectivity value	Very High
Lend Lease's proposed crossing type	Twin Bridges Provide minimum 3m wide fauna passage at southern abutment between the retaining wall and the rail corridor.
Reason for design change	Proposed as a replacement for the deleted culvert at Station 61km690. Widening of bridge over railway to provide a better fauna corridor.
Engineering considerations:	The requirements for the fauna underpass at the North Coast Rail Bridge are required to be captured in Roads and Maritime Services licence agreement with the ARTC. An in principal agreement has been established with the ARTC however it would not be binding until it is signed by ARTC which is post completion of the works. EPA has been provided with a copy of this draft agreement as demonstrated in Attachment B of this report. Upon completion of construction, Roads and Maritime Services will arrange for the signature of the ARTC licence to provide the level of certainty over the fauna corridor.
Ecological outcome:	Positive ecological outcome.
Fauna exclusion fencing provisions	Fauna fence will be tied into the bridge abutments on the western side of the future highway, and located in between the future highway and the future service road on the eastern side. Fauna fence will also be constructed between the twin highway bridges to ensure fauna cannot access the future highway in the median. Double drop down structures will be provided in locations in close proximity to the underpass, as agreed with EPA.

Comment	The investigation and active consultation with the EPA and DPI in relation to this fauna crossing provision fulfils the requirement of Condition B2 of the MCoA. Note Roads and Maritime Services will discuss with EPA further fauna crossing options for the WC2N section of the project.

3.3 Twin Bridges over Boggy Creek and service road

Station:	**Boggy Creek and service road**
Crossing type:	Combined
Original Table 4.1 Structure form	Bridge
Original Table 4.1 dimensions	Bridge structure for highway carriageways with minimum length 70m between front faces of the abutments and 6m wide fauna passage at each abutment. Boggy Creek Service Road was not previously included in Table 4.1. Roads and Maritime Services concept design for the service road was box culverts.
Connectivity value	High
Lend Lease's proposed crossing type	Highway carriageways and service road to have a consistent bridge length with minimum length 48m between the front faces of bridge abutments including a minimum 12m wide fauna passage, measured between the scour protection and the mean high water level, or scour protection and top of bank where the crossing is located above tidal influence. Minimum clearance of 3m to be provided for fauna passage.
Reason for design change	Fauna bottleneck was created with original design in between highway bridges and service road culverts. EPA agreed to a minimum 48m uniform bridge crossing at both locations preferential to a bridge linking to culverts. DPI is in agreement.
Engineering considerations:	The potential to shorten the highway bridges is on the basis that a bridge is provided at the service road and not culverts. Providing similar fauna passage widths between the three bridges. Bridge length is based on 12m wide for fauna (total) plus waterway width. Also, DPI required the following design considerations for waterway bridge design: ▪ Scour protection should not impact width or depth of creek ▪ Minimise piers in waterways ▪ Maintain waterway width and depth ▪ No shortening where realignment planned. Match existing grade and widths ▪ Where scour protection is required it is to mimic existing conditions (maintain fish passage) ▪ Appropriate bank planting
Ecological outcome:	Overall the proposed design refinements at this location achieve a positive ecological outcome.
Fauna exclusion fencing provisions	Fauna fence will be located between the future highway and the future service road on the western side of the alignment and will be tied into the highway bridge abutments on the northern and

	southern embankments. The fauna fence will be tied into the south eastern abutment of Boggy Creek bridge and will be extended around the water quality basin to act as a combined and security fence around the basin. The fauna fence will extend from the north eastern abutment along the toe of the road highway embankment. Double drop down structures will be provided in locations in close proximity to the underpass, as agreed with EPA
Comment	-

3.4 Twin Bridges over Cow Creek and Service Road over Cow Creek

Station:	**Twin Bridges over Cow Creek and service road**
Crossing type:	Combined- Bridges
Original Table 4.1 Structure form	Bridges
Original Table 4.1 dimensions	Minimum length 30 metres between the front faces of bridge abutments including a minimum 6m wide fauna passage at each abutment between the scour protection and the MHWL, or scour protection and top of bank where the crossing is located above tidal influence.
Connectivity value	Corridor value Medium, currently fragmented. Connectivity potential High
Lend Lease's proposed crossing type	No change proposed.
Reason for design change	No design change proposed
Engineering considerations:	Nil
Ecological outcome:	Neutral
Fauna exclusion fencing provisions	Fauna fence will be located along the toe of the south-western bridge embankment and tied into the bridge abutment, and between the future highway and the future service road along the south-eastern bridge embankment. The fauna fence is proposed to extend from the north-western bridge abutment along the top of the future highway embankment to maximise the potential habitat on the north-western side of Cow Creek. Double drop down structures will be provided in locations in close proximity to the underpass, as agreed with EPA
Comment	Potential highway realignment design changes are proposed at this location. The potential realignment will not affect the minimum fauna crossing design criteria.

3.5 Twin Bridges over Deep Creek

Station:	**Twin Bridges over Deep Creek**
Crossing type:	Combined.
Original Table 4.1 Structure form	Bridges
Original Table 4.1 dimensions	Minimum length 90 metres between the front faces of bridge abutments including a minimum 6m wide fauna passage at each abutment between the scour protection and the MHWL, or scour protection and top of bank where the crossing is located above tidal influence.
Connectivity value	Medium connectivity value
Lend Lease's proposed crossing type	No change proposed.
Reason for design change	No change proposed.
Engineering considerations:	N/A
Ecological outcome:	Neutral
Fauna exclusion fencing provisions	Fauna fence will be located along the toe of the western bridge embankments and tied into the bridge abutments of both the south-western and north eastern abutments, and located in between the future service road and future highway on the eastern side of the alignment and tie into the south-east and north-east abutments. Double drop down structures will be provided in locations in close proximity to the underpass, as agreed with EPA.
Comment	-

3.6 Local Access Road at station 66km180

Station:	**Local Access Road at station 66km180**
Crossing type:	Incidental
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 2700mm wide x 900mm high
Connectivity value	Low connectivity value
Lend Lease's proposed crossing type	No change proposed.
Reason for design change	No change proposed.
Engineering considerations:	N/A
Ecological	Neutral

outcome:	
Fauna exclusion fencing provisions	No fauna exclusion fence designed at this location, as it is located under the future service road and has only been identified as being an incidental crossing in an area of low connectivity value.
Comment	-

3.7 Station 67km125

Station:	**Chainage 67km125**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 2400mm wide x 2400mm high
Connectivity value	Low
Lend Lease's proposed crossing type	1 x 1350mm pipe culvert
Reason for design change	Embankment overlap prevented the new structure and the existing highway structure being separated. The existing highway culvert is a 1350mm pipe. Constructing a new 2.4 x 2.4m box culvert to lead into a 1350mm pipe was thought by EPA to be a fauna trap, and the hydraulics would not be optimised.
Engineering considerations:	The retained transverse drainage infrastructure under the existing Pacific Highway was a single 1350mm pipe culvert, while the original Table 4.1 specified a 2.4 x 2.4 m box culvert. Further, the embankments of the existing highway and proposed new highway overlap in this location, which therefore prevented the structures being separated. By providing a 2.4 x 2.4 m culvert, leading into a 1350 mm pipe it was thought that it could cause funnelling and/or a trap where the two culvert types converge. Additionally, it was thought that the hydraulics of the culvert would not be optimised with this option. It was the preference of both the representative from the EPA and DPI to revise the new culvert dimensions to match the existing 1350mm culvert.
Ecological outcome:	Positive outcome as potential for fauna trap has been eliminated.
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert on the western side of the future highway to funnel fauna through the underpass crossing, and will be installed between the future highway alignment and the future service road on the eastern side.
Comment	-

3.8 Station 68km405

Station:	**68km405**
Crossing type:	Combined
Original Table 4.1	Box culvert.

Structure form	
Original Table 4.1 dimensions	Minimum 4 no. 3600mm wide x 1200mm high plus 1 no. x 3600mm wide x 2400mm high
Connectivity value	Low-medium
Lend Lease's proposed crossing type	No design change proposed.
Reason for design change	No design change proposed.
Engineering considerations:	The four 3600mm x 1200 high culverts have been positioned in a diagonal north-west to south-east direction, in a similar alignment to the natural channel. The single 3600mm x 2400mm box culvert has been positioned perpendicular to the highway to minimise the length of the culvert to promote the use of the culvert by fauna. The invert of the single culvert has also been designed above the invert of the drainage culverts to provide for a dry passage. The culvert will act as a drainage culvert in high flow events.
Ecological outcome:	Neutral
Fauna exclusion fencing provisions	Fauna fence to be installed between the future highway and future service roads on both the western and eastern sides of the alignment.
Comment	-

3.9 Station 69km715

Station:	**69km715**
Crossing type:	Incidental
Original Table 4.1 Structure form	Pipe culvert
Original Table 4.1 dimensions	Minimum 4 no. x 1200mm diameter
Connectivity value	Low
Lend Lease's proposed crossing type	No design change proposed.
Reason for design change	No change proposed.
Engineering considerations:	N/A
Ecological outcome as a result of the change:	Neutral
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing on the eastern side of the highway. Fauna exclusion fence will be installed between the

	highway and Local Access Road E on the western side of the highway to exclude fauna from the main highway corridor.
Comment	-

3.10 Station 70km145

Station:	**70km145**
Crossing type:	Incidental
Original Table 4.1 Structure form	Pipe culvert
Original Table 4.1 dimensions	Minimum 2 no. x 1800mm diameter
Connectivity value	Low
Lend Lease's proposed crossing type	No design change proposed.
Reason for design change	No change proposed.
Engineering considerations:	N/A
Ecological outcome as a result of the change:	Neutral
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing.
Comment	-

3.11 Chainage 70km435

Station:	**70km435**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 3600mm wide x 3000mm high
Connectivity value	Medium to high
Lend Lease's proposed crossing type	No design change proposed.
Reason for design change	No design change proposed.
Engineering considerations:	N/A
Ecological	Neutral

outcome as a result of the change:	
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing. The fauna fence is located between the future highway and future service road on the eastern side of the alignment.
Comment	Detailed landscaping design will consider revegetation opportunities between the two culverts to enhance the use of the crossing

3.12 Twin Bridges over McGraths Creek Floodplain 1

Station:	**Twin Bridges over McGraths Creek Floodplain 1**
Crossing type:	Combined
Original Table 4.1 Structure form	Bridges
Original Table 4.1 dimensions	Minimum 70m length between front faces of bridge abutments including a minimum 6m wide fauna passage at each abutment between the scour protection and the MHWL, or scour protection and top of bank where the crossing is located above tidal influence
Connectivity value	Medium
Lend Lease's proposed crossing type	Minimum length 48 metres between front faces of bridge abutments including a minimum 3m wide fauna passage at each abutment and minimum total 12 metre wide fauna passage over both abutments, measured between the scour protection and the MHWL, or scour protection and top of bank where the crossing is located above tidal influence. Min clearance of 3m to be provided for fauna passage.
Reason for design change	Design opportunity to shorten bridge length whilst not negatively impacting fauna connectivity.
Engineering considerations:	Sufficient dry passage will be provided for the fauna crossing. Bridge abutments will remain within forested areas to encourage fauna movement.
Ecological outcome as a result of the change:	Neutral
Fauna exclusion fencing provisions	Fauna fence will be tied into the bridge abutments to ensure fauna cannot enter the road corridor and can be funnelled under the bridge. The fauna fence will be located on the outside of the water quality basin on the south eastern side of the twin bridges, as there is not sufficient space to locate the fence on the road side of the water quality basin. Double drop down structures will be provided in locations in close proximity to the underpass, as agreed with EPA.
Comment	A consensus was reached in consultation with the EPA and DPI that the bridge length could be reduced without decreasing the fauna connectivity benefit. During a site visit to the bridge location, it was agreed with the EPA that due to the flat terrain of the surrounding area, a fauna path would not be required to be constructed above the 1 in 2 year ARI

	flood level, as it was preferable to retain the natural ground level underneath the bridge.

3.13 Chainage 72km720

Station:	**Chainage 72km720**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 2100mm wide x 900mm high
Connectivity value	Low
Lend Lease's proposed crossing type	No change proposed.
Reason for design change	No change proposed.
Engineering considerations:	N/A
Ecological outcome as a result of the change:	Neutral
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing.
Comment	-

3.14 Twin Bridges over Dalhousie Creek

Station:	**Twin Bridges over Dalhousie**
Crossing type:	Combined
Original Table 4.1 Structure form	Bridges
Original Table 4.1 dimensions	Minimum length 15m between the front faces of the abutments including a 3m wide fauna passage at each abutment between the scout protection and the MHWL, or scour protection and top of bank where the crossing is located above tidal influence.
Connectivity value	Very High (critical link)
Lend Lease's proposed crossing type	Minimum length 30 metres between front faces of bridge abutments including a minimum 3 metre wide fauna passage at each abutment between the scour protection and the MHWL, or scour protection and top of bank where the crossing is located above tidal influence
Reason for design change	To meet drainage requirements a longer bridge structure was required. The longer bridge at this location also results in a better biodiversity outcome.
Engineering	Final location of water quality basins will be designed as far away

considerations:	from the bridge opening as possible. Clearing will be minimised in the median. Scour protection is required under the northbound carriageway, however, the extent will be minimised as far as possible and a low flow passage will be shaped into the scour protection rock.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence will be tied into the bridge abutments, and located in between the two bridges – through the widened median – to ensure fauna cannot enter the road corridor at this location and can be funnelled under the bridge. Double drop down structures will be provided in locations in close proximity to the underpass, as agreed with EPA.
Comment	-

3.15 Southbound Main Carriageway at Station 73km630

Station:	**Southbound main carriageway at Chainage 73km630**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 2400 mm wide x 2400mm high
Connectivity value	Medium-High
Lend Lease's proposed crossing type	Deleted. Enhanced crossing provided at 73km780. Fauna crossing replaced by a 2 x 1500mm pipe culvert.
Reason for design change	This fauna crossing was deleted as it was thought by the EPA representative that the fauna fencing requirements at this location could result in a potential fauna trap in the median. A superior fauna crossing could be provided at Station 73km780. Further details are provided below in section 3.18.
Engineering considerations:	The pipe culvert will ideally discourage the use by fauna however still provide the hydraulic capacity for drainage requirements.
Ecological outcome as a result of the change:	Overall Positive
Fauna exclusion fencing provisions	Fauna fence is currently designed to be installed over the headwall of the culvert on the eastern side of the highway to funnel fauna through the underpass crossing. As this culvert is no longer a combined fauna crossing, the fauna fence location may be moved to exclude fauna from this culvert. Further consultation will be undertaken with the EPA to determine the final location of the fauna exclusion fence in this location.
Comment	-

3.16 Southbound Main Carriageway at Station 73km780

Station:	**Southbound main carriageway at Chainage 73km780**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Nil
Connectivity value	Medium-High
Lend Lease's proposed crossing type	Minimum 2400 mm wide x 2400mm high box culvert.
Reason for design change	This box culvert replaces the 3 x 900mm diameter pipe culvert that was originally designed in this location. The box culvert will encourage fauna connectivity at this location, rather than the crossing originally proposed at 73km630 by providing a more direct crossing point.
Engineering considerations:	The pipe culvert will be replaced by a box culvert to encourage the use by fauna. Hydraulically, the box culvert will be sufficient for drainage requirements.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing. The fauna fence will be installed through the widened median section to tie into the fauna underpass at Station 73km795 under the northbound carriageway.
Comment	-

3.17 Northbound Main Carriageway at Station 73km795

Station:	**Northbound main carriageway at Station 73km795**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 2400mm wide x 2400mm high
Connectivity value	Medium-High
Lend Lease's proposed crossing type	No design change proposed.
Reason for design change	No design change proposed.
Engineering	N/A

considerations:	
Ecological outcome as a result of the change:	Neutral
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing. The fauna fence will be installed through the widened median section to tie into the fauna underpass at Station 73km780 under the southbound carriageway.
Comment	-

3.18 Station 74km 800

Station:	**74km800**
Crossing type:	Combined
Original Table 4.1 Structure form	Arch structure
Original Table 4.1 dimensions	Minimum 4m high x 9m wide arch
Connectivity value	Critical-High
Lend Lease's proposed crossing type	Minimum lengths 25m between the front faces of bridge abutments including minimum 9m width between the intersection of batter treatments and finished ground level.
Reason for design change	Bridge preferred to arch structure as it provides greater construction efficiencies and ecological outcomes.
Engineering considerations:	Bridge structure is easier to construct in comparison to an arch. Therefore the bridge proposal has both a positive constructability outcome and a positive ecological outcome.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence will be tied into the bridge abutments, and located in between the two bridges to ensure fauna cannot enter the road corridor at this location and can be funnelled under the bridge. Double drop down structures will be provided in locations in close proximity to the underpass, as agreed with EPA.
Comment	-

3.19 Chainage 75km275

Station:	**75km275**
Crossing type:	Incidental
Original Table 4.1 Structure form	Box culvert
Original Table 4.1	Minimum 3000mm wide x 2400mm high

dimensions	
Connectivity value	High
Lend Lease's proposed crossing type	Minimum 3000mm wide x 3000mm high box culvert
Reason for design change	Design was changed to increase the height of the box culvert at the request of the EPA. The increased height enhances the fauna crossing potential.
Engineering considerations:	The increase in height of the box culvert does not change the hydraulics at this location, nor the vertical alignment of the road.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing.
Comment	-

3.20 Station 75km825

Station:	**75km825**
Crossing type:	Incidental
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 2400mm wide x 1200mm high
Connectivity value	High.
Lend Lease's proposed crossing type	Minimum 3000mm wide x 3000mm high box culvert
Reason for design change	Design was changed to increase the height of the box culvert at the request of the EPA. The increased height enhances the fauna crossing potential.
Engineering considerations:	The increase in height of the box culvert does not change the hydraulics at this location, nor the vertical alignment of the road.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing.
Comment	NSW Forests have recently extensively cleared the area adjacent to this crossing location.

3.21 Station 76km320

Station:	**76km320**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 3600mm wide x 3600mm high
Connectivity value	Medium-High. Core Koala habitat.
Lend Lease's proposed crossing type	No design change proposed.
Reason for design change	No design change proposed.
Engineering considerations:	N/A
Ecological outcome as a result of the change:	Neutral
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing.
Comment	-

3.22 Station 76km560

Station:	**76km560**
Crossing type:	Incidental
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 3600mm wide x 2100mm high
Connectivity value	Low-Medium
Lend Lease's proposed crossing type	Box culvert Minimum 3600mm wide x 3000mm high
Reason for design change	Design was changed to increase the height of the box culvert at the request of the EPA. The increased height enhances the fauna crossing potential.
Engineering considerations:	The increase in height of the box culvert does not change the hydraulics at this location, nor the vertical alignment of the road.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing.

Comment	-

3.23 Station 76km990

Station:	**76km990**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 23 no. x 3600mm wide x 3000mm high
Connectivity value	Low
Lend Lease's proposed crossing type	Bridges Minimum length 89m between front faces of bridge abutments including a minimum 3m wide by 3m high fauna passage at each abutment between the scour protection and the MMHWL, or scour protection and top of bank where the crossing is located above the tidal influence.
Reason for design change	The structure was changed to a bridge primarily due to constructability efficiencies, however, a bridge structure significantly increases the ecological outcome of the crossing and fauna corridor potential.
Engineering considerations:	Bridge more efficient to construct compared to multi-cell box culverts.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence will be tied into the bridge abutments, and located in between the two bridges to ensure fauna cannot enter the road corridor at this location and can be funnelled under the bridge.
Comment	Landscaping of native vegetation at the southern end of the bridge will be investigated to increase the connectivity potential under the bridge.

3.24 Station 78km795

Station:	**78km795**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 2 no. x 2400mm wide x 1200mm high
Connectivity value	High. Core Koala habitat
Lend Lease's proposed crossing type	Box culvert Minimum 2 No 2400mm wide x 3000mm high
Reason for design	Design was changed to increase the height of the box culvert at the

change	request of the EPA. The increased height enhances the fauna crossing potential.
Engineering considerations:	The increase in height of the box culvert does not affect the hydraulics at this location, nor the vertical alignment of the road.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing.
Comment	-

3.25 Twin Bridges northbound at Station 78km865 and southbound at 79km930

Station:	**Twin bridges 79km865 northbound and 79km930 southbound**
Crossing type:	Combined
Original Table 4.1 Structure form	Bridges
Original Table 4.1 dimensions	Minimum length 15m between front faces of bridge abutments including a minimum 3m wide by 3m high fauna passage at each abutment between the scour protection and top of bank where the crossing is located above the tidal zone.
Connectivity value	Very High
Lend Lease's proposed crossing type	Bridges Minimum length 29m between front faces of bridge abutments including a minimum 3m wide by 3m high fauna passage at each abutment between the scour protection and top of bank where the crossing is located above the tidal zone.
Reason for design change	To meet drainage requirements a longer bridge structure was required, thus increasing the bridge in length from 15m to 29m to satisfy drainage requirements, which also results in a better biodiversity outcome.
Engineering considerations:	Fauna pathways should be above the 2yr ARI Revegetate connectivity corridor towards the northeast in the cleared area.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence will be tied into the bridge abutments, and located in between the two bridges – through the widened median – to ensure fauna cannot enter the road corridor at this location and can be funnelled under the bridge. The fauna fence will be located on the outside of the water quality basins at this location due to the limited space between the basins and the highway embankment. Double drop down structures will be provided in locations in close proximity to the underpass, as agreed with EPA.

Comment	-

3.26 Station 80km220

Station:	**80km220**
Crossing type:	Combined
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 2 no. x 3000mm wide x 1500mm high
Connectivity value	Very High. Koala habitat
Lend Lease's proposed crossing type	Box culvert 2 No 3000mm wide x 2100mm high
Reason for design change	Design was changed to increase the height of the box culvert at the request of the EPA. The increased height enhances the fauna crossing potential.
Engineering considerations:	The box culvert could not be increased to 3000mm high at this location without impacting the vertical alignment. Therefore it was agreed with EPA to increase the height of the box culvert to 2100mm. This change still provides a better ecological outcome compared to the original 1500mm high culvert.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	Fauna fence to be installed over the headwall of the culvert to funnel fauna through the underpass crossing. The fauna fence will be installed through the widened median section to tie into the fauna underpass under the opposite carriageway.
Comment	-

3.27 Station 81km885

Station:	**81km885**
Crossing type:	Incidental
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 17 no. x 3300mm wide x 2100mm high
Connectivity value	Very Low.
Lend Lease's proposed crossing type	Bridges Minimum length 13.6m between front faces of bridge abutments with 2.1m high fauna passage at each abutment between the scour protection and top of bank where the crossing is located above the

	tidal zone. Dry passage will be provided only where existing conditions facilitate.
Reason for design change	The structure was changed to a bridge primarily due to constructability efficiencies, however, a bridge structure significantly increases the ecological outcome of the crossing and fauna corridor potential.
Engineering considerations:	The dry passage clearance of 2.1 m is provided under the bridges during normal flow conditions, however due to the restrictions associated with the vertical alignment, the road cannot be raised in this location. Thus 2.1m dry passage is not achieved in the 1 in 2 year ARI flood level. Due to the low lying terrain of the whole area, this location is flooded in the 1 in 2 ARI under current conditions, thus represents the current environmental conditions.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	No fauna fence is provided at this crossing as it has a very low connectivity value, and has been classified as an incidental culvert. This approach has been discussed and agreed with the EPA.
Comment	-

3.28 Station 82km405

Station:	**82km405**
Crossing type:	Incidental
Original Table 4.1 Structure form	Box culvert
Original Table 4.1 dimensions	Minimum 9 no. x 3000mm wide x 2100mm high
Connectivity value	Low
Lend Lease's proposed crossing type	Bridges Minimum length 16.6m between front faces of bridge abutments with 2.1m high fauna passage at each abutment between the scour protection and top of bank where the crossing is located above the tidal zone. Dry passage will be provided only where existing conditions facilitate.
Reason for design change	The structure was changed to a bridge primarily due to constructability efficiencies, however, a bridge structure significantly increases the ecological outcome of the crossing and fauna corridor potential.
Engineering considerations:	The dry passage clearance of 2.1 m is provided under the bridges during normal flow conditions, however due to the restrictions associated with the vertical alignment, the road cannot be raised in this location. Thus 2.1m dry passage is not achieved in the 1 in 2 year ARI flood level. Due to the low lying terrain of the whole area, this location is flooded in the 1 in 2 ARI under current conditions, thus represents the current environmental conditions. The existing culvert under the current Pacific Highway will be

	removed between new highway and service road to enhance fauna crossing. Keep width of 16.6m at this location to stay consistent with new upstream bridge.
Ecological outcome as a result of the change:	Positive
Fauna exclusion fencing provisions	No fauna fence is provided at this crossing as it has a very low connectivity value.
Comment	-

4. Conclusion

In accordance with Ministers Condition of Approval B3, the Roads and Maritime Services and the Roads and Maritime Contractor, Lend Lease have undertaken investigations into the fauna crossings design (with respect to the crossing design and locations identified in conditions B1 and B2) in consultation with the EPA, the DPI (Fisheries) and the project ecologist.

Through these investigations and design development, the Roads and Maritime Services and the Roads and Maritime Contractor, Lend Lease have identified opportunities for design refinements to the fauna crossings identified in the documents listed under Ministers Condition of Approval A1(d). As demonstrated by the information provided above, the proposed design refinements to the fauna crossings will provide overall positive environmental outcomes as agreed by the project ecologist, EPA and DPI (Fisheries). The design refinements also provide overall positive outcomes for Roads and Maritime Services and Lend Lease.

In accordance with Ministers Condition of Approval B1, the Roads and Maritime Services and Lend Lease will now seek approval from the Department of Planning and Infrastructure to implement the proposed fauna crossing design refinements.

5. Attachments

Attachment 1 – Locations of Fauna Crossings

Attachment 2 – Consultation Records with the EPA and DPI

Attachment 1 – Locations of Fauna Crossings

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Alliance)
- NH2U Design (85%)
- Drainage culverts
- Drainage basins
- Geolink Monitoring Bores
- NSW registered groundwater boreholes
- SEPP 14 wetlands
- Aboriginal artefacts
- Aboriginal Heritage areas and required exclusion zones
- Non-Aboriginal Heritage areas
- Noise construction receivers
- Contaminated sites

Frog habitat

- Giant Barred Frog habitat
- Green-Thighed Frog Habitat

- Microbat Box Locations
- Microbat habitat

Fauna underpass

- Fauna underpass

Threatened Fauna

- Black-necked Stork
- Glossy Black Cockatoo
- Glossy Black Cockatoo (feeding signs)
- Grey-headed Flying-fox
- Grey-headed Flying-fox (roost camp)
- Koala (scats and scratchings)
- Little Bent-wing Bat
- Osprey (nest site)
- Pied Oystercatcher
- Powerful Owl
- Sooty Oystercatcher
- Wompoo Fruit-Dove
- Yellow-bellied Glider
- Spider Orchid Habitat
- Hollow Bearing Trees
- Threatened flora species
- Threatened Flora species 50m buffer

Vegetation type

- Freshwater Wetlands (EEC)
- Mangroves
- Lowland Rainforest (EEC)
- Saltmarsh (EEC)
- Swamp Forest - Swamp Oak (EEC)
- Open Forest - Scribbly Gum
- Moist Open Forest - Flooded Gum (Koala habitat)
- Open Forest - Blackbutt (Koala habitat)
- Moist Open Forest - White Mahogany / Grey Gum / Ironbark (Core Koala habitat)
- Swamp Forest - Swamp Mahogany / Paperbark (EEC, Core Koala habitat)
- Mixed Floodplain Forest (EEC, Koala habitat)
- Native Vegetation

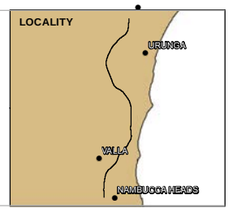
NSW GOVERNMENT Transport Roads & Traffic Authority

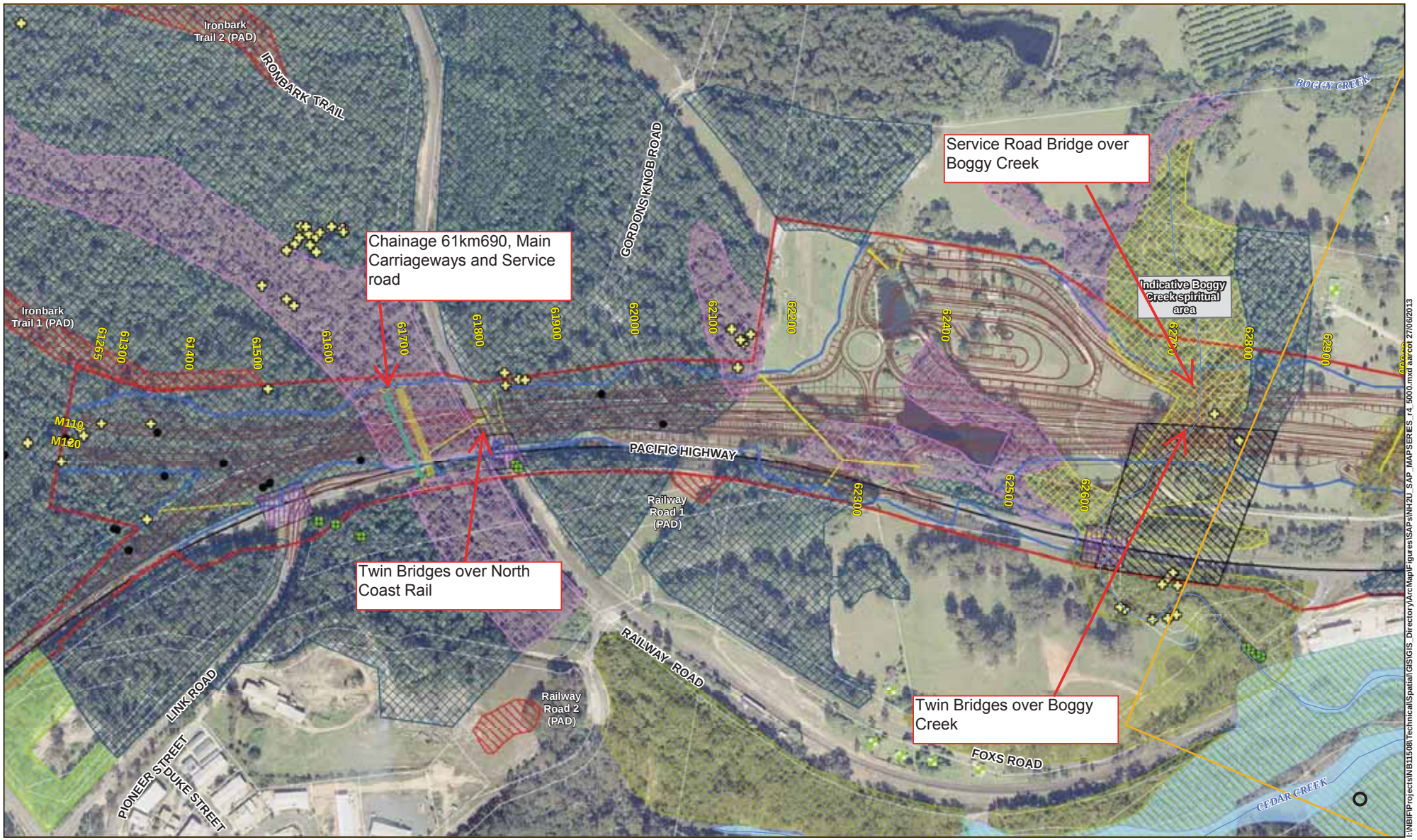
Abigroup Constructing Australia's Future

SINCLAIR KNIGHT MERZ SKM

PLAN TITLE Sensitive area plans
Legend sheet

PROJECT TITLE **NAMBUCCA AND BELLINGEN SHIRE COUNCILS**
H10 PACIFIC HIGHWAY UPGRADE
NAMBUCCA HEADS TO URUNGA





Transport Roads & Traffic Authority

PLAN TITLE Sensitive area plans
Sheet 1 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

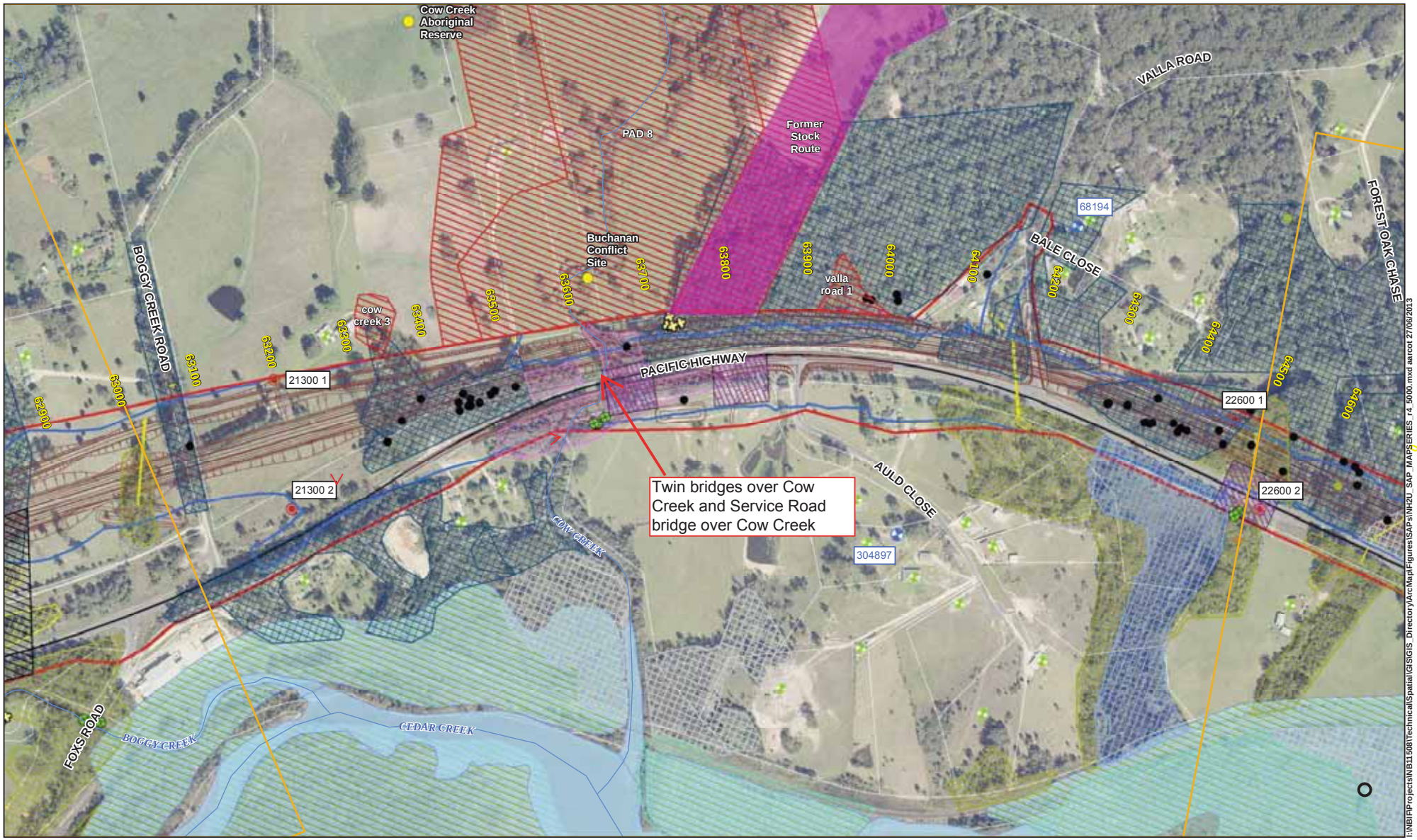
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RAILWAY
URUNGA
YARRAWARRAH
NAMBUCCA HEADS



Transport Roads & Traffic Authority

PLAN TITLE Sensitive area plans
Sheet 2 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RALEIGH
URUNGA
VALLA
NAMBUCCA HEADS

I:\NBIF\Projects\NB115081\Technical\Spatial\GIS\GIS_Directory\ArcMap\Figures\SAPs\NH2U_SAP_MAPSERIES_r4_5000.mxd aarcot 27/06/2013

Transport Roads & Traffic Authority NSW

Abigroup SKM

PLAN TITLE Sensitive area plans
Sheet 3 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

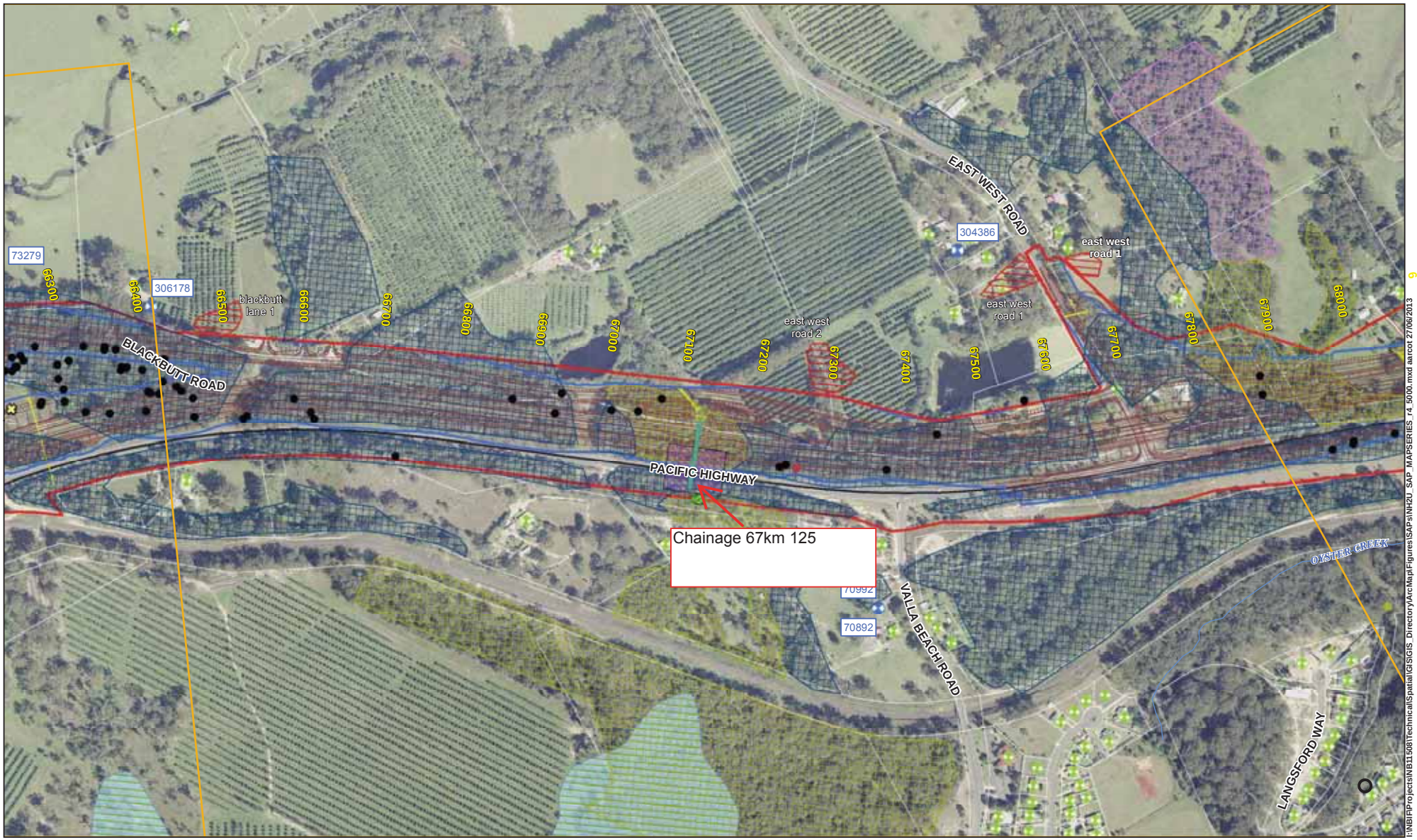
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RAILTON
URUNGA
YELLA
NAMBUCCA HEADS



Transport Roads & Traffic Authority NSW

PLAN TITLE Sensitive area plans
Sheet 4 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

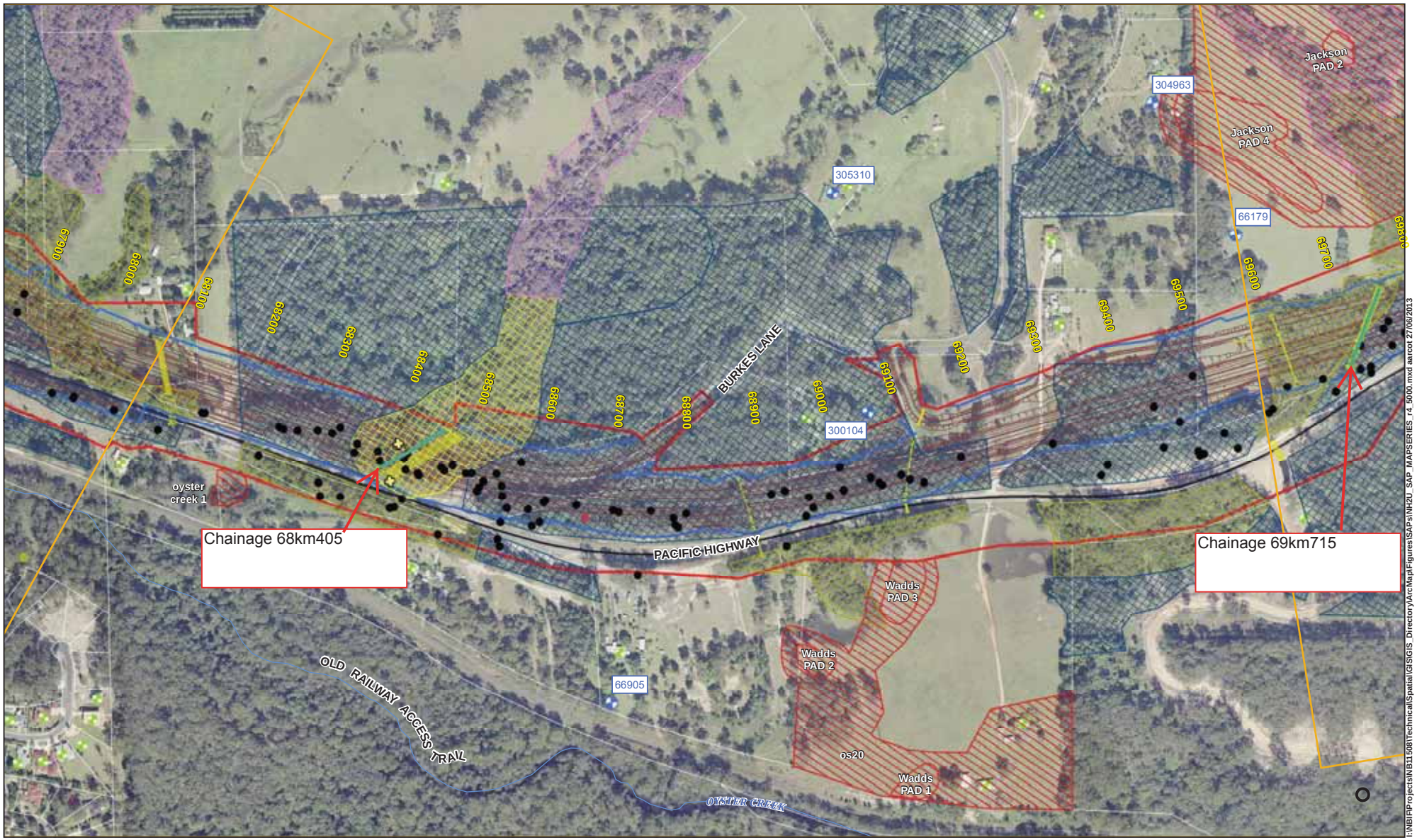
0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RALEIGH
URUNGA
YGL
NAMBUCCA HEADS

I:\NBIAProjects\NB115081Technical\Spatial\GIS\GIS_Directory\ArcMap\Figures\SAPs\NH2U_SAP_MAPSERIES_r4_5000.mxd aarcot 27/06/2013

9



Transport Roads & Traffic Authority

PLAN TITLE Sensitive area plans
Sheet 5 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

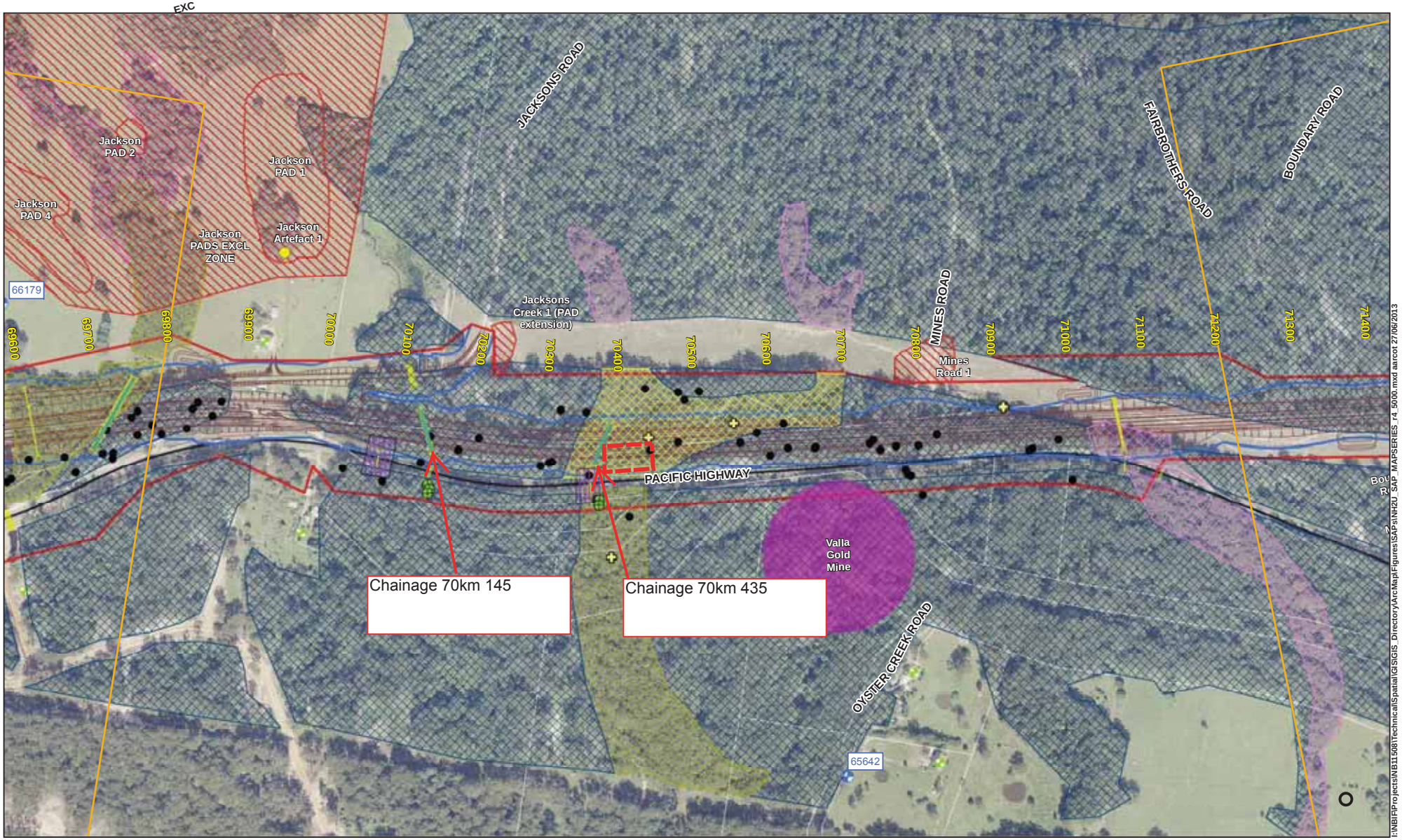
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RALEIGH
URUNGA
YULA
NAMBUCCA HEADS



Transport Roads & Traffic Authority

PLAN TITLE Sensitive area plans
Sheet 6 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

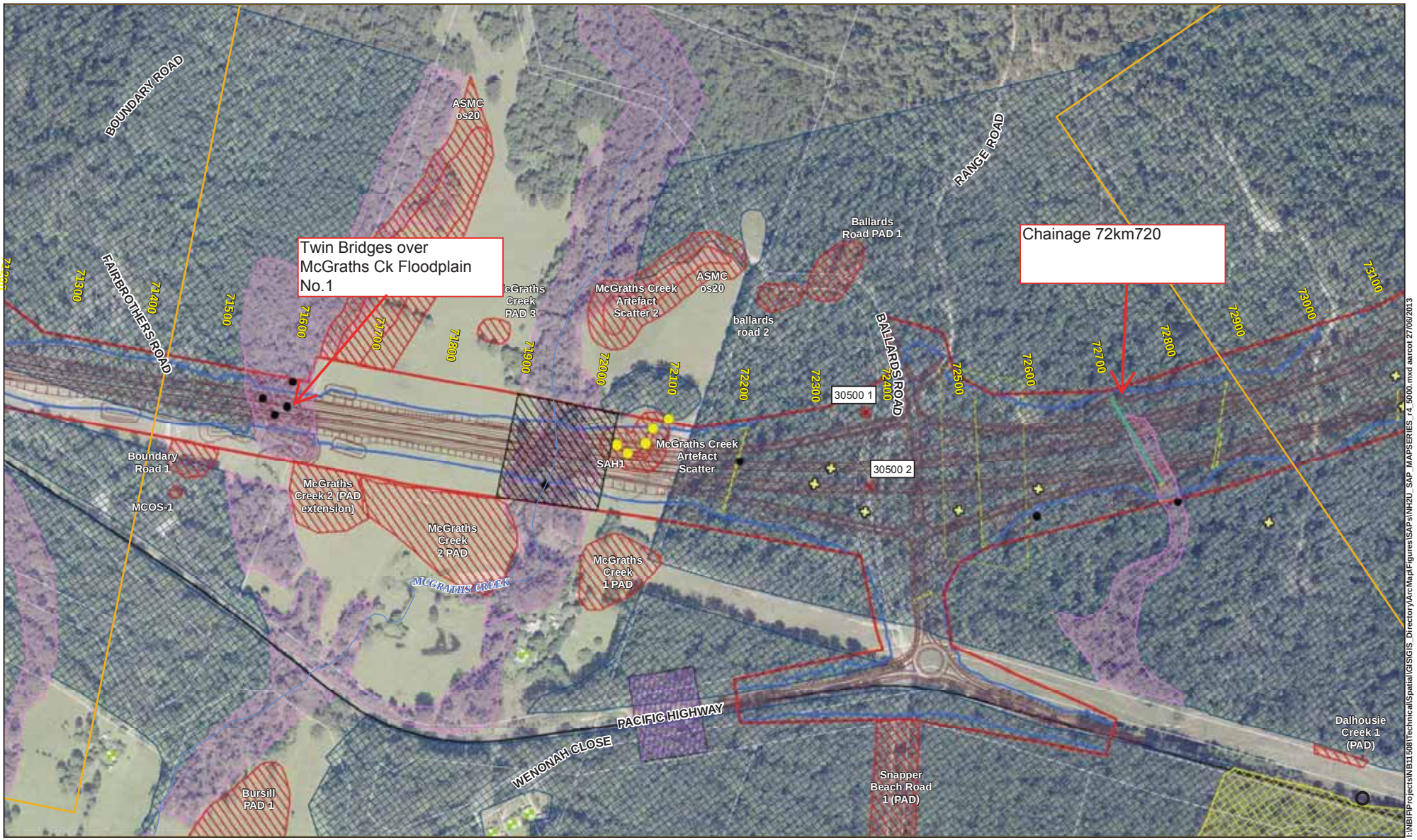
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RALEIGH
URUNGA
VALLA
NAMBUCCA HEADS



Transport Roads & Traffic Authority

PLAN TITLE Sensitive area plans
Sheet 7 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

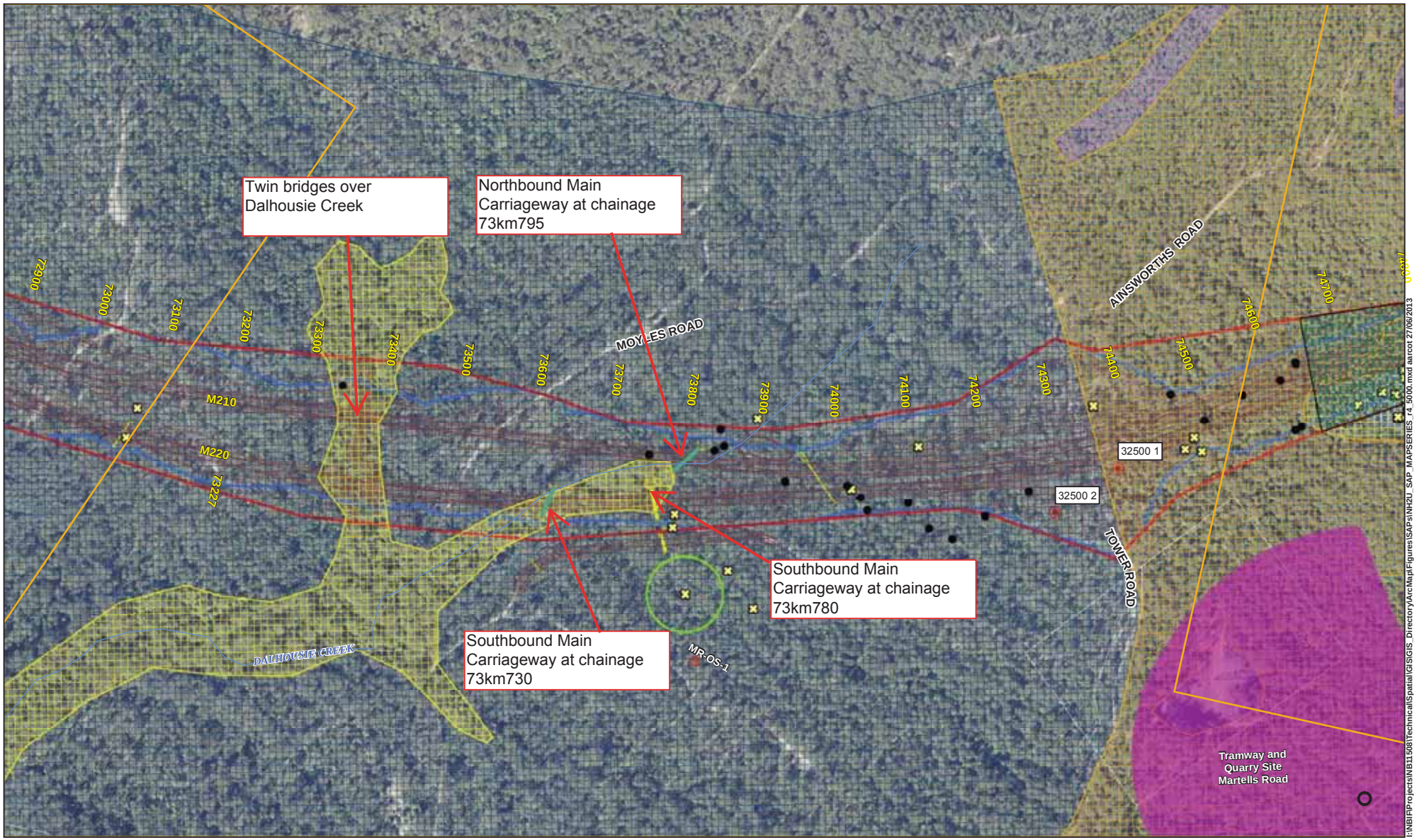
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RALEIGH
URUNGA
YARRAWARRAH
NAMBUCCA HEADS



Transport Roads & Traffic Authority

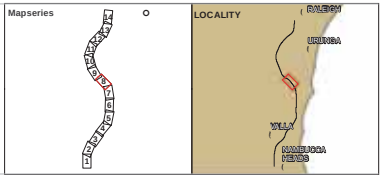
PLAN TITLE Sensitive area plans
Sheet 8 of 14

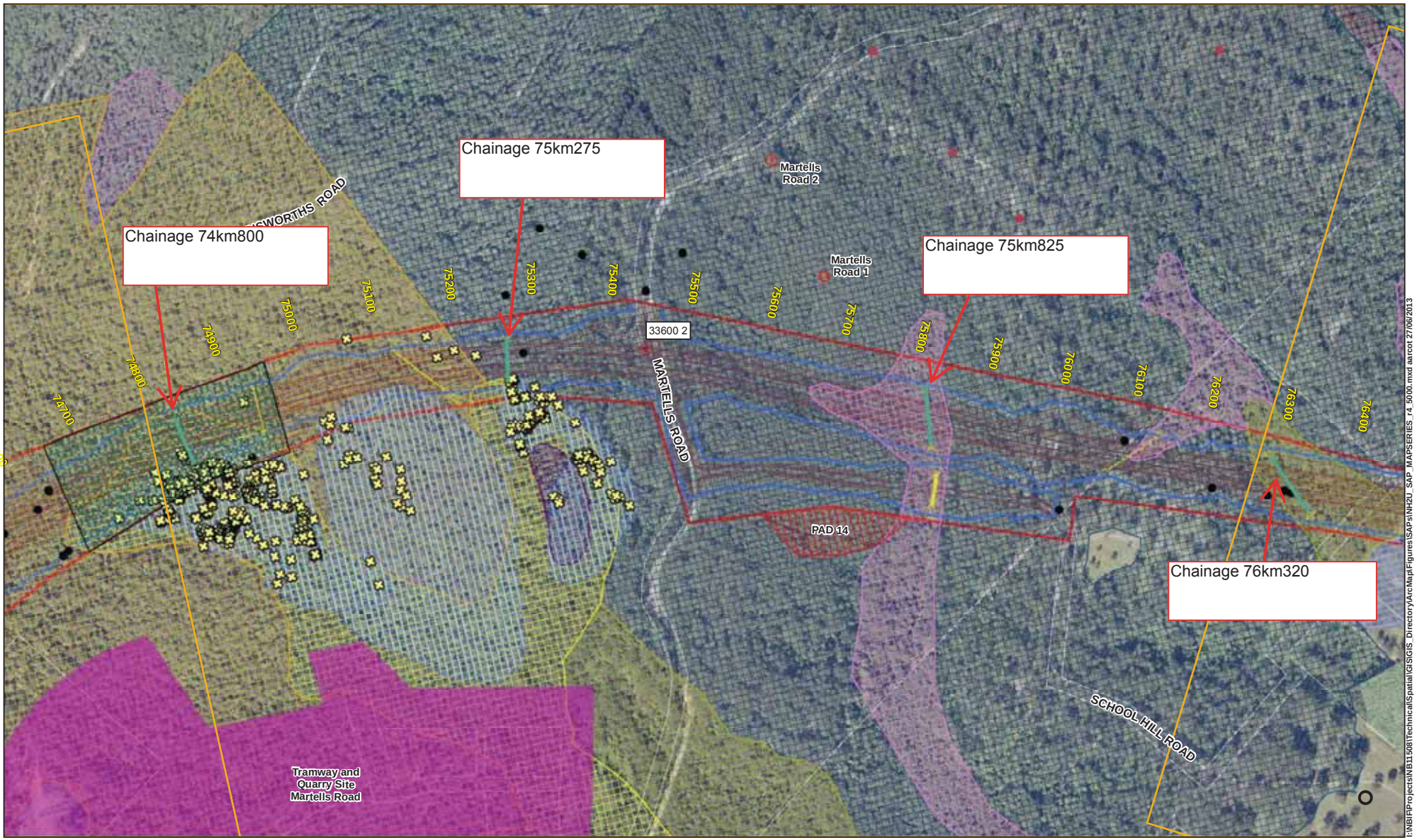
PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3





Transport Roads & Traffic Authority

PLAN TITLE Sensitive area plans
Sheet 9 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

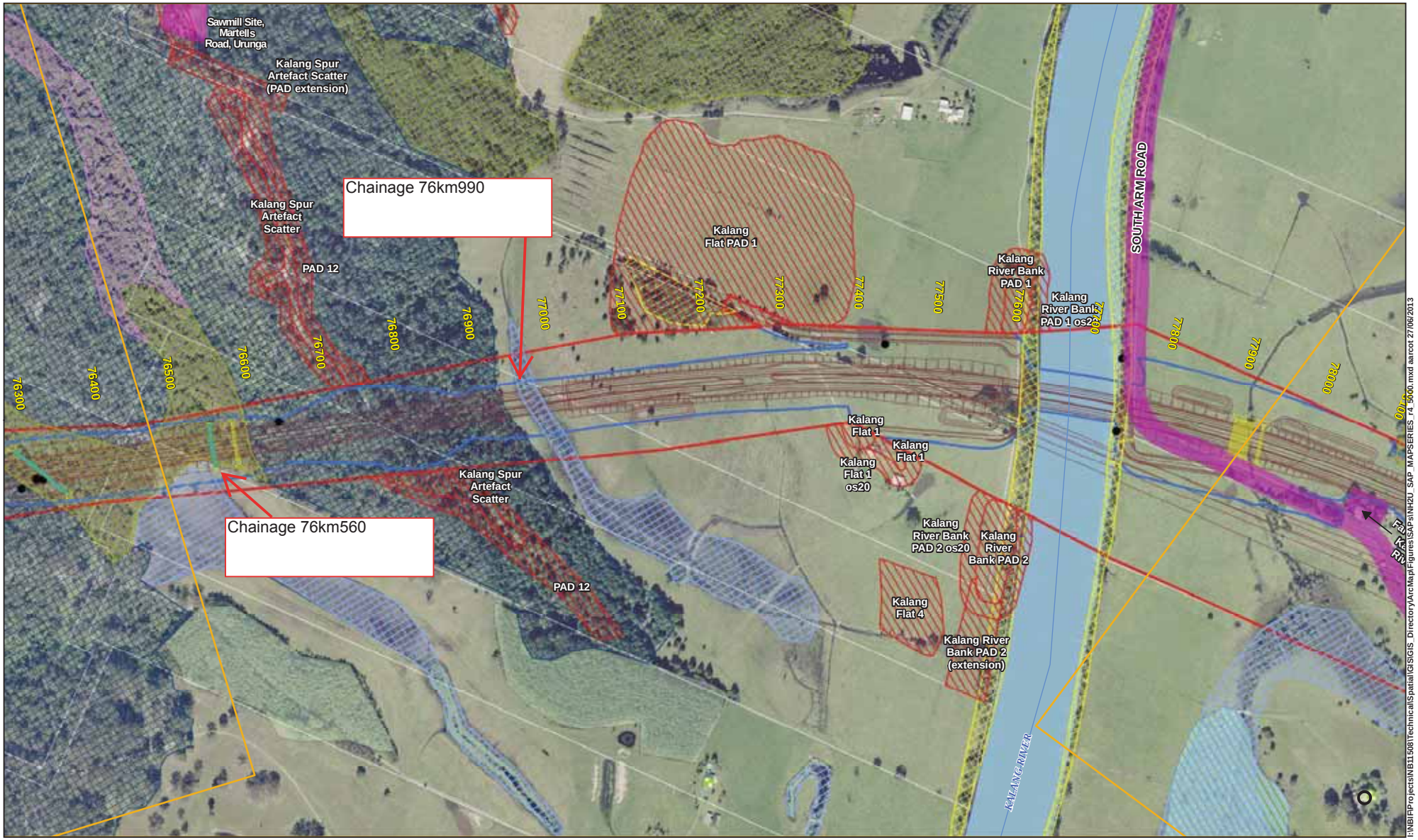
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RAILWAY
URUNGA
YALA
NAMBUCCA HEADS



Transport Roads & Traffic Authority

PLAN TITLE Sensitive area plans
Sheet 10 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

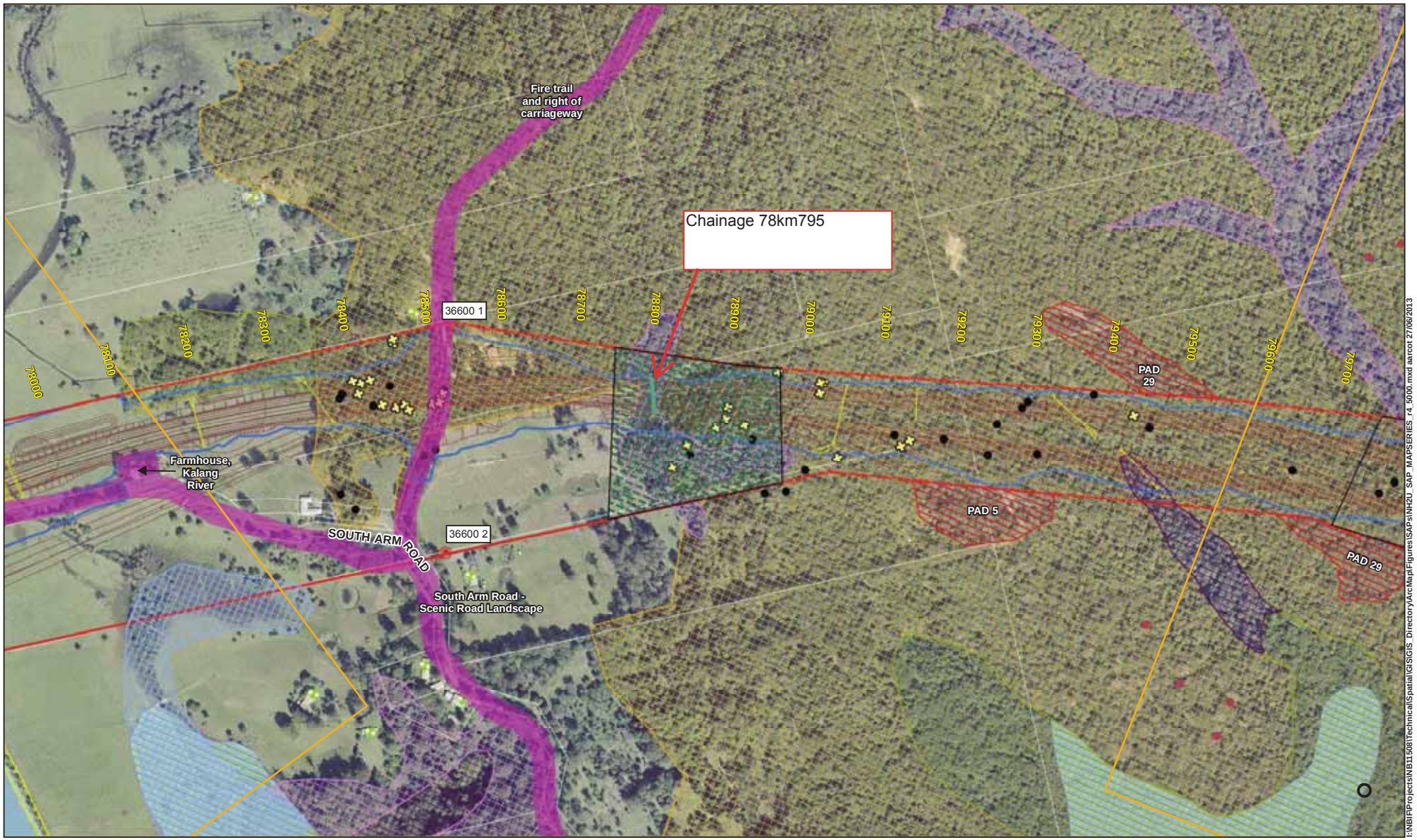
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RALEIGH
URUNGA
YARRAWARRAH
NAMBUCCA HEADS



Transport Roads & Traffic Authority

PLAN TITLE Sensitive area plans
Sheet 11 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

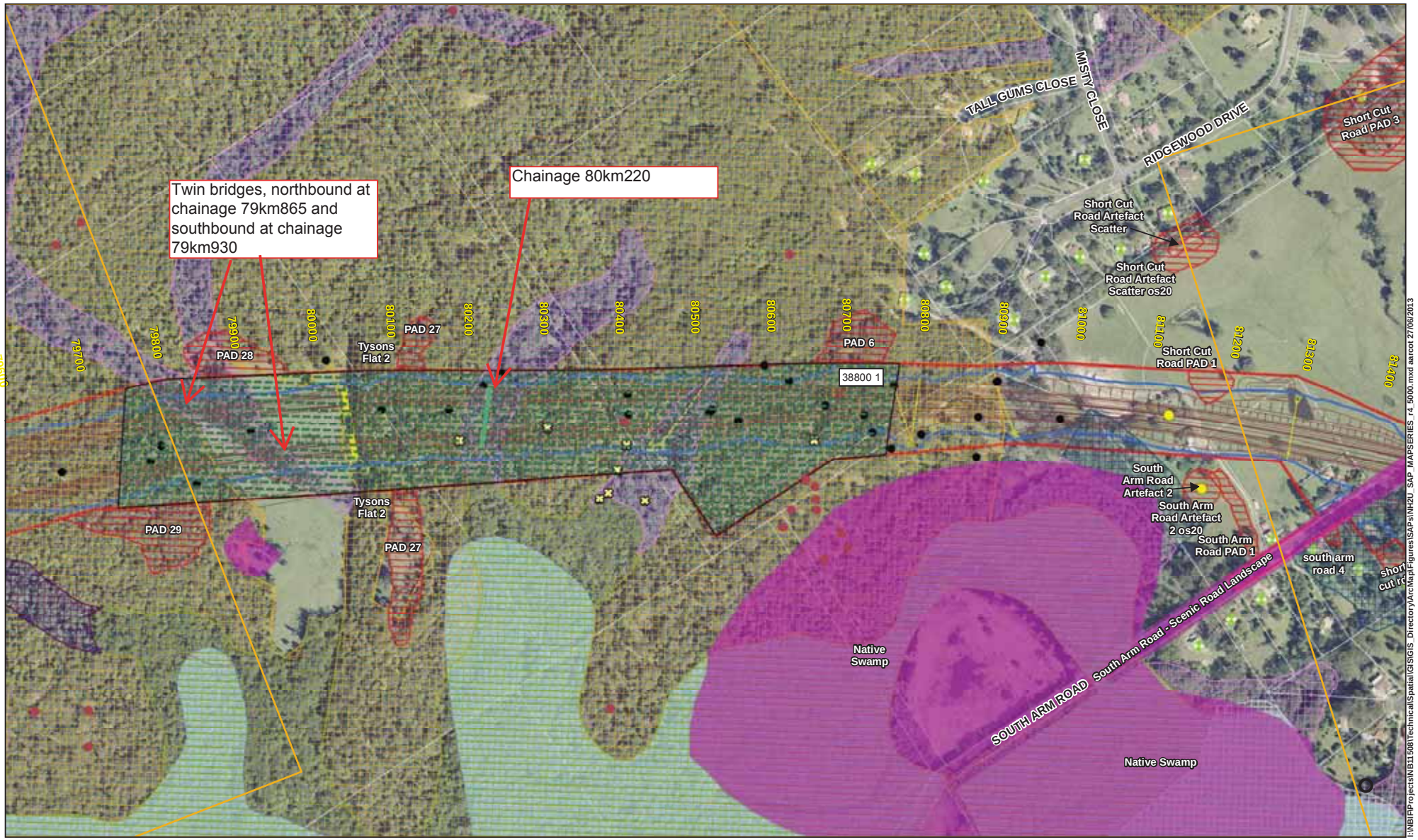
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RAILWAY
URUNGA
YULA
NAMBUCCA HEADS



I:\NBIP\Projects\NB115081\Technical\Spatial\GIS\GIS_Directory\ArcMap\Figures\SAPs\NH2U_SAP_MAPSERIES_r4_5000.mxd aarcot 27/06/2013

Transport Roads & Traffic Authority NSW

PLAN TITLE Sensitive area plans
Sheet 12 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

Abigroup SKM

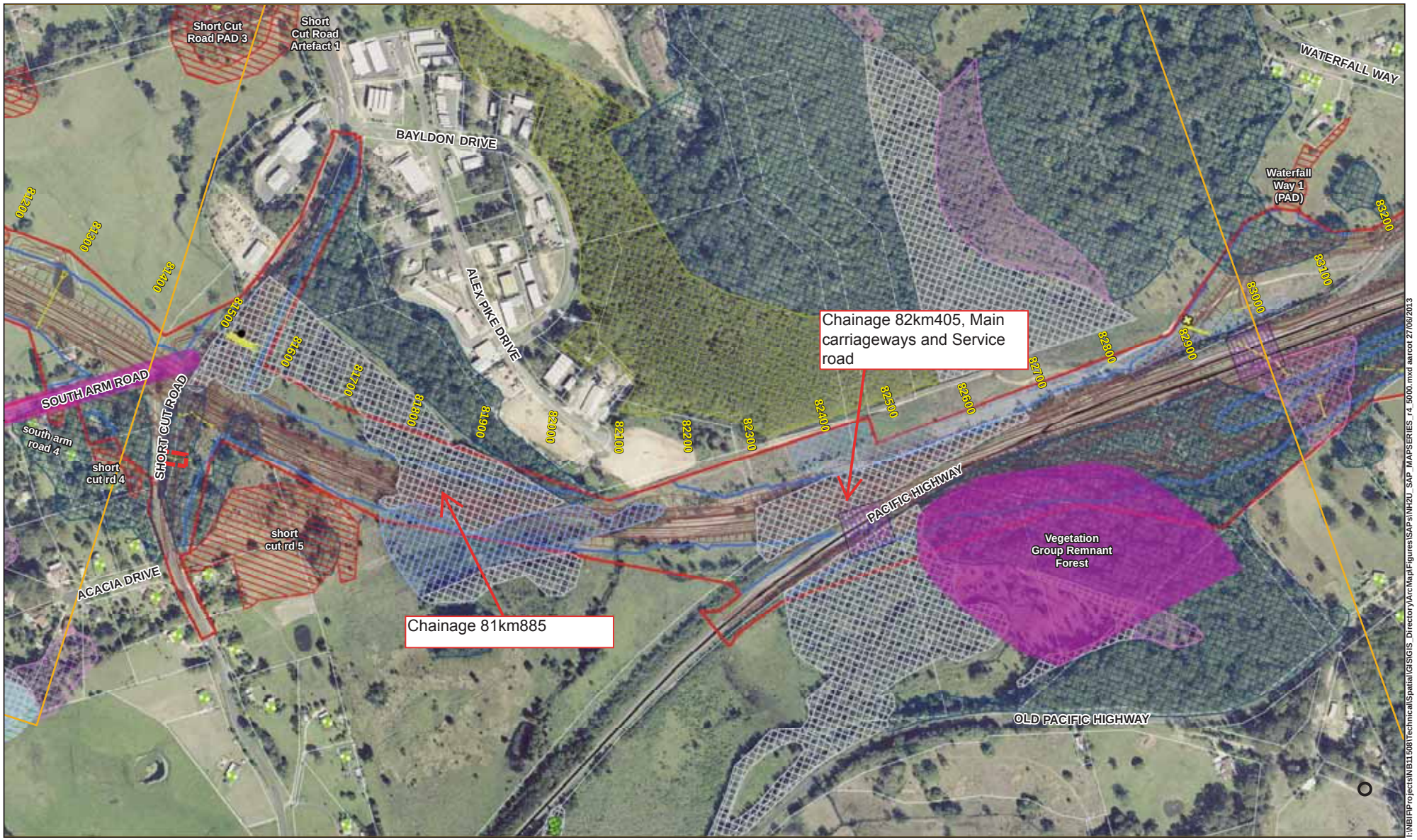
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RALEIGH
URUNGA
YARRAWARRAH
NAMBUCCA HEADS



I:\NBH\Projects\NB115081\Technical\Spatial\GIS\GIS_Directory\ArcMap\Figures\SAPs\NH2U_SAP_MAPSERIES_r4_5000.mxd aarcot 27/06/2013

Transport Roads & Traffic Authority NSW

PLAN TITLE Sensitive area plans
Sheet 13 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

Abigroup SKM

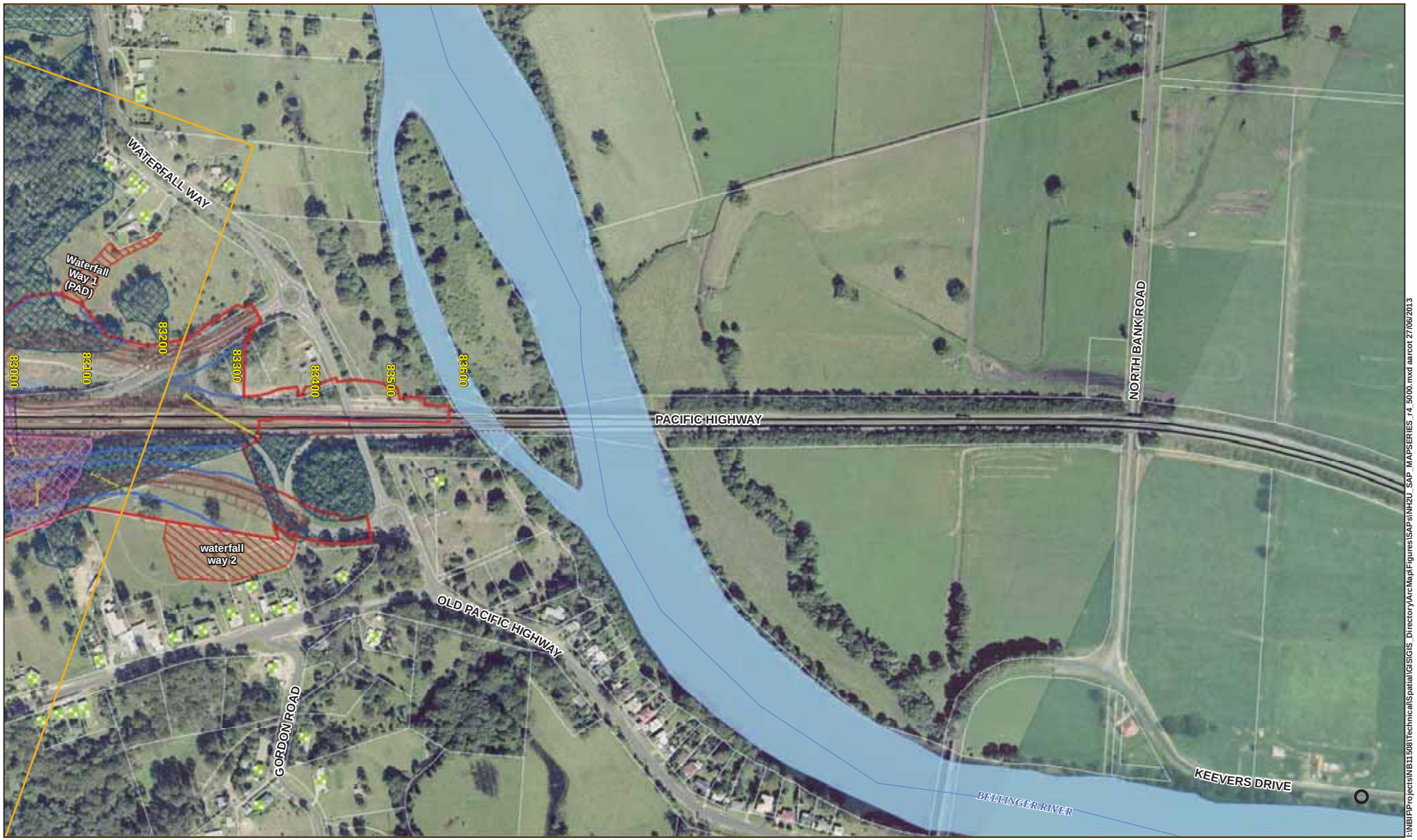
LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RAILTON
URUNGA
YALA
NAMBUCCA HEADS



I:\NBIP\Projects\NB115081\Technical\Spatial\GIS\GIS_Directory\ArcMap\Figures\SAPs\NH2U_SAP_MAPSERIES_r4_5000.mxd aarcot 27/06/2013

Transport Roads & Traffic Authority

PLAN TITLE Sensitive area plans
Sheet 14 of 14

PROJECT TITLE **Nambucca Heads to Urunga**
H10 Pacific Highway Upgrade

LEGEND: For more details, refer the legend sheet

- Aboriginal heritage assesment boundary (RMS)
- Clearing limit boundary (NH2U Project)
- NH2U Design (85%)
- Threatened flora species
- Aboriginal Heritage areas and required exlcusion zones
- Threatened Flora species 50m buffer

0 50 100 200
Metres
GCS GDA 1994 | MGA Zone 56
1:5,000 @ A3

Mapseries

LOCALITY
RAILWAY
URUNGA
YULA
NAMBUCCA HEADS

Attachment 2 – Consultation Records with the EPA and DPI

EPA ENDORSEMENT OF DESIGN REFINEMENTS

Jenny Butler

From:	WILSON Leanne <Leanne.WILSON@rms.nsw.gov.au>
Sent:	Tuesday, 10 September 2013 4:33 PM
To:	GREEN Shane P
Cc:	HIGGINS Bob G; BOWLES Yvonne E
Subject:	FW: N2U - Revised Table 4.1 Options A&B

Hi Shane - as requested email from Gary Davey, as requested.

kind regards

Leanne Wilson
Assistant to General Manager
Pacific Highway Office
T 02 6640 1378 **F** 02 6640 1001
M 0457 525210
www.rms.nsw.gov.au

Roads and Maritime Services
21 Prince Street Grafton NSW 2460

From: Gary Davey [mailto:Gary.Davey@epa.nsw.gov.au]
Sent: Tuesday, 30 July 2013 10:51 AM
To: HIGGINS Bob G
Cc: Brett Nudd
Subject: N2U - Revised Table 4.1 Options A&B

Bob, thanks for your call this morning.

In relation to the NH2U project and the tables you referred to me last week, I can confirm that the EPA supports the proposed amendments. The amendments appear to be the same as those which I previously endorsed before going on leave.

Cheers GD.

Gary Davey
Director - North| **NSW Environment Protection Authority** |
☎: (02) 6659 8230 | Mobile ☎: 0402 149 300| 🖷: (02) 6659 8257|🖱: Gary.Davey@epa.nsw.gov.au

---

From: HIGGINS Bob G <Bob.HIGGINS@rms.nsw.gov.au>
Date: 24 July 2013 5:49:52 AM AEST
To: Gary Davey <Gary.Davey@epa.nsw.gov.au>
Cc: LAWRENCE Scott B <Scott.LAWRENCE@rms.nsw.gov.au>, GREEN Shane <Shane.Green@n2u.com.au>
Subject: FW: N2U - Revised Table 4.1 Options A&B

Hi Garry

I am enclosing some tables of proposed amendment to Table 4.1 of the CoA's for the Nambucca Heads to Urunga upgrade project for discussions

The second table tries to capture perspectives from our contractor, EPA, DoPI and RMS for each of the amendments..... it looks like an overall win/win/win/win for everyone and in particular animals using the crossings

Jenny Butler

From: Craig Harre <Craig.HARRE@epa.nsw.gov.au>
Sent: Tuesday, 9 July 2013 4:45 PM
To: Courtney Hoops; Jenny Butler
Cc: Robert Donohoe
Subject: FW: Nambucca Heads to Urunga Fauna Crossings

Courtney/Jenny

Please find Gary's response below

Regards

Craig Harré

Senior Threatened Species Officer | **NSW Environment Protection Authority** |

☎: (02) 6659 8223 | | : craig.harre@environment.nsw.gov.au

From: Davey Gary
Sent: Tuesday, 9 July 2013 4:40 PM
To: Harre Craig
Cc: Davey Gary; Donohoe Robert
Subject: Re: Nambucca Heads to Urunga Fauna Crossings

Craig, thanks for the follow up. I had meant to discuss this with Bob last Thursday but ran out of time.

Please forward this email to the RMS Team confirming that Table A is the EPA's preferred option.

Thanks GD.

Sent from my iPhone

On 09/07/2013, at 4:16 PM, "Harre Craig" <Craig.HARRE@epa.nsw.gov.au> wrote:

> Gary
>
> The Nambucca Heads to Urunga project team are chasing a response on the EPA preference for Table A or B. They are insisting that this comes form you. Can I confirm that Table A is our preferred option?
>
> Thanks
>
> **Craig Harré**
>
> Senior Threatened Species Officer | **NSW Environment Protection Authority** |
>
> ☎: (02) 6659 8223 | | : craig.harre@environment.nsw.gov.au
>
> ---
>
> **From:** Harre Craig
> **Sent:** Friday, 28 June 2013 5:11 PM

I understand you may have been involved earlier and it would be good to get your views on the proposed amendments before we formally go to DoPI

Bob
Bob Higgins
General Manager, Pacific Highway
(Insert Section) | Pacific Highway
T 02 6640 1305 **F** 02 6640 1001
www.rms.nsw.gov.au

Roads and Maritime Services
21 Prince Street Grafton NSW 2460

From: Shane Green [mailto:Shane.Green@n2u.com.au]
Sent: Tuesday, 23 July 2013 9:27 AM
To: HIGGINS Bob G
Cc: Admin
Subject: N2U - Revised Table 4.1 Options A&B

Bob,

As discussed last week find attached proposed changes to table 4.1, which is the list fauna connectivity structures with EPA. The team (RMS, Abigroup, EPA and Fisheries) have been working to get a better environmental outcome at a reduced cost. I believe that cooperatively we have achieved this and all parties are now happy with the updated table.

Please find attached a copy of the final versions of table 4.1 for discussion with Gary. Option A includes the extra length on the Rail bridge to allow for fauna connectivity at the southern abutment which is the teams preference. If we cannot get ARTC agreement to this fauna corridor at the rail overbridge then we will implement option B.

Regards,

Shane

Shane Green I Senior Project Manager I Nambucca Heads to Urunga
T 02 8874 6914 F 02 8874 6919 M 0488 101 302 I PO Box 231 Urunga NSW 2448
Pacific Highway Upgrade I Major Projects Northern I www.rms.nsw.gov.au

CONSULTATION WITH EPA REGARDING ARTC LICENCE FOR NORTH COAST RAIL BRIDGE

From: Shane Green <Shane.Green@n2u.com.au>
Date: 30 August 2013 5:03:31 PM AEST
To: Craig Harre <Craig.HARRE@epa.nsw.gov.au>
Cc: "Courtney Hoops (courtney.hoops@abigroup.com.au)" <courtney.hoops@abigroup.com.au>, Admin <Admin@n2u.com.au>, Craig Dunk <Craig.Dunk@epa.nsw.gov.au>, Robert Donohoe <Robert.Donohoe@epa.nsw.gov.au>, Mike Cragg <Mike.Cragg@n2u.com.au>
Subject: RE: Amended ARTC Licence including the Provision for Fauna Underpass at North Coast Rail Bridge on Nambucca to Urunga Project.

Craig,

This agreement would not be binding until it is signed by ARTC which is post completion of the works. Based on your response I propose we move forward with option A, which is the preferred way forward for RMS, Abigroup and EPA.

We will forward this option through to planning in order to comply with MCOA B1. Once approved, we will finalise the design of the extended bridge over the railway providing the connectivity corridor.

Upon completion of construction RMS will arrange for the signature of the ARTC licence to provide the level of certainty over the fauna corridor.

Regards,

Shane

Shane Green I Senior Project Manager I Nambucca Heads to Urunga
T 02 8874 6914 F 02 8874 6919 M 0488 101 302 I PO Box 231 Urunga NSW 2448
Pacific Highway Upgrade I Major Projects Northern I www.rms.nsw.gov.au

---

From: Craig Harre [mailto:Craig.HARRE@epa.nsw.gov.au]
Sent: Friday, 30 August 2013 3:05 PM
To: Mike Cragg
Cc: Shane Green; Courtney Hoops (courtney.hoops@abigroup.com.au); Admin; Craig Dunk; Robert Donohoe
Subject: RE: Amended ARTC Licence including the Provision for Fauna Underpass at North Coast Rail Bridge on Nambucca to Urunga Project.

Mike

I'm unsure on whether you need any more EPA concurrence on this issue. I'm reluctant to send the ARTC licence to EPA legal for their view as it could open a whole new range of issues and significantly add delays. I think if the RMS has satisfied themselves that the agreement is legal and meets the intent of the project approvals this will suffice for the purposes of providing fauna connectivity following Table 4.1.

Regards

Craig Harré

Senior Threatened Species Officer | **NSW Environment Protection Authority** |

☎: (02) 6659 8223 | | : craig.harre@environment.nsw.gov.au

From: Mike Cragg [mailto:Mike.Cragg@n2u.com.au]
Sent: Wednesday, 14 August 2013 2:14 PM
To: Harre Craig
Cc: Shane Green; Courtney Hoops (courtney.hoops@abigroup.com.au); Admin
Subject: Amended ARTC Licence including the Provision for Fauna Underpass at North Coast Rail Bridge on Nambucca to Urunga Project.

Craig,

Please find attached a letter, that has previously been posted to you including the amended ARTC licence that captures our requirements for the fauna underpass at the North Coast Rail Bridge on the Nambucca to Urunga Project. The draft wording is the best position that RMS have been able to negotiate with ARTC as they still want to retain their rights to use this area for maintenance and emergency response (if required).

I have also attached the tracked changes from the original agreement with ARTC for your information.

Please advise if you are satisfied for us to use Option A of the amended Table 4.1 based on the proposed wording of the ARTC Licence agreement.

Regards,

Mike Cragg I Resident Engineer I Nambucca Heads to Urunga
T 02 8874 6912 F 02 8874 6919 M 0448 625 760 I PO Box 231 Urunga NSW 2455
Pacific Highway Upgrade I Major Projects Northern I www.rms.nsw.gov.au

CA.04/08 N2U-O-0139
Major Projects, Northern
Mr Mike Cragg (02) 8874 6912
mike.cragg@n2u.com.au

Transport Roads & Maritime Services

8 August 2013

Mr Craig Harre
The NSW Environmental Protection Authority
Federation House
24 Moonee Street
COFFS HARBOUR NSW 2450

RE: PACIFIC HIGHWAY No 10 NAMBUCCA HEADS TO URUNGA
INCORPORATION OF FAUNA CROSSING INTO BRIDGE OVER NORTH COAST RAILWAY AT NAMBUCCA HEADS

As discussed in our meeting on 28 June 2013, Roads and Maritime Services (RMS) and the Australian Rail Track Corporation (ARTC) have developed a modified licence to accommodate the introduction of a fauna crossing underneath the new and existing bridges over the North Coast Railway.

The key features in the licence regarding the fauna crossing are:

- The inclusion of Plan B showing the proposed new bridges and fauna crossing.
- Additional clauses to cover access and obstruction of the fauna crossing.
- The inclusion of the fauna crossing within the Infrastructure definition to ensure the licence for the fauna crossing is joined to the licence for the Pacific Highway twin bridges.

The proposed draft licence is attached for your information.

RMS would appreciate your comments on the draft licence within 14 days.

Please don't hesitate to contact the undersigned if you have any concerns or queries regarding the above.

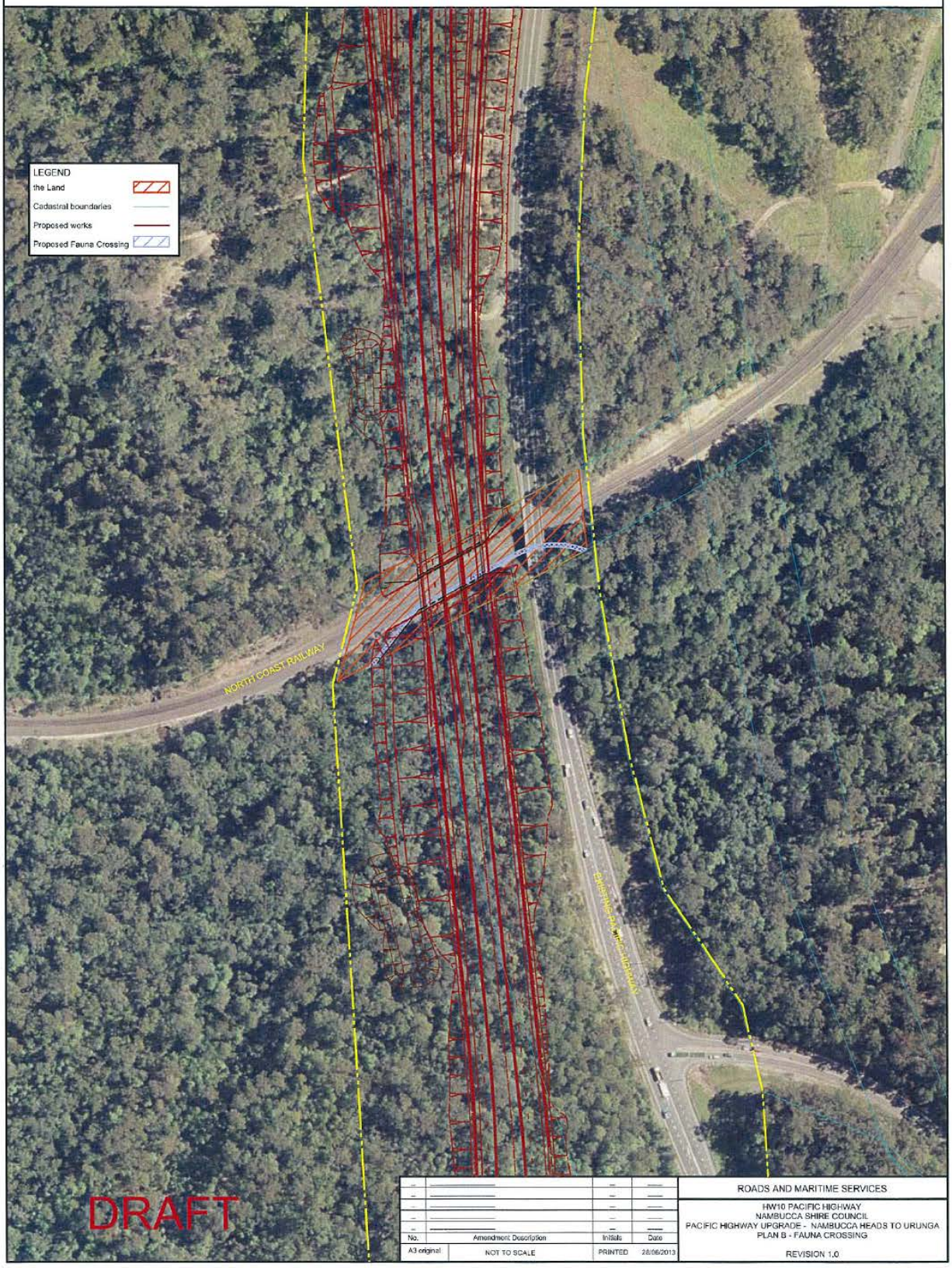
Yours faithfully

Mike Cragg
Resident Engineer

Roads & Maritime Services

21 Auld Close Valla NSW 2448 | PO Box 231 Urunga NSW 2455
T 02 6604 9344 | **F** 02 8874 6919

PLAN B - FAUNA CROSSING



LICENCE – EXISTING INFRASTRUCTURE WITHIN THE RAILWAY CORRIDOR

Between

AUSTRALIAN RAIL TRACK CORPORATION LIMITED
("ARTC")

and

ROADS AND MARITIME SERVICES
("LICENSEE")

LICENCE – EXISTING INFRASTRUCTURE WITHIN THE RAILWAY CORRIDOR

BETWEEN: **AUSTRALIAN RAIL TRACK CORPORATION LIMITED** (ABN 75 081 455 754) of Level 15, 60 Carrington Street Sydney NSW 2000 (**"ARTC"**).

AND: **ROADS AND MARITIME SERVICES** (ABN 76 236 371 088) of Level 9, 101 Miller Street, North Sydney NSW 2060 (**"The Licensee"**)

RECITALS

A. ARTC controls and has the power to enter into agreements over the Land, either as owner or lessee of the Land or as agent for the owner of the Land.

B. The Licensee has installed a facility, structure or other installation (including the area dedicated as a Fauna Crossing) on the Land as described in Item 2 of the Schedule (**'Infrastructure'**) and desires to gain permission in order to keep, maintain and use the Infrastructure on the Land in accordance with the terms and conditions of this agreement (**"Agreement"**).

The Licensee agrees to be bound by the terms and conditions set out in this Agreement.

IN CONSIDERATION of the payment of the licence fees set out in this Agreement it is **HEREBY AGREED** as follows:

1. DEFINITIONS

'Annual Licence Fee' means the fee set out in clause 3.2 and Item 4 of the Schedule

'Claims' means any liability, loss, damage, cost, charge or expense.

'Fauna Crossing' means the area of the Land dedicated as a Fauna Crossing to be used as a wildlife access path as shown on the plan attached and marked "B" forming part of the Infrastructure described in Item 2 of the Schedule.

'Commencement Date' means the date upon which the Licence commences as set out in Item 3 of the Schedule.

'Infrastructure' means the facility, structure or other installation (including the area dedicated as the Fauna Crossing) on the Land as described in Item 2 of the Schedule, and where applicable, installed by the Licensee pursuant to the Works Deed.

'Land' means that parcel of land described in Item 1 of the Schedule.

'Licence' means the licence set out in this Agreement and includes the Schedule attached.

'Lease' means the deed of lease dated 4 June 2004 between Rail Infrastructure Corporation, State Rail Authority of New South Wales and ARTC pursuant to which ARTC is granted a lease of the Land.

'Rail Facilities' means all railway track, railway stations, tunnels, civil works, associated track structures, over track structures, signalling systems, train control systems, communication systems, equipment, nodes, conduits, ducting, cable, cable support structures and other plant, equipment, buildings or facilities owned, leased or used by ARTC on, or in relation to, or in any way connected to, the Railway Corridor.

'Rail Safety National Law' means the Act in relation to rail safety for the time being in force in the jurisdiction in which the Land is situated.

'Railway' means the guided system for transportation of passengers or freight or both (whether or not passengers, freight or both are being transported) on a railway track within the Railway Corridor.

'Railway Corridor' means any and all land owned, leased or controlled by ARTC.

'Schedule' means the schedule attached to this Agreement.

'Term' means the term of this Agreement set out in clause 2.1(b).

'Works Deed' means the works deed entered into or to be entered into between ARTC and the Licensee in respect of the construction of any of the Infrastructure on the Land.

'Work Health and Safety Act' means the Act in relation to occupational or work health and safety for the time being in force in the jurisdiction in which the Land is situated.

2. GRANT OF LICENCE

2.1 Grant of Licence

(a) ARTC hereby grants to the Licensee a non-exclusive licence to keep, maintain and use the Infrastructure on the Land for the purposes of:

(i) facilitating the exercise by the Licensee of its functions under the *Roads Act 1993* (NSW); and

(ii) facilitating a Fauna Crossing.

(b) Subject to clause 7.1(a), the period of the licence granted by this Agreement shall be for the period commencing on the Commencement Date and will remain in force for the period that ARTC is the owner or lessee of the Land under the Lease.

(c) The Licensee shall ensure that the Licensee and all persons entering the Land with the authority of the Licensee to discharge the Licensee's obligation under clause 5 do not disrupt or interfere with any activities of ARTC or any other person lawfully using the Land.

(d) The Licensee acknowledges that the Licence comprises only a non exclusive licence and does not create rights in the nature of a lease or easement.

(e) Subject to clause 2.1(f), ARTC acknowledges and agrees that during the term of this Licence it will, to the extent practicable having regard to ARTC's business operations and statutory responsibilities, endeavour not to obstruct or allow any third party on its Land to obstruct the Fauna Crossing in a manner which would prevent the Fauna Crossing being used as a Fauna Crossing under this Licence.

(f) Notwithstanding clause 2.1(e), the parties acknowledge and agree that ARTC may temporarily obstruct, or allow a third party to temporarily obstruct, the Fauna Crossing if such obstruction is reasonably necessary for the purposes of ARTC's business operations or compliance with ARTC's statutory responsibilities.

3. LICENCE FEES AND CHARGES

3.1 Payment of Fees

(a) Any amount owing by the Licensee and unpaid within 30 days of it falling due by the terms of this Agreement will attract interest for each day the amount is overdue, calculated at the end of each month and compounded on a daily basis at a rate equal to 2% above the corporate reference rate of the Commonwealth Bank of Australia on the last business day of the relevant month from the due date to the date of payment.

(b) Unless otherwise stated, all amounts payable under or in connection with this Agreement are expressed exclusive of GST and shall be increased by the relevant rate of GST from time to time.

3.2 Annual Licence Fee

(a) The Licensee shall pay ARTC an Annual Licence Fee in accordance with this clause or such capitalised amount as is otherwise agreed by the parties.

(b) The Annual Licence Fee for the first year of the Term shall be the amount set out in Item 4 of the Schedule (exclusive of GST). For each subsequent year of the Term the Annual Licence Fee shall be increased in accordance with the method set out in Item 5 of the Schedule.

(c) The Annual Licence Fee for each year is to be paid within THIRTY (30) days after ARTC issues a tax invoice to the Licensee.

4. INDEMNITIES

(a) Subject to clause 4(e), the Licensee must effect and keep current at all times during the term of this Licence a public liability insurance policy on an occurrence basis:

(i) covering legal liability in respect of loss of or damage to any real or personal property and personal injury to, or death, of any person, arising out of any activity conducted by the Licensee or its contractors on the Land and the Infrastructure;

(ii) for an amount not less than $100,000,000 in respect of any single occurrence and unlimited in the aggregate as to the number of occurrences for any one period of insurance; and

(iii) which notes ARTC's interest in the Land.

(b) Subject to clause 4(e), a certificate of currency is to be given to ARTC before the Licensee exercises any rights under this Agreement and whenever ARTC may reasonably request such a certificate.

(c) The Licensee indemnifies ARTC against all Claims arising out of or in any way connected to a breach by the Licensee of this Agreement, including, but not limited to:

(i) loss of or damage to property of ARTC;

(ii) damage, expense, loss or liability in respect of loss of or damage to any other property belonging to any third party; and

(iii) damage, expense, loss or liability in respect of personal injury or death.

(d) The Licensee's liability under the indemnity in clause 4(c) will be reduced proportionally to the extent that such liability was attributable to the wrongful, negligent or unlawful acts or omissions or wilful misconduct of ARTC.

(e) The parties acknowledge that the Licensee is a member of the Treasury Managed Fund (TMF). The Contract of Coverage is the NSW

Government's explanatory document of its Self Insurance Scheme. The TMF will operate to provide the Licensee with cover for its liabilities in respect of activities associated with access to the Land and the Infrastructure. Notwithstanding the provisions of clauses 4(a) and 4(b), the Licensee will not be required to comply with the terms of those clauses for so long as the Licensee remains a member of the TMF.

5. INFRASTRUCTURE

(a) The Licensee must if required by ARTC provide surveyed plans in a form acceptable to ARTC delineating the location of the Infrastructure on the Land.

(b) The Licensee must maintain, repair and keep the Infrastructure in good and substantial repair order and condition (including during any 12 month period prior to removal of the Infrastructure in accordance with clause 7.2). If the Licensee requires access to the Railway Corridor to undertake maintenance or to carry out any other activity with respect to the Infrastructure, the Licensee must obtain ARTC's prior consent on each such occasion. ARTC's consent may upon reasonable grounds be withheld or granted conditionally.

(c) When accessing the Railway Corridor the Licensee must comply with:

(i) the requirements of any law in relation to safety including the Rail Safety National Law and Work Health and Safety Act; and

(ii) the provisions of clause 9 of the Works Deed in relation to 'Safety Protocol' and any further requirements notified by ARTC from time to time.

(d) ARTC has no obligation to, but may, inform the Licensee that maintenance or repairs to the Infrastructure are required. If ARTC notifies the Licensee at any time that maintenance or repairs are required to the Infrastructure in order to protect ARTC interests or property, the Licensee must carry out the maintenance and repairs required by ARTC within the time and on the conditions required by ARTC. If the Licensee is unable or unwilling to carry out the required maintenance in accordance with ARTC's requirements and timeframe (or if ARTC considers the maintenance to be urgently required), ARTC may carry out or arrange for a third party to carry out the maintenance at the Licensee's cost. The Licensee must pay the costs of such maintenance and repair within 30 days of receipt of an invoice from ARTC.

(e) ARTC may request from the Licensee a condition report from a duly qualified engineer certifying the condition of the Infrastructure. ARTC may only request such report once during every 24 month period of the Term. Should the Licensee fail to provide a condition report within 30

days of written request by ARTC, ARTC may engage a duly qualified engineer to undertake an inspection of the Infrastructure and provide an asset condition report. ARTC may recover such costs of the duly qualified engineer from the Licensee as a debt due under this Agreement.

6. ASSIGNMENT

The Licensee must not assign or otherwise dispose of this Agreement without ARTC's prior written consent, which will not be unreasonably withheld. Should ARTC transfer its interest in the Land, it may assign its rights under this Agreement to the transferee and upon the transferee assuming ARTC's obligations under this Agreement on its part to be performed or observed on or after the effective date of assignment, ARTC shall automatically be released from them.

7. TERMINATION

7.1 Closure of Infrastructure

(a) ARTC may terminate this Agreement forthwith and re-enter and take possession of the Land or convert this Agreement to a monthly licence if the Licensee closes the whole of the Infrastructure for the use by the public save for:

(i) any temporary closure of 60 days or less or any closure of part only of the Infrastructure; or

(ii) any closure required to enable the Licensee or its contractors to carry out any repairs, maintenance or upgrade work to the Infrastructure; or

(iii) any closure in whole or in part of the Fauna Crossing.

(b) If ARTC converts this Agreement to a monthly licence under clause 7.1 (a) such monthly licence shall be on the same terms as this Agreement, and either party may terminate the monthly licence by giving one month's written notice to the other.

(c) This Agreement will automatically terminate if ARTC's rights to the Land under the Lease come to an end for any reason.

7.2 Termination

Should ARTC terminate this agreement in accordance with Clause 7.1 (a), ARTC may by notice in writing to the Licensee, require the Licensee (at the Licensee's expense) to remove the Infrastructure from the Land or disconnect the

Infrastructure from any services, systems or other infrastructure as specified by ARTC and repair all damage to the Land. In these circumstances, the Licensee must carry out such works during the twelve month (12) month period following ARTC's request on terms of access agreed with ARTC.

8. GENERAL

8.1 Interpretation

Unless the contrary intention appears:

(a) Headings are for convenience of reference only and do not affect the interpretation or construction of this Agreement.

(b) words importing the singular include the plural and vice versa;

(c) a reference to any thing (including any right or any period of time) includes a part of that thing;

(d) a reference to an individual person includes a corporation, partnership, joint venture, association, authority, trust, state or government and vice versa;

(e) a reference to any gender includes all genders;

(f) a reference to any agreement or document is to that agreement or document (and, where applicable, any of its provisions) as amended, novated, supplemented or replaced from time to time;

(g) a reference to any Act or statutory instrument or particular provision of an Act or such statutory instrument is taken to include all regulations, orders or instruments issued under the legislation or provision, any modification, consolidation, amendment, re-enactment, replacement or codification of such legislation or provision and any substituted legislation or substituted provision;

(h) a reference to any party to this Agreement includes, in the case of ARTC, its assignees and successive assignees, the owner for the time being of the Land and, in the case of the Licensee, its permitted assigns;

(i) where an expression is defined, another part of speech or grammatical form of that expression has a corresponding meaning;

(j) in the interpretation of this Agreement no rule of construction applies to the disadvantage of a party because that party put forward this Agreement or any portion of it;

(k) The expressions "including", "includes" or "include" have the meaning as

if followed by "without limitation"; and

(l) In the event of any inconsistency between the terms of this Agreement and the terms of the Works Deed, then the terms of the Works Deed shall apply but only to the extent of such inconsistency.

8.2 Notices

(a) For the purpose of this clause notice means a notice, consent, approval or other communication under this Agreement.

(b) A notice must be signed by or on behalf of the person giving it, addressed to the person to whom it is to be given and:

(i) delivered to that person's address;

(ii) sent by pre- paid mail to that person's address; or

(iii) transmitted by facsimile to that person's address.

(c) A notice given to a person in accordance with this clause is treated as having been given and received:

(i) if delivered, on the day of delivery if delivered before 5.00pm on a business day, otherwise on the next business day;

(ii) if sent by pre-paid mail, on the third business day after posting; or

(iii) if transmitted by facsimile and a correct and complete transmission report is received, on the day of transmission if the report states that transmission was completed before 5.00pm on a business day, otherwise on the next business day.

8.3 Governing Law

This Agreement is governed by the law in force in the jurisdiction in which the Land is located and the parties submit to the exclusive jurisdiction of the courts of that jurisdiction and any courts which may hear appeals from those courts in respect of any proceedings in connection with this Agreement.

8.4 Waiver

The non-exercise of or delay in exercising any power or right of a party does not operate as a waiver of that power or right, nor does any single exercise of a power or right preclude any other or further exercise of it or the exercise of any other power or right. A power or right may only be waived in writing, signed by the party to be bound by the waiver.

8.5 Severance

If any provision of this Agreement is held invalid, unenforceable or illegal for any reason, this Agreement shall remain otherwise in full force apart from the said provision which shall be deemed deleted.

8.6 Entire Agreement

This Agreement (incorporating the provisions of the Works Deed to the extent specified under this Agreement) is the entire agreement of the parties on the subject matter. The only enforceable obligations and liabilities of the parties in relation to the subject matter are those that arise out of the provisions contained in this agreement. All representations, communications and prior agreements in relation to the subject matter are merged in and superseded by this Agreement. Any subsequent variation of this Agreement must be in writing in appropriate form and executed by both ARTC and the Licensee.

8.7 No Merger

The provisions of this Agreement do not merge on termination.

8.8 No prejudice to accrued rights

The expiration or termination of this Agreement shall be without prejudice to the accrued rights of either party at the time of expiration or termination.

8.9 No fetters

Nothing in this Agreement fetters the statutory rights and powers of ARTC or the Licensee.

SIGNED for and on behalf of)
AUSTRALIAN RAIL TRACK)
CORPORATION LIMITED by a)
duly authorised officer of the
Company in the presence of:

. . . . . .
Signature of witness

. . . . . .
Name of witness

. . . . . .
Signature of Authorised Officer

. . . . . .
Name of Authorised Officer

SIGNED for and on behalf of the)
ROADS AND MARITIME)
SERVICES)
by a duly authorised delegate in the presence of:

. . . . . .
. . . . . .
Signature of Witness

. . . . . .
. . . . . .
Name of Witness (print)

. . . . . .
. . . . . .
Signature of Authorised Officer

. . . . . .
. . . . . .
Name of Authorised Officer (print)

SCHEDULE

ITEM 1 "Land"	That portion of the Railway Corridor at 564.550 km from Sydney as shown in the plan attached marked "Plan A".
ITEM 2 Infrastructure	(a) Road over rail bridges at 564.550 km from Sydney on the North Coast Railway, including spans, abutments, support columns, together with approach roads to that bridge and all associated works, including drainage works and road furniture, to the extent constructed within the Railway Corridor; and (b) Fauna Crossing being the area of the Land identified in the plan attached and marked "B" to be used as a wildlife access path under the Road over rail bridges including all associated works, including fencing and drainage works to the extent constructed within the Railway Corridor.
ITEM 3 Commencement Date	The date upon which Completion (as that term is defined in the Works Deed) occurs under the Works Deed.
ITEM 4 Annual Licence Fee	$1.00
ITEM 5 Review of Annual Licence Fee	Not Used

MEETING MINUTES FROM MEETINGS HELD ON 12/4/13 AND 8/5/13 WITH EPA AND DPI

Constructing Australia's Future

Nambucca Heads to Urunga	
Meeting:	**Fauna Crossings/Fencing Meeting (Rev 1)**
Date:	8.05.13
Time:	10.30am-2.00pm
Location:	Coffs harbour

Attendees			
Name	**Initials**	**Name**	**Initials**
Michael Stuyt (Abi)	MS	James Sakker (DPI)	JS
Jenny Butler (Abi)	JB	Craig Hare (EPA)	Cha
Courtney Hoops (Abi)	CH	Shane Green (RMS)	SG
		Mike Cragg (RMS)	MC
Apologies:			
Distribution:	All Above		

Minutes

1. General

SG informed that agreement was required to be reached between Bob Higgins and Gary Davis (EPA) on any changes to previously agreed fauna structure sizes as per Table 4.1. Once agreed then RMS will approve Abigroup to proceed further with the proposed design changes. Objective of this meeting was to get alignment on the proposed changes so that CHa could discuss with Gary Davis.

2. Fauna Underpass Details							
Location	**Table 4.1 Requirement**	**Abigroup Proposed**	**EPA/DPI Comments as at 12/4/13**	**Corridor value**	**Action as at 12/4/13**	**8/5/13 Actions Agreed**	**8/5/13 Benefit compared to Table 4.1**

61700	Minimum 5 no. x 2400 mm wide x 2100 mm high	3 no. 3000mm wide x 2100mm high for drainage 1 no. 3000mm high x 2100mm wide elevated combined fauna drainage	Investigate widening of bridge over railway to provide better corridor. Prefer bridge to be lengthened on the Southern side if culvert at Stn 61 690 deleted as preferred culvert height difficult to achieve under existing highway. Existing Highway bridge appears sufficient due to thickness of existing vegetation.	Very high	Investigate widening of bridge over railway to provide better corridor.	Agree remove culvert crossing at Ch 61690 and widen rail bridge by 3m to the south Cha - Concerned as to whether Rail Authority are accepting of the rail corridor being used as a Fauna crossing and recommended they be consulted. Include fauna fence in final design effectively isolating fauna and rail corridors to ensure fauna corridor is on RMS land and doesn't get blocked off by future rail activities. Drop downs required in fence. Complete actions above then feedback to Cha. Note – RMS to discuss with EPA further fauna crossing options for the WC2N section of the project just to the south of Ch 61700.	Positive
Boggy Creek + service road	Minimum length 70 metres between front faces of bridge abutments including a minimum 6 metre wide fauna passage at each abutment between the toe of the scour protection and the mean high water level(MHWL) 2 , or scour protection and top of bank3 where the crossing is located above tidal influence	70 meters between front faces of abutments with 6 meter wide fauna passage	Fauna bottle neck as per current design between highway bridges and service road culverts. EPA would consider 30m uniform bridge crossing at both locations preferential to bridge linking to culverts. Trade-off for best outcome - DPI in agreement. Keep bridges within riparian zone. 15m fauna underpass was previously the maximum EPA requirement. Note: Potential GB frog habitat.	High	Potential to shortened highway bridges on the basis that a bridge is provided at the service road and not culverts. Provide similar fauna passage widths between the three bridges. Bridge length based on 12m wide for fauna (total) plus waterway width.	Consensus is to lock in the following for both the main carriageways and the service road bridges: • Minimum 50m bridge length • Minimum 3m height from underside of bridge for fauna passage • Minimum 12m wide fauna passage (to be reviewed onsite to configure). DPI raised a concern the creek realignment appears to significantly shorten length of creek and is concerned about grades. Site visit proposed to further look at realignment & design details required. Prior to site visit abutment locations to be surveyed and pier positions pegged. DPI –tabled principles of to consider for waterway bridge design: • Scour protection should not impact width or depth of creek. • Minimise piers in waterways • Maintain waterway width and depth • No shortening where realignment planned - match grade and widths	Positive overall benefit as a result of service road structure change

						• Where scour protection is required it is to mimic existing conditions (maintain fish passage) • Appropriate bank planting Note: Existing creek alignment needs to be clearly indicated on design plans.	
Cow Creek	Minimum length 30 metres between front faces of bridge abutments including a minimum 6 metre wide fauna passage at each abutment between the toe of the scour protection and the MHWL2 , or scour protection and top of bank where the crossing is located above tidal influence	30 to 34 meters between front faces of abutments with 6 meter wide fauna passage Possible lengthening due to Valla Road realignment	Area heavily impacted. Known Koala population on both sides of Hwy. Spotted tail Quoll presence. Potential for revegetation in liaison with AFG and adjacent landowners & approval to impact heritage site required. DPI – creek currently not in good condition. Any improvements would be good. Potential for design changes in this area. To be further discussed.	Medium - Currently fragmented. Connectivity potential high.	Potential for design changes in this area. To be further discussed.	Table 4.1 requirements will be met.	Neutral
Deep Creek	Minimum length 90 metres between front faces of bridge abutments including a minimum 3 metre wide fauna passage at each abutment between the toe of the scour protection and the MHWL2 , or scour protection and top of bank3 where the crossing is located above tidal influence	>90m between front faces of abutments with 3m wide fauna passage	Design as is. No change desired	Medium	-	No change	Neutral
66220 Local Road C	Minimum 2700 mm wide x 900 mm high	2700 mm wide x 900 mm high	Design as is. No change desired	Low	-	No change	Neutral

67100	Minimum 2400 mm wide x 2400 mm high	2400mm wide x 2400mm high below main carriageways connected to existing 1350mm dia RCP below existing highway	Review new culvert dimensions to match existing 1350mm culvert. Hydrology requirements more important to get right here. Large RCBC feeding into small dia RCP highly undesirable. Existing highway water to enter pit adjacent to road and ok not have fauna existing onto old highway.	Low	Preference is to match existing culvert diameter with new upstream pipe.	Afflux approved to match existing pipe. Agreed to continue to match new culvert with existing size.	Positive as not a fauna trap.
Oyster Creek Tributary Ch 67900	- not included in Table 4.1	2400 mm x2400 mm RCBC	Fish Passage: Low flow channel design to correspond with existing creek width – depends on depth. Utilise natural rock as opposed to besser block for in stream baffles. No light wells. Current design indicates grade as 400mm over 70m - no issues.	Fish passage	Remove light wells. Review low flow channel. Use natural rock.	Review scour protection at inlet and outlet of culvert. Low flow channel needs to stay wet or alternative is to lower cell 200mm below bed level. Note SWTC relaxation required to lower cell. Light well can be removed.	N/A not included in Table 4.1
68470	Minimum 4 no. x 3600 mm wide x 1200 mm high plus 1 no. x 3600 mm wide x 2400 mm high	4 no. x 3600 mm wide x 1200 mm high plus 1 no. x 3600 mm wide x 2400 mm high	As per concept design. No change desired	Low - medium	-	No change	Neutral
69715	Minimum 4 no. x 1200 mm diameter	4 no. x 1200 mm diameter	As per concept design. No change desired	Low	-	No change	Neutral
70145	Minimum 2 no. x 1800 mm diameter	3 no. x 1800 mm diameter	As per concept design. No change desired	Low	-	No change	Neutral
70400	Minimum 3600 mm wide x 3000 mm high	3600 mm wide x 3000 mm high	Review if veg can be replanted between the 2 culverts to help with line of sight to vegetation. Review current basin location as too close to	Medium - High	Review if reveg opportunities in between culverts to enhance use. Basin location to	No change to Table 4.1 requirements. Detail design to consider previous items raised.	Neutral

			opening.		be reviewed.		
McGrath Creek Floodplain 1	Minimum length 70 metres between front faces of bridge abutments including a minimum 6 metre wide fauna passage at each abutment between the toe of the scour protection and the MHWL2 , or scour protection and top of bank3 where the crossing is located above tidal influence	70 meters between front faces of abutments with 6 meter wide fauna passage	Keep bridge abutment in forested area if shortening length. There is potential to shorten from 70m to 50 m. Creek realignment may cause some issues and requires further discussion. Need to keep some dry passage for fauna use.	Medium	Potential to investigate shortening bridge. Keep dry passage. Review/discuss creek realignment.	Consensus is lock in the following: • Minimum 50m bridge length • Minimum 3m height from underside of bridge for fauna passage • Minimum 6m wide fauna passage at each abutment (or reviewed onsite to configure). DPI – fish passage should not be an issue with the creek realignment as existing creek doesn't appear to meander much at this location. There is enough room to move the creek at this location.	Neutral
72km720	Minimum 2100 mm wide x 900 mm high	2100 mm wide x 900 mm high	No change desired	Low given length	-	No change	Neutral
Dalhousie Creek	Minimum length 15 metres between front faces of bridge abutments including a minimum 3 metre wide fauna passage at each abutment between the toe of the scour protection and the MHWL2 , or scour protection and top of bank3 where the crossing is located above tidal influence	32 meters between front faces of abutments with 3 meter wide fauna passage	Basin location needs reassessment away from opening and to minimise clearing in riparian corridor if possible. Yellow belly glider habitat. Area protected from forestry activities. Investigate possibility of retaining natural creek or including low flow channel for fish. Current design indicates creek flowing through extensive scour protection with no low flow channel for fish passage. Review extent of scour protection required. Maintain taller trees in median in drainage line for gliders.	Very high – critical link	Review amount of scour required, potential for natural or low flow channel; review basin location if possible; maintain glider trees. Review once marked onsite.	Increase in bridge length from 15m to 32 m to satisfy drainage requirements results in a better outcome overall. Review detailed design of realignment & once pegged onsite.	Positive overall

			DPI and EPA request site inspection after area has been marked out.				
73650	Minimum 2400 mm wide x 2400 mm high	2400 mm wide x 2400 mm high	No change desired	Medium to High	-	Discourage use at this location as potential Fauna trap into fenced area. Remove from table 4.1 and only size to drainage requirements. Suggest changing structure to pipes or much smaller structure.	Positive overall to eliminate potential fauna trap
73840	Minimum 2400 mm wide x 2400 mm high	2400 mm wide x 2400 mm high	Possible Fauna trap in fenced area in median strip. Consider making ancillary drainage culvert (Southbound Main Carriageway at chainage 73km780) bigger (currently 3x900mm). Investigate realigning fence to get fauna through culverts ASAP.	Medium to High	Consider making ancillary culvert bigger to 2400 mm wide x 2400 mm high RCBC (same as fauna structure). Investigate realigning fence.	Confirmed the 3x900mm pipes can be changed to 2400 mm wide x 2400 mm high RCBC on the southbound to match fauna culvert on northbound carriageway. Investigate the possibility of lining up the northbound and southbound culverts more. Add Southbound Main Carriageway at chainage 73km780 to Table 4.1 (as 2400 mm wide x 2400 mm high RCBC)	Positive
74810	Minimum 4metres high x 9 metres wide	33.5 m long bridge	Bridge better than concept arch structure. Potential to reduce length of bridge. Calculate drainage requirements then add 3m on either side for fauna passage. Values option – consider retaining walls to reduce bridge length.	Critical high	Happy with bridge. Potential to reduce bridge length if required.	Consensus is to commit to: • Minimum 33 m length • Minimum 3m high to underside of bridge • 6m wide fauna passage (configure onsite if required)	Positive
75250	Minimum 3000 mm wide x 2400 mm high	3000 mm wide x 2400 mm high	Increase to 3m in height if possible. Note: Length of underpass >50m diminishes value for fauna to want to move through.	High	3000 mm high RCBC preferred	3m height confirmed to be achievable. Lock in changed height.	Positive
75800	Minimum 2400 mm wide x 1200 mm high	3000 mm wide x 1200 mm high	Increase to 3m in height if possible. Potential for Spotted Tail Quolls in vicinity.	High (adjacent to State forest)	3000 mm high RCBC preferred	3m height confirmed to be achievable. Lock in changed height.	Positive

76300	Minimum 3600 mm wide x 3600 mm high	3600 mm wide x 3600 mm high	Core koala habitat Skew & length not ideal. Relocate basin away from opening and revegetate right up to opening if possible, retain as much vegetation as possible during construction. As this is also a drainage culvert there may be some fauna furniture design issues	Medium to high value	Consider basin location - veg right up to crossing preferred.	Investigate if culvert can be straightened to decrease length. No change to size required.	Neutral – potential for positive benefit if culvert can be straightened
76560	Minimum 3600 mm wide x 2100 mm high	3600 mm wide x 2100 mm high	Low value currently but could be higher. Review opportunities to enhance shown as 2 culverts 40m apart potential to join into one, realign and revegetate. Prefer to increase height to 3m.	Low to medium	3000 mm high RCBC preferred. Consider reveg to improve connectivity to the North. Review to see if culverts can be converted into one.	3m height confirmed to be achievable. Lock in changed height. No issues if culverts are combined however combination to the northern culvert preferred	Positive
76990	Minimum 23 no. x 3600 mm wide x 3000 mm high	94m long bridge	Highly disturbed and impacted area. Revegetation potential to extend existing forest to abutment would be a good outcome. Prefer relocation of bridge to south to capture native vegetation. Can't move the bridge south due to alignment/cut.	low	No change to bridge Plant native vegetation at southern end of bridge	No change to structure. Revegetation still required.	Neutral
78800	Minimum 2 no. x 2400 mm wide x 1200 mm high	2 no. x 2400 mm wide x 1200 mm high	Core Koala habitat Prefer height to be 3m if possible.	High	3000 mm high RCBC preferred	3m cells achievable. Check if 3m applies to one or all three cells. Note EPA only requires at least one dry cell to be 3m high.	Positive
79865 northbound and 79930	Minimum length 15 metres between front faces of bridge abutments including	31 meters between front faces of abutments with	Investigate how wet underlying ground will be (wet ground not ideal for fauna crossings).	Very high - key dedicated fauna	No change desired in culvert dimension.	No change to structure. Commit to revegetation	Neutral

southbound	a minimum 3 metre wide by 3 metre high fauna passage at each abutment between the toe of the scour protection and the MHWL2 , or scour protection and top of bank3 where the crossing is located above tidal influence	3 meter wide fauna passage	Pathways should be above 2yr ARI. Avoid basin adjacent to crossing opening and check basin design/size-permanent or construction. Revegetate near culvert opening. Basins best to be 10m back from culverts for fauna underpasses. Opportunity to revegetate connectivity corridor towards the NE in the cleared area.	crossing	Consider reveg to improve connectivity and review basin location.		
80220	Minimum 2 no. x 3000 mm wide x 1500 mm high	2 no. x 3000 mm wide x 1500 mm high	Koala habitat. Increase height to 2.1m or greater if possible. Note: potential presence of Phascogales in vicinity.	Very High	Prefer 3000 mm high; Provide as much height as feasible without affecting vertical alignment	Further investigation into whether height is achievable due to amount of fill required in this section.	Potential positive if 3m achieved.
81880	Minimum 17 no. x 3300 mm wide x 2100 mm high	62m long bridge to accommodate fauna envelope	Improvement on concept design - Bridge = better connectivity outcome. Satisfied with shorter bridge under the proviso that ground is not wet all year round. Note: Be aware of possible presence of Phascogales during pre-clearing surveys	Very low	Possible to reduce bridge length	Consensus is to lock in the following: • Minimum 15 m length • Minimum 2.1m height from floor of waterway • No minimum width for fauna crossing Note site is either all dry or all wet - construct to match existing conditions once reviewed onsite. Potential to construct connective dry corridor mound.	Positive overall
82410	Minimum 9 no. x 3000 mm wide x 2100 mm high	36m long bridges to satisfy fauna envelope	Improvement on concept design - Bridge = better connectivity outcome. Satisfied with shorter bridge under the proviso that ground is not wet all year round. Note: point raised as to whether cross sectional	Low – no target species	Possible to reduce bridge length	Investigate removing and revegetating decommissioned section/culvert of existing pacific Highway between new highway and service road. Keep width of 18m at this location to stay consistent with upstream new bridge. Commit to lock in the following for the new bridge: • Minimum 18 m length • Minimum 2.1m height	Positive overall

			area of bridge needs to correspond to culvert area			• No minimum width for fauna passage conditions. Review onsite if a dry passage is required.	

Jenny Butler

From: Craig Harre <Craig.HARRE@epa.nsw.gov.au>
Sent: Monday, 27 May 2013 9:43 AM
To: Jenny Butler; james.sakker@dpi.nsw.gov.au
Cc: shane.green@n2u.com.au; Courtney Hoops; mike.cragg@n2u.com.au; Stefan Everingham <stefan.everingham@n2u.com.au> (stefan.everingham@n2u.com.au); 'BOCK Belinda (Belinda.BOCK@rms.nsw.gov.au)'
Subject: RE: fauna crossing minutes

Jenny

The meeting minutes are accurate and comprehensive. I look forward to the ARTC response and design/scour improvements at Dalhousie Creek.

Regards

Craig Harré

Senior Threatened Species Officer | **NSW Environment Protection Authority** |

☎: (02) 6659 8223 | | : craig.harre@environment.nsw.gov.au

From: Jenny Butler [mailto:Jenny.Butler@Abigroup.com.au]
Sent: Friday, 24 May 2013 1:22 PM
To: james.sakker@dpi.nsw.gov.au; Harre Craig
Cc: shane.green@n2u.com.au; Courtney Hoops; mike.cragg@n2u.com.au; Stefan Everingham <stefan.everingham@n2u.com.au> (stefan.everingham@n2u.com.au); 'BOCK Belinda (Belinda.BOCK@rms.nsw.gov.au)'
Subject: fauna crossing minutes

Hi James and Craig,
Please find attached the minutes from the last 2 fauna crossing meeting. If you require any changes to the minutes please let me know.
Sorry for the delay.

Regards
Jenny Butler
Environmental Manager – Nambucca Heads to Urunga - NH2U |NSW| Abigroup Contractors Pty Ltd
PO Box 506 Nambucca Heads NSW 2448 - 8 Park Ave, Coffs Harbour NSW 2450
m 0424 139 609 e jenny.butler@abigroup.com.au
please consider the environment before printing this email