

Appendix B10.1

Tyndale Borrow Site Management Plan

Woolgoolga to Ballina (sections 3 to 11)

Pacific Highway Upgrade

SEPTEMBER 2016

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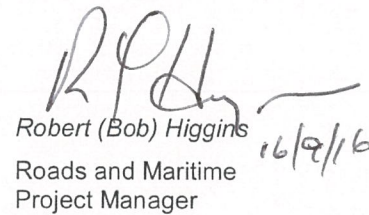
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Revision history

Revision	Date	Description	Approval
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1	16/03/16	Draft for internal review	Hugh Madden
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3	28/06/16	Final for submission to DP&E	Hugh Madden
4	26/07/16	Update DP&E comments	Hugh Madden
5	06/09/16	Update DPI-Water groundwater memo review	Andrea Zambolt

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Glossary / Abbreviations

BSMP	Borrow Site Management Plan
CEMP	Construction Environmental Management Plan
CNVMP	Construction Noise and Vibration Management Plan
dB	decibels
EEC	Endangered Ecological Communities
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
ESCP	Erosion and Sediment Control
EWMS	Environmental Work Method Statements
MCoA	Ministers Conditions of Approval
NML	Noise Management Level
L _{Aeq}	The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.
OEH	Office of Environment and Heritage
OOH	Out of Hours
PC	Pacific Complete
Project, the	The Woolgoolga to Ballina Highway Upgrade (section 3 to 11)
Secretary	Secretary of the Department of Planning and Environment
SPIR	Submissions/Preferred Infrastructure Report
TSC Act	<i>Threatened Species Conservation Act 1995</i>
Roads and Maritime	Roads and Maritime Services

1 Introduction

1.1 Context

This Borrow Site Management Plan (BSMP) for the Tyndale Borrow Site forms part of the Construction Environmental Management Plan (CEMP) for construction of sections 3 to 11 of the Woolgoolga to Ballina Pacific Highway Upgrade.

This BSMP has been prepared to address the requirements of the Minister's Conditions of Approval (McoA), specifically McoA D22, the mitigation measures listed in the Pacific Highway Upgrade: Woolgoolga to Ballina Submissions/Preferred Infrastructure Report November 2013 (SPIR) and all applicable legislation.

The EIS indicates that if nearby road projects and quarries cannot supply the material required for the project, other material sources near the project would be investigated. The EIS also advised that any material sourced would need to be:

- More than 40 metres from waterways
- Of low ecological and heritage value
- Greater than 100 metres from the closest receiver (unless a negotiated agreement is in place).

1.2 Background

On behalf of the Australian and NSW governments, NSW Roads and Maritime Services (Roads and Maritime) is progressively upgrading the Pacific Highway to dual carriageway between the Hunter and NSW/Queensland border.

The Woolgoolga to Ballina Pacific Highway Upgrade involves upgrading approximately 155 kilometres (km) of highway to four-lane dual-carriageway road between Woolgoolga (north of Coffs Harbour) and Ballina (near the NSW/Queensland border) on the NSW north coast. The project bypasses the towns of Grafton, South Grafton, Ulmarra, Woodburn, Broadwater and Wardell. The project will include road duplication, alignment modification and new road sections. Once complete, the project will create a four-lane divided road, with two lanes in each direction. It would also allow for the road's upgrade in the future to a six-lane divided highway.

The Woolgoolga to Ballina Project was declared critical State significant infrastructure under section 115V of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and was assessed under Part 5.1 of the EP&A Act. Following preparation and exhibition of the environmental impact statement (EIS) and response to submissions (SPIR) the project was approved by the NSW Government on 24 June 2014.

The Woolgoolga to Ballina project has also been subject to approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Woolgoolga to Ballina Project was declared by the Commonwealth Minister for Sustainability, Environment, Water, Populations and Communities to be a controlled action under this Act on 20 June 2012. Approval was granted on 26 June 2014.

The Woolgoolga to Ballina project has been staged with Sections 1 and 2 delivered separately. This document covers Sections 3–11 of the Woolgoolga to Ballina upgrade (the project). The project will be delivered by the Pacific Complete, appointed as the Delivery Partner of Roads and Maritime. Pacific Complete comprises Laing O'Rourke Australia Construction Pty Ltd and Parsons Brinckerhoff Australia Pty Limited working in close collaboration with Roads and Maritime Services (Roads and Maritime).

1.3 Environmental management systems overview

The Pacific Complete CEMP (sections 3 to 11) describes the overall system for environmental management of the project being delivered by Pacific Complete in partnership with Roads and Maritime.

As outlined in Section 4.2.3 of the approved Pacific Complete CEMP, contractors will be required to develop project specific environmental management documentation to address the operational control requirements outlined in the Pacific Complete CEMP. This includes the development of a Contractor's Construction Environmental Management Plan (CCEMP) that will be reviewed by Pacific Complete to ensure its compliance with the relevant requirements of the Pacific Complete CEMP.

Management measures identified in this borrow site management plan would be incorporated into site or activity specific Environmental Work Method Statements (EWMS) prepared by the contractor.

Contractor EWMS would be developed and signed off by the PC Environment Manager prior to commencement of works and construction personnel would be required to undertake works in accordance with the identified mitigation and management measures.

Additionally an online GIS system of mapping (PCMap) has been developed for the project and this includes all of the sensitive environmental issues identified during the environmental assessment process for the project. Used together, the CEMP, PCMap, strategies, procedures and EWMS form a management system that clearly identifies required environmental management actions for reference by project personnel and contractors.

The review and document control processes for this plan are described in Chapters 9 and 10 of the CEMP.

1.3.1 Pacific Complete Environment Protection Licence (EPL)

Following the approval of this borrow site management plan, Pacific Complete would seek a variation to the boundary of our EPL (20713) to incorporate the borrow site and its associated activities.

1.4 Purpose

The purpose of this plan is to describe how Pacific Complete would manage the establishment, operation and rehabilitation of Tyndale Borrow Site which would be used for the construction of the Woolgoolga to Ballina Pacific Highway Project (sections 3 to 11).

1.5 Objectives

The key objectives of this BSMP is to ensure that impacts associated with the borrow site are minimised within the scope permitted by the project approval. To achieve this, the following would be undertaken:

- Ensure appropriate measures are implemented to address the relevant McoA outlined in Table 2.2 and the safeguards detailed in the SPIR.
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 2.1 of this plan.
- Ensure appropriate measures are implemented to avoid damage or destruction to threatened species, aboriginal and non-aboriginal sites and artefacts and sensitive ecosystems during the establishment, operation, decommissioning and rehabilitation of the site.
- Provide staff with an increased level of understanding and awareness of sensitive environmental issues within or adjacent to the borrow site and ensure effective communication is maintained with statutory authorities.

- Ensure consultation is carried out with sensitive receives and stakeholders to address questions or concerns raised during consultation.

2 Relevant legislation and guidelines

2.1 Legislation

Table 2-1 lists the principal legislation and regulation that applies to borrow site management.

Table 2-1 Principal legislation and regulation relevant to borrow site management

Legislation and regulation	Relevance
Commonwealth	
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Provides for the protection of matters of national environmental significance including species, populations, communities and their habitat that could be impacted by the work.
<i>National Greenhouse and Energy Report Act 2007</i>	Provides the statutory basis for the National Greenhouse and Energy Reporting Scheme in relation to greenhouse gas emissions and energy consumption and production.
<i>Native Title Act 1993</i>	Provides a mechanism for the recognition and protecting of native title.
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>	Protects objects and areas that are of particular significance to Aboriginal people.
State	
<i>Environmental Planning and Assessment Act 1979 (EP&A Act)</i>	Describes the processes for consenting development in NSW, managing land use and implementing environmental planning instruments. Describes certain permitting and licencing streaming and exclusion provisions that will apply to the work.
<i>Protection of the Environment Operations Act 1997</i>	Prescribes pollution control, incident notification, offence notices and the provision of Environment Protection Licences.
<i>Noxious Weeds Act 1993</i>	Provides for the management and control of noxious weeds to reduce the spread of weeds and minimise damage to the environment.
<i>Threatened Species Conservation Act 1995</i>	Provides a complete list of all endangered and vulnerable species and ecological communities in NSW listed under the Act.
<i>Fisheries Management Act 1994</i>	Governs the management of fish and their habitat in NSW.
<i>Native Vegetation Act 2003</i>	Stipulates the way native vegetation is managed in NSW by preventing largescale clearing, unless it improves or maintains environmental outcomes.
<i>National Parks and Wildlife Act 1974</i>	Provides statutory protection for native fauna and flora and Aboriginal places and objects throughout NSW.
<i>Heritage Act 1997</i>	Provides for the conservation of buildings, works, archaeological relics and places of heritage value.

Legislation and regulation	Relevance
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth)</i>	Enacted to specifically protect Aboriginal and Torres Strait Islander heritage.
<i>Water Act 1912</i>	Provides for the protection of groundwater in the few areas in NSW where water-sharing plans have not come into effect.
<i>Water Management Act 2000</i>	Provides for the protection, enhancement and restoration of water sources and ecosystems, ecological processes and biological diversity.
<i>Soil Conservation Act 1938</i>	Establishes controls to prevent soil erosion and land degradation.
<i>Contaminated Land Management Act 1997</i>	Provides for the investigation and remediation of contaminated land considered to post a significant risk to human health of the environment.
<i>Waste Avoidance and Resource Recovery Act 2001 (WARR Act)</i>	Supplementary legislation aimed at reducing waste and resource consumption, defining the waste hierarchy and promoting its adoption across NSW.
<i>Environmentally Hazardous Chemicals Act 1985</i>	Controls the movement, storage, and disposal of chemical waste. Administered by EPA and the Hazardous Chemicals Advisory Committee.
<i>Dangerous Goods (Roads and Rail Transport) Act 2008</i>	Ensures that dangerous goods are transported in a safe manner.
<i>Pesticides Act 1999</i>	Controls and regulates the use of pesticides in NSW. It prohibits the misuse of pesticides that harms people, property, animals or plants. Under the Act the EPA can issue a person with a clean-up notice, prevention notice and compliance cost notice.

2.1.1 Guidelines

- NSW Industrial Noise Policy (INP) (EPA 2000)
- Assessing vibration a technical guideline (EPA, 2006)
- Environmental Noise Management Manual (RMS, 2011)
- Interim Construction Noise Guideline (ICNG) (DECC 2009)
- Assessing Vibration: A Technical Guideline (DEC 2006)
- British Standard 7385: Part 2 'Evaluation and measurement of vibration in buildings'
- *German DIN 4150: Part 3 – 1999 Effects of Vibration on Structure* (DIN 1999)
- Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (1990) Australian and New Zealand Environment and Conservation Council (ANZECC)
- Australian Standard AS2187.2-2006: 'Explosives – Storage, Transport and Use'
- National Environment Protection Council's (NEPC) – NEPM for Ambient Air Quality Guidelines
- Protection of the Environment Operations (Clean Air) Regulation, 2002
- AS 3580.1.1:2007 Methods for Sampling and Analysis of Ambient Air – Guide to Siting Air Quality Monitoring Equipment
- AS 3580.10.1-2003 Methods of Sampling Analysis of Ambient Air

- Action for Air 2009 (NSW DEC)
- Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC 2005)
- Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DEC 2007)
- Air Quality Monitoring Criteria for Deposited Dust (DEC Guideline).

2.2 Minister's conditions of approval

The McoA relevant to this plan are listed in Table 2-2. A cross reference is also included to indicate where the condition is addressed in this plan or other project management documents.

Table 2-2 Conditions of approval relevant to the Borrow Site Management Plan

McoA No.	Condition Requirements	Document Reference
D22	<p>The Applicant shall prepare and implement a Borrow Sites Management Plan, to manage the construction, operation and rehabilitation of the borrow sites used to source construction material for the SSI, prior to the commencement of construction at the borrow sites, or as otherwise agreed by the Secretary. The Plan shall be prepared in consultation with the EPA, OEH and DPI (Fisheries) and to the satisfaction of the Secretary, and shall include, but not necessarily be limited to:</p>	Section 4
	(a) details of construction/extraction methods and activities carried out at the borrow site;	Section 6
	(b) management and mitigation measures to be used to minimise surface and groundwater impacts, Aboriginal and non-Aboriginal heritage, air quality, noise and vibration, biodiversity and visual impacts;	Section 7
	(c) consultation with sensitive receivers; and	Section 8
	(d) details of the rehabilitation of the borrow site, including future landform and use of the borrow site, landscaping and revegetation, and measures that would be implemented to minimise or manage the ongoing environmental effects of the site.	NA
	<p>The Plan shall demonstrate that the construction and operation of the Lang Hill borrow site has no adverse impact on the known Oxleyan Pygmy Perch habitat waterway.</p>	
B79	<p>The applicant shall ensure that material extracted from the borrow sites established for the SSI, is only used for the construction of the SSI subject to this approval, and no other sections of the Pacific Highway or other works.</p>	Noted.

3 Borrow site description

The proposed Tyndale Borrow Site, also known locally as Jacko’s Quarry, is located on the westerly facing slope of Bondi Hill near the township of Tyndale, on the eastern side of the highway upgrade alignment, in Portion A of the Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11), refer to Figure 3-1. The site is privately owned and was an operational sandstone quarry over 15 years ago, supplying material to a local brick manufacturing facility.

Table 3-1 Site description

Item	Description
Chainage	67200 to 67500
Location	Tyndale
Lot ID	Lot 1 DP1185493
Size	1.8 hectares

The footprint of the proposed borrow site lies within the footprint of the existing quarry void and is vegetated with early regrowth of Pink Bloodwood – Tallowwood moist open forest vegetation that is considered to be of low ecological value.

The existing access track requires widening to allow for two way traffic. The vegetation surrounding the borrow site and access track has been identified as Pink Bloodwood – Tallowwood moist open forest and is considered to be of moderate to high conservation value vegetation/habitat. As shown in Appendix A and Appendix B, a number of threatened species and habitat trees are located within the surveyed corridor for the access track and surrounding the borrow site. Not all vegetation within the surveyed corridor for the access track requires removal, therefore the track would be designed to avoid the removal of threatened species, hollow bearing trees and mature trees (>300 millimetres diameter at chest height). The remaining vegetation would require removal to allow for the widening of the access track.

Surrounding land uses include rural residential, residential and agricultural land including sugar cane and grazing. The closest sensitive receivers are located more than 450 metres from the borrow site. The owner of the property has established some sheds approximately 200 metres south-east of the site, however these are not proposed for housing during the operation of the borrow site.

Land within this private property surrounding the proposed borrow site has been identified as a potential biodiversity offsite site for the project as it provides a high offset potential for *Angophora robur* (A. robur), also known as Sandstone Rough-Barked Apple. The borrow site itself is located outside the proposed conservation area (i.e. proposed covenant area), however the access track traverses the southern section of the conservation area. It is anticipated that the widening of the access track would not impact on the properties ability to be used for biodiversity offset.

If an offset covenant agreement is to be established at the property, the access track may be excluded for the duration of the operation of the borrow site. Once the borrow site is decommissioned and rehabilitated the access track would be considered for inclusion in the offset covenant agreement, subject to consultation with the land owner.

3.1 Justification

The following four borrow sites were identified in the SPIR: Lang Hill, Lumleys Hill, Gibsons and Eatons). The EIS outlines the potential to develop addition borrow sites near the project if there are any shortfalls of material. Chapter 6 of the Environmental Impact Statement (EIS), Section 6.4.1. Material Quantities and Sources states the following:

The balance of earthwork material would be reviewed during detailed design, and it is possible that there could be a shortfall or surplus of materials. For example, there may not

be sufficient quantity or quality of material within the project boundary, or it may not be feasible or economical to transport material between project sections. If there were any shortfall or excess of materials, this could be addressed in a number of ways:

- *Flattening the cutting batters to provide more material*
- *Increasing the excavated width at the base of cutting batters*
- *Lowering some sections of new local access roads*
- *Obtaining material generated from other road projects near the project that is in excess*
- *Obtaining materials from licensed local quarries near the project*
- *Developing other borrow sites near the project*
- *Using recycled material (such as removed pavement for select fill).*

In terms of sourcing external fill, the priority would be to obtain material from nearby road projects and licensed quarries. Potential material sources are identified in Table 6-13. If nearby road projects and quarries are not able to supply the material within the timeframe, or have the quantity required, other material sources near the project would be investigated. Any material source areas would need to be:

- *More than 40 metres from waterways*
- *Of low ecological and heritage value*
- *Greater than 100 metres from the closest receiver (unless a negotiated agreement is in place.)*

Additionally, the Ministers Conditions of Approval (McoA) does not prevent the applicant from exploring options for additional borrow sites for the project. McoA D22 only specifies that the applicant is to prepare and implement a borrow site management plan, to manage the construction, operation and rehabilitation of the borrow sites used to source construction material for the SSI.

Tyndale Borrow Site would provide the appropriate material to offset any potential deficits in fill material in Portion A, B and E of the project. The extracted material would be used in the construction of Clarence River Bridge (Portion E) as well as rockfill, select material, verge, structural backfill, spill through abutment material and fill material for hardstands and access tracks in Portions A and B of the project.

The borrow site's location adjacent to the construction corridor, alleviates the need to source material from existing quarries, reducing cost, travel time and the number of haulage vehicles travelling along the existing highway.

In addition, the depth and width of the cuttings within the construction corridor near the Tyndale community have been reduced during detailed design. The Tyndale Borrow Site would alleviate the deficit in rock material resulting from the reduction in depth of the cuts. The reduction in depth and width of the Tyndale cuts provides a number of environmental and social benefits namely reduced noise and vibration impacts from excavation and blasting activities on the sensitive receivers in the Tyndale area and a reduction in the clearing of threatened *Angophora robur* (*A. robur*) species. It is estimated that there will be a saving of approximately 211 individual *A. robur* due to changes in the clearing limits from the SPIR to the current revised clearing limit between CH 67,540 and CH 69,400.

3.2 Commissioning and decommissioning

The proposed commissioning date for the site is mid-2016. The site would be in use for approximately three to four years, with decommissioning estimated to occur in the third quarter of 2019. Rehabilitation would occur post decommissioning and is estimated to be complete in the first quarter of 2020. Table 3-2 provides indicative timeframes for the different phases of the borrow site.

Table 3-2 Indicative timeframes for borrow site activities

	2016				2017				2018				2019				2020	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Site establishment																		
Operation																		
Decommissioning																		
Rehabilitation																		

Rehabilitation of the borrow site and access track would be undertaken in consultation with and to the satisfaction of the individual landowner. If an offset covenant agreement is to be established at the property, the access track may be excluded for the duration of the operation of the borrow site. Once the borrow site is decommissioned and rehabilitated the access track would be considered for inclusion in the offset covenant agreement, subject to consultation with the land owner.

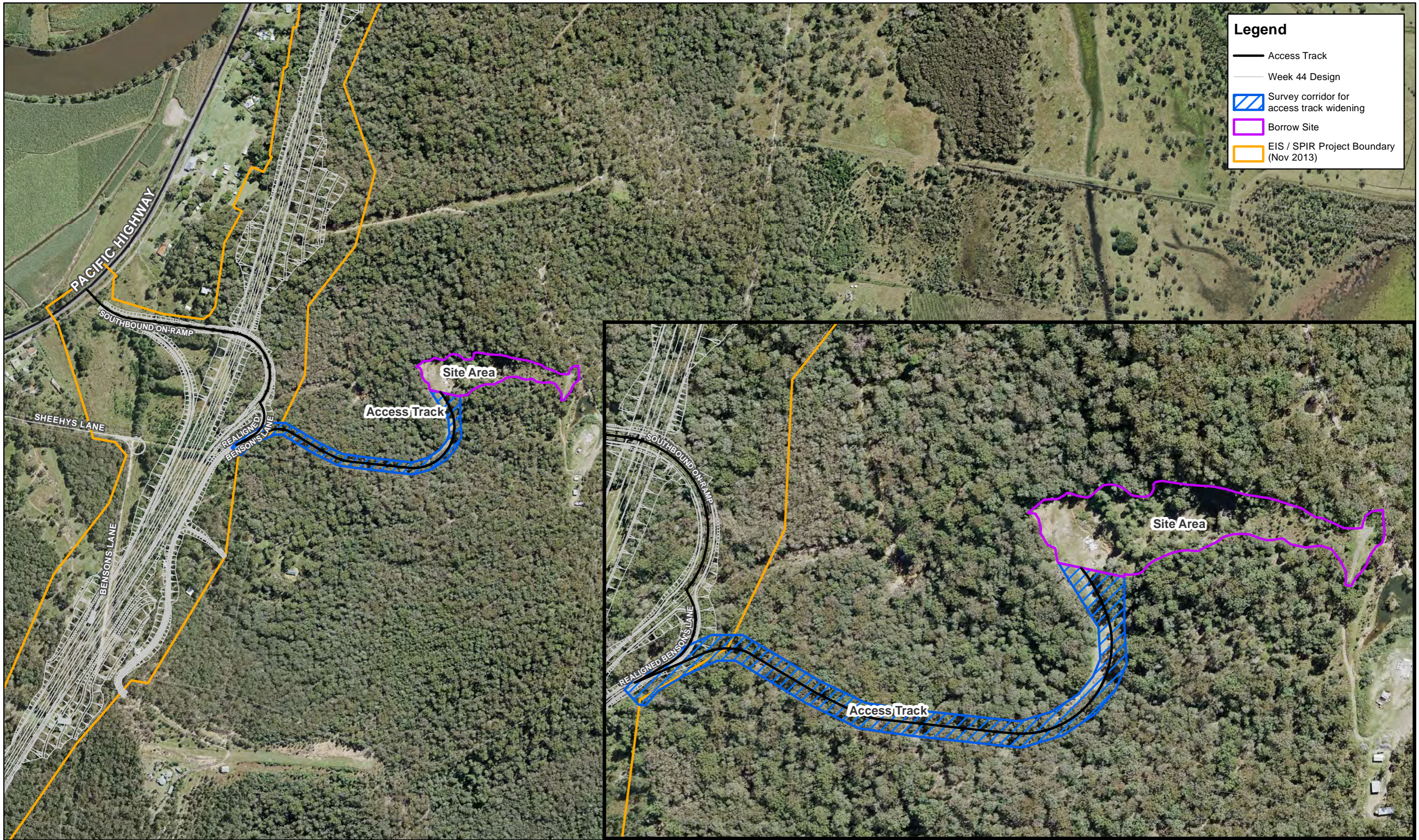
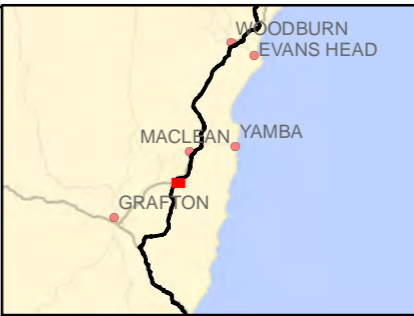




Figure 3-1
TYNDALE BORROW
SITE

Map 1 of 1

Note: ecology surveys were carried out within the survey corridor to determine the location of threatened species and habitat trees to assist in the design for the widening of the access track. Only the required clearing within the survey corridor will occur.



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4 Material extraction

4.1 Extraction description

It is anticipated that approximately 300,000 m³ of material would be excavation from the borrow site with excavation depths ranging from approximately 7 to 30 metres below the existing ground level. The material is primarily Kangaroo Creek Sandstone and would be used for the construction of Clarence River Bridge (Portion E) as well as rockfill, select material, verge, structural backfill, spill through abutment material and fill material for hardstands and access tracks in Portions A and B of the project.

4.2 Construction and extraction method

4.2.1 Site establishment

An intersection between the existing Pacific Highway and the construction corridor would be constructed at chainage 67,450 to enable access to the main construction corridor and for the establishment of the borrow site. Machinery and vehicles would travel from the existing highway along the newly constructed on ramp, onto the realigned Bensons Lane and then onto the existing borrow site access track as shown in Figure 3-1. Incidental traffic may also access the site from Sheehy's Lane until the newly formed intersection from the Pacific Highway has been constructed. This incidental traffic would not include heavy vehicle movements.

The borrow site would be cleared and the existing three metre wide access track would be widened by two metres on either side to create a seven metre wide access track to allow for two way traffic.

Mobile amenities and a small site office would be established at the site.

4.2.2 Extraction method

Typical extraction methods would be used to excavate any easily ripped material down to the solid competent rock layer. Direct drill and blast would then be used to fragment the rock.

Once extracted, the rock would be processed using crushing and screening techniques to produce the required material for the project. This process would be conducted either within the borrow pit void and/ or within the construction corridor. Crushing and screening plant would be mobile and fitted with misting sprays for dust suppression. Material would then be stockpiled prior to being loaded into haul vehicles for use on the project.

All blasts would be planned, executed and monitored in accordance with the Blast Management Procedure, Appendix B of the approved Pacific Complete Construction Noise and Vibration Management Plan (sections 3 to 11) (CNVMP) and would ensure the overpressure and vibration limits outlined in McoA B22 and B23 are not exceeded. This would be achieved through the preparation of a site specific blast management plan prior to each blast which would be prepared by the contractor and would address potential risks and control measures.

The pre-existing quarry was excavated to approximately 30 metres. The borrow site would be excavated to approximately another 30 metres below this level, leaving a 60 metre void at the deepest location.

4.3 Activities to be carried out at the facility

Activities to be carried out at the borrow site include:

- Site establishment/mobilisation of the site:
 - Clearing of vegetation
 - Establishment of site access

- Establishment of site office, crib shed, carpark and amenities
- Installation of security and exclusion fencing
- Installation of plant and equipment
- Establishment of sedimentation and erosion control measures
- Stockpiling of topsoil/overburden.
- Mechanical excavation
- Material processing (crushing and screening)
- Drilling and blasting
- Stockpiling and truck haulage of material
- Monitoring and maintenance of environmental measures during the use of the site and demobilisation when extraction is complete.
- Rehabilitation following decommissioning.

As outlined in the project approval, the site would operate during the hours of:

Monday to Friday: 7am to 6pm

Saturday: 8am to 5pm

Sunday and Public Holidays: no work.

Low noise impact activities and works may also be carried out between:

Monday to Friday: 6am to 7am and 6pm to 7pm.

Blasting would only be conducted during the hours of:

Monday to Friday: 9am to 5pm

Saturday: 9am to 1pm

Sunday and Public Holidays: no blasting.

Figure 4-1 provides an indicative site layout for the proposed borrow site. Stockpiling and material processing would occur within the void of the borrow pit to reduce the need for additional clearing of vegetation. Mobile plant and equipment and stockpiles may be relocated during the use of the borrow site, depending where excavation works are taking place. Pacific Complete would review and approve any changes to this layout to ensure their locations are compliant with this borrow site management plan and other approvals for the project.

4.4 Plant and equipment

Plant and equipment used for the extraction of material from the borrow site are listed in Table 4-1.

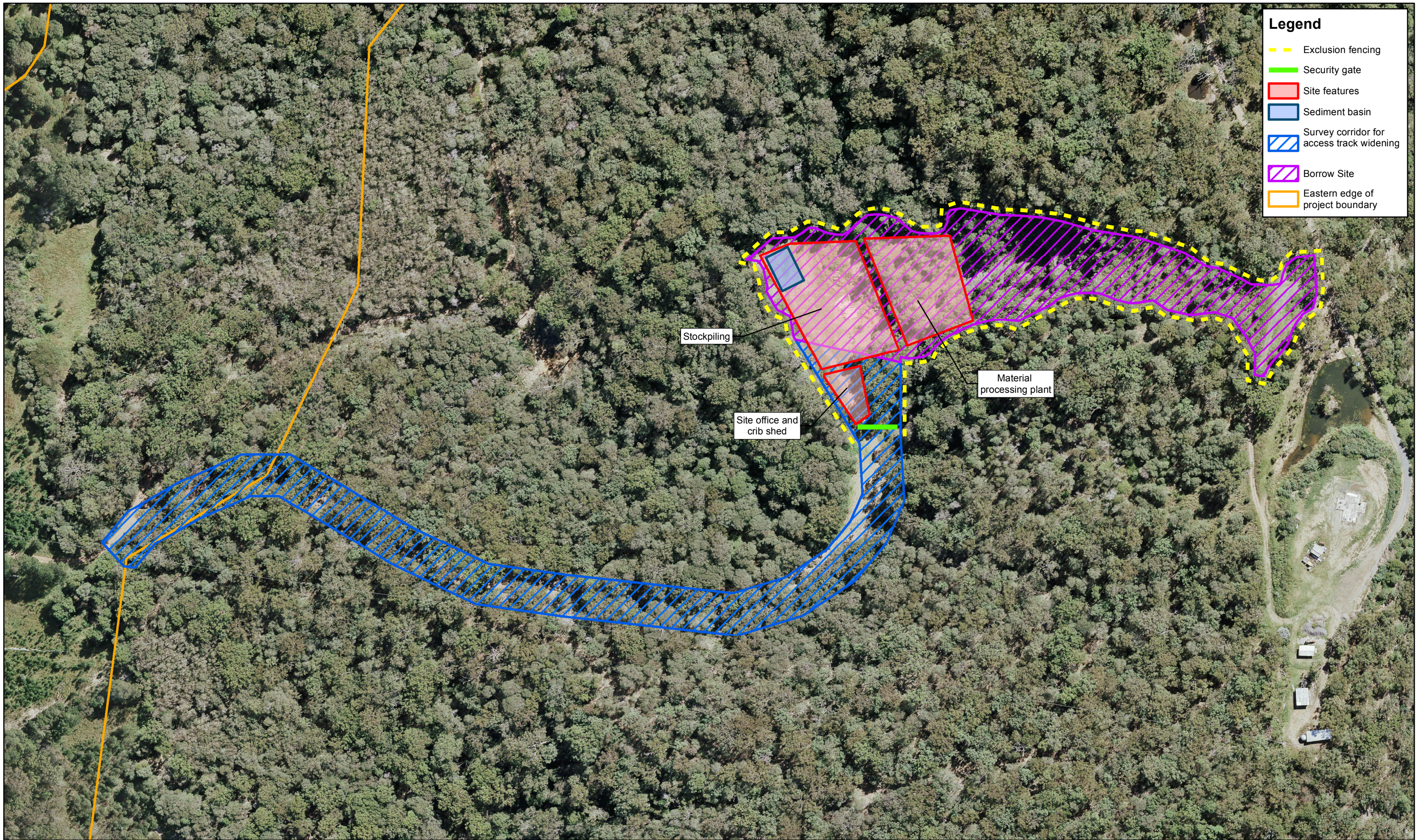
Table 4-1 Plant and equipment to be used and stored at the site

Plant	Equipment
<ul style="list-style-type: none"> • 1 x Drill Rig • 1 x Dozer D11/D9 • 2 x Excavator 22–50 t • 2 x Dump Trucks 30–50 t • 6 x Road Trucks 12–33 t payload • 1 x Jaw Crusher • 1 x Impactor • 1 x Cone • 1 x Reclaimer Screen • 1 x Screen • 2 x Stackers. 	<ul style="list-style-type: none"> • 1 x Pumps • 1 x Generator • 1 x Fuel Storage • 1–2 x Trailers • 2–3 x Shipping Containers • 2 x Tools.

4.5 Chemical and fuel storage details

It is expected that there would be a small amounts of fuel and chemicals stored at the borrow site. Fuel and chemicals expected to be stored at the facility and approximate quantities include:

- Diesel fuel – 5,000 L
- Unleaded fuel – 100 L
- Oils and lubricants – 200 L.



Legend

- Exclusion fencing
- Security gate
- Site features
- Sediment basin
- Survey corridor for access track widening
- Borrow Site
- Eastern edge of project boundary

Stockpiling

Site office and crib shed

Material processing plant

NSW Government
Transport
 Roads & Maritime
 Services

**PACIFIC HIGHWAY
 UPGRADE**

Woolgoolga to Ballina

**Figure 4-1
 INDICATIVE SITE
 LAYOUT FOR
 TYNDALE BORROW
 SITE**

Map 1 of 1

Note: ecology surveys were carried out within the survey corridor to determine the location of threatened species and habitat trees to assist in the design for the widening of the access track. Only the required clearing within the survey corridor will occur.

Note: material processing plant includes the mobile plant and equipment outlined in Table 4-1

Note: fuels and chemicals listed under Section 4.5 will be stored at the site office and crib shed



Scale: 1:2,000 at A3

0 10 20 40 60 80 100 Metres

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Author: GOGANOVSKIM

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5 Environmental impacts of the borrow site

Section 5 outlines the environmental constraints located within and adjacent to the Tyndale Borrow Site. Only relevant environmental constraints have been outlined below. In addition, the impacts associated with the sites activities have been assessed to determine whether they are consistent with the approved project.

5.1 Biodiversity

An ecology survey of the Tyndale Borrow site was carried out on 25 September 2015 (refer to Appendix A). An additional survey was then carried out on 1 and 4 February 2016 to investigate the impacts of widening the existing access track. A corridor with an approximate width of 25 metres was surveyed (refer to Appendix B).

The footprint of the proposed borrow site lies within the void of the previous quarry and is vegetated with early regrowth vegetation including sections of Pink Bloodwood – Tallowwood Moist Open Forest (refer to Appendix A). The vegetation within the borrow site has been assessed as being of 'low ecological value' based on the following criteria:

- No threatened species (flora and fauna)
- No Endangered Ecological Communities (EEC)
- No habitat trees.

The vegetation within the borrow site would be cleared, including approximately 6,800 m² of regrowth Pink Bloodwood – Tallowwood Moist Open Forest.

The vegetation surrounding the borrow site and the existing access track is Pink Bloodwood-Tallowwood moist open forest, considered to be of moderate to high conservation value vegetation/habitat with localised edge effect identified adjacent to the access track. Varying densities of Pink-flowering Lantana (*Lantana camara*) was also identified within and adjacent to the borrow site and access track.

As shown in Appendix A and B, a number of potential *Angophora robur* (*A. robur*) trees and hollow bearing trees occur adjacent to the borrow site and within the surveyed corridor for the access track. *A. robur* is listed as vulnerable under the *Threatened Species Conservation Act (TSC Act)* and *Environmental Protection and Biodiversity Conservation Act (EPBC Act)* and is included in the Threatened Flora Management Plan for the project.

Not all vegetation within the surveyed corridor for the access track requires removal. During the ecology survey, vegetation identified for retention were flagged including *A. robur*, hollow bearing trees and mature trees (>300 mm diameter at chest height). These locations were then surveyed by Pacific Complete on 12 February 2016. A concept design has estimated that approximately 1,800 m² of Pink Bloodwood-Tallowwood Moist Open Forest would be cleared for the widening of the access track and does not require the removal of the vegetation flagged and surveyed for retention. The final clearing amount would be confirmed as part of detailed design.

The contractor would be required to complete the detailed design of the access track noting the environmental constraints identified with respect to retention of vegetation that avoids the removal of *A. robur*, hollow bearing trees and mature trees (>300 mm diameter at chest height). Where feasible other habitat trees including Forest Oak, Tallowwood, Forest Red Gum and Pink Bloodwood trees should be retained. The contractor would be provided with the survey data of vegetation to be retained that was collected by Pacific Complete on 12 February 2016. Prior to works commencing at the site an ecologist and/or arborist would assess the trees proposed for retention (including any potential *A. robur*) to determine the required protection zones in accordance with the Threatened Flora Management Plan and AS 4970-2009 – Protection of trees on development sites. This would be undertaken by the contractor during the detailed design of the access track.

Tallowood is known koala habitat, however no koala droppings/scats were identified during the site inspection and historical records indicate that koala records in proximity to the site are low. In addition, Pacific Complete undertook a search of the NSW Wildlife Atlas and identified three records of koalas within a 5 km radius of the site. The site is located at the North West extremity of an area of potential koala habitat, therefore the proposed activities at the site are considered unlikely to remove, modify, fragment or isolate important habitat for the long-term survival of a local population of koala.

Endangered coastal emus are located within Section 3 and 4 of the project. No emu's were sighted during the surveys carried out at the borrow site and access track. In addition, Pacific Complete undertook a search of the NSW Wildlife Atlas and identified 25 records of emus within a 5 km radius of the site. The borrow site is located outside of the emu connectivity zone outlined in the Coastal Emu Management Plan (RMS, 2015), therefore the proposed activities at the site are considered unlikely to reduce an area of occupancy that would place a viable local Emu population at risk.

Pre-clearing surveys and clearing activities would be carried out in accordance with the approved Pacific Complete Construction Flora and Fauna Management Plan (sections 3 to 11) (CFFMP), Appendix B2 of the CEMP. *A. robur* in the vicinity of the borrow site and access track would be managed in accordance with the approved Threatened Flora Management Plan (RMS, 2015) and the Pacific Complete CFFMP.

All vegetation that requires clearing would be surveyed and recorded and included in the Biodiversity Offset Package for the project.

Biodiversity impacts associated with the borrow site and access track are considered to be consistent with those assessed and approved under the EIS and SPIR. These impacts would be managed in accordance with this borrow site management plan.

As outlined in Section 4.2.3 of the approved Pacific Complete CEMP, contractors would be required to develop project specific environmental management documentation to address the operational control requirements outlined in the Pacific Complete CEMP. This includes the development of a Contractor's Construction Environmental Management Plan (CCEMP) that would be reviewed by Pacific Complete to ensure its compliance with the relevant requirements of the Pacific Complete CEMP.

Management measures identified in this borrow site management plan would be incorporated into site or activity specific Environmental Work Method Statements (EWMS) prepared by the contractor.

5.2 Noise and vibration

Construction noise modelling was undertaken to assess the noise impacts associated with the operation of the Tyndale Borrow Site. Fifteen (15) residential receivers and two commercial receivers were identified within 600 metres of the borrow site. Sensitive receivers surrounding the borrow site were quantitatively assessed for noise impacts from several construction activities including vehicles and loading, material extraction and crushing and screening. Noise impacts are based on a realistic worst-case assessment.

Noise management levels (NML) for the residential and commercial sensitive receivers surrounding the site were determined to be 51 dB and 75 dB respectively, for standard construction hours, and 46 dB for daytime Out of Hours (OOH) for residential receivers.

The results of this modelling, including a contour map, are detailed in Appendix C of this management plan. One residential receiver is predicted to experience exceedances of the NMLs by 1 dB during daytime works. Nineteen (19) residential receivers are anticipated to experience exceedances of up to 6 dB during daytime OOHs works. Exceedances during daytime and daytime OOHs are anticipated only during crushing and screening activities.

No NML exceedances are anticipated for commercial receivers.

The Pacific Complete Construction Noise and Vibration Management Plan (sections 3 to 11) (CNVMP), Appendix B3 of the CEMP outlines general construction noise mitigation and management measures. Where NMLs are expected to be exceeded, the relevant management measures would be implemented where appropriate.

The standard construction hours and daytime OOHs exceedances are not considered to be substantial exceedances. Mitigation measure NV8 in the CNVMP, the establishment of noise shielding, is not anticipated to be required.

Noise impacts associated with the borrow site are considered to be consistent with those assessed and approved under the EIS and SPIR. These impacts would be managed in accordance with this borrow site management plan.

As outlined in Section 4.2.3 of the approved Pacific Complete CEMP, contractors would be required to develop project specific environmental management documentation to address the operational control requirements outlined in the Pacific Complete CEMP. This includes the development of a Contractor's Construction Environmental Management Plan (CCEMP) that would be reviewed by Pacific Complete to ensure its compliance with the relevant requirements of the Pacific Complete CEMP.

Management measures identified in this borrow site management plan would be incorporated into site or activity specific Environmental Work Method Statements (EWMS) prepared by the contractor.

5.2.1 Cumulative noise assessment

Cumulative noise modelling was undertaken to assess the cumulative impacts of the mainline construction and the Tyndale Borrow Site. Mainline construction activities used for the modelling were extracted from the Pacific Complete Construction Noise and Vibration Management Plan (CNVMP).

Daytime NMLs are predicted to be exceeded at some residential receivers during some combinations of the borrow site activities and mainline construction. The assessment determined that the mainline construction is the dominant noise source where larger exceedances are predicted. Where NMLs are expected to be exceeded, management measures from the CNVMP shall be implemented where applicable.

Noise impacts associated with the borrow site are considered to be consistent with those assessed and approved under the EIS and SPIR. These impacts would be managed in accordance with this borrow site management plan.

As outlined in Section 4.2.3 of the approved Pacific Complete CEMP, contractors would be required to develop project specific environmental management documentation to address the operational control requirements outlined in the Pacific Complete CEMP. This includes the development of a Contractor's Construction Environmental Management Plan (CCEMP) that would be reviewed by Pacific Complete to ensure its compliance with the relevant requirements of the Pacific Complete CEMP.

Management measures identified in this borrow site management plan would be incorporated into site or activity specific Environmental Work Method Statements (EWMS) prepared by the contractor.

5.2.2 Vibration

The plant and equipment anticipated to be used at the Tyndale Borrow Site are not considered to be vibration intensive items. Vibration impacts from plant and equipment are therefore considered to be negligible.

5.2.3 Blasting

All blasts would be planned, executed and monitored in accordance with the Blast Management Procedure, Appendix B of the CNVMP to and would ensure the overpressure and vibration limits outlined in McoA B22 and B23 are not exceeded. This would be achieved through the preparation of a site specific blast management plan prior to each blast which would be prepared by the contractor and approved by Pacific Complete. The blast management plan would address the required ground vibration limits.

5.3 Visual

Due to the elevation of the site, there may be some minor localised visual impacts. The footprint for the borrow site lies within the void of the quarry. The majority of the excavation works would occur within the quarry extents, therefore these activities are unlikely to be visible. The dense vegetation surrounding the site, and the distance of the site from the existing highway and township of Tyndale, is anticipated to further limit its visibility from the existing highway, the new highway alignment and sensitive receivers. The widening of the access track may cause some visual impacts, however due to the distance between receivers and the site, these impacts are considered to be minor.

The closest sensitive receivers, excluding the land owner who does not reside at the property, are located more than 450 metres from the borrow site, with the majority of these located on the western side of the new highway alignment. Substantial clearing would be required for the new highway alignment, however more than 200 metres of vegetation would remain between the new highway alignment and the borrow site.

The majority of the visual impacts of the site would be from vehicles entering and exiting the site along the access track and potential dust generated from blasting, excavation activities, crushing and screening activities, vehicle movements and emissions.

Visual impacts associated with the borrow site are considered to be consistent with those assessed and approved under the EIS and SPIR. These impacts would be managed in accordance with this borrow site management plan.

As outlined in Section 4.2.3 of the approved Pacific Complete CEMP, contractors would be required to develop project specific environmental management documentation to address the operational control requirements outlined in the Pacific Complete CEMP. This includes the development of a Contractor's Construction Environmental Management Plan (CCEMP) that would be reviewed by Pacific Complete to ensure its compliance with the relevant requirements of the Pacific Complete CEMP.

Management measures identified in this borrow site management plan would be incorporated into site or activity specific Environmental Work Method Statements (EWMS) prepared by the contractor.

5.4 Geology, soils and water

The Clarence-Moreton Basin is an extensive sedimentary basin in north-east New South Wales and southern Queensland and is the main geological feature in the region. The borrow site is located on Kangaroo Creek Sandstone which would be extracted from the site.

The borrow site is located at an elevation ranging from 65 to 120 AHD on the western facing slope of Bondi Hill. Two groundwater systems are located at the site, a shallow perched groundwater system and a deep regional groundwater system. The activities at the site are unlikely to impact these groundwater systems. The excavations at the site are not anticipated to intercept the deep groundwater table as it is considered to be located below the proposed floor of the borrow pit. The perched groundwater system is sustained by rainfall recharge and not connected to the deep regional groundwater system. The excavations at the site are unlikely to interfere with the perched system (any more than the existing pit) and hence the

perched system would continue to support the vegetation adjacent to the site. The proposed borrow site activities are therefore not anticipated to have a meaningful impact on groundwater levels, water quality or existing groundwater users in the area (refer to Appendix D).

A number of drainage lines flow parallel to the borrow site, as shown in Appendix A and B, and drain into the Clarence River South Arm, located approximately 730 metres north-west of the site. One of these waterways crosses the access track towards the bottom of the hill that leads to the borrow site. This waterway would be maintained during the widening of the access track and the use of the borrow site in accordance with the approved Pacific Complete Construction Soil and Water Quality Management Plan (sections 3 to 11), (CSWMP), Appendix B4 of the CEMP. The site is outside the 20 year ARI flood level and is not identified as being at risk to acid sulphate soils, according to the EIS.

In flow of surface water runoff into the borrow site void is not anticipated due to the surrounding topography. Rainfall that falls directly into the site is not expected to impact on quarrying activities. A sump would be established within the borrow site to facilitate the management of rainwater. This water would be collected and used for construction purposes such as dust suppression and material processing (crushing and screening). Any collected water would not be discharged from the borrow site, however should the need arise permission would be required from the Pacific Complete Environment Manager and would be carried out in accordance with the projects Environment Protection Licence. If additional water is required for site activities, this would be supplied from the construction corridor (i.e. sediment basins along the alignment).

Additional soil and water management measures would be implemented in accordance with Volume 2E of the Blue Book which covers soil and water management for mines and quarries.

Geology, soil and water impacts associated with the borrow site are considered to be consistent with those assessed and approved under the EIS and SPIR. These impacts would be managed in accordance with this borrow site management plan.

As outlined in Section 4.2.3 of the approved Pacific Complete CEMP, contractors would be required to develop project specific environmental management documentation to address the operational control requirements outlined in the Pacific Complete CEMP. This includes the development of a Contractor's Construction Environmental Management Plan (CCEMP) that would be reviewed by Pacific Complete to ensure its compliance with the relevant requirements of the Pacific Complete CEMP.

Management measures identified in this borrow site management plan would be incorporated into site or activity specific Environmental Work Method Statements (EWMS) prepared by the contractor.

5.5 Heritage

5.5.1 Aboriginal

No Aboriginal objects or places were identified within or adjacent to the borrow site and access track, therefore no impacts to Aboriginal heritage are anticipated during the use of the site (refer to Appendix E). If unidentified Aboriginal materials, features and/or deposits are found, the Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds, Appendix B of the approved Pacific Complete Construction Heritage Management Plan (sections 3 to 11) (CHMP), would be implemented.

5.5.2 Non-Aboriginal

No items of heritage significance were identified within or adjacent to the borrow site and access track, therefore no impacts to non-Aboriginal heritage are anticipated during the use of the site (refer to Appendix F). If unidentified non-Aboriginal materials, features and/or deposits are found, the Roads and Maritime Standard Management Procedure: Unexpected

Archaeological Finds, Appendix B of the approved Pacific Complete Construction Heritage Management Plan (sections 3 to 11) (CHMP), would be implemented.

5.6 Air quality

Activities at the borrow site that may impact on air quality include excavation activities, blasting, crushing and screening activities, vehicles movements within the borrow site as well along the access track and associated emissions. The closest receivers are more than 450 metres from the site, therefore impacts on air quality are anticipated to be minimal. These impacts are considered to be consistent with those assessed under the EIS and SPIR.

To assist in monitoring the sites impact on air quality, a dust deposition gauge would be established at the borrow site and monitored in accordance with the dust deposition gauge procedure, Appendix B of the approved Pacific Complete Construction Air Quality Management Plan (sections 3 to 11) (CAQMP).

5.7 Traffic, transport and access

The borrow site would be accessed from the existing Pacific Highway at chainage 67450, along the newly constructed on ramp, onto the realigned Bensons Lane and then onto the modified existing borrow site access track, as shown in Figure 3-1. Incidental traffic may also access the site from Sheehy's Lane until the newly formed intersection from the Pacific Highway has been constructed. This incidental traffic would not include heavy vehicle movements.

Once extracted, the rock would be processed using crushing and screening techniques to produce the required material for the project. This process would be conducted at the borrow site and/or within the construction corridor. Material would be stockpiled at the borrow site, within the construction corridor, at the Tyndale Ancillary Facility or other ancillary facilities approved for stockpiles prior to being transported for use on the project.

The excavated material would be used mainly in Portion A and B of the project, however some excess material may be transported further north to other portions of the project if other borrow sites cannot provide the required material. The majority of the material would be transported via the construction corridor, or where required, material may also be transported via the existing highway.

It is estimated that the truck movements would reach up to 400 truck movements per day at peak production times. However, it is anticipated that on average these truck movements would be lower. The impacts to the local road network are expected to be minimal due to the majority of traffic movements occurring along the access road and construction corridor. Extracted material would not be transported along Sheehys Lane or through the streets of Tyndale so as to reduce noise and visual impacts to sensitive receivers.

Traffic impacts associated with the borrow site are considered to be consistent with those assessed and approved under the EIS and SPIR. These impacts would be managed in accordance with this borrow site management plan.

As outlined in Section 4.2.3 of the approved Pacific Complete CEMP, contractors would be required to develop project specific environmental management documentation to address the operational control requirements outlined in the Pacific Complete CEMP. This includes the development of a Contractor's Construction Environmental Management Plan (CCEMP) that would be reviewed by Pacific Complete to ensure its compliance with the relevant requirements of the Pacific Complete CEMP.

Management measures identified in this borrow site management plan would be incorporated into site or activity specific Environmental Work Method Statements (EWMS) prepared by the contractor.

6 Management and mitigation

A range of environmental requirements and control measures are identified in the various environmental documents, including additional mitigation measures included in the Submission/Preferred Infrastructure Report (November 2013)(SPIR), the Conditions of Approval and additional studies conducted post approval of the SPIR. The Tyndale Borrow Site would be established, operated, maintained and decommissioned in accordance with the requirements included in the Pacific Complete Construction Environmental Management Plan and sub-plans.

As outlined in Section 4.2.3 of the approved Pacific Complete CEMP, contractors will be required to develop project specific environmental management documentation to address the operational control requirements outlined in the Pacific Complete CEMP. This includes the development of a Contractor's Construction Environmental Management Plan (CCEMP) that will be reviewed by Pacific Complete to ensure its compliance with the relevant requirements of the Pacific Complete CEMP.

In accordance with the Project CEMP an Environmental Work Method Statement would be developed by the contractor for the Tyndale Borrow Site. Management measures identified in this borrow site management plan would be incorporated into site or activity specific Environmental Work Method Statements (EWMS) prepared by the contractor.

Specific measures and requirements to address environmental impacts from the Tyndale Borrow Site that are not included in the approved CEMP documentation are listed in Table 6-1 below.

Table 6-1 Site specific mitigation measures additional to the CEMP

	Measure/Requirement	Responsibility	Timing/frequency	Reference
GENERAL				
TBS 1	The applicant shall ensure that material extracted from the borrow sites established for the SSI (i.e. project), is only used for the construction of the SSI subject to this approval, and no other sections of the Pacific Highway or other works.	Pacific Complete Construction Personnel Contractor Project Engineer	Pre-construction Construction	McoA B79
TBS 2	Temporary security fencing will be installed at the site to restrict access to working areas of the borrow site. An appropriate security gate will be established to prevent public access.	Pacific Complete Site Environment Officer Project Contractor's Environment Representative/ Project Engineer	Construction	Good practice

	Measure/Requirement	Responsibility	Timing/ frequency	Reference
SOIL, SEDIMENT AND WATER				
TBS 3	An erosion and sediment control plan (ESCP) for both the borrow site and access track will be prepared by the contractor prior to the works commencing.	Project Contractor's Project Engineer/ Foreman/ Environment Representative	Pre-construction	CEMP, G38
TBS4	Prior to the commencement of extraction activities, Pacific Complete will undertake a contamination assessment as per Appendix B (Procedure to Assess Potential Contaminated Sites) of the approved Pacific Complete Construction Contaminated Land Management Plan (sections 3 to 11) (CCLMP), Appendix B8 of the CEMP.	Pacific Complete Construction Personnel	Pre-construction	Construction Contaminated Land Management Plan
TBS 5	The unnamed waterway that crosses the access track will be maintained during the widening of the access track and throughout the use of the borrow site in accordance with the approved Pacific Complete Construction Soil and Water Quality Management Plan (sections 3 to 11) (CSWMP), Appendix B4 of the CEMP.	Project Contractor's Project Engineer/ Foreman/ Environment Representative	Construction	Good practice
TBS 6	If excavation works at the site encounter a permanent water table in the bedrock sandstone to a depth in excess of 5m, review and management measures will be considered, and these would include re-evaluation of the groundwater impact, return of captured water (inflows) to local drainages after treatment in an appropriate sedimentation pond (to capture suspended solids) or ceasing excavation below the -5m mark. These management measures will be implemented in accordance with the project approvals and the approved Pacific Complete Construction Soil and Water Quality Management Plan (sections 3 to 11) (CWQMP), Appendix B4 of the CEMP.	Project Contractor's Project Engineer/ Foreman/ Environment Representative	Construction	Groundwater memorandum
BIODIVERSITY				
TBS 7	Threatened species and habitat trees located adjacent to the track will be identified and exclusion zones set up if required.	Pacific Complete Site Environment Officer Project Contractor's	Pre-construction	FFMP, TFMP

Measure/Requirement		Responsibility	Timing/ frequency	Reference
		Environment Representative		
TBS 8	<p>Exclusion fencing will be installed at the borrow site prior to the commencement of construction and maintained during operation with the objectives of:</p> <ul style="list-style-type: none"> • Delineating areas to be retained and cleared as part of the borrow site activities • Preventing disturbance and impacts to adjacent areas of existing vegetation • Preventing construction activities from impacting on retained vegetation, hollow bearing trees, and the root zones of such trees. 	Project Contractor's Project Engineer/ Environment Representative	Pre-construction	Ecology Assessment (Appendix A and B)
TBS 9	Exclusion fencing will be installed to delineate the clearing and access road widening construction footprint prior to commencement of clearing.	Project Contractor's Project Engineer/ Environment Representative	Pre-construction	Ecology Assessment (Appendix B)
TBS 10	Tree protection zones and associated no-go barriers will be installed around any hollow-bearing trees in close proximity to the works to prevent any impacts to the root zones of such trees.	Pacific Complete Site Environment Officer Project Contractor's Environment Representative/ Project Engineer	Pre-construction	Ecology Assessment (Appendix A)
TBS 11	<p>The final design of the access road will be designed to allow for the retention of:</p> <ul style="list-style-type: none"> • All potential <i>Angohora robur</i> (<i>A. robur</i>) trees (unless determined through genetic testing not to be <i>A. robur</i>). • All hollow-bearing trees. • Mature trees >300 mm in diameter at chest height. <p>Where feasible Forest oak, Tallowwood, Forest Red Gum and Pink Bloodwood trees should be retained.</p> <p>A concept design has estimated that approximately 1,800 m² of Pink Bloodwood-Tallowwood Moist Open Forest would be cleared for the widening of the access track and does not require the removal of the vegetation flagged and surveyed for retention.</p>	Pacific Complete Construction Personnel Project Contractor Project Engineer	Pre-construction	Ecology Assessment (Appendix B)

	Measure/Requirement	Responsibility	Timing/ frequency	Reference
	Any additional clearing impacts identified during the detailed design and/or construction will be reviewed by Pacific Complete and will require approval from the Secretary.			
TBS 12	Prior to works commencing at the site an ecologist and/or arborist will assess the trees proposed for retention (including any potential <i>Angophora robur</i>) to determine the required protection zones in accordance with the Threatened Flora Management Plan and AS 4970-2009 – Protection of trees on development sites. This will be undertaken by the contractor during the detailed design of the access track.	Project Contractor's Environment Representative/ Project Engineer/Foreman	Pre-construction	Good practice
TBS 13	The speed limit along the access track will be limited to a maximum of 20 km/h to minimise dust impacts on threatened flora species.	Project Contractor's Environment Representative/ Project Engineer/Foreman	Construction	Ecology Assessment (Appendix B)
TBS 14	Bush rock within the road widening footprint will be gently placed into adjacent retained vegetation in accordance with the Roads and Maritime Biodiversity Guidelines.	Project Contractors Environmental Representative Project Contractors Foreman	Construction	Ecology Assessment (Appendix B)
TBS 15	Clearing, including pre-clearing surveys, will be carried out in accordance with the approved Pacific Complete Construction Flora and Fauna Management Plan (sections 3 to 11) (CFFMP), Appendix B2 of the CEMP.	Project Contractors Environmental Representative/ Project Engineer/ Foreman	Construction	Construction Flora and Fauna Management Plan

	Measure/Requirement	Responsibility	Timing/ frequency	Reference
TBS 16	<p>Daily pre-start meetings will be conducted to maintain awareness of the potential presence of emus in the area and to report emu sightings/ finds from the previous day. Emu awareness signs will be erected along the access track to increase driver awareness for the potential of emus in the area.</p> <p>Workers on site to actively note and report emu sightings daily by recording number and location of emus on map to be provided. Important to identify time and date, and number of birds including which side of the construction corridor emus sighted. These recordings must be provided to Pacific Complete, who will forward the information to the specialist engaged to undertake emu monitoring for the project.</p>	<p>Pacific Complete Site Environment Officer</p> <p>Project Contractors Environmental Representative/ Project Engineer/ Foreman</p>	Construction	Emu Management Plan (RMS, 2015)
TBS 17	If emus continue to enter the borrow site or access track on a regular basis (three or more observations in a day), the contractor must consult with Pacific Complete/ Roads and Maritime and EPA to assess the risk to emus and consider establishing a temporary fence, or reduced speed limits.	<p>Project Contractors Environmental Representative/ Project Engineer/ Foreman</p>	Construction	Emu Management Plan (RMS, 2015)
TBS 18	The Unexpected Threatened Species/ EEC Procedure, Appendix O of the approved Pacific Complete Flora and Fauna Management Plan, will be implemented if an emu is encountered.	<p>Project Contractors Environmental Representative/ Project Engineer/ Foreman</p>	Construction	Emu Management Plan (RMS, 2015)
Pests and disease				
TBS 19	Weed control measures outlined in the Noxious Weed and Pathogen Management Plan, Appendix P of the approved Pacific Complete Construction Flora and Fauna Management Plan (sections 3 to 11) (CFFMP), will be applied for the control of Lantana and any other noxious weed or pathogen found on site.	<p>Project Contractor's Environment Representative/ Project Engineer</p>	Construction	Ecology Assessment (Appendix A and B)
TBS 20	All plant and equipment brought to site should be clean and free of soil and potential weed propagules prior to being brought to the site to prevent the spread of weeds.	<p>Project Contractor's Environment Representative/ Project Engineer</p>	Construction	Ecology Assessment (Appendix A and B)

	Measure/Requirement	Responsibility	Timing/ frequency	Reference
NOISE AND VIBRATION				
TBS 21	Relevant noise management and mitigation measures from the Pacific Complete CNVMP will be implemented where NMLs are expected to be exceeded.	Pacific Complete Construction Personnel Project Contractor's Environment Representative/ Project Engineer/ Foreman	Construction	Noise assessment
TBS 22	The construction contractor will prepare detailed site specific blast management plans prior to each blast in accordance with the Blast Management Procedure, Appendix B of the approved Pacific Complete Construction Noise and Vibration Management Plan (sections 3 to 11) (CNVMP).	Pacific Complete Construction Personnel Project Contractor's Environment Representative/ Project Engineer/ Foreman	Construction	Pacific Complete CNVMP
TRANSPORT AND ACCESS				
TBS 23	Extracted material will not be transported along Sheehys Lane or through the streets of Tyndale to reduce noise and visual impacts to sensitive receivers.	Project Contractor's Environment Representative/ Project Engineer	Construction	Good practice
REHABILITATION				
TBS 24	Any topsoil from the borrow site will be stockpiled separately and reused in the rehabilitation of the borrow site.	Pacific Complete Site Environment Officer Project Contractor's Environment	Construction	Ecology Assessment (Appendix A)

	Measure/Requirement	Responsibility	Timing/ frequency	Reference
		Representative/ Project Engineer		
TBS 25	Future access arrangements to the property after the borrow site activities and rehabilitation has occurred will be determined in consultation with the property owner.	Project Contractor's Environment Representative/ Project Engineer	Post-construction	Good practice
TBS 26	Mulch used for rehabilitation will be sourced from the clearing of similar vegetation, for example mulch from the access track clearing, to reduce the introduction of weeds or pathogens as well as species that are not endemic to the area.	Pacific Complete Environment Manager Project Contractor's Environment Representative/ Project Engineer	Post-construction	Good practice

7 Consultation

7.1 Sensitive receivers

A community information session was held in Tyndale on Tuesday 12 April 2016 to provide an update on the Woolgoolga to Ballina upgrade and an opportunity for residents and business owners to learn more about the project, ask questions and provide feedback. The Tyndale Borrow Site was raised at this meeting and copies of a notification letter and feedback form were provided (refer to Appendix G). Twenty three (23) people attended this meeting.

A letter and feedback form on the proposed Tyndale Borrow Site was also distributed by letterbox drop on Thursday 14 April 2016 to over 40 residents within Tyndale. Residents were given until 26 April 2016 to respond.

Eight responses to the proposal were received, six written and two verbal responses. Appendix H details the community feedback received and Pacific Complete's responses. Pacific Complete would provide a written response to each submission received.

In accordance with SPIR mitigation measure CNV21, a minimum of 24 hours' notice would be provided to all residences located within 500 metres of any blast, including an indication of blasting times and a contact name and telephone number.

7.2 Government agencies

EPA, OEH and DPI (Fisheries) were provided with a briefing memo describing the location and proposed activities that would be carried out at the proposed borrow site. Their comments have been considered and incorporated into this management plan where required.

8 Rehabilitation

8.1 Existing landscape

The Tyndale Borrow Site is located in a rural landscape, east of the township of Tyndale. The site is positioned on the westerly facing slope of Bondi Hill surrounded predominately by Pink Bloodwood – Tallowwood moist open forest. *Angophora robur* (A. robur), also known as Sandstone Rough-barked Apple, a species listed as vulnerable under the TSC Act and EPBC Act, occurs within the vegetation surrounding the site. Due to the historical use of the site as a quarry, the vegetation within the footprint of the site is considered to be regrowth of Pink Bloodwood-Tallowwood moist open forest and of low ecological value.

The direct surroundings of the borrow site consists of dense forest. Other land uses in the area include rural residential, residential and agricultural land including sugar cane and grazing. Majority of these land uses are located to the west of the site. The township of Tyndale consists of dwellings that front onto the existing highway and local streets at the base of the ridge line that includes Bondi Hill. Some of these dwellings are located on elevated land overlooking the South Arm River and the extensive Clarence River floodplain. Drainage lines from Bondi Hill flow west towards the Clarence River floodplain via relatively straight creeks that become modified cane drains on the floodplain.

8.2 Visual impacts

As outlined in Section 5.7, the visual impacts of the site during operation are considered to be minor. Once the operation of the site has ceased, it is anticipated that the site would not be visible from receivers, similarly to its current state as a disused quarry, due to the dense surrounding forest. The site would be returned to the owner and only occasional private use of the access track is anticipated.

8.3 Rehabilitation

The landowner has requested that the borrow site be left as a water storage pond. Due to the surrounding forest, it is anticipated that this land feature would not be visible from the existing highway, the new highway alignment or sensitive receivers.

Due to the strength of the primary rock, steep (near vertical) walls would remain with 2 metre benches. The design of the benches would be in accordance with relevant guidelines and legislation. Disturbed flat areas would be landscaped with topsoil and mulch to foster an environment where natural revegetation can occur from seeds dispersed from the surrounding vegetation. It is anticipated that natural regeneration would occur at the site over a few years. The rate of regeneration would be dependent on climatic factors such as rainfall, seasonal temperatures and bushfires that can influence the rate of regeneration. Figure 8-1 provides a cross section of the final landform that would exist post excavation. A 3D image of the borrow site post excavation can also be found in Appendix I.

Access restrictions to the property and borrow area would be determined in consultation with the property landowner prior to completion of activities on site.

Soil/ overburden stripped from the site before excavation would be stockpiled onsite or at a nearby ancillary facility for reuse during rehabilitation. The mulch used for rehabilitation would be sourced from the clearing of similar vegetation to reduce the introduction of weeds or pathogens as well as species that are not endemic to the area.

There is the potential for the site to be partially backfilled with excess spoil material from the project. Quantities available for backfill are currently unknown and the cut and fill balance for the project would continually be updated during the detailed design phase. Any backfilling would only be up to the current ground level of the quarry, not the ground level that existed prior to the site being used as a quarry.

Material identified for backfilling would be managed in accordance with the following documents as outlined in the approved Pacific Complete Construction Waste, Resource and Energy Management Plan (sections 3 to 11) (CWREMP), Appendix B7 of the Construction Environmental Management Plan:

- Excavated Natural Material Exemption 2014 (EPA, 2014)
- Guidelines on Resource Recovery Exemptions – Land Application of Waste Materials as Fill (2011, DECCW).

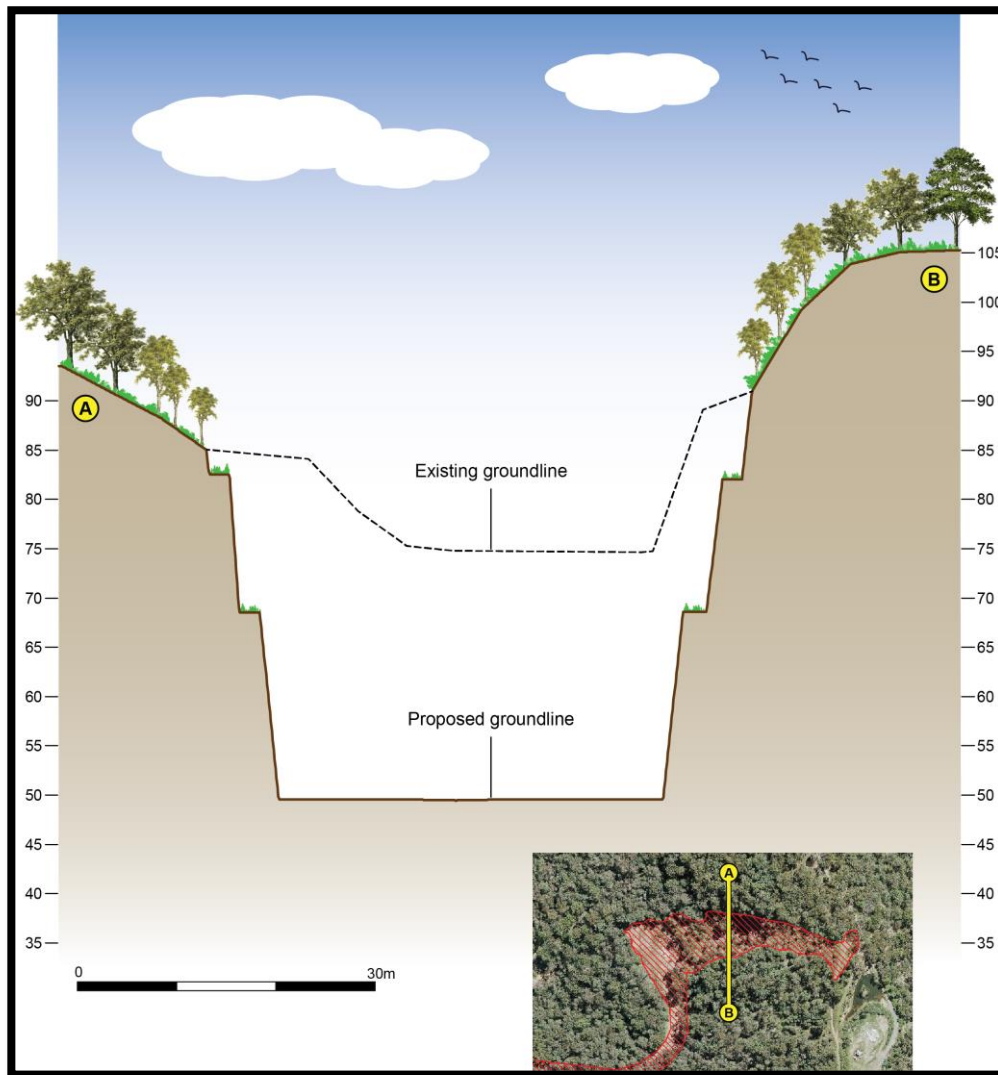


Figure 8-1 Indicative cross section of Tyndale Borrow Site

9 Review and improvement

9.1 Continuous improvement

Continuous improvement of this plan would be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process would be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventive actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

9.2 Borrow Site Management Plan update and amendment

The processes described in Chapter 8 and Chapter 9 of the CEMP may result in the need to update or revise this plan. These updates would occur as required.

Any revisions to the Tyndale Borrow Site Management Plan would be in accordance with the process outlined in Section 1.6 of the CEMP.

A copy of the updated plan and changes would be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 10.2 of the CEMP.

Appendix A Tyndale Borrow Site Ecological Investigation

30 September 2015
Ref No.: 2550-1014

Pacific Complete
17-19 Prince Street
GRAFTON NSW 2460

Attention: Mr Kenny Frain

W2B Section 3 Tyndale Borrow Site Ecological Investigation

1. Introduction

GeoLINK has been engaged by Pacific Complete to undertake an ecological investigation for a potential borrow site at Tyndale. The site is located on private property adjacent (east) to a portion of the approved Woolgoolga to Ballina (W2B) Pacific Highway upgrade. The location of the site is shown in **Illustration 1**. Parts of the site have been subject to past disturbance associated with quarrying activities.

The purpose of this assessment is to provide a preliminary investigation of the site to determine ecological values of the site and determine if any parts of the proposed borrow site are located within 'low value ecological areas'. Based on a review of the W2B project approval, for the purposes of this report 'low ecological value' is defined as satisfying the following criteria:

- No threatened species (flora or fauna);
- No Endangered Ecological Communities (EECs); and
- No habitat trees (HBTs).

The findings of this report will be used to refine the proposal and assess its viability. It should be noted that as this proposal is in the process of being developed, this report does not provide a legislative impact assessment for the proposal.

2. Methodology

This assessment included the following:

- A desktop review of relevant background ecological information including:
 - The W2B EIS and associated ecological studies.
 - GIS analysis including review of the following GIS layers: aerial photograph, topographic map and NSW Office of Environment and Heritage (OEH) Key Habitat and Wildlife Corridors mapping.
 - The BioNet Atlas of NSW Wildlife database for records of *Threatened Species Conservation Act 1995* (TSC Act) and/ or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened flora and fauna species and endangered populations recorded within a 10 km² area around the site (OEH 2015).

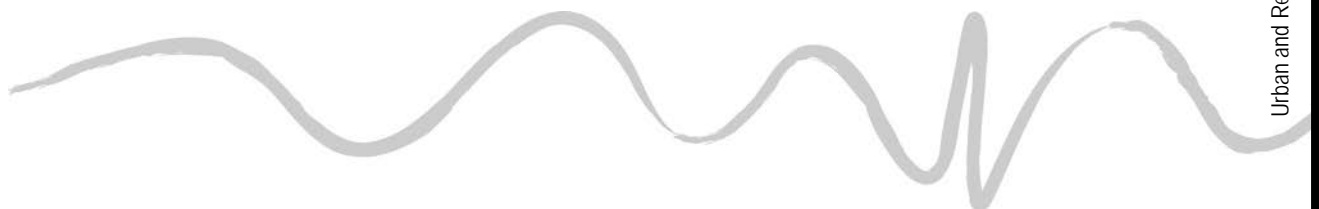
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- The Department of Environment (DoE) Protected Matters Online Search Tool (DoE 2015) for records of EPBC Act listed threatened species, communities or species habitat likely to occur within a 10 km radius (i.e. ~315 km²) of the site.
- The OEH's Critical Habitat Register.
- Field survey involving six person hours of meander transects searching for threatened flora, identifying vegetation communities and identifying key threatened fauna habitat features surrounding the site. The survey was undertaken on 25 September 2015 by ecologist, David Havilah, within the site area defined in **Illustration 1**.

3. Results – Desktop Assessment

Critical Habitat Register

Review of the OEH Critical habitat register (30/09/2015) found no areas of critical habitat relevant to the Proposal.

Important Populations

One important population was identified as occurring associated with the site namely, the Endangered Coastal Emu Population. This population comprises three sub-populations, one of which is centered on Yuraygir National Park and surrounds on the southern side of the Clarence River, estimated at between 80 and 120 individuals. The site overlaps with the potential distribution of this population.

OEH Key Habitats and Wildlife Corridors Mapping

The site does not occur within a mapped OEH Wildlife Corridor or key habitat although it does occur as part of a larger forested habitat area which would provide linkages for local flora/ fauna species to disperse within the locality.

Threatened Flora

A list of potentially occurring threatened flora species (as determined from database searches) was refined based on habitat types present within the project site to create a list of target threatened flora species for the site. The following four species were considered to have some potential to occur at the site:

- Sandstone Rough-barked Apple (*Angophora robur*).
- Basket Fern (*Drynaria rigida*).
- Bordered Guinea Flower (*Hibbertia marginata*).
- Slender Screw Fern (*Lindsaea incisa*).

Threatened Fauna

The W2B EA confirmed the following three threatened fauna records occurring in proximity to the site:

- Squirrel Glider (*Petaurus norfolcensis*).
- Brush-tailed Phascogale (*Phascogale tapoatafa*).
- Grey-headed Flying Fox (*Pteropus poliocephalus*).

In addition another 12 threatened fauna species are considered to be potential occurrences at the site based on the results of database searches and habitat types present at the site. Further details of habitat for these species associated with the site are included in **Section 4**.

Migratory Species

Ten migratory species listed under the EPBC Act were identified for the search area by the Protected Matters Search Tool (DoE 2015). One is listed as a migratory marine species, five are listed as migratory terrestrial species and four are listed as migratory wetland species.

4. Results – Field Survey

Flora

The following biometric vegetation communities were identified associated with the site:

- Pink Bloodwood – Tallowwood Moist Open Forest.
- Paperbark Swamp Forest.
- Swamp Mahogany Swamp Forest.

The site comprises both early stage – native regenerating sclerophyll forest, occurring in and immediately adjacent to the footprint of an existing quarry and more mature sclerophyll forest associated with areas around the quarry and its accesses.

Early stage regenerating vegetation comprises juvenile Tallowwood (*Eucalyptus microcorys*), Pink Bloodwood (*Corymbia gummifera*) and White Mahogany (*Eucalyptus acmenioides*) trees with regenerating *Acacia disparrima*. Areas of Blady Grass, introduced grasses and weeds such as Pink Flowering Lantana (*Lantana camara*) occur in association with early stage native regenerating vegetation. Examples of areas comprising early stage regeneration at the site are shown in **Plates 1** and **2** below.



Plate 1 Early stage regrowth vegetation occurring within existing quarry footprint



Plate 2 Regrowth Acacia and Tallowwood on existing quarry site

Areas surrounding the existing quarry disturbance area comprise predominantly *Pink Bloodwood – Tallowwood Moist Open Forest* including mature Tallowwood, Pink Bloodwood and White Mahogany trees in the canopy (refer to **Plate 4**). Additionally, mature Angophora trees occur as part of this community on the upper slopes of the site (refer to **Plate 3**). Both the threatened Sandstone Rough-barked Apple and similar *Angophora subvelutina* are known to occur in proximity to the site. Due to the lack of reproductive material on Angophora trees at the time of survey confirmation of this species was not possible. Further surveys would be required at an appropriate time of year to confirm the classification of Angophora trees at the site.

At lower elevations of the site, the more moisture dependent communities of Paperbark Swamp Forest (dominated largely by *Melaleuca quinkenervia*) and Swamp Mahogany Swamp Forest (dominated by *Eucalyptus robusta* and *Melaleuca quinkenervia*) occur.

Vegetation mapping for the site is included as **Illustration 1**.



Plate 3 Potential threatened Sandstone Rough-barked Apple occurring at the site



Plate 4 Example of more mature Pink Bloodwood Moist open Forest

EECs

The following vegetation types identified at the site conform to the definition of the EEC of *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions*:

- Paperbark Swamp Forest.
- Swamp Mahogany Swamp Forest.

Threatened Flora

No threatened flora species were confirmed occurrences at the site. As mentioned, a number of *Angophora* trees were identified within more mature vegetation present at the site. Both the threatened Sandstone Rough-barked Apple (*Angophora robur*) and similar *Angophora subvelutina* are known to occur in proximity to the site. Due to the lack of reproductive material on *Angophora* trees at the time of survey confirmation of this species was not possible. Further surveys would be required at an appropriate time of year to confirm the classification of *Angophora* trees at the site. The location of potential *Angophora robur* trees at the site are shown in **Illustration 1**.

Angophora robur is listed as vulnerable under the NSW TSC Act 1995 and the Commonwealth EPBC Act 1999.

Noxious Weeds

A number of occurrences of Pink-flowering Lantana (*Lantana camara*) occur at the site. Lantana is listed as a noxious weed (N4) under the Noxious Weeds Act. Under this Act, *the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.*

Fauna

The study area supports the following key fauna habitat features:

- Hollow-bearing trees with various sized cavities occur in the general area and provide suitable roosting, nesting and denning resources for a range of hollow obligate fauna (including small mammals, microbats and large forest owls).
- Flowering eucalypts provide nectar resource for nectivorous species such as birds and arboreal mammals. The nectar also attracts insects which in turn provide food for insectivores such as microchiropteran bats and birds.
- Rock outcrops and boulders are common and provide sheltering opportunities for reptiles and mammals. They also provide potential latrine sites for the Spotted-tailed Quoll (*Dasyurus maculatus maculatus*).
- Fallen timbers of varying stage of decay are common throughout the broader study area. These features provide good foraging habitat for invertebrate prey, as well as shelter for terrestrial reptiles and small mammals.
- Primary Koala food trees (Tallowwood) are present through much of the site forested parts of the site.
- The vegetation within the study area forms part of an extensive area of forest/ woodland occurring locally. It includes a mosaic of vegetative structures (e.g. varying density strata layers with grassy to heathy understoreys) and varying topographical features such as rock outcrops, steep slopes and protected gullies. Collectively the broader landscape supports an array of fauna habitat features for broad forest/ woodland fauna assemblages.

Threatened Fauna

The following threatened fauna species are considered to have some potential to occur at the site:

- Squirrel Glider (*Petaurus norfolcensis*).
- Brush-tailed Phascogale (*Phascogale tapoatafa*).
- Grey-headed Flying Fox (*Pteropus poliocephalus*).
- Barking Owl (*Ninox connivens*).
- Powerful Owl (*Ninox strenua*).
- Masked Owl (*Tyto novaehollandiae*).
- Brown Treecreeper (*Climacteris picumnus*).
- Grey-crowned Babbler (*Pomatostomus temporalis*).
- Little Lorikeet (*Glossopsitta pusilla*).
- Glossy Black Cockatoo (*Calyptorhynchus lathamii*).
- Regent Honeyeater (*Anthochaera Phrygia*).
- Swift Parrot (*Lathamus discolor*).
- Little Eagle (*Hieraaetus morphnoides*).
- Koala (*Phascolarctos cinereus*).
- Rufous Bettong (*Aepyprymnus rufescens*).
- Spotted-tailed Quoll (*Dasyurus maculate*).
- Common Planigale (*Planigale maculata*).

Potential habitat for the aforementioned species would be largely restricted to areas outside of the existing disturbed quarry area which is generally lacking mature vegetation and hollow-bearing trees required by most of these species for permanent habitats.

Areas of mature vegetation associated with the site contain a moderate number of hollow-bearing and larger trees providing good quality habitat for arboreal species such as the Brush-tailed Phascogale (known to occur in proximity to the site) and Squirrel Glider (likely to occur in the locality). Such habitat resources are also likely to provide foraging and potential nesting/ roosting habitat for the large forest owls.

Whilst primary Koala feed trees (Tallowwood) were present associated with the site, no scats were located during the site inspection. A search of the BioNET Wildlife Atlas indicated that historical records of Koalas in proximity to the site are low. Mature vegetation at the site is likely to represent potential habitat for Koalas ranging throughout the broader area rather than more permanent habitat. Early regrowth vegetation associated with the disturbed quarry area represents low quality habitat for this species.

Migratory Species

The site does not comprise DoE defined important habitat for any EPBC Act listed migratory species. The scale of the proposal is such that no EPBC Act listed migratory species are likely to be significantly impacted.

5. Areas of 'Low Ecological Value' on the Site

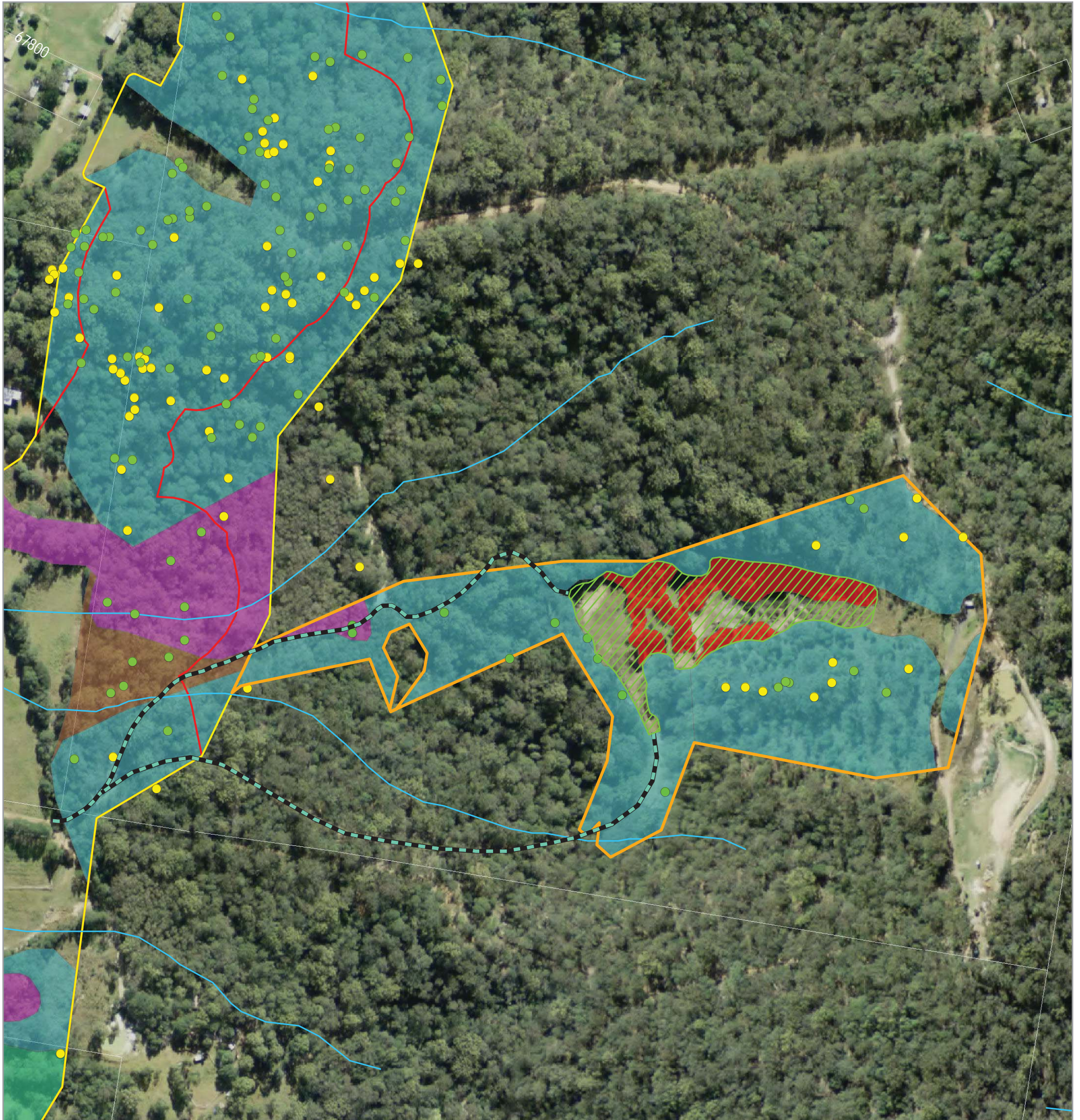
Based on a review of the W2B Project approval, for the purposes of this report 'low ecological value is defined as satisfying the following criteria:

- No threatened species (flora or fauna);
- No Endangered Ecological Communities (EECs); and
- No habitat trees (HBTs).

Based on the presence of early regrowth vegetation within the already disturbed quarry footprint, this area can be considered to be of 'low ecological value' as per the above definition and identified in **Illustration 1**. This area of 'low ecological value' would define the footprint of the proposed Tyndale Borrow Site. Areas of mature vegetation occurring outside of this area provide potential habitat for a number of locally occurring threatened fauna species as described within **Section 4**.

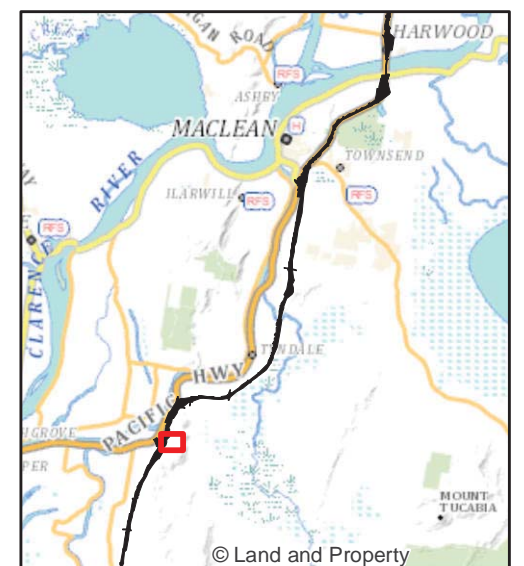
For the proposal to be consistent with the above criteria the following areas must be not be impacted by the proposal:

- Mature vegetation as defined as occurring outside the mapped polygon of low ecological value (refer to **Illustration 1**).
- Endangered Ecological Communities (EECs) as mapped in **Illustration 1**.
- Habitat trees.



LEGEND

- Habitat tree
- Angophora sp.
- Drainage line
- Tyndale borrow site access track
- Area of low ecological value
- Tyndale borrow site survey area
- EIS/SPIR clearing boundary
- Approved project boundary draft v5 20150610
- Angophora robur shrubby forest and woodland
- EEC - Paperbark swamp forest
- Pink Bloodwood - Tallowood moist open forest
- Re-growth Pink Bloodwood - Tallowood moist open forest
- EEC - Swamp Mahogany swamp forest



Ecological Constraints



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6. Recommended Safeguards

It is understood that a Borrow Site Management Plan is to be prepared for the proposal. The following recommendations are provided for inclusion into this plan:

1. No-go fencing should be installed at the extent of the borrow site and maintained during its operation to prevent any disturbance/ impacts to adjacent areas of vegetation.
2. Tree protection zones and associated no-go barrier should be established around any hollow-bearing trees in close proximity to the works to prevent any impacts to the root zones of such trees.
3. Any topsoil from the borrow site should be stockpiled separately and reused in the rehabilitation of the borrow site. Rehabilitation of the borrow site should include measures to revegetate the site where appropriate.
4. Clearing of vegetation at the site should be undertaken in accordance with the RMS Biodiversity guidelines and involve ecologist pre-clearing surveys to identify/ manage any fauna present within areas to be cleared.
5. Weed control of noxious weeds at the site (Lantana) should be undertaken in accordance with the Noxious weeds Act.
6. All plant and equipment brought to the site should be clean and free of soil and potential weed propagules prior to being brought to the site to prevent the spread of weeds.
7. Best practice erosion/ sediment control should be implemented for the construction/ operation of the site.

References

DoE, (2015). *Protected Matters Search Tool [Online]*. Department of Environment. Available from: <http://www.environment.gov.au/cgi-bin/sprat>. Accessed 10/08/2015.

OEH, (2015). *BioNet Atlas of NSW Wildlife. NSW Office of Environment and Heritage*. Available from: <http://www.bionet.nsw.gov.au/>. Accessed 10/08/2015.

Certification

GeoLINK



David Havilah
Ecologist

Appendix B Tyndale Borrow Site Access Road Ecological Investigation

5 February 2016
Ref No.: 2550-1032

Mr Kenny Frain
Project Engineer
17-19 Prince Street
GRAFTON NSW 1460

Dear Kenny

W2B Section 3 Tyndale Borrow Site Access Road Ecological Investigation

1. Introduction and Methodology

GeoLINK has been engaged by Pacific Complete to undertake an ecological investigation for the widening of an existing access track which provides access to the proposed potential borrow site at Tyndale. The site is located on private property adjacent (east) to a portion of the approved Woolgoolga to Ballina (W2B) Pacific Highway upgrade. The location of the borrow site and subject access track widening footprint is shown in **Illustration 1**.

GeoLINK has previously undertaken ecological investigations of the proposed borrow site to identify areas of 'low value ecological areas', (*W2B Section 3 Tyndale Borrow Site Ecological Investigation*, GeoLINK 2015). This investigation focused on the proposed access road widening footprint, and included three hours of meander surveys undertaking the following activities:

- Vegetation identification and mapping based on NSW Office of Environment and Heritage (OEH) *Biometric* vegetation types.
- Identification of endangered ecological communities (EECs).
- Target searches and mapping of threatened flora.
- Identification and mapping of significant fauna habitat features.

The site inspection was undertaken by ecologists, David Andrighetto and Ian Colvin on the 1 and 4 February 2015.

2. Results

The vegetation adjoining the existing access road proposed for widening comprises the *Biometric* vegetation type: *Pink Bloodwood-Tallowwood moist open forest* (refer to **Illustration 1** and **Plate 1**). It is in moderate to good condition, with localised edge effects and varying density Lantana (*Lantana camara*) infestation. In total 0.822 ha of *Pink Bloodwood-Tallowwood moist open forest* occurs within the assessed access track widening footprint (*note: not all vegetation within the assessed footprint requires removal*).

No *Threatened Species Conservation Act 1995* (TSC Act) or *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed EECs occur within the access track widening footprint.

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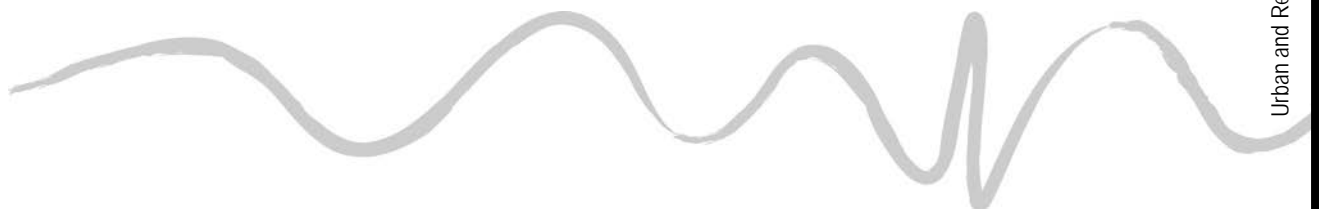




Plate 1 Typical view of existing access track proposed for widening and adjoining Pink Bloodwood-Tallowwood moist open forest

Potential Sandstone Rough-barked Apple (*Angophora robur*) trees are common within the vegetation surrounding the existing access track (refer to **Illustration 1**). Sandstone Rough-barked Apple (*Angophora robur*) is listed as 'Vulnerable' under the TSC Act and EPBC Act. In accordance with the *W2B Threatened Flora Management Plan Version 3* (RMS 2015), all potential Sandstone Rough-barked Apple (*Angophora robur*) are assumed as being Sandstone Rough-barked Apple (*Angophora robur*), other than areas where genetic testing has confirmed otherwise.

Approximately 25 Sandstone Rough-barked Apple (*Angophora robur*) trees occur within the subject access track widening footprint (refer to **Illustration 1**). These trees are recommended for retention and are marked in the field with red and white flagging tape. No other threatened flora species were detected within the subject access track widening footprint.

Key fauna habitat features at the site include:

- **Hollow-bearing trees:** Four hollow-bearing trees occur within the subject access track widening footprint (refer to **Illustration 1**). These trees have been marked in the field with white spray paint and red and white flagging tape. Hollow-bearing trees provide roosting/ denning/ nesting opportunities for a range of hollow-obligated fauna, including threatened species. These trees are recommended for retention.
- **Bush rock:** A small pile of sandstone bush rock occurs on the edge of the access track (refer to **Illustration 1**). It provides potential shelter and basking sites for reptiles and other small terrestrial fauna. The rocks are recommended for retention or relocation into adjacent retained habitat.
- **Forest Oak (*Allocasuarina torulosa*):** Forest Oak is a preferred foraging resource of the threatened Glossy Black Cockatoo (*Calyptorhynchus lathamii*) and is a common understorey tree species within the vegetation surrounding the access track. Selective retention of Forest Oak is recommended where possible.
- **Koala food trees:** Preferred Koala (*Phascolarctos cinereus*) food trees at the site include Tallowwood (*Eucalyptus microcorys*) and Forest Red Gum (*Eucalyptus tereticornis*). Forest Red Gum is also a key diet nectar and pollen resource for the Grey-headed Flying-fox (*Pteropus poliocephalus*). Selective retention of Tallowwood and Forest Red Gum is recommended where possible.
- **Pink Bloodwood (*Corymbia intermedia*):** Pink Bloodwood provides a range of important fauna resources including sap sources for glider (including threatened species) and a key nectar and pollen resource (including for the Grey-headed Flying-fox). Selective retention of Tallowwood and Forest Red Gum is recommended where possible.
- **Large area of contiguous forest:** The vegetation within the access track widening footprint forms part of an extensive area of forest/ woodland occurring locally. It includes a mosaic of

vegetative structures (e.g. varying density strata layers with grassy to heathy understoreys) and varying topographical features such as rock outcrops, steep slopes and protected gullies. Collectively the broader landscape supports an array of fauna habitat features for broad forest/ woodland fauna assemblages.

These fauna resources are locally common within the vegetation surrounding the proposed access track widening footprint.

3. Discussion and Recommendations

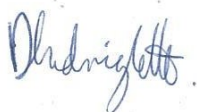
The subject access road is located within a broader area of moderate to high conservation value vegetation/ habitat. Due to the proposed temporary use of the access road, widening of the road should be undertaken in a way that minimises vegetation removal and allows for selective retention of key ecological features (*Angophora robur*, hollow-bearing trees and mature vegetation >300 mm diameter at breast height). This should be achievable based on the existing clearing associated with the access road and open vegetation structure.

Widening and use of the subject access road would be undertaken in accordance with the W2B project Construction Environmental Management Plan (CEMP). Site specific recommended safeguards during access road widening and use include:

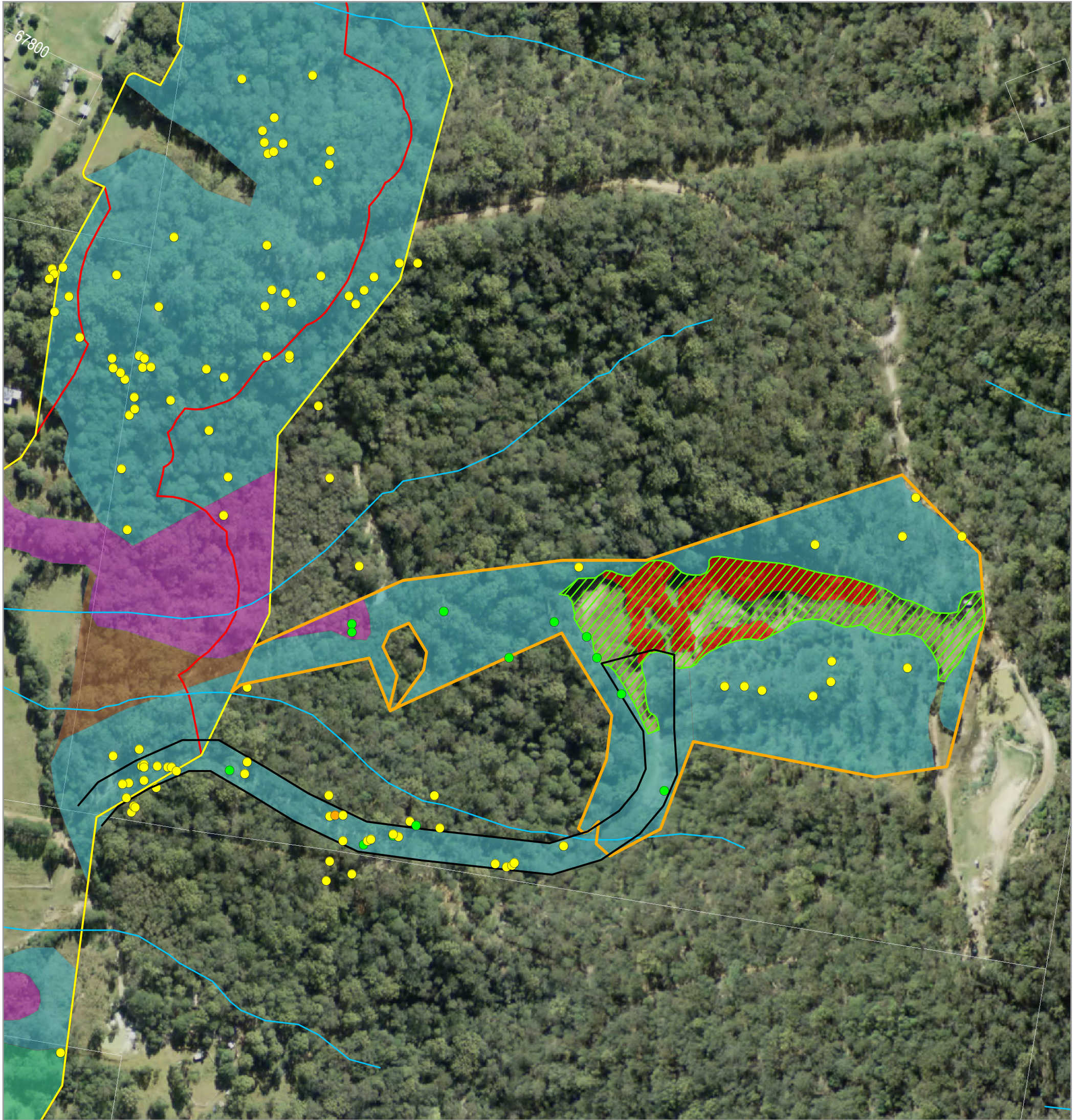
1. Vegetation clearing should be minimised where possible.
2. The access road widening should be aligned to allow for retention of:
 - All potential Sandstone Rough-barked Apple (*Angophora robur*) trees (refer to **Illustration 1**) (unless determined through genetic testing not to be Sandstone Rough-barked Apple).
 - All hollow-bearing trees (refer to **Illustration 1**).
 - All mature trees >300 mm diameter at breast height.
 - Other Forest Oak, Tallowwood, Forest Red Gum and Pink Bloodwood trees should be retained where possible.
3. No-go fencing should be installed to delineate the clearing and access road widening construction footprint prior to commencement of clearing.
4. The speed limit along the access road should be limited to a maximum of 20 km/hr.
5. Clearing of vegetation at the site should be undertaken in accordance with the RMS Biodiversity guidelines and involve ecologist pre-clearing surveys to identify/ manage any fauna present within areas to be cleared.
6. Bush rock within the road widening footprint should be gently placed into adjacent retained vegetation.
7. Weed control of noxious weeds at the site (*Lantana*) should be undertaken in accordance with the *Noxious weeds Act*.
8. All plant and equipment brought to the site should be clean and free of soil and potential weed propagules prior to being brought to the site to prevent the spread of weeds.
9. Best practice erosion/ sediment control should be implemented for the construction/ operation of the site.

Please contact the undersigned if you require any further information.

Yours sincerely
GeoLINK



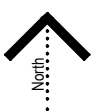
David Andrighetto
Ecologist/



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	Bush rock for retention or relocation
	Hollow-bearing tree
	Potential Angophora robur
	Drainage line
	Area of low ecological value
	Tyndale borrow site survey area
	EIS/SPIR clearing boundary
	ApprovedProjectBoundary_draft_v8_20151015
	Angophora robur shrubby forest and woodland
	EEC - Paperbark swamp forest
	Pink Bloodwood - Tallowood moist open forest
	Re-growth Pink Bloodwood - Tallowood moist open forest
	EEC - Swamp Mahogany swamp forest



Borrow Site Access Road Constraints Mapping



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GeoLINK
environmental management and design

Tyndale Borrow Site Access Road – Ecological Investigation
2550-1033

Appendix C Construction Noise Impact Assessment

Woolgoolga to Ballina Pacific Highway Upgrade (Sections 3 to 11)
Tyndale Borrow Site
SS D21 Construction Noise and Vibration Impact Assessment

Report Number 610.15470-CNIA-R3

4 April 2016

Pacific Complete
21 Prince Street
Grafton NSW 2460

Version: Revision 0

Woolgoolga to Ballina Pacific Highway Upgrade (Sections 3 to 11)

Tyndale Borrow Site

SS D21 Construction Noise and Vibration Impact Assessment

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This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Pacific Complete. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
610.15470-CNIA-R3	Revision 0	4 April 2016	Joshua Ridgway	Mark Russell	Mark Russell

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APPENDICES

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1 INTRODUCTION

1.1 Project Background

NSW Roads and Maritime Services (RMS) is progressively upgrading the Pacific Highway to dual carriageway between the Hunter and the NSW / Queensland border.

The Woolgoolga to Ballina Pacific Highway Upgrade (W2B) involves upgrading approximately 155 km of highway to four-lane dual-carriageway road between Woolgoolga (north of Coffs Harbour) and Ballina (near the NSW / Queensland border) on the NSW north coast. The project bypasses the towns of Grafton, South Grafton, Ulmarra, Woodburn, Broadwater and Wardell. The project will include road duplication, alignment modification and new road sections. Once complete, the project will create a four-lane divided road, with two lanes in each direction. It would also allow for the road's upgrade in the future to a six-lane divided highway.

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Pacific Complete to prepare a Construction Noise Impact Assessment (CNIA) of the noise impacts associated with the Tyndale Borrow Site. This report presents the results of the assessment.

1.2 Relevant Guidelines

The main guidelines, specifications and policy documents relevant to this CNIA include:

- RMS QA Specification G36: Environmental Protection (Management System) (RMS, 2014)
- NSW *Road Noise Policy* (RNP) (DECCW 2011)
- NSW *Industrial Noise Policy* (EPA 2000)
- RTA *Environmental Noise Management Manual* (ENMM) (RTA 2001)
- NSW *Interim Construction Noise Guideline* (ICNG) (DECC 2009)
- NSW *Assessing Vibration: A Technical Guideline* (DEC 2006)
- British Standard *BS7385: Part 2 Evaluation and Measurement of Vibration in Buildings*
- German *DIN 4150: Part 3 – 1999 Effects of Vibration on Structure* (DIN 1999)
- *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (1990) Australian and New Zealand Environment and Conservation Council (ANZECC)
- Australian Standard *AS2187.2-2006: Explosives – Storage, Transport and Use*

1.3 Terminology

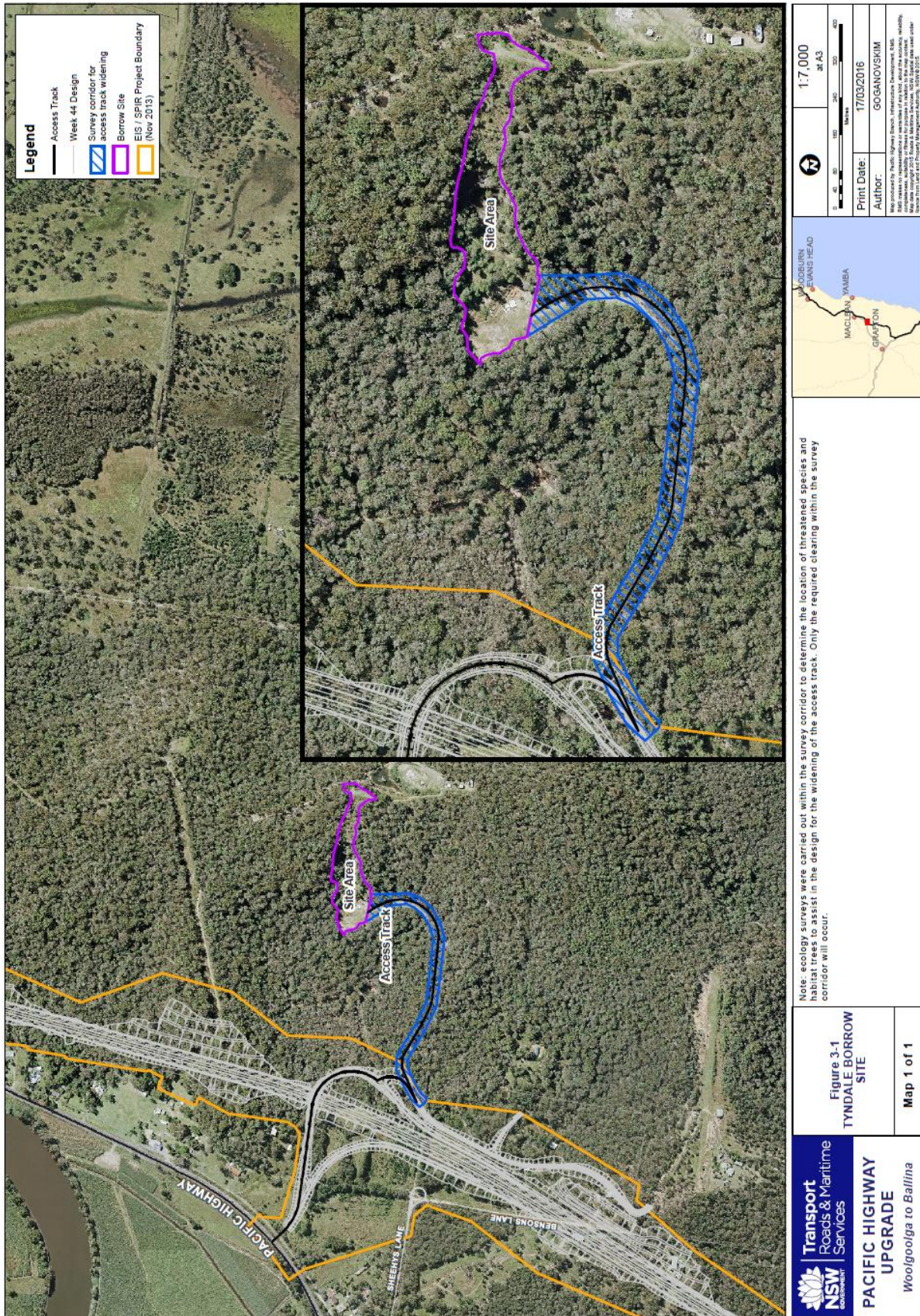
The assessment has used specific acoustic terminology. An explanation of common terms is included as **Appendix A**.

2 BORROW SITE DETAILS

2.1 Description of Borrow Site

The proposed Tyndale Borrow Site (the Site), also known locally as Jacko's Quarry, is located within Lot 1 DP 1185493, Tyndale, in the Clarence Valley Council Local Government Area which is situated in Section 4 of the W2B project. The Site is approximately 1.8 hectares in size and would be accessed from the mainline construction site and existing site access track. The concept layout for the proposed Tyndale Borrow Site is shown in **Figure 1**.

Figure 1 Proposed Site Layout Plan for Tyndale Borrow Site



Note 1: Design provided by the client.

The primary uses of the Site would be:

- Mechanical excavation.
- Material storage / stockpile.
- Truck haulage of material.

2.2 Approved Project Construction Hours

Activities associated with the use of the site would be undertaken during the following standard project approved construction hours:

- 7:00 am to 6:00 pm Monday to Friday, inclusive.
- 8:00 am to 5:00 pm Saturday.
- At no time on Sunday or Public Holidays

Activities which would be deemed as being of low noise impact to the surrounding environment may be conducted between 6:00 am and 7:00 am Monday to Friday, and 6:00 pm and 7:00 pm Monday to Friday in accordance with the Project Approval. Any Out of Hours Works (OOHW) would be undertaken in accordance with the projects approved Out of Hours Works Protocol included in the *Construction Environmental Management Plan (CEMP)* for the Approved Project.

3 EXISTING ENVIRONMENT

3.1 Sensitive Receivers

The *Construction Noise and Vibration Management Plan (CNVMP)* for the Approved Project identified sensitive receivers within the project area and defined Noise Catchment Areas (NCAs) characterising the changing land uses adjacent to the project. The Tyndale Borrow Site is located within NCA-C, as defined in the CNVMP. NCA-C consists primarily of farmland and bushland, adjacent to the existing highway, with scattered rural dwellings and the townships of Tyndale and Gulmarrad. There are a total of 131 residential and 16 commercial sensitive receivers in NCA-C. Of these, 15 residential receivers and 2 commercial receivers have been identified within 600 m of the Tyndale Borrow Site.

3.2 Ambient Noise

To quantify and characterise the existing ambient noise environment, a baseline noise survey was undertaken as part of the Environmental Impact Statement (EIS) for the Approved Project.

The noise monitoring location applicable to NCA-C is Noise Monitor ID 26, located at 86 O'maras Lane, Gulmarrad. The measured noise levels have been used as a basis for assessing potential noise impacts during construction and are summarised in **Table 1**.

Table 1 Ambient Noise Monitoring Results

NCA	Noise Monitor ID	Address	RBL ¹ (dBA)		
			Day (07:00-18:00)	Evening (18:00-22:00)	Night-time (22:00-07:00)
NCA-C	26	86 O'maras Lane, Gulmarrad	41	38	33

Note 1: The Rating Background Levels (RBL) have been obtained using the calculation procedures documented in the *NSW Industrial Noise Policy (INP)*.

4 CONSTRUCTION NOISE AND VIBRATION CRITERIA

4.1 Construction Noise Criteria

The NSW EPA *Interim Construction Noise Guideline* (ICNG) requires project specific Noise Management Levels (NMLs) to be established for noise affected receivers. In the event construction noise levels are predicted to be above the NMLs, all feasible and reasonable work practices are investigated to minimise noise emissions.

Having investigated all feasible and reasonable work practices, if construction noise levels are still predicted to exceed the NMLs then the potential noise impacts would be managed via the construction noise mitigation and management measures outlined in the Approved Project CNVMP and this CNIA.

4.1.1 Residential Receivers

The ICNG provides an approach for determining LAeq(15minute) NMLs at residential receivers in the vicinity of the Tyndale Borrow Site by applying the measured LA90(15minute) background noise levels, as described in **Table 2**.

Table 2 Determination of Noise Management Levels for Residential Receivers

Time of Day	NML LAeq(15minute)	How to Apply
Standard hours Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm No work on Sundays or public holidays	RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. <ul style="list-style-type: none"> Where the predicted or measured LAeq(15minute) is greater than the noise management level, the proponent should apply all feasible and reasonable work practises to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account: <ul style="list-style-type: none"> Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	RBL + 5 dB	<ul style="list-style-type: none"> A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Adopting the measured background noise levels in **Table 1**, the NMLs derived for the project are detailed in **Table 3**.

Table 3 Construction Noise Management Levels for Residential Receivers

NCA	NML (dBA)				
	Standard Hours – Daytime	Out of Hours – Daytime	Out of Hours – Evening	Out of Hours – Night-time	Sleep Disturbance
NCA-C	51	46	43	38	48

4.1.2 Other Sensitive Receivers

The ICNG provides NMLs for other sensitive land uses such as commercial premises. The NMLs applicable to this project are shown in **Table 4**.

Internal noise levels are assessed at the centre of the occupied room. Where internal noise levels cannot be measured, external noise levels may be used. A conservative estimate of the difference between internal and external noise levels is 10 dB for buildings other than residences. Some buildings may achieve greater performance, such as where windows are fixed (ie, cannot be opened).

Table 4 Constructions Noise Management Levels for Other Sensitive Receivers

Land Use	NML LAeq(15minute) (Applicable when the property is in use)
Industrial and commercial premises	External noise level 75 dB
Other noise sensitive businesses	Investigation to determine suitable noise levels on project-by-project basis

Note 1: Active recreation areas are characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.

Note 2: Passive recreation areas are characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion (eg. reading, meditation).

4.2 Construction Vibration Criteria

Effects of ground borne vibration on buildings may be segregated into the following three categories:

- Human comfort – vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.
- Effects on building contents – where vibration can cause damage to fixtures, fittings and other non-building related objects.
- Effects on building structures – where vibration can compromise the integrity of the building or structure itself.

Vibration criteria for these three categories have been defined in the CNVMP for the Approved Project.

The first of these vibration effects relating specifically to the human comfort aspects of the project are taken from the *Assessing Vibration – A Technical Guideline*, DEC (2006). This type of impact can be further categorised and assessed using the appropriate criterion as follows:

- Continuous vibration – from uninterrupted sources (refer to **Table 5**).
- Impulsive vibration – up to three instances of sudden impact, eg dropping heavy items, per monitoring period (refer to **Table 6**).
- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (refer to **Table 7**).

Table 5 Continuous Vibration Acceleration Criteria (m/s^2) 1-80 Hz

Location	Assessment Period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z- axis	x- and y-axis
Residences	Daytime	0.010	0.007	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Educational institutions, places of worship and offices	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night-time	0.04	0.029	0.080	0.058

Table 6 Impulsive Vibration Acceleration Criteria (m/s^2) 1-80 Hz

Location	Assessment Period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z- axis	x- and y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.07	0.20	0.14
Educational institutions, places of worship and offices	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

Table 7 Intermittent Vibration Impacts Criteria ($m/s^{1.75}$) 1-80 Hz

Location	Assessment Period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z- axis	x- and y-axis
Residences	Day or night-time	0.20	0.40	0.13	0.26
Educational institutions, places of worship and offices	Day or night-time	0.40	0.80	0.40	0.80
Workshops	Day or night-time	0.80	1.60	0.80	1.60

The other two effects relate to impacts on the building itself and are assessed against international standards as follows:

- British Standard *BS7385: Part 2-1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration* (BSI 1993)
- German *DIN4150: Part 3 – 1999 Effects of Vibration on Structure* (DIN 1999).

The German standard provides the most stringent criteria and has been adopted in the CNVMP. The DIN guideline values for peak particle velocity (mm/s) measured at the foundation of the building are summarised in **Table 8**. The criteria are frequency dependent and specific to particular categories of structure.

Table 8 Structural Damage Criteria

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of:			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz ¹	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in Rows 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note 1: The criteria applied for frequencies above 100 Hz shall be at least the values specified in this column.

4.2.1 Safe Working Distances

The CNVMP outlines safe working distances for construction plant that may be used in the construction of the project. These are reproduced in **Table 9** and **Table 10**.

Key:

	Expected to comply with vibration criteria
	Expected to exceed the recommended vibration criteria
	Expected to exceed the maximum vibration criteria

Table 9 Typical Plant Vibration Levels – Structural Damage

Plant Description	Vibration Level (mm/s) ¹ at Distance from Structure				
	5 m	10 m	25 m	50 m	100 m
Criterion	5 (typical) / 3 (heritage)				
Vibratory roller (3-8 tonne) ²	7	3	0.7	0.3	0.1
Vibratory roller (8-13 tonne) ²	19	9	2	1	0.4
Vibratory roller (13-18 tonne) ²	22	10	3	1	0.4
Vibratory roller (>18 tonne) ²	28	13	4	1	0.5
Hydraulic hammer	6	2	0.5	0.2	0.1
Impact Pile driver ³	30	12	3.6	1.5	0.6
Vibratory pile driver ⁴	28	11	3	1	0.4
Drilling of blasting holes	6	2	0.5	0.2	0.1
Pile boring	6	2	0.5	0.2	0.1
Jackhammer (hand held)	2	0.8	0.2	<0.1	-

Note 1: Calculated in accordance with BS5228 – Code of practice for noise and vibration control on construction and open sites (95% confidence) / FTA Guidance Manual for Transit Noise and Vibration Impact Assessment

Note 2: Mid amplitude setting.

Note 3: Assumes soft ground

Note 4: Steady state operation (startup / shutdown may be higher).

Table 10 Typical Plant Vibration Levels – Human Comfort

Plant Description	eVDV (mm/s ^{1.75}) ¹ at Distance from Receiver				
	5 m	10 m	25 m	50 m	100 m
Criterion	0.2 daytime / 0.1 night-time				
Vibratory roller (3-8 tonne) ²	5.9	2.3	0.6	0.2	0.1
Vibratory roller (8-13 tonne) ²	16.2	7.3	2.2	0.8	0.3
Vibratory roller (13-18 tonne) ²	18.2	8.2	2.5	0.9	0.3
Vibratory roller (>18 tonne) ²	23.7	10.7	3.2	1.2	0.4
Hydraulic hammer	5	1.8	0.5	0.2	0.1
Impact Pile driver ³	65	26	8	3.2	1.3
Vibratory pile driver ⁴	23	9	2.5	0.9	0.4
Drilling of blasting holes	5	1.8	0.5	0.2	0.1
Pile boring	5	1.8	0.5	0.2	0.1
Jackhammer (hand held)	1.9	0.7	0.2	<0.1	-

Note 1: Calculated in accordance with *Assessing vibration a technical guideline* and assumes 6 hrs per day of intermittent vibration.

Note 2: Mid amplitude setting.

Note 3: Assumes soft ground

Note 4: Steady state operation (startup / shutdown may be higher).

5 CONSTRUCTION NOISE IMPACT ASSESSMENT

People are usually more tolerant to noise during the construction phase of projects than during normal operation. This response results from recognition that the construction emissions are of a temporary nature – especially if the most noise-intensive construction impacts occur during the less sensitive daytime period. For these reasons, acceptable noise levels are normally higher during construction than during operations.

Construction often requires the use of heavy machinery which can generate high noise levels at nearby buildings and receivers. For some equipment, there is limited opportunity to mitigate the noise levels in a cost-effective manner and hence the potential impacts should be minimised by using all feasible and reasonable management techniques.

At any particular location, the potential impacts can vary greatly depending on factors such as the relative proximity of sensitive receivers, the overall duration of the construction works, the intensity of the noise levels, the time at which the construction works are undertaken and the character of the noise emissions.

5.1 Proposed Construction Activities

The construction noise and vibration assessment has considered the following construction activities associated with the Tyndale Borrow Site:

- Site operation including vehicle movements, material extraction, and crushing and screening.

5.2 Construction Noise Modelling

Construction noise modelling of the Tyndale Borrow Site was undertaken using SoundPLAN V7.1 modelling software.

Maximum sound power levels (L_{WA}) for the typical construction equipment (item) and construction activities that have been used in the noise modelling are listed in **Table 11**.

Table 11 Sound Power Levels for Construction Equipment

ID	Construction Activity	Equipment	Operating minutes in 15-min period	No of items in same location	Sound Power Level L_{WA} (dB)	
					Item	Activity
1a	Site Operation – Vehicles & Loading	Semi Trailer	5.0	2	106	113
		Front End Loader 962	15.0	1	112	
		Generator	7.5	1	101	
1b	Site Operation – Material Extraction	Drill Rig ¹	15.0	1	108	110
		Excavator (30 tonne)	15.0	1	104	
		Dump Truck (approx. 15 tonne)	15.0	2	100	
1c	Site Operation – Crushing & Screening	Crusher	15.0	1	120	123
		Screen	15.0	1	119	

Note 1: In accordance with the ICNG, for activities identified as particularly annoying (such as jackhammering, rock breaking and power saw operations), a 5 dB 'penalty' is added to the source sound power level when predicting noise using the quantitative method.

Consistent with the requirements of the ICNG, the construction noise impacts are based on a realistic worst-case assessment. For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted for the realistic worst-case assessment.

5.3 Predicted Construction Noise Impacts

In the receiver areas surrounding the Tyndale Borrow Site, the noise impacts have been quantitatively assessed for several construction activities. The activities considered are described in **Table 11**.

The predicted $L_{Aeq(15\text{minute})}$ noise levels at the surrounding noise sensitive receivers are detailed in **Table 12**. Construction activities are representative of the 'noisiest' construction periods, which accounts for the simultaneous operation of noise intensive construction plant in close proximity. Predicted noise levels have been included for periods outside the approved project operating hours (evening and night) for reference purposes only. Noise contour maps of the worst-case maximum $L_{Aeq(15\text{minute})}$ noise levels are provided in **Appendix B**.

Table 12 Predicted Construction Noise Levels

Sensitive Receiver Type	NML				Noise Level – LAeq(15minute) (dB)					Number of Exceedances (Receivers)			
	Day	Day OOH	Eve OOH	Night OOH	Worst-case ¹ Predicted	NML Exceedance				Day	Day OOH	Eve OOH	Night OOH
						Day	Day OOH	Eve OOH	Night OOH				
1a – Site Operation – Vehicles & Loading													
Residential	51	46	43	38	Up to 44	-	-	Up to 1	Up to 6	-	-	1	15
Commercial	75	-	-	-	Up to 40	-	-	-	-	-	-	-	-
1b – Site Operation – Material Extraction													
Residential	51	46	43	38	Up to 39	-	-	-	Up to 1	-	-	-	1
Commercial	75	-	-	-	Up to 37	-	-	-	-	-	-	-	-
1c – Site Operation – Crushing & Screening													
Residential	51	46	43	38	Up to 52	Up to 1	Up to 6	Up to 9	Up to 14	1	19	26	34
Commercial	75	-	-	-	Up to 50	-	-	-	-	-	-	-	-

Note 1: The nearest identified dwelling to the facility is the operator / landowner of the Borrow Site. SLR has been informed that that the dwelling is no longer occupied and given the land owners involvement with the project no predictions have been made to this receiver.

During standard construction hours, exceedances of the NMLs of up to 1 dB are predicted at one residential receiver during site operations. Exceedances of the Out of Hours NMLs of up to 14 dB are predicted at 34 residential receivers during site operations.

No exceedances of the NMLs are predicted at any commercial receivers.

Where construction noise levels are predicted to exceed the NMLs, it is recommended that construction noise mitigation measures should be considered, where reasonable and feasible. Construction noise mitigation measures are discussed in **Section 7**.

5.4 Cumulative Construction Noise Impacts

In order to assess the cumulative noise impacts of the Tyndale Borrow Site with construction activities which may occur on the mainline, construction activities for the mainline works have been extracted from the CNVMP. Mainline construction activities are shown in **Table 13**.

Table 13 Mainline Construction Activities

Construction Activity			Overall Sound Power Level L _{WA} (dB)
ID	Reference	Activity	
01	08_BAS	Construction of water quality basins	106
	20_SGN	Signage installation	
02	17_LMK	Linemarking	107
	18_WLI	Wall installation	
03	11_ENV	Installation of environmental controls	108
04	16_SPS	Spray sealing activities	109
05	01_GEO	Geotechnical works	110
	02_DCL	Discrete clearing	
	07_SER	Services and drainage installation	

Construction Activity			Overall Sound Power Level L _{WA} (dB)
ID	Reference	Activity	
06	14_CSC	Soft concrete saw cutting	111
	03_BCL	Broad clearing	
	09_HAU	Plant and materials haulage	
07	10_VMW	Verge and median works	112
	19_BDG	Bridge installations – bored piling	
08	05_DRL	Earthworks – drill and blasting	113
	12_KCB	Kerb and barrier works	
	15_SCP	Shoulder concrete paving	
	21_MCP	Main compound	
09	13_CCP	Carriageway concrete paving	114
10	06_FIL	Earthworks – fill and compact	116
11	04_CUT	Earthworks – cut	124
12	22_CCP	Crushing compound	125

Cumulative impacts from the mainline construction activities were modelled with the Tyndale Borrow Site construction activities. The cumulative noise levels, exceedances and dominant construction activities are summarised in **Table 14**.

Table 14 Cumulative Construction Noise Impacts at Residences

Mainline Scenarios	Worst-case Predicted Noise Level – LAeq(15minute) (dB)			Dominant Construction Noise Source ¹		
	Cumulative Noise Level (Day NML Exceedance) ²					
	Borrow Site Construction Scenario			Borrow Site Construction Scenario		
	1a	1b	1c	1a	1b	1c
01	51 (-)	51 (-)	54 (3)	CU	CU	CU
02	52 (1)	52 (1)	55 (4)	CU	CU	CU
03	53 (2)	53 (2)	55 (4)	CU	CU	CU
04	54 (3)	54 (3)	56 (5)	CU	CU	CU
05	55 (4)	55 (4)	56 (5)	CU	CU	CU
06	56 (5)	55 (4)	57 (6)	CU	ML	CU
07	57 (6)	56 (5)	58 (7)	CU	ML	CU
08	58 (7)	57 (6)	58 (7)	CU	ML	CU
09	59 (8)	58 (7)	59 (8)	CU	ML	CU
10	61 (10)	60 (9)	61 (10)	CU	ML	CU
11	68 (17)	68 (17)	68 (17)	ML	ML	ML
12	69 (18)	69 (18)	69 (18)	ML	ML	ML

Note 1: ML = Mainline; CU = Cumulative.

Note 2: Day NML exceedances noted in Red.

As shown in **Table 14**, worst-case noise levels during cumulative operations of the Borrow Site and mainline construction activities are predicted to exceed the daytime NMLs at nearby residential receivers.

Where the dominant noise source is listed as mainline (ML), borrow site construction activities do not contribute to the LAeq(15minute) noise levels at the most-affected receivers.

Where the dominant noise source is listed as cumulative (CU), both the borrow site and mainline construction activities contribute to the LAeq(15minute) noise levels at the most-affected receivers.

Where the dominant noise source is noted as either the borrow site or cumulative impact, and construction noise levels are predicted to exceed the NMLs, it is recommended that construction noise mitigation measures should be considered, where reasonable and feasible. Construction noise mitigation measures are discussed in **Section 7**.

5.5 Construction Traffic

While light and heavy vehicle movements within the Tyndale Borrow Site are classified as part of the site noise, once they move off the site and onto public roads they are assessed under the *NSW Road Noise Policy* (RNP).

One of the objectives of the RNP is to apply relevant permissible noise increase criteria to protect sensitive receivers against excessive decreases in amenity as a result of the project. In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

On this basis, construction traffic NMLs set at 2 dB above the existing road traffic noise levels during the daytime and night-time periods are considered appropriate to identify the onset of potential noise impacts. Where the road traffic noise levels are predicted to increase by more than 2 dB as a result of construction traffic, consideration would be given to applying feasible and reasonable noise mitigation measures to reduce the potential noise impacts and preserve acoustic amenity.

In considering feasible and reasonable mitigation measures where the relevant noise increase is greater than 2 dB, consideration would also be given to the actual noise levels associated with construction traffic and whether or not these levels comply with the following road traffic noise criteria in the RNP:

- 60 dB LAeq(15hour) daytime and 55 dB LAeq(9hour) night-time for existing freeway / arterial / sub-arterial roads.
- 55 dB LAeq(1hour) daytime and 50 dB LAeq(1hour) night-time for existing local roads.

An increase of greater than 2 dB requires an increase in traffic volumes of approximately 60% or higher.

The main access route to the Tyndale Borrow Site would be via the existing Pacific Highway, the mainline construction site, and the existing site access track. Vehicle movements on the site access track and within the mainline construction site are considered to be part of the construction noise emissions and have been assessed in **Section 5.2** (Activity 1a – Vehicles & Loading) and in the CNVMP for the Approved Project respectively. The existing volume of traffic on the Pacific Highway is significantly higher than the proposed construction traffic volumes from the site and therefore, an increase in traffic noise due to construction traffic greater than 2 dB is not considered likely. No mitigation is likely to be required as a result.

6 CONSTRUCTION VIBRATION IMPACT ASSESSMENT

6.1 Predicted Construction Vibration Impacts

No vibration intensive items of plant have been identified in the equipment list for the proposed construction activities outlined in **Table 11**. If any vibration intensive items of plant are proposed to be used then the safe working distances outlined in **Section 4.2.1** should be observed.

Where vibration intensive construction activities are proposed within 100 m of sensitive receivers, it is recommended that construction vibration mitigation measures should be considered, where reasonable and feasible. Construction vibration mitigation measures are discussed in **Section 7**.

7 CONSTRUCTION NOISE AND VIBRATION MITIGATION

The CNVMP for the Approved Project outlines a range of environmental requirements and control measures to minimise construction noise and vibration impacts associated with the project. The strategies are designed to minimise, to the fullest extent practicable, noise and vibration during construction.

Where construction noise levels are predicted to exceed the NMLs or vibration intensive construction activities are proposed within 100 m of sensitive receivers, it is recommended that construction noise and vibration mitigation measures should be considered, where reasonable and feasible. Project construction noise and vibration mitigation measures are outlined in the CNVMP. No additional site specific mitigation measures are considered to be required.

It is noted that as works are limited to the daytime and daytime out of hour's periods only and are not considered substantial exceedances, mitigation measures such as site hording (mitigation measure NV8) is not anticipated to be required. No additional mitigation measures other than those outlined in the Approved Project CNVMP are proposed for the operation of Tyndale Borrow Site.

8 SUMMARY OF IMPACTS

8.1 Construction Noise Impacts

During standard construction hours, exceedances of the NMLs of up to 1 dB are predicted at one residential receiver during site operations. Exceedances of the daytime Out of Hours NMLs of up to 14 dB are predicted at 34 residential receivers during site operations.

No exceedances of the NMLs are predicted at any commercial receivers.

The main access route to the Tyndale Borrow Site would be via the existing Pacific Highway, the mainline construction site, and the existing site access track. Vehicle movements on the site access track and within the mainline construction site are considered to be part of the construction noise emissions and have been assessed in **Section 5.2** (Activity 1a – Vehicles & Loading) and in the CNVMP for the Approved Project respectively. The existing volume of traffic on the Pacific Highway is significantly higher than the proposed construction traffic volumes from the site, therefore, an increase in traffic noise due to construction traffic of greater than 2 dB is not considered likely. No mitigation is likely to be required as a result.

Construction noise mitigation and management measures for the project have been defined in the CNVMP for the Approved Project. No additional mitigation measures other than those outlined in the Approved Project CNVMP are proposed.

8.2 Cumulative Noise Impacts

During standard construction hours, worst-case noise levels are predicted to exceed the NMLs at some residential receivers during some combinations of Borrow Site and mainline construction activities.

Construction noise mitigation and management measures for the project have been defined in the CNVMP for the Approved Project. Where noise levels are predicted to exceed the NMLs, it is recommended that construction noise mitigation measures be considered, where reasonable and feasible.

8.3 Construction Vibration Impacts

No vibration intensive items of plant have been identified in the equipment list for the proposed construction activities. As such, vibration impacts associated with the Tyndale Borrow Site are considered to be negligible.

Construction vibration mitigation and management measures for the project have been defined in the CNVMP for the Approved Project. Where vibration intensive construction activities are proposed within 100 m of sensitive receivers, it is recommended that construction noise mitigation measures be considered, where reasonable and feasible.

1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that in common usage 'noise' is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3 Sound Power Level

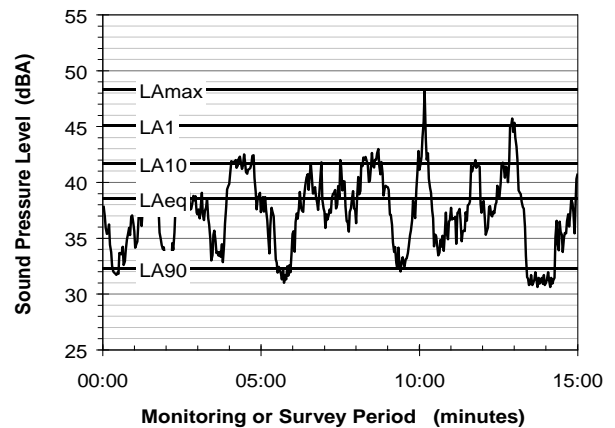
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or Lw, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the 'repeatable minimum' LA90 noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or 'average' levels representative of the other descriptors (LAeq, LA10, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than 'broad band' noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

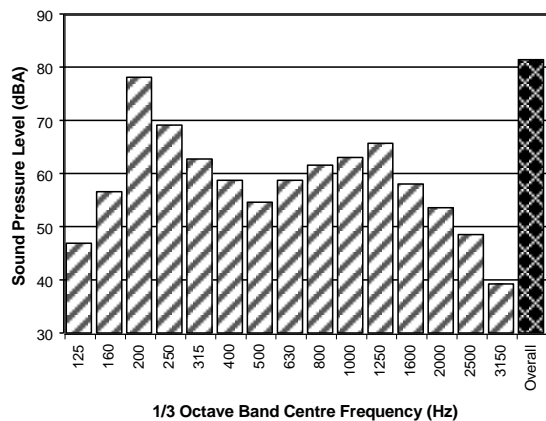
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V , expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_0)$, where V_0 is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organizations.

9 Human Perception of Vibration

People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

10 Over-Pressure

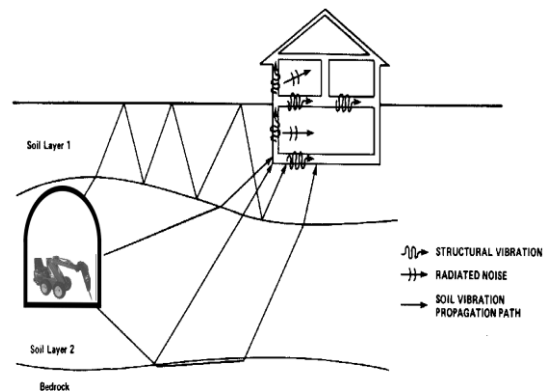
The term 'over-pressure' is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

11 Ground-borne Noise, Structure-borne Noise and Regenerated Noise

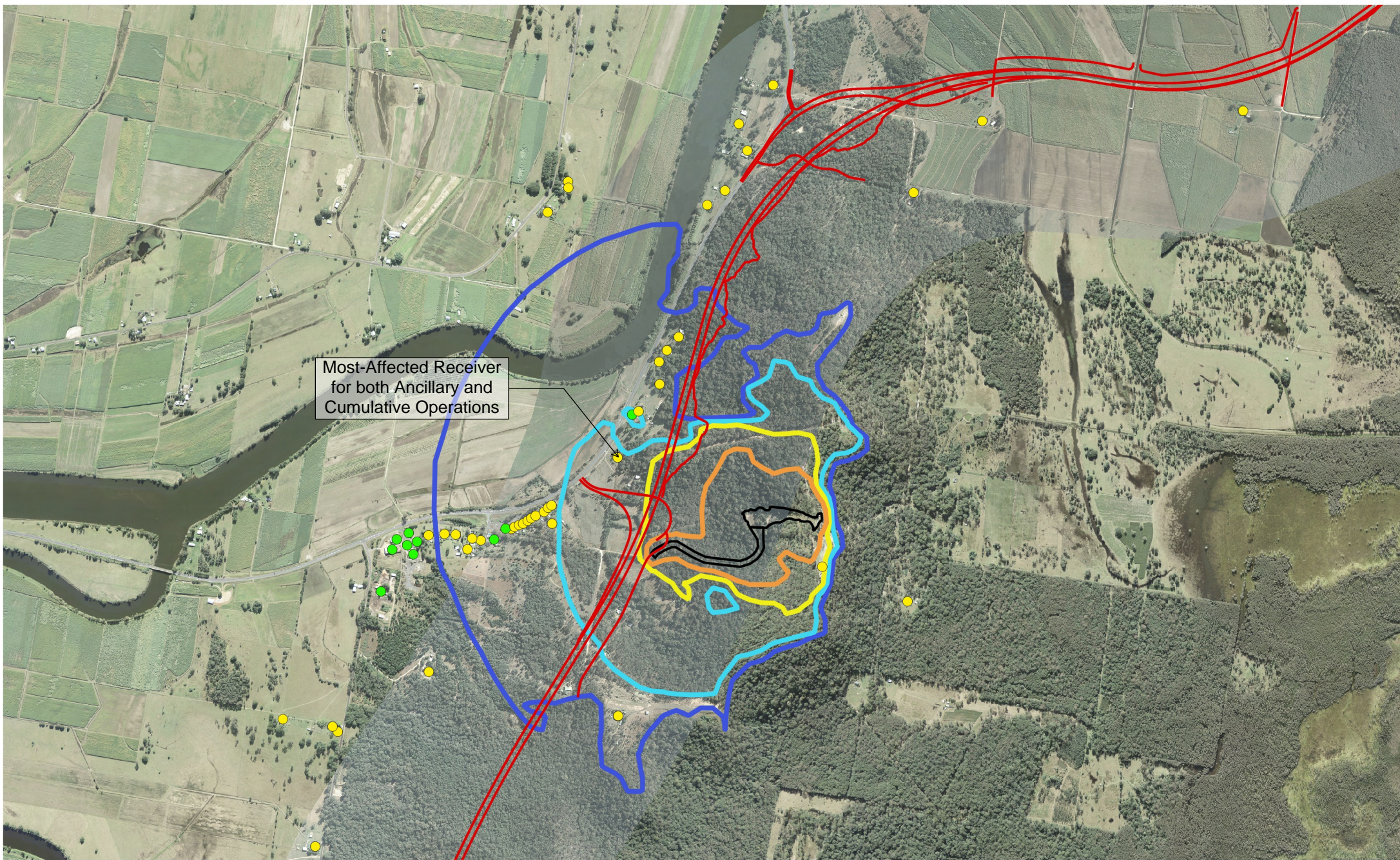
Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise



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Date:	4/04/2016
Drawn by:	DS
Scale:	1:20,000
Sheet Size:	@A4
Projection:	GDA 1994 MGA Zone 56

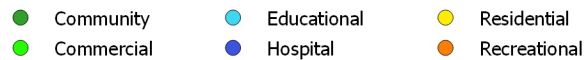


— Mainline Works — Borrow Site

Predicted LAeq Noise Levels



Receiver Categories



Pacific Complete

Woolgoolga to Ballina Pacific Highway Upgrade (Sections 3 to 11)

**Construction Noise Assessment
Maximum LAeq(15 minute)
Tyndale Borrow Site**

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Appendix D Groundwater Memorandum

MEMORANDUM



TO:	Hugh Madden – Planning and Approvals Lead	FUNCTION:	Environment
FROM:	Ray Hatley – Capability Executive Hydrogeologist	FUNCTION:	Environment
CC:		DATE:	19 August 2016
REF:		NO. OF PAGES:	13
SUBJECT: W2B Tyndale Borrow Site/ Groundwater			

Abstract/Summary

This review of groundwater behaviour affecting the proposed borrow pit area, indicates that two (2) groundwater regimes operating at the site, the shallow perched (within 5m below ground level (bgl)) and deep regional groundwater (>35m bgl, 38mAHD) systems, are not likely to be impacted by proposed quarrying activities. The deep regional groundwater table will not be intersected by the quarrying since it is located at depth below the proposed pit floor. The perched system is surficial and is not connected to the deep regional groundwater system, and, therefore, will not be additionally interfered with by the proposed quarrying works (any more than the existing pit has already affected it). As such, this perched system will continue to support the existing Pink Bloodwood - Tallwood Moist Open Forest and regrowth, since it is sustained by rainfall recharge. This review therefore concludes that the proposed borrow pit works will not have a meaningful impact on the groundwater levels and water quality, and existing groundwater users in the area. In the unlikely event that the borrow pit does encounter a permanent water table in the bedrock sandstone to a depth in excess of 5m, review and management measures should be considered, and these could include re-evaluation of the groundwater impact, return of captured water (inflows) to local drainages after treatment in an appropriate sedimentation pond (to capture suspended solids) or ceasing excavation beneath the -5m mark.

Issue

This memo has been prepared to address Comment 2, of the Department of Planning and Environment (DPE) review comments on the *Tyndale Borrow Site Management Plan (BSMP)* (Appendix B10.1), of the Construction Environmental Management Plan (Sections 3 to 11) (CEMP):

Document		Woolgoolga to Ballina (sections 3-11) Pacific Highway Upgrade Tyndale Borrow Site Management Plan Appendix B10.1	
Version No.		Revision 3 June 2016	
Agency Name		Department of Planning & Environment	
Date		12 July 2016	
Item	Condition No/Report Reference	Department's Comment	RMS Response
1.	D22(b)	Section 5.4 of the management plan assesses geology, soils and water. The management plan states that the excavation is not anticipated to intercept groundwater due to its high elevation (second paragraph). No other information is provided on groundwater impacts. Given that the quarry pit is proposed to be excavated to a depth of 30 metres below existing ground level the Department requests evidence/information to support the above statement and an assessment of the potential impact on groundwater levels and quality, and existing groundwater users in the area. The assessment must include consultation with DPI-Water.	This memo

		No information is provided on the proposal's water usage (dust suppression and quarrying) and source of water for the borrow pit operations.	Refer to section 5.4 of the Tyndale Borrow Site Management Plan.
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As indicated above, the BSMP states that the excavation is not anticipated to intercept groundwater due to its high elevation. This memo provides:

- substantiating information on the potential for groundwater impacts to the local ecology (including groundwater dependent ecosystems, GDE's) and existing groundwater users; and
- an assessment of the potential impact on groundwater levels and quality, and existing groundwater users in the area.

This memo and accompanying assessment will be provided to DPI-Water for consideration.

Background

The Woolgoolga to Ballina Pacific Highway Upgrade involves upgrading approximately 155 kilometres (km) of highway to four-lane dual-carriageway road between Woolgoolga (north of Coffs Harbour) and Ballina (near the NSW/Queensland border) on the NSW north coast.

The Pacific Complete CEMP (sections 3 to 11) describes the overall system for environmental management of the project being delivered by Pacific Complete in partnership with Roads and Maritime.

The purpose of the Woolgoolga to Ballina (sections 3-11) Pacific Highway Upgrade Tyndale Borrow Site Management Plan SSI-4963 is to describe how Pacific Complete would manage the establishment, operation and rehabilitation of the Tyndale Borrow Site which would be used for the construction of the Woolgoolga to Ballina Pacific Highway Project (sections 3 to 11).

The BSMP has been reviewed and endorsed by RMS in consultation with relevant government agencies and stakeholders to satisfy project approval requirements (SSI-4963).

The BSMP should be consulted when considering the detail of this memo as it provides the detailed background to the Tyndale Borrow Site (the Site), the objectives of the plan, the site setting, environmental safeguards, legislative requirements, EPBC Act requirements, and staffing competencies, and the Ministers requirements (particularly, D22(b)).

Proposal

The proposed Tyndale Borrow Site (known locally as Jacko's Quarry) is located on the westerly facing slope of Bondi Hill near the township of Tyndale, on the eastern side of the highway upgrade alignment, in Portion A of the Woolgoolga to Ballina Pacific Highway Upgrade (sections 3 to 11), refer to Figure 1. The site is privately owned and was an operational sandstone quarry over 15 years ago, supplying material to a local brick manufacturing facility.

It is anticipated that approximately 300,000 m³ of material would be excavation from the borrow site with excavation depths ranging from approximately 7 to 30 metres below the existing ground level. The material is primarily Kangaroo Creek Sandstone and would be used for the construction of Clarence River Bridge (Portion E) as well as rockfill, select material, verge, structural backfill, spill through abutment material and fill material for hardstands and access tracks in Portions A and B of the project.

The footprint of the proposed borrow site lies within the footprint of the existing quarry void and is vegetated with early regrowth of Pink Bloodwood – Tallowood moist open forest vegetation that is considered to be of low ecological value. The borrow site is designed to avoid the removal of threatened species, hollow bearing trees and mature trees (>300mm diameter at chest height).

Figure 1 illustrates the location of the closest groundwater monitoring well, PZ51 (Cut C3-31 monitoring), and the Week 44 design. Figure 2 illustrates the borrow pit site layout. The subject

monitoring well was originally not within the footprint of the SPIR design. Due to significant design changes to the southbound on/off ramps, the design footprint has shifted east and conflicts with the position of the monitoring well.



Figure 1 – Location of proposed Tyndale Borrow Site and closest project monitoring well site.

Environmental setting

Topography

The borrow site is located on the western facing slope of Bondi Hill (locally part of the Central Sandstone Ridge), overlooking the alluvial flats of the Clarence River Floodplain below and to the west. These north-south trending sandstone ridge features dominate the topography at the borrow pit location. The existing pit itself lies at an elevation ranging from 50 to 105m AHD, with the highest elevation of the surrounding topography being at 140m AHD, located 450m to the southeast.

The Clarence River flood plain lies at an elevation of between 1m and 8m AHD at its closest to the borrow pit site (760m to the northwest), with the river stage being at sea level (0m AHD).

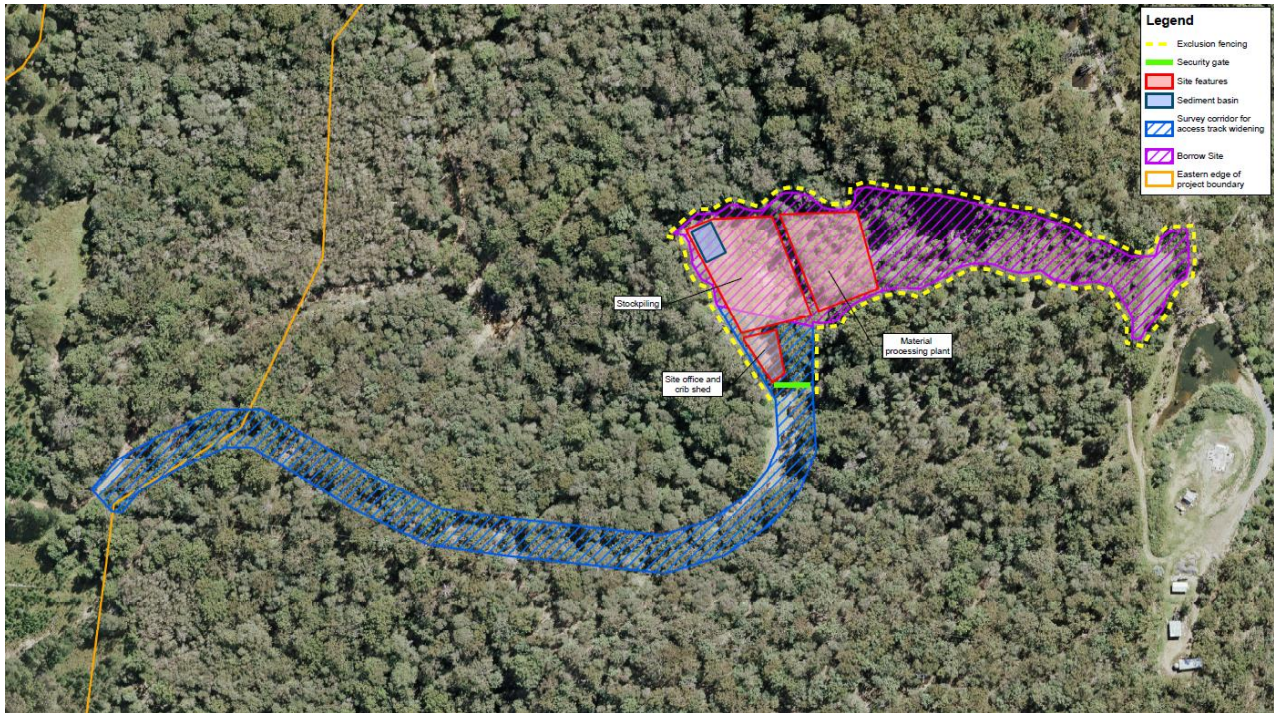


Figure 2 – Layout and extent of the proposed Tyndale Borrow Site

Geology

The proposed borrow pit occurs in a sandstone bedrock unit within the upper portion of the Clarence-Moreton Basin (CMB) stratigraphy. These Jurassic-Cretaceous age sediments are highly indurated competent rocks, and form prominent ridge features due to their resistance to weathering. The CMB is an extensive sedimentary basin in north-east New South Wales and southern Queensland and is the main bedrock geological feature in the region.

The sandstone unit within which the existing borrow pit is located is referred to as the Kangaroo Creek Sandstone (KCS) formation rock. It is this material that is proposed to be extracted from the site.

The KCS comprises quartz arenite beds with interbedded minor quartz and lithic conglomerates (Geoscience Australia, 2012). These rocks, in their unweathered state, are well cemented, indurated and competent due to their burial during the formation of the CMB.

Structurally, the site is located on the eastern dip slope of a minor north-south trending anticline affecting this area. No major faults are mapped within this area of KCS outcrop. The rock is moderately fractured and jointed, and has a strongly developed bedding plane discontinuity pattern.

Alluvial sediments occupy the palaeovalley that is now the Clarence River. These recent sediments include unconsolidated silts, muds, sands and gravel beds typical of alluvial systems.

Hydrogeology

The indurated nature of the rockmass means that the primary porosity and permeability of the KCS is very low. The overprint of fracturing and jointing provides minimal improvement in porosity, permeability and storage. As such groundwater flow is limited and the KCS bedrock is considered as aquitards at this location.

The inferred cross sectional profile of the groundwater table, extending from the Clarence River (South Arm) to the northwest and up to the top of the sandstone ridge in the southeast is anticipated to mimic the topography, as is typical for these hydrostratigraphic units, but at a lower elevation and in a subdued manner. At the borrow pit site, a 25m deep cored borehole did not intersect the natural groundwater table over its total depth (drilled to 49m AHD). The collar height of the pit base borehole is ~74m AHD, implying that the groundwater table beneath the pit floor is equal to or likely less than 44m AHD (Figures 1 and 3). The theoretical maximum possible depth of groundwater that could be intersected is $\leq 5\text{m}$.

This is corroborated by water level measurements at the closest W2B monitoring piezometer, PZ51 (GWB3-46, screened in KCS), located some 340m northwest of the pit site but at a lower (collar at 65.17m AHD) (Appendix A). At PZ51 an average elevation of the water table is approximately 38m AHD (SWL at 27.21m bgl) (Appendix A, Table A-1), some 6m below the final depth of the pit.

The water table profile is interpolated to fall away, down the topographic slope, to the northwest, to the Clarence River flood plain. Here, the low-lying saturated unconsolidated alluvial plain sedimentary sequence on-lap onto the KCS bedrock ridge, where water levels are anticipated to be between 0.0m (at the river bank) to $<8.0\text{m}$ AHD. The alluvial flood plain sediments associated with the Clarence River (South Arm) that exist to the west and north of the borrow pit site, together with the low lying valley (comprising farmland and riparian vegetation) and wetlands associated with Shark Creek that exists to the east, sustain a shallow water system intimately associated with the Clarence River surface water / groundwater system. The Clarence River groundwater system is considered entirely separate from the KCS bedrock groundwater system.

Regional groundwater flow beneath the borrow pit site is therefore in a westerly to northwesterly direction (following the topographic slope), from a groundwater divide running along the topmost ridge crest to the alluvial plain sediments, and ultimately emerging to the Clarence River (South Arm).

Groundwater recharge to this groundwater system is via rainfall infiltration at the topographic surface though shallower unsaturated sandstone profile down to the deep water table (the saturated zone). Rainfall falling on the land surface will either discharge as surface runoff or infiltrate to the subsurface. In the case of the latter, the thin soil zone will facilitate rapid horizontal flow within a shallow perched system on top of the low permeability KCS sandstone aquitard. Limited vertical infiltration sustains the deep water table in the KCS aquitard.

Local Groundwater Regime

Two groundwater flow systems are inferred for the immediate vicinity of the borrow pit site; namely:

- *Perched water aquifer*: the shallow perched groundwater in the veneer comprising the soil/weathered zone (regolith) on top of the KCS bedrock; and
- *Deep aquitard*: a deeper KCS sandstone aquitard system, located at depth beneath the existing and proposed pit floor depth.

Groundwater flow in the former is controlled by the local scale topography, while the latter is controlled by the more regional topography (west to northwest).

The groundwater levels within the shallow perched systems are inferred to fluctuate considerably over time due to their dependence on rainfall recharge and their limited storage capacity. Groundwater flow is strictly controlled by the immediate topographic profile and discharges to local drainage tributaries. This shallow groundwater system sustains the local ecology, as illustrated in Figure 3, with evapo-transpiration contributing significantly to the water balance losses from these systems.

The deeper system is a slow flowing deep system which reacts slowly to rainfall events and, as such, does not fluctuate much over time ($\pm 0.53\text{m}$, Figure H55, "Groundwater Monitoring Program Interpretative Report", Coffey, 2014) (Table A-3). Because of its depth, this groundwater system does not meaningfully sustain the local ecology.

Ecosystems sustained or dependant on groundwater

The ecological studies undertaken to date, report that the footprint of the proposed borrow site lies within the void of the previous quarry and is vegetated with early regrowth vegetation including sections of Pink Bloodwood - Tallowood Moist Open Forest and associated regrowth (W2B Section 3 Tyndale Borrow Site Ecological Investigation, GeoLINK 2015 and Tyndale Borrow Site Management Plan, WSP-PB 2016). The vegetation within the borrow site has been assessed as being of *low ecological value* based on the following criteria:

- No threatened species (flora and fauna)
- No Endangered Ecological Communities (EEC)
- No habitat trees.

The proposed excavation works to be carried out at the borrow site is not anticipated to intercept the deep bedrock groundwater table due to its elevation (as illustrated in Figure 3) within the KCS topography. That is, the floor of the final void will not penetrate the regional water table, and as such no regional impact from the works is foreseen.

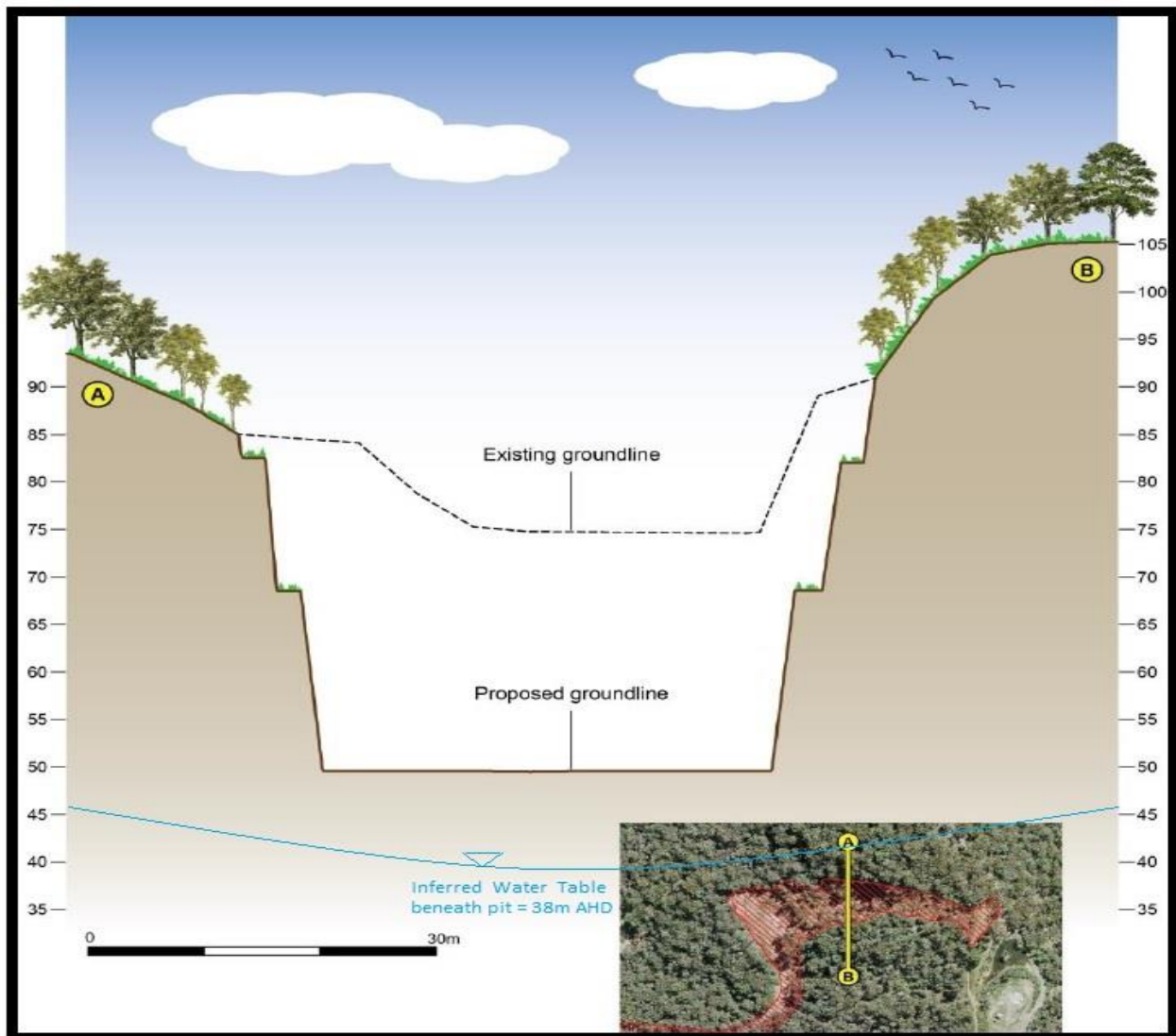


Figure 3 – Conceptual cross section of the proposed Tyndale Borrow Site showing the inferred regional water table level profile

The presence of the pit may enhance recharge to the regional groundwater system marginally, but this will be limited due to the low permeability of the bedrock mass, and mild mounding of the local groundwater table beneath the immediate footprint of the pit might occur. The limited mass flux of infiltrating rainfall water is unlikely to adversely impact the water quality of the regional groundwater for similar reasons. The limited density and tightness of the fracture flow pathways would effectively filter suspended solids (turbidity) related quarry activities, the primary source of pollutants associated with quarrying.

Further, there will be no additional impact to the pertinent ecosystems on or surrounding the pit rim (particularly, *Pink Bloodwood - Tallowood Moist Open Forest*) since this has been impacted by the pre-existing quarrying activities. The current vegetation on the pit rim does not demonstrate meaningful impact from the pits prior presence, a fact that further corroborates the circumstance that these ecosystems are sustained by recharge-in/recharge-out processes associated with rainfall infiltration which typically characterise the behaviour of shallow perched water systems.

These conclusions are consistent with the most recent Bioregional Assessment mapping (1 October 2015, <http://www.bom.gov.au/water/groundwater/gde/map.shtml>) undertaken in the *Clarence-Moreton Bioregion*. The key conclusions being that:

- no identified GDE's exist at or in the vicinity of the Tyndale Borrow Pit site; and
- a low to very low likelihood that GDE's being inferred from remote sensing surveys.

Groundwater users

Groundwater users within 2.5km of the borrow pit area number 7, of which 4 are utilised and domestic, stock and irrigation bores. They exploit the groundwater resource within the alluvial aquifer of the Clarence River flood plain (Appendix B). The exception is Bore GW306065, located 1.45km north of the Tyndale borrow pit on the Clarence River Floodplain at an elevation of 9m AHD (Google Earth Pro, 2016). The bore lies in the bedrock groundwater catchment to the north of the borrow pit site, separate from that in which the pit lies, and exploits a sandstone (likely fracture) aquifer at -34m AHD (below sea level), in close proximity to the Clarence River Alluvial aquifer/s. The latter are likely to provide the main component of recharge to the fracture aquifer system through vertical hydraulic connection at or close to this location.

As such, the localised impacts associated with the proposed borrow pit (limited mounding beneath the pit footprint) will not have a meaningful effect on the local groundwaters user's access to the groundwater supply.

Management Contingencies

In the unlikely event that the borrow pit does encounter a permanent water table in the bedrock sandstone to a depth in excess of 5m, review and management measures should be considered, and these could include re-evaluation of the groundwater impact, return of captured water (inflows) to local drainages after treatment in an appropriate sedimentation pond (to capture suspended solids) or ceasing excavation beneath the -5m mark.

Conclusion

This review of groundwater behaviour affecting the proposed borrow pit area, indicates that two (2) groundwater regimes operating at the site, the shallow perched (within 5m bgl) and deep regional groundwater (>35m bgl, 38mAHD) systems, are not likely to be impacted by proposed quarrying activities. The deep regional groundwater table will not be intersected by the quarrying since it is located at depth below the proposed pit floor. The perched system is surficial and is not connected to the deep regional groundwater system, and, as such, will not be additionally interfered with by the proposed quarrying works (any more than the existing pit has already affected it). As such, this perched system will continue to support the existing *Pink Bloodwood - Tallowood Moist Open Forest* and regrowth, since it is sustained by rainfall recharge.

This review therefore concludes that the proposed borrow pit works will not have a meaningful impact on the groundwater levels and water quality, and existing groundwater users in the area. In the unlikely event that the borrow pit does encounter a permanent water table in the bedrock sandstone to a depth in excess of 5m mitigation and management measures are discussed.

Should you have any questions please contact Ray Hatley – Capability Executive Hydrogeologist.

Attachment A – Groundwater Piezometers and Water Level Monitoring Data (Coffey, 2012)

Table A-1: Details of closest piezometer to borrow pit site, PZ51

PZ51	Record
Elevation	65.17mAHD
Coordinates	514781.39E; 6729717.22N
Depth	28m below ground level
Screen	6m
Average water level	27.21m below ground level

Table A-2: Location of closest groundwater piezometers

Piezometer ID	Approx. Chainage	Cut/Fill No.	Data Logger Installed	Included as Permanent Piezometer	Status
BH1159	66,650	C3-30	Yes	Yes	Active
BH1164	66,800	C3-30	Yes	No	Active
BH1169	66,850	C3-30	Yes	No	Active
BH1170	66,850	C3-30	Yes	No	Active
BH1180	67,450	F3-31	No	No	Active
BH1187	67,650	C3-31	Yes	Yes	Active

Table A-3: Water level data at piezometers closest to the proposed borrow pit

Cut/Fill Number	Monitoring Location	Borehole Depth	Typical SWL (m below ground level)		
			AVG	MED	SD
Cut C3-28	PZ48	14	11.34	11.27	0.27
	PZ49	15	11.27	11.32	0.36
Cut C3-30	BH1159	15.1	9.03	8.98	0.68
	PZ50	25	13.68	13.55	0.49
	BH1170	24.25	8.88	8.88	0.24
Cut C3-31	BH1187	25	17.37	17.42	0.22
	PZ51	28	27.21	26.99	0.53
Cut C3-32	PZ52	12	9.23	9.12	0.39
	BH1197	26.5	6.70	7.06	1.16
Cut C3-33	PZ53	6	4.19	4.43	1.69
	BH1200	37	26.37	26.73	0.99

Table A-4: Piezometer water quality data

Cut/Fill Number	Monitoring Location	Electrical Conductivity ($\mu\text{S}/\text{cm}$)			pH			Temperature ($^{\circ}\text{C}$)		
		AVG	MED	SD	AVG	MED	SD	AVG	MED	SD
Cut C3-28	PZ48	695	762	201	6.44	6.54	0.45	20.23	20.30	0.41
	PZ49	187	187	4	4.01	4.06	0.49	20.03	20.00	0.37
Cut C3-30	BH1159	1536	1472	175	3.96	3.95	0.35	23.00	23.10	0.92
	PZ50	798	830	104	6.80	6.84	0.24	22.15	22.10	0.37
	BH1170	274	261	37	7.69	7.62	1.14	22.80	22.75	0.45
Cut C3-31	BH1187	491	438	126	4.91	5.00	0.56	21.50	21.50	0.59
	PZ51	910	963	512	5.73	5.66	2.87	21.47	21.50	0.35
Cut C3-32	PZ52	475	478	90	6.20	6.44	0.56	21.05	21.00	0.82
	BH1197	416	387	83	6.24	6.40	0.44	20.78	20.95	0.53
Cut C3-33	PZ53	162	172	85	5.55	5.52	2.78	20.73	20.40	1.23
	BH1200	642	592	234	4.46	5.73	2.81	21.15	20.75	1.13

Attachment B – Groundwater Users with 2.5km of the Borrow Site

Table B-1 Groundwater users

	Bore	Status	Purpose	LATITUDE	LONGITUDE	DEPTH
1	GW300883	Active	DOMESTIC	-29.563975	153.146443	7
	GW300883	Cancelled	IRRIGATION			
	GW300883	Active	STOCK			
2	GW303174	Active	STOCK	-29.552737	153.162922	6
	GW303174	Active	DOMESTIC			
3	GW306065	Active	DOMESTIC	-29.545734	153.156837	48
	GW306065	Active	IRRIGATION			
4	GW306376	Active	DOMESTIC	-29.544064	153.15735	4.2
	GW306376	Active	FARMING			
	GW306376	Active	STOCK			
5	GW062404	Cancelled	STOCK			
	GW062404	Cancelled	IRRIGATION			
	GW062404	Cancelled	DOMESTIC			
6	GW301842	Abandoned	DOMESTIC			
7	GW305352	Active	MONITORING BORE			
	GW305352	Cancelled	TEST BORE			

Table B-2 Geology

	WORK_NO	FROM DEPTH	TO DEPTH	DRILLERS LOG	ROCK TYPE	ROCK TYPE
2	GW303174	0	1.2	Soil	SOIL	Soil
	GW303174	1.2	2.4	Sand	SAND	Sand
	GW303174	2.4	3.6	Decomposed Sandstone	DCMP	Invalid Code
	GW303174	3.6	6	Sandstone	SDSN	Sandstone
3	GW306065	0	0.6	Topsoil, black	TPSL	Topsoil
	GW306065	0.6	1.5	Clay, yellow	CLAY	Clay
	GW306065	1.5	5	Sandy Clay, light grey	20	Invalid Code
	GW306065	5	6	Sandstone, yellow	SDSN	Sandstone
	GW306065	6	8	Sandstone, red	SDSN	Sandstone
	GW306065	8	18	Sandstone, grey, fine	SDSN	Sandstone
	GW306065	18	23	Sandstone, cracky, grey, water bearing*	SDSN	Sandstone
	GW306065	23	42	Sandstone, grey, fine	SDSN	Sandstone
	GW306065	42	46	Sandstone, cracky, grey, water bearing*	SDSN	Sandstone
	GW306065	46	48	Sandstone, grey	SDSN	Sandstone


Note: Water bearing zones slotted.

Figure B-1 – Location of existing water bore users within 2.5km of the borrow pit site



 350m

Legend

 Boreholes

Appendix E Heritage due diligence assessment: Jacko's Quarry



Sydney Office

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Date: 25/05/2016
Our Ref: PR120887-17
Via: Email

Attn: Mark Cowan
Roads and Maritime Services
Level 2, 76 Victoria Street
Grafton NSW 2460

Dear Mark

Heritage Due Diligence Assessment: Jacko's Quarry

Roads and Maritime Services (RMS) (the proponent) engaged RPS to prepare a due diligence assessment for a proposed ancillary facility. RMS and Pacific Complete propose to re-open a quarry at Tyndale and use the material for the construction of the Woolgoolga to Ballina upgrade.

The purpose of a due diligence assessment is to demonstrate that reasonable and practicable steps have been taken to prevent harm to an Aboriginal object or place and in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (2010) ("Due Diligence Code"). RPS has prepared the due diligence assessment in accordance with the Environmental Impact Statement (EIS) and Ministers Conditions of Approval Condition B78.

This report was written by RPS Cultural Heritage Consultant Alexandra Byrne and reviewed by Heritage Consultant Joshua Madden. Technical assistance was provided by RPS Draftsperson Natalie Wood.

The project area incorporates part of Lot 1 of Deposited Plan 1185493 (Figure 1). It is located on a ridgeline 600 metres southwest of the Clarence River. A search of the Aboriginal Heritage Information Management System (AHIMS) identified three items within the searched coordinates, two of which are located within two kilometres of the project area.

RPS undertook a survey and assessment of the project area on Friday 13 November 2015. The Yaegl Native Title Group, Birrigan Garble Local Aboriginal Land Council and Yaegl Local Aboriginal Land Council participated in survey and assessment (Table 1). Representatives from three registered Aboriginal parties (RAPs) were present: Ferlin Laurie and Michael Randall Jnr from the Yaegl Native Title Group, Shane Williams from the Birrigan Gargle Local Aboriginal Land Council and Shane Mcleay and from the Yaegl Local Aboriginal Land Council. The RAPs were accompanied by Joshua Madden, Georgia Wright and Simon Rabagliati of RPS.

The survey and assessment identified no Aboriginal objects or places within the project area. It is considered that there is low to nil identified risk of harm to Aboriginal objects. The proposed quarry re-opening and expansion may therefore proceed with caution. The recommendations of the due diligence assessment are provided at the conclusion of this report.

Environmental context

The main geological feature in the broader landscape is the Clarence-Moreton Basin, an extensive Mesozoic sedimentary basin in north-eastern New South Wales and southern Queensland. The Kangaroo Creek Sandstone geological formation, formed in the Jurassic-Cretaceous periods, fringes the project area, and comprises quartz sandstone with some conglomerate (Brownlow, 2003). The project area is located on Quaternary undifferentiated alluvium which contains alluvium, gravel, sand and silt (Rose 1968; Brownlow 2003). The sedimentary rocks available in the local landscape would therefore include quartz, quartzite and sandstone.

The nearest and most relevant soil landscape assessment was undertaken about three kilometres south east of the project area at Tucabia-Tyndale Road. The soil profile was identified as mottled mesotrophic brown kurosol and yellow podzolic soils. The soils were identified as shallow <100 centimetres and consisted of mottled, thick gravelly loam giving way to a clayey base.

The local landscape consists of an undulating slope and crest landform associated with ridges running north south along the Clarence River. The coastal range consists of lowland hills and ridges with various ephemeral and permanent water sources; the low-lying area to the east consists of swamp with few elevated landforms located above water.

The Clarence River is located 750 metres west of the project area with Sandy Creek located one kilometre southeast and Coldstream River two kilometres southwest of the project area.

The project area includes two vegetation communities, the North Coast Dry Sclerophyll Forests and the Coastal Floodplain Wetlands. The North Coast Dry Sclerophyll Forests comprise a canopy of eucalypts up to 25 metres in height, with an understorey of sclerophyllous shrubs (Keith 2006:144-145). The Coastal Floodplain Wetlands are located along the east of the Great Dividing Range on expansive coastal plains that are periodically inundated floodplains. The forest canopy on elevated rises and ridgelines are dominated by Eucalyptus with an under storey of shrubs and various herbs and grasses form the ground cover (Keith 2006: 226-227). Fauna found in the sclerophyll forests includes various nectar and insect feeding birds and small mammals. Tree hollow-dwelling marsupials such as the brushtail possum, sugar glider, feathertail glider are also found in North Coast Dry Sclerophyll Forests (Keith 2006:120-121), as well as larger mammals such as kangaroos, wallabies and echidnas.

Non-Aboriginal people settled in the local area during the mid-1800s. The population relied heavily on water transport, moving timber and later agricultural products to and from markets, brining in goods and transporting people. Early settlers engaged in timber getting, later turning to agricultural pursuits such as cultivating sugar cane and producing dairy products, as well as banana plantations, pig farming and bee-keeping (Kijas 2007:19). The development of the area was impeded by its distance from viable market places, the frequency of flooding and the uneven fertility of soils. The Depression stunted the growth of the area in the early to mid-twentieth century, as many people moved to the city in search of work. In the 1950s and 1960s, tourism became an instrument which encouraged growth in the region, bringing improvements to roads and transport infrastructure. It led to the development of coastal land, and provided the impetus for the growth of coastal towns (Kijas 2007:20-21).

Heritage context

A search of the AHIMS was conducted on 24 July 2015 for the project area (Client Service ID: 182884), using the following coordinates: Eastings 513007 to 516117 and Northings 6727630 to 6737800 (GDA 94, Zone 56). The search identified three sites within the searched coordinates, two of which are located within two kilometres of the project area (Table 2) (Figure 2). There are no registered sites within or near the project area.

Table 1: AHIMS search results

Type	Site name	AHIMS number	Proximity to project area
Potential Archaeological Deposit	Tyndale 1	09-04-0099	1.5 kilometre
Potential Archaeological Deposit	Tyndale 2	13-04-0177	1.8 kilometres
Shelter with Deposit	Woodford Island	13-4-0077	4 kilometres

Previous archaeological investigations

As part of the wider Woolgoolga to Ballina project, a number of cultural heritage and archaeological assessments have been undertaken throughout the Clarence Valley and wider regions. The foremost assessments within the region are a series of archaeological assessments developed as part of the Woolgoolga to Ballina EIS, from which a summary of the relevant sections is provided below.

Prior to this project, research into the prehistory of the Clarence region began with the site surveys and excavations of McBryde (1974) in the early 1960s, with results from Seelands rockshelter establishing a minimum time depth of 6,400 years for Aboriginal occupation. The first systematic survey of the coastal zone was undertaken by Starling (1974) to identify sites likely to be affected by sandmining. The survey focussed on foredunes and headlands, resulting in the discovery of 13 middens between Red Cliff and Tree Point.

In 1986 Byrne completed an Aboriginal heritage study of the Ulmarra Shire. Having reviewed available evidence for Aboriginal use of the coast and coastal wetlands, Byrne (Byrne 1986:50) concluded that the most favoured locations for large and/or long term camps would have been estuary banks and coastal situations adjacent to large rock platforms. Byrne predicted that the backdune complexes between Sandon and Bare Point would have offered favoured locations for small campsites by virtue of their proximity to extensive swamps and lakes (Byrne 1986:52).

A summary of selected relevant previous archaeological investigations are outlined below.

RPS (2015) Survey Report: Maclean Interchange – Woolgoolga to Ballina Pacific Highway Upgrade

This report details the results of an archaeological survey of design changes for the Maclean Interchange upgrade as part of the wider Pacific Highway Woolgoolga to Ballina highway upgrade program. The assessment assessed only those properties to be impacted and included: Lot 9 DP 1152500, Lot 8 DP 816172 and Lot 2 DP 634170.

Prior to the archaeological survey, it was identified that a previously recorded Aboriginal site was located 80 metres to the west of the assessed area. The archaeological survey was undertaken with members of the Yaegl Native Title Claimant Group and the Yaegl Local Aboriginal Land

Council. The project area was found to be extensively disturbed by vegetation clearance, livestock grazing, sugar cane cultivation, the installation of power lines, and flooding events.

The assessed area was found to be within a low lying and flood prone zone. No Aboriginal cultural heritage sites and/or objects were identified during the archaeological survey.

Woolgoolga to Ballina Planning Alliance (2012) Woolgoolga to Ballina Pacific Highway Upgrade, Woolgoolga to Wells Crossing Aboriginal cultural heritage assessment

This report details the results of the Woolgoolga to Wells Crossing Aboriginal cultural heritage assessment. The report stated that 99 per cent of the project boundary was subject to archaeological survey; initial archaeological surveys were undertaken between 2005 and 2007, and then as part of the cultural heritage assessment process between 2010 and 2012. The assessment identified 15 Aboriginal objects within the project boundary between Woolgoolga and Wells Crossing, 10 of which were identified to be of low to moderate or higher potential for archaeological deposits. The assessment included archaeological excavations at nine of the 10 identified potential archaeological deposits, five of which contained cultural materials.

The report defined the Sherwood Creek Road to Kangaroo Trail PAD (22-1-0401) as a PAD that extended from north of Sherwood Creek Road to near Kangaroo Trail Road. Further archaeological survey determined that the PAD had been subject to disturbance including a banana plantation, previous road construction and services. Further, the report noted that 60 per cent of the PAD was swamp. The Sherwood Creek Road to Kangaroo Trail PAD (22-1-0401) was reassessed as not a PAD within the boundary of the Woolgoolga to Ballina upgrade. The PAD was assessed to extend west outside of the Woolgoolga to Ballina upgrade.

Kayandel (2007) Cultural heritage assessment for a Local Environmental Plan amendment, Red Rock and Corindi

This report details the results of a cultural heritage assessment at Red Rock and Corindi, east of the project area. The assessment formed part of a wider investigation undertaken to inform an amendment to the Coffs Harbour draft Local Environmental Plan following the amalgamation of the Pristine Waters and Coffs Harbour local government areas. The lands subject to the amalgamation were the subject of this report.

The assessment found that 174 Aboriginal objects and places had been recorded within or adjacent to the subject area. The assessment identified a further 73 Aboriginal objects in the subject area. The subject area included the Arrawarra Fish Traps (protected under the Coffs Harbour Local Environmental Plan and also as a special purpose zone reserved for educational and Aboriginal resource use) and Red Rock Recreation Reserve Midden 1 (AHIMS 13-4-0093). The report noted radiocarbon dates taken from the midden lens of the Red Rock Recreation Reserve Midden spanned c.3800 cal BP to c.2800 cal BP, making the midden one of the earliest known cultural deposits on the coast. The report also noted a number of scarred trees, which are related to women's spiritual places, and a birthing ground, used up to the 1960s. The report presented a predictive model for evidence of Aboriginal land use.

The report recommended five management options including further archaeological investigation (archaeological survey or test excavation) to determine the nature and extent of identified Aboriginal objects and conservation of items of high archaeological and/or cultural significance, or for landforms that have high potential to contain cultural material as a representative sample of potential archaeological resources. The report noted that conservation included exclusion of development from areas of high cultural heritage significance or potential, or preservation of specified areas within conservation zones. The report also recommended that where

conservation is not feasible, mitigation through the salvage of surface artefacts or excavation of archaeological deposits. The report recommended that mitigation is not required for Aboriginal objects of low archaeological and cultural value (unmitigated impact) and archaeological monitoring as an option where archaeological evidence such as burials is predicted to occur. The report noted that monitoring allows for the identification and retrieval of cultural evidence that may not have otherwise been recorded or salvaged.

Visual inspection results

RPS conducted an archaeological survey of the project area on Friday 13 November 2015. Representatives from three RAPs were present: Ferlin Laurie and Michael Randall Jnr from the Yaegl Native Title Group, Shane Williams from the Birrigan Gargle Local Aboriginal Land Council and Shane Mcleay and from the Yaegl Local Aboriginal Land Council. RPS conducted the archaeological survey on foot (pedestrian). It included the project area and immediate surrounds.

The archaeological survey found that the project area was located across severely disturbed and impacted ridge and slope landforms. Visibility across the project area was low (10%) due to the recent and dense re-growth which has grown over the project area since the closure of the quarry.

The archaeological survey identified a high level of disturbance. The survey identified the former quarry with two 'benches', multiple man-made dams and drainage lines, an impacted flat and a series of gravel and sealed access roads. The soil profile across the project area was shallow and impacted with numerous layers of fill across the impacted flat.

Impact assessment

The proposal is to re-open and extend the quarry at Tyndale. The proposal will include blasting and cutting. There are no Aboriginal objects within the project area. Due to the high level of disturbance, RPS has assessed the project area to be of low archaeological potential. There is no identified risk of harm to Aboriginal objects.

Cultural significance

RPS discussed cultural significance with the Yaegl Native Title Group, Birrigan Gargle Local Aboriginal Land Council and Yaegl Local Aboriginal Land Council during the archaeological survey of the project area. The Yaegl Native Title Group, Birrigan Gargle Local Aboriginal Land Council and Yaegl Local Aboriginal Land Council agreed that there was little to no cultural significance associated with the project area but noted that it is located in close proximity to areas of high cultural sensitivity.

Archaeological significance

The archaeological significance of Aboriginal objects, places and landscapes is determined through the assessment of Aboriginal objects, places and landscapes against archaeological criteria.

No Aboriginal objects and no potential for subsurface archaeological deposits were identified within the project area. It is therefore assessed that there is low to nil risk of impact to Aboriginal objects within the assessed project area.

Conclusions and recommendations

This report has considered the available archaeological information for the project area, the land condition and the proposed activity. The purpose of the due diligence assessment was to identify if there was risk of impact to Aboriginal objects by the proposed re-opening of the quarry at Tyndale. No Aboriginal objects or places were identified within the project area. It is considered that there is low to nil identified risk of harm to Aboriginal objects or places and as such, proposed activity may proceed with caution.

The following recommendations are made in relation to the proposed activity:

Recommendation 1

All relevant RMS and Pacific Complete personnel, contractors and subcontractors should be made aware of the statutory obligations for heritage under the *National Parks and Wildlife Act 1974* and the *Heritage Act 1977*, which may be implemented as a heritage induction.

Recommendation 2

This assessment must be kept by RMS so that it can be presented, if needed, as a defence from prosecution under Section 86(2) of the *National Parks and Wildlife Act 1974*.

Recommendation 3

If unrecorded Aboriginal object/s are identified in the project area during the conduct of the proposed activity, then all activity in the immediate area must cease and the area should be cordoned off. OEH must be notified on Enviroline 131 555 so that the site can be adequately assessed and managed.

Recommendation 4

In the unlikely event that human remains are identified, all activity must cease immediately in the vicinity of the remains and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, OEH must be contacted by ringing the Enviroline 131 555. An OEH officer will determine if the remains are Aboriginal or not; and a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.

Recommendation 5

If, during the course of development works, suspected historic cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch, Office of Environment and Heritage (Enviroline 131 555) should be notified and works only recommence when an approved management strategy has been developed.

Yours sincerely

RPS



Joshua Madden
Senior Cultural Heritage Consultant

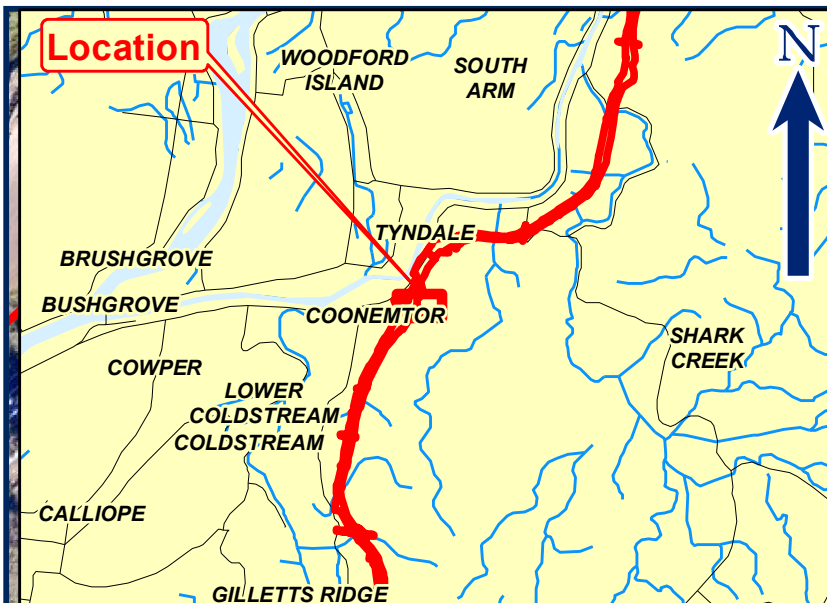
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Attachment I

Figures



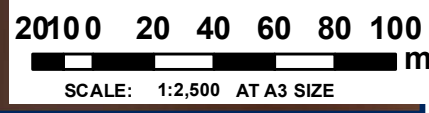
Legend

- Borrow Site - Jackos Quarry
- Project Area
- Cadastre

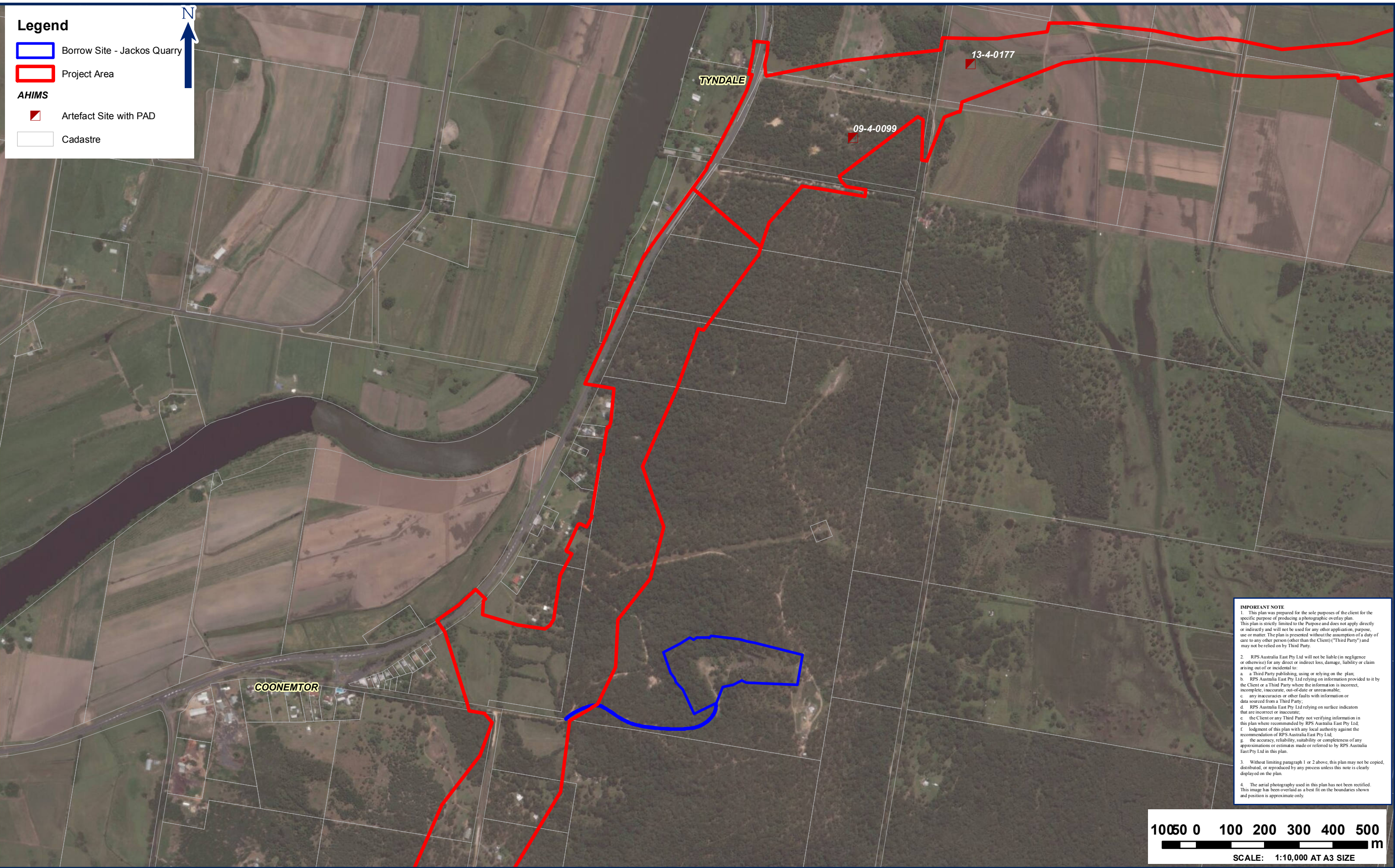


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TITLE : FIGURE 1: LOCATION MAP	LOCATION : TYNDALE	DATUM: GDA 1994	DATE : 25/05/2016
		PROJECTION: GDA 1994 MGA Zone 56	PURPOSE: HERITAGE
			VERSION (PLAN BY): B A3 (Natalie.Wood)
			PATH: F:\Sydney Working Files\Woolgoolga to Ballina\120887-17 Jacko's\120887-17 Figure 1 B A4 20160525.mxd



Legend

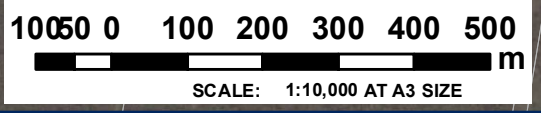
- Borrow Site - Jackos Quarry
- Project Area

AHIMS

- Artefact Site with PAD
- Cadastre

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TITLE : FIGURE 2: PROJECT AREA WITH AHIMS	LOCATION : TYNDALE	DATUM: GDA 1994	DATE : 25/05/2016
		PROJECTION: GDA 1994 MGA Zone 56	PURPOSE: HERITAGE
			VERSION (PLAN BY): B A3 (Natalie.Wood)
			PATH: F:\Sydney Working Files\Woolgoolga to Ballina\120887-17 Jacko's\120887-17 Figure 2 B A3 20160525.mxd



Attachment 2

Plates



Plate 1: View SE overlooking directly west of the project area at sealed access track



Plate 2: View E looking at the two tiers of the former quarry



Plate 3: View W overlooking fill dump for the construction of the impacted flat



Plate 4: View SW overlooking the impacted flat showing various disturbances



Plate 5: View N overlooking re-growth quarry slope



Plate 6: View NW overlooking one of the many access tracks



Attachment 3

AHIMS Search



SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
09-4-0099	Tyndale 1	GDA	56	515389	6730969	Open site	Valid	Artefact : 2, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Ms.Vanessa Edmonds,Jacobs Group (Australia) Pty Ltd - Armadale Victoria,Mr.Josej Permits							
13-4-0177	Tyndale 2 PAD	GDA	56	515734	6731186	Open site	Valid	Artefact : 9, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	Ms.Vanessa Edmonds,Jacobs Group (Australia) Pty Ltd - Armadale Victoria,Mr.Josej Permits							
13-4-0077	Woodford Island B;Brushgrove;	AGD	56	515850	6732650	Closed site	Valid	Artefact : -	Shelter with Deposit	102620
	Contact	Recorders	P Cuming Permits							

Report generated by AHIMS Web Service on 24/07/2015 for Philippa Sokol for the following area at Datum :GDA, Zone : 56, Eastings : 513007 - 516117, Northings : 6727630 - 6737800 with a Buffer of 0 meters. Additional Info : Background information. Number of Aboriginal sites and Aboriginal objects found is 3

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Appendix F Historical heritage site assessment



Woolgoolga to Ballina Pacific Highway Upgrade Historical Heritage Pre-Construction Services

Roads and Maritime Services

Historical heritage assessment for four ancillary sites

IS096000.V4 | FINAL

3 March 2016

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Woolgoolga to Ballina Pacific Highway Upgrade Historical Heritage Pre-Construction Services

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Abbreviations

CVLEP	Clarence Valley Local Environmental Plan
EIS	Environmental Impact Statement
Jacobs	Jacobs Group (Australia) Pty Ltd
km	kilometre
m	metre
MCoA	Minister's Conditions of Approval
Roads and Maritime	Roads and Maritime Services
SKM	Sinclair Knight Merz
W2B	Woolgoolga to Ballina Pacific Highway Upgrade

Executive Summary

Introduction

Jacobs Group (Australia) Pty Ltd (Jacobs) (formerly Sinclair Knight Merz Pty Ltd (SKM)) was previously commissioned by Roads and Maritime Services (Roads and Maritime) to prepare an Environmental Impact Statement (EIS) for the Woolgoolga to Ballina Pacific Highway Upgrade (W2B) Project (RMS 2012). The W2B project was designated critical infrastructure, under Part 3A of the *Environmental Planning and Assessment Act 1979*, and was approved on 14 August 2014. Roads and Maritime engaged Jacobs to undertake the non-Aboriginal Heritage pre-construction services under contract 13.2544.0922, including the preparation of this desktop historical heritage assessment and site inspection on behalf of W2B project delivery partner, Pacific Complete. This report includes the desktop assessment for four ancillary sites outside the approved project boundary which are required during construction and the details of the site inspection of two of these ancillary sites. The locations of the proposed ancillary sites are shown in Figure 1.1 and described below:

- A4 Firth Heinz (Conor's) is located towards the centre of Lot 14 DP1195225 to the east of Tucabia Tyndale Road, Tucabia.
- A8 Tyndale/A6 Jacko's Quarry is located within the south of Lot 1 DP1185493 at 43 Sheeys Lane, Tyndale.
- B5 Clyde Essex Drive is located in the eastern half of Lot 171 DP1134269, to the west of Sheehans Lane and north of Clyde Essex Drive, Gulmarrad.
- B6 Benson's Lane is located within the centre and east of Lot 1 DP572678 at 22 Sheehys Lane, Tyndale.

The aim of this assessment is to identify historical heritage items within and adjacent to the proposed ancillary sites, and to identify whether there may be any potential impact to any known historical heritage items. This assessment is being undertaken in order to meet the requirements of the Minister's Conditions of Approval (MCoA) for the W2B project.

Desktop assessment

There are no registered heritage items within or immediately adjacent to the proposed ancillary sites. B6 Benson's Lane and A8 Tyndale/A6 Jacko's Quarry are 450 m and 600 m respectively from Tyndale Sheehy Residence (I388), listed on the Clarence Valley Local Environmental Plan (CVLEP). A8 Tyndale/A6 Jacko's Quarry is also 800 m from Tyndale Residence (I389). The closest heritage items to A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive are over two kilometres away from the ancillary sites.

The following predictive statement indicates the type and distribution of historical heritage items that may occur in the proposed ancillary sites. It is based on the predictive model developed for Sections 3 and 4 of the W2B project as outlined by SKM (2012) and updated from the current desktop assessment:

- The whole of two of the ancillary sites, A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive, and cleared areas of A8 Tyndale/A6 Jacko's Quarry (approximately 15 percent) and B6 Benson's Lane (approximately 80 percent) have been subject to ground disturbance from road/track construction, clearing and ploughing. The remaining sections of the two ancillary sites, A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane are covered in trees.
- There is potential for previously unidentified historical heritage to be present within the tree-covered areas of A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane.
- Historical heritage site types in the tree-covered areas may include sites associated with farming, and transport and water infrastructure.

Site inspection

An inspection of two ancillary areas, A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane, was completed by Rebecca Andrews (Project Archaeologist, Jacobs) and Jennifer Chandler (Project Archaeologist, Jacobs) on 16 February 2016. During the site inspection one potential heritage item, Jacko's Quarry, was identified within A8 Tyndale/A6 Jacko's Quarry ancillary area. A potential historical heritage item – Benson's Land Brick Mound -

was identified during the site visit to B6 Benson's Lane. Both potential heritage items were subsequently assessed as not having sufficient significance to fulfil the criteria for State or local listing.

Impact assessment

As A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive have a low potential for previously unidentified historical heritage to be present, it is unlikely that there will be any impact on historical heritage during the use of these sites as ancillary areas.

As there have been no heritage items identified at B6 Benson's Lane or A8 Tyndale/A6 Jacko's Quarry, it is unlikely for there to be any impact on historical heritage during the use of these sites as ancillary areas.

Management measures

If any historical heritage or human remains are located during the construction or use of any of the ancillary areas, the procedure for the discovery of historical heritage materials, features or deposits (Section 6.1.1) and the discovery of human remains (Section 6.1.2) of *Upgrading the Pacific Highway, Woolgoolga to Ballina Upgrade: Historical (non-Aboriginal) Heritage Assessment* (SKM 2012) or similar management measures in the relevant Constuction Heritage Management Plan must be followed.

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs Group (Australia) Pty Ltd (Jacobs) is to prepare a historical heritage assessment for four ancillary sites outside of the approved project boundary, in accordance with the scope of services set out in the contract between Jacobs and Roads and Maritime Services (the Client). That scope of services, as described in this report, was developed with the Client.

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1. Introduction

1.1 Project background

Jacobs Group (Australia) Pty Ltd (Jacobs) (formerly Sinclair Knight Merz Pty Ltd (SKM)) was previously commissioned by Roads and Maritime Services (Roads and Maritime) to prepare an Environmental Impact Statement (EIS) for the Woolgoolga to Ballina Pacific Highway Upgrade (W2B) Project (RMS 2012). The W2B project was designated critical infrastructure, under Part 3A of the *Environmental Planning and Assessment Act 1979*, and was approved on 14 August 2014. Roads and Maritime engaged Jacobs to undertake the non-Aboriginal Heritage pre-construction services under contract 13.2544.0922, including the preparation of this desktop historical heritage assessment and site inspection on behalf of W2B project delivery partner, Pacific Complete. This report includes the desktop assessment for four ancillary sites outside the approved project boundary which are required during construction and details of the site inspection of two of these ancillary sites.

1.2 Aim and scope of assessment

The aim of this assessment is to identify historical heritage items within and adjacent to the proposed ancillary sites, and to identify whether there may be any potential impact to any known historical heritage items. This assessment is being undertaken in order to meet the requirements of the Minister's Conditions of Approval (MCoA) for the W2B project.

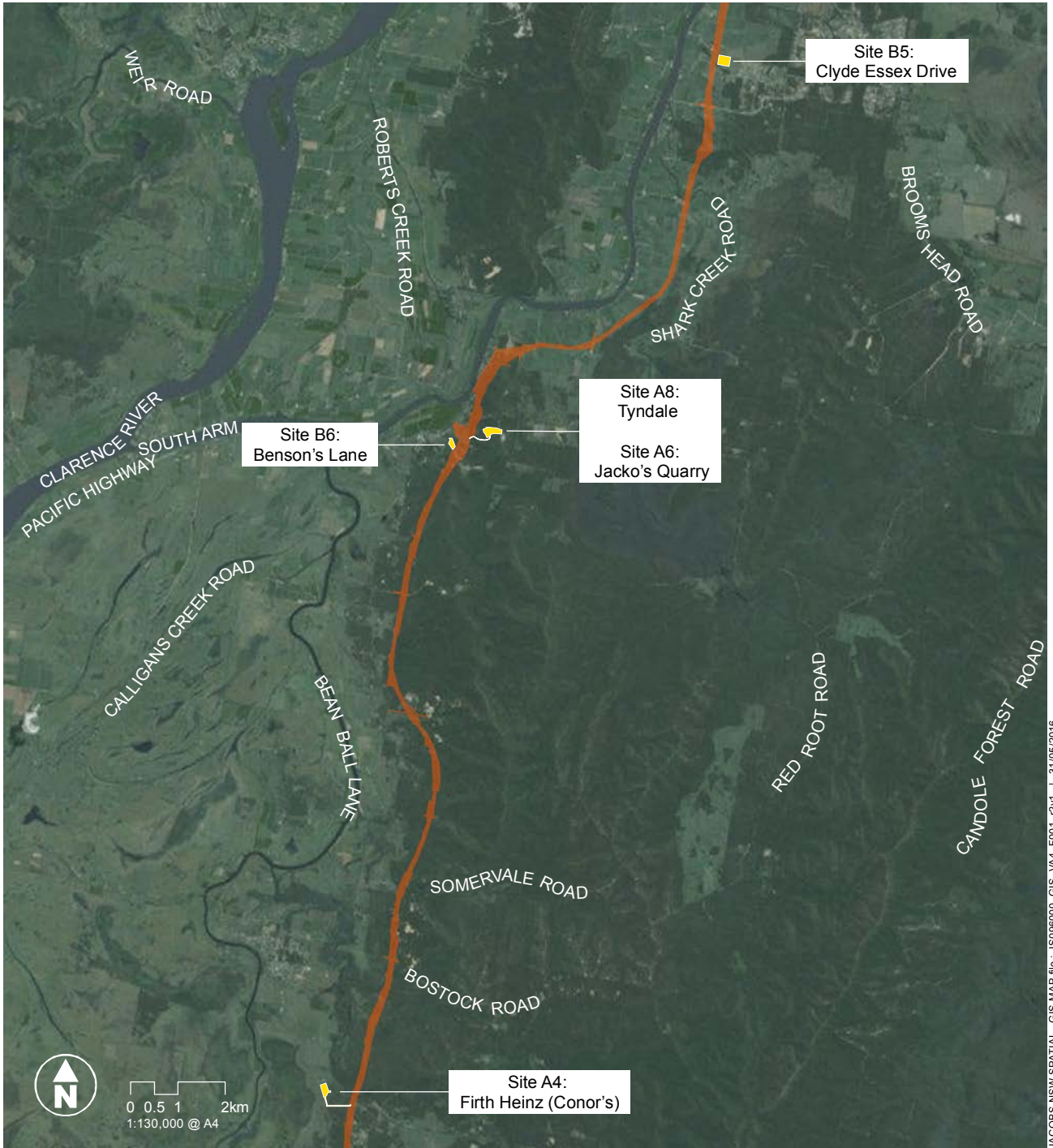
The MCoA outline the requirements for ancillary facilities which were not assessed during the previous assessments, and that are outside the approved project boundary. Conditions B74 and B75 outline the requirements:

- B74: Ancillary facilities that have not been previously identified and assessed ... shall be approved by the Environmental Representative prior to its establishment. In obtaining this approval, the Applicant (Roads and Maritime) shall consult with the relevant public authority(s) and the relevant council, and demonstrate to the satisfaction of the Environmental Representative, how the potential environmental impacts can be mitigated and managed to acceptable standards. The outcomes of the assessment shall be documented in a report. A copy of the report shall be included in the Ancillary Facilities Management Plan.
- B75: Ancillary facilities that have not been previously identified and assessed ... and result in additional impacts to biodiversity, heritage, flooding and noise beyond those approved for the State Significant Infrastructure (W2B project), shall be approved by the Secretary prior to their establishment. In order to obtain this approval, the Applicant shall undertake an assessment of the ancillary facility in accordance with condition B74 (above) and forward a copy of the assessment report to the Secretary, as part of the approval submission, at least one month prior to the establishment of the facility.

1.3 Location of ancillary sites

The four ancillary sites are all located within the Clarence Valley Local Government Area. The locations of the proposed ancillary sites are shown in Figure 1.1 and described below:

- A4 Firth Heinz (Conor's) is located towards the centre of Lot 14 DP1195225 to the east of Tucabia Tyndale Road, Tucabia.
- A8 Tyndale/A6 Jacko's Quarry is located within the south of Lot 1 DP1185493 at 43 Sheeys Lane, Tyndale.
- B5 Clyde Essex Drive is located in the eastern half of Lot 171 DP1134269, to the west of Sheehans Lane and north of Clyde Essex Drive, Gulmarrad.
- B6 Benson's Lane is located within the centre and east of Lot 1 DP572678 at 22 Sheehys Lane, Tyndale.



Legend

- Project boundary
- Ancillary site

Data sources

RMS 2015, Jacobs 2015, LPI 2015

Figure 1.1 | Location of the ancillary areas



2. Heritage context

2.1 Previous studies

2.1.1 *Maclean Community Based Heritage Study (Gardiner 2006)*

Gardiner (2006) completed a heritage study for the former Maclean Shire area (now part of the Clarence Valley Council area). During the heritage study, 437 potential heritage items were identified through register searches, community consultation and historical research. Of these heritage items, 265 were recommended for inclusion on the Clarence Valley Local Environmental Plan (CVLEP). Four heritage items in Tyndale, including the two residences located within 800 m of B6 Benson's Lane and A8 Tyndale/A6 Jacko's Quarry (Table 2.1), were identified prior to the 2006 heritage study. The heritage significance for these items was reassessed, and each of the items was determined to still be in good condition, and of local heritage significance.

2.1.2 *Wells Crossing to Iluka Road, Upgrading the Pacific Highway, Concept Design Report, Cultural Heritage Working Paper (Navin Officer 2009)*

In 2009, Navin Officer completed a historical heritage assessment for the preferred route of the Woolgoolga to Ballina Pacific Highway Upgrade announced in September 2006. The assessment included a review of documentary sources, register searches and field survey. No additional heritage items were identified during the survey. There are two heritage items identified in the Navin Officer assessment which are located within the approved project boundary at Harwood, but both of these are outside the proposed ancillary sites currently being assessed. The predictive statement highlights drainage channels and farming related features as potential unrecorded heritage items within the region (Navin Officer 2009).

2.1.3 *Upgrading the Pacific Highway, Woolgoolga to Ballina Upgrade: Historical (non-Aboriginal) Heritage Assessment (SKM 2012)*

In 2012, SKM prepared a historical heritage Working Paper for the W2B project as part of the EIS (SKM 2012). The assessment identified heritage items within and adjacent to the W2B project boundary through a review of previous heritage studies, register searches and field survey. The only heritage place identified in the Working Paper which is situated within one kilometre of the four ancillary sites is the Tyndale Residence (Item 11), (within 800 m of A8 Tyndale/A6 Jacko's Quarry) (Table 2.1).

Based on the historical synthesis for the region, the following predictive model for the types and distribution of sites for the area between Glenugie upgrade to Maclean (Sections 3 and 4 of the W2B project) was developed (SKM 2012):

- The majority of the area has been subject to ground disturbance from road construction, clearing and ploughing, or are low lying areas with frequent waterways
- Historical heritage site types may include sites associated with: exploration or early survey, farming and pastoral activities, towns and villages, road and water transport infrastructure, and water management infrastructure
- Areas of higher potential for historical heritage include areas within close proximity to fresh water, areas with hill top positions, areas alongside historical roads and areas immediately adjacent to traversable waterways. Sites associated with water management infrastructure (for example channels) are the most likely site type to be located within Section 3. As Section 4 has been extensively disturbed, archaeological sites are less likely to be present and the historical sites are more likely to be those within established townships, or near historical homesteads.
- Areas of lesser potential for historical heritage sites may include areas subject to ground disturbance, such as those under previous and current sugar cane cultivation, areas subject to frequent inundation, and areas of forested regrowth such as Glenugie State Forest.

2.2 Register search results

A search of all available historical heritage registers was undertaken for the proposed ancillary sites. The following registers were searched using a combination of online databases, and where available, using spatial data using Geographic Information System on 18 November 2015:

- State Heritage Register
- State Heritage Inventory
- Section 170 Heritage Conservation Registers
- CVLEP
- Commonwealth Heritage List
- National Heritage List
- World Heritage List
- Register of the National Estate

There are no registered heritage items within or immediately adjacent to the proposed ancillary sites. B6 Benson's Lane and A8 Tyndale/A6 Jacko's Quarry are 450 m and 600 m respectively from Tyndale Sheehy Residence (I388), listed on the CVLEP. A8 Tyndale/A6 Jacko's Quarry is also 800 m from Tyndale Residence (I389). The closest heritage items to A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive are over two kilometres away from the ancillary sites.

Table 2.1 : Historical heritage items located within 800m of the four ancillary sites

Item name	Register	Number	Significance	Location	Distance from ancillary site
Tyndale Sheehy Residence	CVLEP	I388	Local	2742 Pacific Highway, Tyndale	600 m from A8 Tyndale/A6 Jacko's Quarry 450 m from B6 Benson's Lane
Tyndale Residence	CVLEP	I389	Local	2861 Pacific Highway, Tyndale	800 m from A8 Tyndale/A6 Jacko's Quarry

2.3 Aerial imagery and parish maps

The current aerial imagery on New South Wales Six Maps and Google Maps was reviewed for the ancillary sites on 18 November 2015. A review of historical parish maps was also completed.

2.3.1 A4 Firth Heinz (Conor's)

A4 Firth Heinz (Conor's) comprises mainly of a cleared area with some tracks running irregularly across the site. There are also a couple of isolated trees within the ancillary site. Surrounding the ancillary site there is a farm house to the north, a road to the west and a tree-covered area to the south and east. There do not appear to be any potential historical heritage features visible in the aerial imagery.

The review of the Historical Parish Map, County of Clarence, Parish of Coldstream dated 1910 indicates that the ancillary site is located within an area which had been divided into allotments. There is a stream or creek shown on the map within the ancillary site. There are also road or drainage features within the area surrounding the ancillary site. However, these road or drainage features are not within the ancillary site. The review of the parish map did not provide any further information regarding the presence of historical heritage items on the ancillary site.

2.3.2 A8 Tyndale/A6 Jacko's Quarry

A8 Tyndale/A6 Jacko's Quarry comprises a predominantly tree-covered area with a small cleared area in the centre of the ancillary site. A track leads from the end of Sheehys Lane to the cleared area. The trees are

potentially regrowth. Due to part of the ground surface (approximately 85 percent) of the ancillary site not being visible due to vegetation coverage, the review of the aerial imagery is inconclusive in determining the likelihood of historical heritage items within the ancillary site.

The Historical Parish Map for the County of Clarence, Parish of Tyndale dated 1909 shows that the area of the ancillary site has been divided up into allotments. There are some drainage features or roads shown on the map in the area surrounding the ancillary site. The review of the parish map did not provide any further information regarding the presence of historical heritage items on the ancillary site.

2.3.3 B5 Clyde Essex Drive

B5 Clyde Essex Drive comprises a cleared area with a row of trees along the northern border of the ancillary site. There is a cluster of trees outside of the ancillary site to the southwest. There do not appear to be any potential historical heritage features indicated in the aerial imagery.

The Historical Parish Map for the County of Clarence, Parish of Gulmarrad dated 1913 indicates that the area surrounding the ancillary site had been divided into allotments. There is also a stream or creek with a marsh/swamp within the area surrounding the ancillary site. The review of the parish map did not provide any further information regarding the presence of historical heritage items on the ancillary site.

2.3.4 B6 Benson's Lane

B6 Benson's Lane comprises a predominantly cleared area with a track running through it. There is a small structure (possibly a shed) approximately 6.5 m by 6.5 m in size in the north of the ancillary site. The western side of the ancillary site is covered in trees, which are potentially regrowth. The northern and eastern edges of the ancillary site are bordered with dense vegetation. Due to part of the ground surface of the ancillary site (approximately 20 percent) not being visible due to vegetation coverage, the review of the aerial imagery is inconclusive in determining the likelihood of historical heritage items within the ancillary site.

The Historical Parish Map for the County of Clarence, Parish of Tyndale dated 1909 shows that the area of the ancillary site has been divided up into allotments. There are some drainage features or roads shown on the map in the area surrounding the ancillary site. The review of the parish map did not provide any further information regarding the presence of historical heritage items on the ancillary site.

2.3.5 Summary

The review of the aerial imagery at A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane is inconclusive due to the dense tree cover which conceals the ground surface. Therefore, determining the ground disturbance and the presence of historical heritage items is difficult to assess from the aerial imagery.

The aerial imagery at A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive shows that the ancillary sites are in areas where there is clear ground surface visibility. As there are no potential historical heritage features indicated in the aerial imagery present within these two ancillary sites, there is a low potential for previously unidentified historical heritage features to be present.

The review of the parish maps indicates the area surrounding each of the ancillary sites had been divided into allotments. All of the ancillary sites have road or drainage features, and streams or creeks nearby. The review of the parish maps did not provide any further information regarding the presence of historical heritage items on the ancillary sites.

2.4 Predictive statement

The following predictive statement indicates the type and distribution of historical heritage items that may occur in the proposed ancillary sites. It is based on the predictive model developed for Sections 3 and 4 of the W2B project as outlined in SKM (2012) and updated from the current desktop assessment:

- The whole of two of the ancillary sites, A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive, and cleared areas of A8 Tyndale/A6 Jacko's Quarry (approximately 15 percent) and B6 Benson's Lane (approximately 80 percent) have been subject to ground disturbance from road/track construction, clearing and ploughing. The remaining sections of the two ancillary sites, A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane are covered in trees.
- There is potential for previously unidentified historical heritage to be present within the tree-covered areas.
- Historical heritage site types in the tree-covered areas may include sites associated with farming, and transport and water infrastructure.

2.5 Conclusions

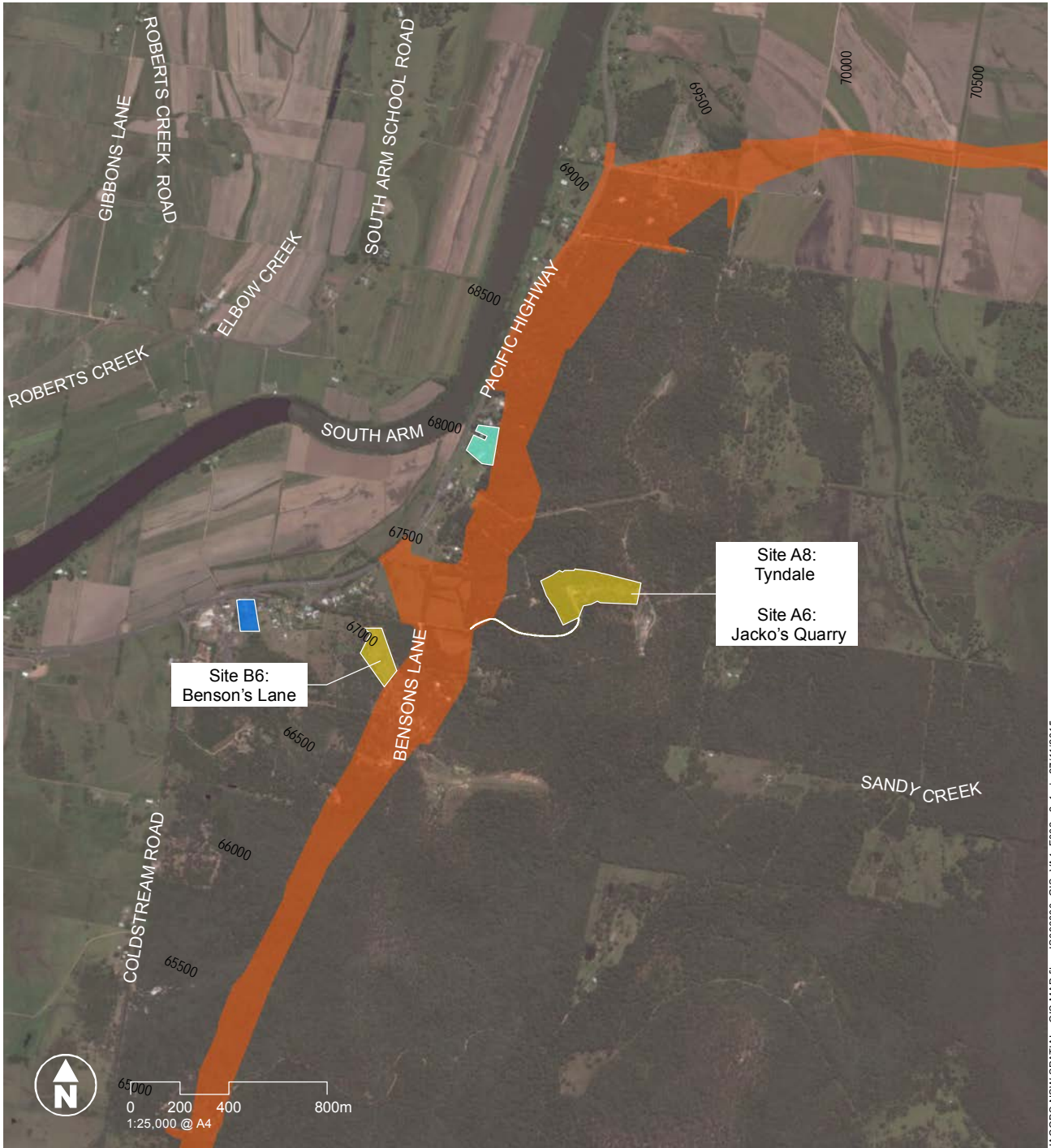
There are no registered historical heritage places within the proposed ancillary sites. There are two registered heritage places within 800 m of the B6 Benson's Lane and A8 Tyndale/A6 Jacko's Quarry ancillary sites. The whole of two ancillary sites, A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive, and the cleared areas of A8 Tyndale/A6 Jacko's Quarry (approximately 15 percent) and B6 Benson's Lane (approximately 80 percent) have been subject to ground disturbance from road/track construction, clearing and ploughing. However, there are sections of the proposed ancillary sites which are covered in trees, making the review of aerial imagery inconclusive at two of the ancillary site sites; A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane. Additionally, the ancillary sites are outside the areas previously subject to historical heritage survey. Therefore, the potential for previously unidentified historical heritage to be present within the tree covered areas of A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane ancillary sites is inconclusive. The most likely previously unidentified site type would be sites relating to farming.

The other two proposed ancillary sites comprise cleared paddocks, with no visible features that may be historical heritage items. Therefore, the A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive ancillary sites have a low potential for previously unidentified historical heritage to be present.

Table 2.2 summarises the heritage assessment for the proposed ancillary sites.

Table 2.2 : Summary heritage assessment for proposed ancillary sites

Ancillary site	Heritage item within/adjacent	Heritage item within 800 m	Potential for previously unidentified heritage
A4 Firth Heinz (Conor's)	No	No	Low
A8 Tyndale/A6 Jacko's Quarry	No	Yes	Inconclusive
B5 Clyde Essex Drive	No	No	Low
B6 Benson's Lane	No	Yes	Inconclusive



JACOBS NSW SPATIAL - GIS MAP file : IS096800_GIS_VA4_F002_r2v1 | 27/11/2015

Legend

- Project boundary
- Ancillary site
- Local heritage
- I388: Tyndale Sheehy Residence
- I389: Tyndale Residence

Data sources

RMS 2015, Jacobs 2015, LPI 2015

Figure 2.1 | Location of heritage items within 800m of the ancillary areas



3. Site inspection

An inspection of two ancillary areas, A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane, was completed by Rebecca Andrews (Project Archaeologist, Jacobs) and Jennifer Chandler (Project Archaeologist, Jacobs) on 16 February 2016. The ancillary areas were accessed by vehicle and then inspected on foot, where it was possible to do so safely. The terrain was very steep, and in the east of A8 Tyndale/A6 Jacko's Quarry was too steep to survey safely. The photographs in this section were taken by Rebecca Andrews during the site inspection.

3.1 A8 Tyndale/A6 Jacko's Quarry

The majority of A8 Tyndale/A6 Jacko's Quarry is located on a steep incline and is vegetated with trees (eucalypt and she-oak species). In the east of the ancillary area, at the quarry face described below, the incline is almost vertical, making the survey unsafe to complete. There are four wheel drive tracks through the ancillary site, linking the cleared areas. The cleared area in the centre of the ancillary area (visible from the aerial imagery) is flat. There is modern rubbish, including a truck, tires, cut wood, and a metal structure dumped near the sides of the clearing (Figure 3.1). The western edge of the clearing drops off steeply and more modern rubbish, including concrete, wooden posts and tractor treads have been dumped over the edge (Figure 3.2). This rubbish is likely to have been opportunistically dumped, rather than being associated with the quarry. There is also lantana present at this edge of the clearing. In the west of the ancillary area there is a dam approximately 70 m by 40 m in size. To the west of the dam is a vehicle track which has an adjacent drain channelling water into the dam.

3.1.1 Jacko's Quarry

There is a stone quarry to the north-east of the main cleared area in the centre of the ancillary area. The quarry is roughly semi-circular with a diameter of approximately 30 m (Figure 3.16). The edge of the quarry to the north-west, north, east and south, is a quarry face, approximately 10 m in height where stone has been removed (Figure 3.3). The north-west section of the quarry face is overgrown with some grass and shrub species (Figure 3.4). There are corroded oil barrels dumped in the centre of the quarry (Figure 3.5). There are at least two small circular holes (approximately eight centimetres in diameter), drilled into the rock on the floor of the quarry, which are possibly holes used to break the rock with explosives or machinery (Figure 3.6).

3.2 B6 Benson's Lane

B6 Benson's Lane ancillary area is located on the side of a hill. The hill is very steep with natural rock terraces on the north-eastern side. The hill slopes gently towards the road in the north. The treed area is very steeply inclined; with narrow, irregular, natural rock terraces present (Figure 3.7). There are also natural boulders present in the area. The cleared area is located on two wide terraces and has juvenile pine trees starting to grow on part of it (Figure 3.8). There is also rubbish dumped in piles around the site, including; broken concrete roof tiles (Figure 3.9), concrete pipes (Figure 3.10) and a large, corroded metal chain (Figure 3.11).

3.2.1 B6 Benson's Lane Brick Mound

There is also a mounded area, approximately 4 m by 3 m in size, immediately to the south of the ancillary area, approximately 5 m outside the ancillary area boundary. The mound is made from bricks and leaf litter, with a young tree growing through the centre of it (Figure 3.12 and Figure 3.13). The bricks have a frog on one side – a small rectangle in the centre of the face. They are reasonably uniform in size and are composed of a red-orange material. The edges and corners of the bricks are slightly rounded. There is a group of bricks joined together with mortar (three courses high and three wide). Some of the other bricks have traces of mortar. The following artefacts were also identified on the mound:

- Two pieces of clear glass (including a screw top rim piece) (Figure 3.14)
- Two pieces of white, earthenware ceramic (one with a transfer print floral pattern) (Figure 3.14)
- Half an oyster shell (Figure 3.14)
- A green, flat, metal circular object (possibly a container lid) (Figure 3.15).



Figure 3.1 : View west showing the rubbish dumped in the clearing at the centre of A8 Tyndale/A6 Jacko's Quarry



Figure 3.2 : View south showing the rubbish dumped at the clearing at the centre of A8 Tyndale/A6 Jacko's Quarry



Figure 3.3 : View south-east showing the quarry wall in the north-eastern clearing of A8 Tyndale/A6 Jacko's Quarry



Figure 3.4 : View north-west showing the overgrown wall in the north-eastern clearing of A8 Tyndale/A6 Jacko's Quarry



Figure 3.5 : Oil drums in the north-eastern clearing of A8 Tyndale/A6 Jacko's Quarry



Figure 3.6 : Small circular hole in the rock surface in north-eastern clearing of A8 Tyndale/A6 Jacko's Quarry



Figure 3.7 : View south towards natural rock terrace in cleared area of B6 Benson's Lane



Figure 3.8 : View north showing the young pine trees at B6 Benson's Lane



Figure 3.9 : View south-east towards a pile of broken cement roof tiles at B6 Benson's Lane



Figure 3.10 : View west showing the cement pipes at B6 Benson's Lane



Figure 3.11 : View north showing the large, corroded metal chain at B6 Benson's Lane



Figure 3.12 : View south-east showing the pile of bricks at B6 Benson's Lane



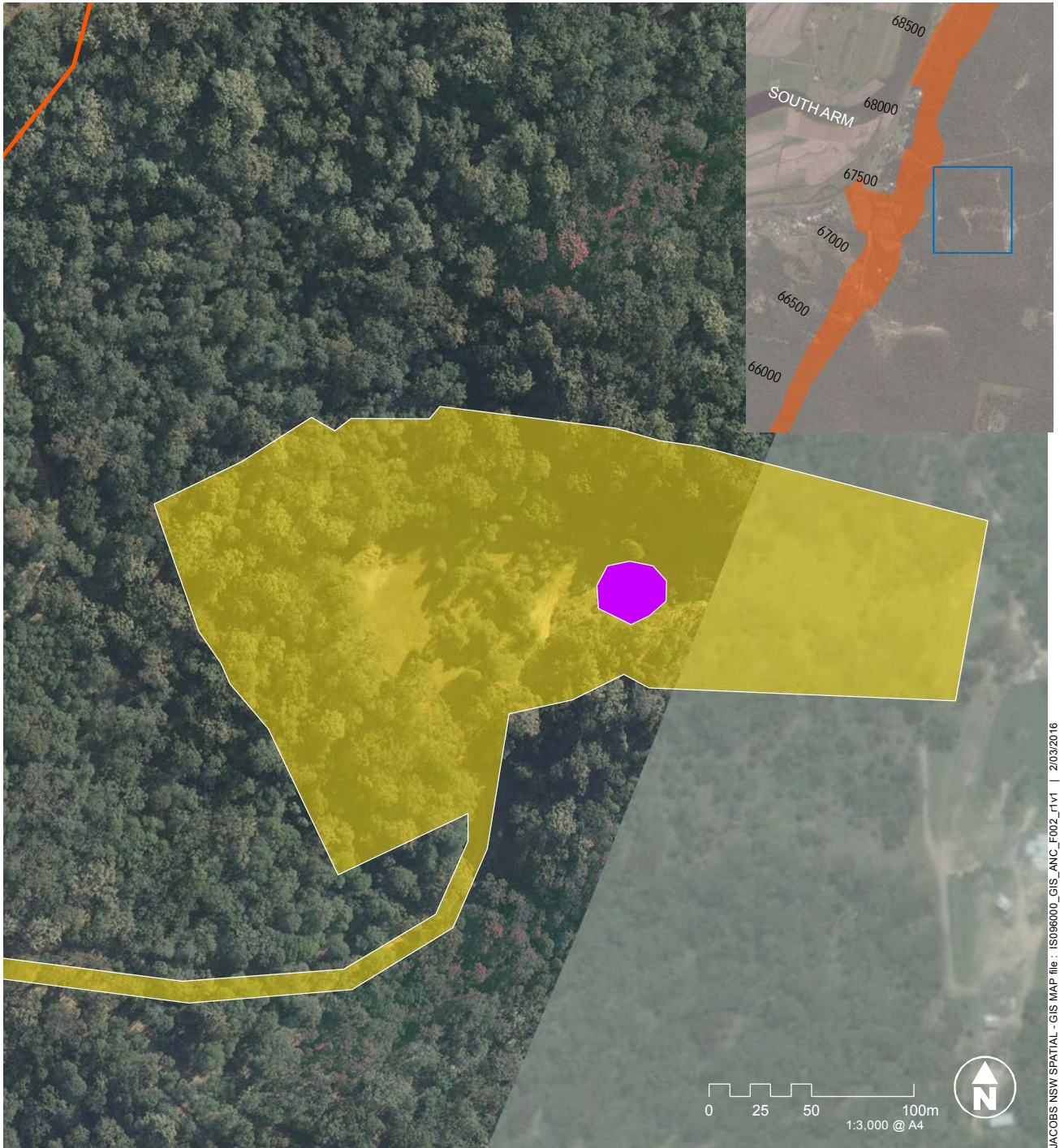
Figure 3.13 : Scatter of bricks immediately south of the pile of bricks at B6 Benson's Lane



Figure 3.14 : Artefacts present in pile of bricks at B6 Benson's Lane



Figure 3.15 : Green metal circler object located in the pile of bricks at B6 Benson's Lane



JACOBS NSW SPATIAL - GIS MAP file : IS096000_GIS_ANC_F002_T1V1 | 2/03/2016

Legend

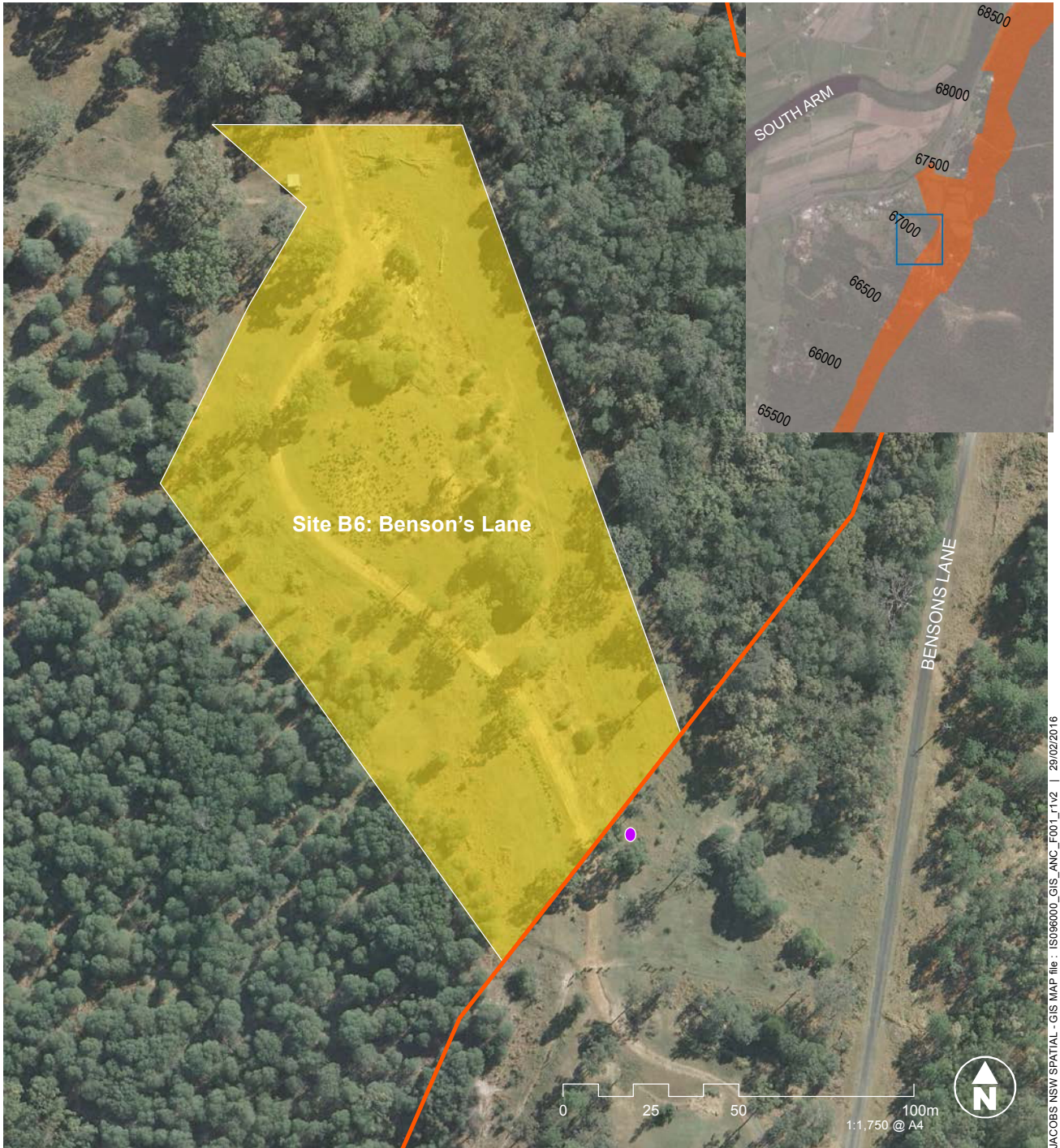
- Project boundary
- Jacko's Quarry
- Ancillary site

Data sources

RMS 2016, Jacobs 2016, LPI 2015






Figure 3.16 | Location of Jacko's Quarry



JACOBS NSW SPATIAL - GIS MAP file : IS096800_GIS_ANC_F001_T1v2 | 29/02/2016

Legend

-  Project boundary
-  Ancillary site
-  B6 Benson's Lane Brick Mound

Data sources

RMS 2016, Jacobs 2016, LPI 2015

Figure 3.17 | Location of B6 Benson's Lane Brick Mound



4. Significance assessment

4.1 Basis for assessment

The concept of cultural heritage significance helps in estimating the value of places. Places which are likely to be significant are those which 'help an understanding of the past or enrich the present, and which will be of value to future generations' (Australia ICOMOS 2000:12). In Australia, the significance of a place is generally assessed according to the following values:

- Aesthetic value
- Historic value
- Scientific value
- Social value

The NSW Heritage Council has adopted specific criteria for heritage assessment, which have been gazetted pursuant to the *Heritage Act 1977*. The seven criteria upon which the following assessment of significance is based are outlined below:

Criterion (a) an item is important in the course, or pattern, of NSW cultural or natural history.

Criterion (b) an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW cultural or natural history.

Criterion (c) an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW.

Criterion (d) an item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons.

Criterion (e) an item has potential to yield information that will contribute to an understanding of NSW cultural or natural history.

Criterion (f) an item possesses uncommon, rare or endangered aspects of NSW cultural or natural history.

Criterion (g) an item is important in demonstrating the principal characteristics of a class of NSW cultural or natural places or cultural or natural environments.

Components of the *NSW Heritage Manual*, published by the NSW Heritage Office and Department of Urban Affairs and Planning (NSW Heritage Office 2001) (now the Heritage Branch of the OEH), sets out a detailed process for conducting assessments of heritage significance. These guidelines have also been used in undertaking this significance assessment.

4.2 Significance of Jacko's Quarry

The original land grant for the lot on which Jacko's Quarry is situated, issued to the English Scottish and Australian Bank Limited in 1903, included permission to 'search for, mine, dig, and remove' minerals in the area (Volume 1481 Folio 189). Stone quarrying in the Tyndale area was being undertaken prior to this with Tyndale stone being used for river bank protection on different parts of the river (likely the Clarence River) (Clarence and Richmond Examiner, Tuesday 6 June 1899:8). In 1909 a quarry at Tyndale, run by Mr William James was producing a large amount of stone (Clarence and Richmond Examiner, 27 November 1909:2). William James was still running a quarry in Tyndale in 1911. By this time, James had constructed a 350 foot (approximately 100 m) long tram line to the river, and a wharf, allowing the stone to be directly transferred onto the punts. The quarry was also described as having a depth of 50 feet (approximately 15 m) and the stone as being of superior quality for road, river bank protection or building purposes. The quarry infrastructure (the wharf and tram line) was described as assisting in creating easier working conditions for the workers (Clarence and Richmond

Examiner, 18 February 1911:4 and 22 June 1911:4). As Jacko's Quarry is approximately 850 m from the Clarence River and no remains of quarry infrastructure such as a tramline were identified during the site visit, there is a low potential that it is the same quarry as James' quarry. No further background history on the use and operation of Jacko's Quarry has been identified from land records, historical newspapers or the Department of Industry, Resources and Energy DIGS database.

Jacko's Quarry has been assessed against the Criteria for listing on the State Heritage Register in Table 4.1.

Table 4.1 : Jacko's Quarry significance assessment

Criterion	Significance (local level)
A – Important in the pattern of NSW's history	Quarrying occurred in Tyndale from at least as early as 1899. However, it cannot be confirmed that Jacko's Quarry, is a historical quarry. Therefore, Jacko's Quarry does not meet this criterion.
B – Strong or special associations	Jacko's Quarry does not meet this criterion.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Jacko's Quarry does not meet this criterion.
D – Strong or special associations with a particular community or cultural group	Jacko's Quarry does not meet this criterion.
E – Potential to yield information	Jacko's Quarry has some potential to yield information about quarrying techniques used in the area. However, this information would be limited due to the small size of the quarry, and the difficulty in determining a date for the quarry. Therefore, Jacko's Quarry does not meet this criterion.
F – Uncommon or rare	Jacko's Quarry does not meet this criterion.
G – Principal characteristics of a class	Jacko's Quarry does not meet this criterion.

4.2.1 Statement of significance

Although quarrying occurred within Tyndale from as early as 1899, it cannot be confirmed that Jacko's Quarry was in use at this time. There is only limited potential for the site to yield information about quarrying techniques used in the area due to the small size of the quarry. Therefore Jacko's Quarry does not have sufficient significance for State or local heritage listing.

4.3 Significance of B6 Benson's Lane Brick Mound

The property on which the B6 Benson's Lane Brick Mound is located was originally selected by Richard Benson. Benson immigrated to Australia from Ireland in the late in the 1870s (Richmond River Herald and Northern Districts Advertiser, 20 September 1935:4). He first selected land in the Tyndale area in 1887, with the selection being confirmed in 1888 (Clarence and Richmond Examiner and New England Advertiser, 28 April 1888:10). Over the following three decades, Benson built up considerable land holdings at Tyndale, with his allotments reaching 330 acres by 1909. The Sand Directory between 1904 and 1916 indicates that he maintained approximately 100 cattle and 10 horses on his property until World War One, where it dropped to 79 cattle and seven horses. Benson retired as a farmer after the completion of World War One. He died in Yamba in 1935. His obituary describes him as a retired farmer and grazier, and as one of the earliest settlers on the Clarence. Benson's sons were also farmers (Richmond River Herald and Northern Districts Advertiser, 20 September 1935:4). Richard Benson and his family rarely made the news, with only official notices such as land selections, obituaries, and the resulting probates mentioning them by name. The site has continued to be a rural property, likely used for grazing, and more recently to grow pine trees.

The B6 Benson's Lane Brick Mound has been assessed against the Criteria for listing on the State Heritage Register in Table 4.2.

Table 4.2 : B6 Benson's Lane Brick Mound significance assessment

Criterion	Significance (local level)
A – Important in the pattern of NSW's history	B6 Benson's Lane Brick Mound does not meet this criterion as it does not demonstrate any particular historical activity or use.
B – Strong or special associations	Although the property on which B6 Benson's Lane Brick Mound is situated is associated with Richard Benson, an early settler in the Tyndale area, he was not a particularly locally significant figure during his life. Therefore B6 Benson's Lane Brick Mound does not meet this criterion.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	B6 Benson's Lane Brick Mound does not meet this criterion.
D – Strong or special associations with a particular community or cultural group	B6 Benson's Lane Brick Mound does not meet this criterion.
E – Potential to yield information	Although there are artefacts present at B6 Benson's Lane Brick Mound, they have limited potential to yield information about the history and use of the site. This is due to the small number of artefacts, and the lack of diagnostic features such as makers' marks. Additionally, the Mound is likely dumped material from elsewhere and not necessarily indicative of activities on the property. Therefore B6 Benson's Lane Brick Mound does not meet this criterion.
F – Uncommon or rare	B6 Benson's Lane Brick Mound does not meet this criterion.
G – Principal characteristics of a class	B6 Benson's Lane Brick Mound does not meet this criterion.

4.3.1 Statement of significance

B6 Benson's Lane Brick Mound is likely to have been created as a dumping site for bricks and other rubbish. It does not meet any of the criterion for significance assessment. Therefore B6 Benson's Lane Brick Mound does not have sufficient significance for State or local heritage listing.

5. Impact assessment and management measures

5.1 Impact assessment

As there is low potential for historical heritage items to be present at A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive there is unlikely to be any impact on historical heritage from the use of A4 Firth Heinz (Conor's) and B5 Clyde Essex Drive as ancillary sites.

While there are two heritage items within 800 m of A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane, there would not be any impact on these items as they are sufficient distance from the ancillary sites. The potential for previously unidentified historical heritage items to be present at A8 Tyndale/A6 Jacko's Quarry and B6 Benson's Lane was assessed during the site inspection. Two potential heritage items identified during the site inspection were subsequently assessed as not being of heritage significance. Therefore, no impact to historical heritage from the use of A8 Tyndale/A6 Jacko's Quarry or B6 Benson's Lane as ancillary areas is expected.

5.2 Management measures

If any historical heritage or human remains are located during the construction or use of any of the ancillary areas, the procedure for the discovery of historical heritage materials, features or deposits (Section 6.1.1) and the discovery of human remains (Section 6.1.2) of *Upgrading the Pacific Highway, Woolgoolga to Ballina Upgrade: Historical (non-Aboriginal) Heritage Assessment* (SKM 2012) or similar management measures in the relevant Constuction Heritage Management Plan must be followed.

6. References

Gardiner, J. 2006 *Maclean Community Based Heritage Study*. Report to Clarence Valley Council.

Navin Officer 2009 *Wells Crossing to Iluka Road, Upgrading the Pacific Highway, Concept Design Report, Cultural Heritage Working Paper*. Report to NSW RTA.

RMS 2012 *Pacific Highway Upgrade: Woolgoolga to Ballina, Environmental Impact Statement, Main Volume 1A*, NSW Roads and Maritime Services, Sydney.

SKM 2012 *Upgrading the Pacific Highway, Woolgoolga to Ballina Upgrade: Historical (non-Aboriginal) Heritage Assessment*, NSW Roads and Maritime Services, Aurecon, Sinclair Knight Merz, Sydney.

Maps

Historical Parish Maps, County of Clarence, Parish of Coldstream 1910.

Historical Parish Maps, County of Clarence, Parish of Gulmarrad 1913.

Historical Parish Maps, County of Clarence, Parish of Tyndale, 1909.

Newspapers

Clarence and Richmond Examiner (Grafton, NSW : 1889 - 1915).

Clarence and Richmond Examiner and New England Advertiser (Grafton, NSW : 1859 - 1889).

Richmond River Herald and Northern Districts Advertiser (NSW : 1886 - 1942).

Appendix G Community notification letter and feedback form



Australian Government

BUILDING OUR FUTURE



April 2016

Using rock from Tyndale to build the Woolgoolga to Ballina upgrade

The Australian and NSW governments are jointly funding the \$4.36 billion Woolgoolga to Ballina Pacific Highway upgrade. Roads and Maritime Services has engaged Pacific Complete, comprising Laing O'Rourke and WSP Parsons Brinckerhoff, to partner with the Pacific Highway Office to deliver the project.

Rock material for the highway is available on a property next to the project alignment in Tyndale. Using material from this site to build the project will reduce travel distances and the number of trucks on the existing highway, improving safety and efficiency for all road users. Rocks and earth will be transported within the project alignment directly from the material site.

What are we proposing?

To prepare for work we need to:

- Remove regrowth and small amounts of low grade vegetation along the access track
- Install environmental controls and site security, including fencing
- Install a small site office and staff amenities.

Operational activities involve:

- About 400 truck movements per day to enable work at the site during peak building times. The majority of this number includes trucks moving material within the project alignment. Some trucks will also be required to enter and leave the project alignment via the Pacific Highway, however, we will work to minimise this number wherever possible
- Operating machines and equipment within the site
- Drilling and blasting to remove about 276,000 cubic metres or the equivalent of 110 Olympic swimming pools of Kangaroo Creek sandstone
- Crushing rock material.

Work would start from mid-2016 and the site would be operational for about four years. Once work is finished the area would be rehabilitated.

The Tyndale site is next to the project alignment on the westerly facing slope of Bondi Hill. The site was used as a quarry about 15 years ago.

How will the work affect you?

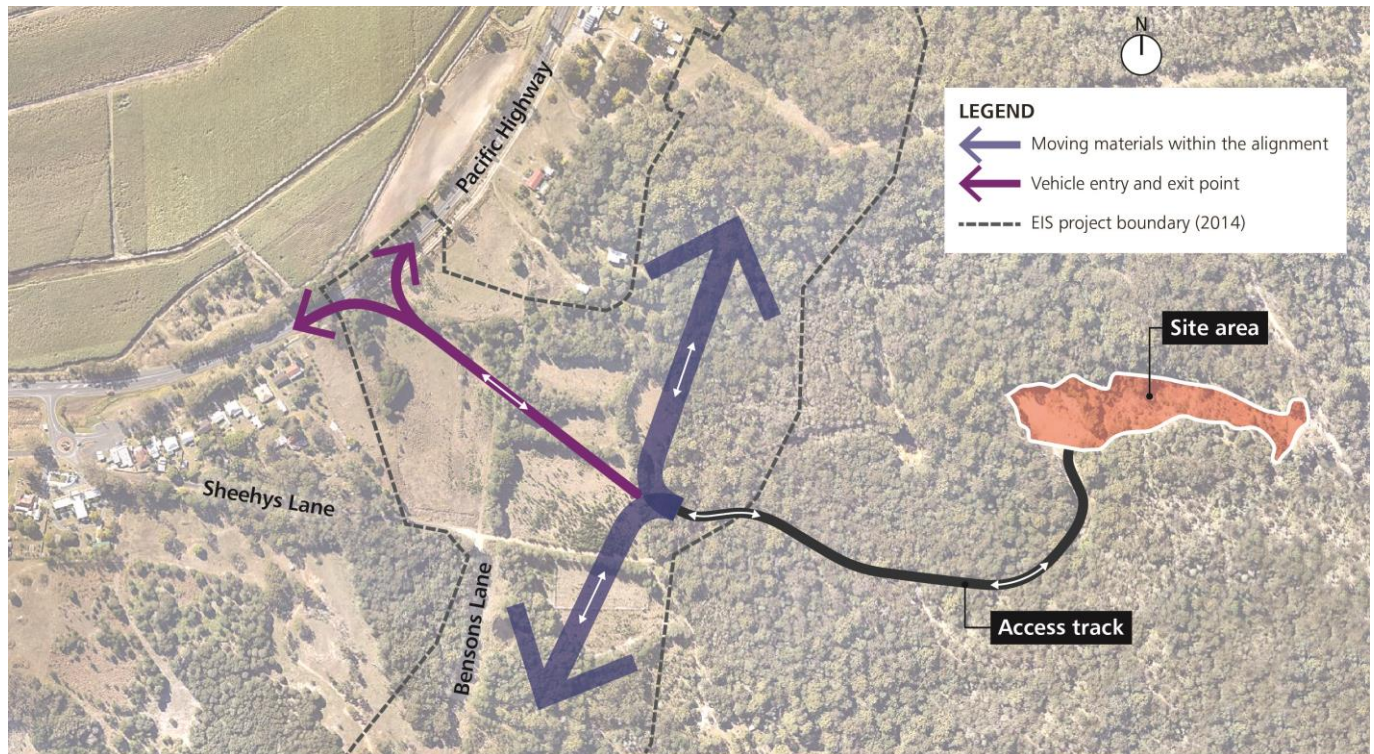
Material from within the Tyndale site requires crushing and screening to make it a uniform size and shape that meets road building specifications. It is proposed to set up a crushing and screening operation within the site area.

Noise and dust will be managed in accordance with our Construction Environmental Management Plan, approved by the Department of Planning and Environment. This will include using mitigation measures like water sprays to increase the moisture content of the material, making sure equipment is serviced and maintained, using non tonal reversing beepers, placing stockpiled materials in mounds to help to reduce noise as well as noise monitoring.

Hours of work

Approved work hours are 7am to 6pm on weekdays and Saturdays from 8am to 5pm.

Approved hours for blasting are 9am to 5pm weekdays and Saturdays from 9am to 1pm.



Proposed Tyndale Site

Next steps

An assessment of the site will be submitted for approval to the Department of Planning and Environment. As part of this process we are seeking your feedback on use of the Tyndale site.

Please fill in the feedback form attached and return it to us by **Tuesday 26 April 2016**.

You can return it by:

Email: W2B@pacificcomplete.com.au

Post: Please use the supplied reply paid envelope.

Alternatively, you can provide your feedback over the phone by calling **1800 778 900**.

For more information

For more information about the project, please contact us on 1800 778 900, email W2B@pacificcomplete.com.au or visit the project website at www.rms.nsw.gov.au/W2B



Australian Government

BUILDING OUR FUTURE



Woolgoolga to Ballina - Tyndale site

Feedback form

We would like to confirm your agreement with our approach to the Tyndale site, as outlined in the attached letter.

- Yes I agree
- No I don't agree – If you don't agree would you please provide feedback on your key concerns.

Would you like the project team to contact you to discuss your concerns?

- Yes
- No

Name:	
Address	
Phone:	
Email:	
Signature	
Date	

Key issues raised will be included in the sites assessment which will be provided to the Department of Planning and Environment.

Appendix H Community consultation responses

TYNDALE BORROW SITE MANAGEMENT PLAN
COMMUNITY COMMENTS
WOOLGOOLGA TO BALLINA (SSI-4963)

Feedback	Issue category	Summary of issue	Verbatim	Pacific Complete Response
W2B-TBS-FF-001	Legacy	Indicate history of subsidence as a result of previous quarry operation.	I live on the eastern side of Bondi Hill - part of the hill "exploded" during very heavy rains in 20 ? Large rocks & debris travelled over a kilometre distance into Denis Gravalins property and blocked our access road. The hill was supposed to be stabilised by the owner (Jacko) but this has never happened. How stable will this section be when blasting at Tyndale quarry starts. Has anyone checked this section.	<p>Pacific Complete conducted an inspection of the site with a community member. The incident relating to the dam wall failing is considered to be unrelated to quarry activities and was caused by the overflow of water from the dam at the top of Bondi Hill. It appears from the inspection that measures have been taken to prevent further impacts.</p> <p>Blasting activities are managed, controlled and monitored by processes as detailed in the approved Pacific Complete Construction Environmental Management Plan (including the Construction Noise and Vibration Management Plan) and limits for noise and vibration associated with blasting have been set by the NSW Department of Planning and Environment (DPE) via the Project Approval and the NSW Environment Protection Authority via the Pacific Complete Environment Protection Licence.</p>
	Blasting	Concerned blasting may result in subsidence.	I live on the eastern side of Bondi Hill - part of the hill "exploded" during very heavy rains in 20 ? Large rocks & debris travelled over a kilometre distance into Denis Gravalins property and blocked our access road. It the hill was supposed to be stabilised by the owner (Jacko) but this has	Pacific Complete conducted an inspection of the site with a community member. The incident relating to the dam wall failing is considered to be unrelated to quarry activities and was caused by the overflow of water from the dam at the

Feedback	Issue category	Summary of issue	Verbatim	Pacific Complete Response
			<p>never happened. How stable will this section be when blasting at Tyndale quarry starts. Has anyone checked this section.</p>	<p>top of Bondi Hill. It appears from the inspection that measures have been taken to prevent further impacts.</p> <p>Blasting activities are managed, controlled and monitored by processes as detailed in the approved Pacific Complete Construction Environmental Management Plan (including the Construction Noise and Vibration Management Plan) and limits for noise and vibration associated with blasting have been set by the NSW Department of Planning and Environment (DPE) via the Project Approval and the NSW Environment Protection Authority via the Pacific Complete Environment Protection Licence.</p>
<p>W2B-TBS-FF-002</p>	<p>Legacy</p>	<p>Indicate borrow site's use has caused environmental damage in the past.</p>	<p>We both object to the reopening of the Tyndal Quarry. Not only the environmental damage caused 15 years ago when it was operating now with the new highway to be constructed adjacent to our land you want to inflict more damage to our house and surroundings. You people of the R.M.S do not take any responsibility to any damage you create.</p>	<p>The original quarry was run by a private operator completely separate to Roads and Maritime. The borrow site will be governed by the environmental management requirements outlined in the approval documents for this project and the site will be operated in accordance with regulations, guidelines and legislation applicable to the operation of the site.</p> <p>Specifically, our activities at the borrow site are required to be undertaken in accordance with the approved Construction Environmental Management Plan (and its associated sub plans), a site specific borrow site management plan and</p>

Feedback	Issue category	Summary of issue	Verbatim	Pacific Complete Response
				our Environment Protection Licence issued by the NSW EPA.
	Damage (person and environment)	Suggest borrow site's reopening would result in environmental damage.	We both object to the reopening of the Tyndal Quarry. Not only the environmental damage caused 15 years ago when it was operating now with the new highway to be constructed adjacent to our land you want to inflict more damage to our house and surroundings. You people of the R.M.S do not take any responsibility to any damage you create.	<p>Pacific Complete and Roads and Maritime are committed to protecting the surrounding environment during the establishment, operation and decommissioning of this borrow site. The management plan for the site has assessed the environmental impacts of the borrow site and has concluded that the impacts to the environment are considered to be in accordance with those approved under the Woolgoolga to Ballina Highway Upgrade Project. The borrow site will be governed by the environmental management requirements outlined in the approval documents for this project and the site will be operated in accordance with regulations, guidelines and legislation applicable to the operation of the site.</p> <p>Specifically, our activities at the borrow site are required to be undertaken in accordance with the approved Construction Environmental Management Plan (and its associated sub plans), a site specific borrow site management plan and our Environment Protection Licence issued by the NSW EPA.</p>
	Damage (person and environment)	Indicate borrow site's use would result in damage to property and surroundings.	We both object to the reopening of the Tyndal Quarry. Not only the environmental damage caused 15 years ago when it was operating now with the new highway to be constructed adjacent to our land you want to inflict more damage to our house and surroundings. You people of the	<p>Pacific Complete and Roads and Maritime are committed to undertaking activities at the proposed borrow site so that they do not pose a risk to property, people or the environment.</p> <p>Specifically, our activities at the borrow site are</p>

Feedback	Issue category	Summary of issue	Verbatim	Pacific Complete Response
			R.M.S do not take any responsibility to any damage you create.	required to be undertaken in accordance with the approved Construction Environmental Management Plan (and its associated sub plans), a site specific borrow site management plan and our Environment Protection Licence issued by the NSW EPA.
	Funding	Indicate the proposal is a poor use of Government funding.	This is possible the worst use of government money I have ever heard off. Some common use must prevail or do you think this is the way to conduct yourselves.	The Tyndale Borrow Site will provide the required fill material to construct the Woolgoolga to Ballina Pacific Highway Upgrade. Pacific Complete has determined that opening the borrow site is a more economical option than purchasing the required material from existing quarries and transporting it for use on the project, therefore the use of the proposed borrow site provides for the prudent and efficient use of government / taxpayer funds.
W2B-TBS-FF-003	Legacy	Objects to the reopening of the borrow site as reason for initial closure still stands [Submission does not specify reasons]	Under <u>no</u> circumstances would we like to see you. open the Tyndale Quarry. It was shut down 15 years ago for a reason and those reasons haven't changed. With the highway being done & the damage that will cause what else can you do to us. <u>SHOOT US</u> and be done with it why don't you.	The original quarry was run by a private operator completely separate to Roads and Maritime. The borrow site will be governed by the environmental management requirements outlined in the approval documents for this project and the site will be operated in accordance with regulations, guidelines and legislation applicable to the operation of the site. Specifically, our activities at the borrow site are required to be undertaken in accordance with the approved Construction Environmental Management Plan (and its associated sub plans), a site specific borrow site management plan and our Environment Protection Licence issued by the NSW EPA.

Feedback	Issue category	Summary of issue	Verbatim	Pacific Complete Response
W2B-TBS-FF-004	Out of Scope	Indicates preference for an alternative route which would bypass Tyndale	An alternative route would be more economical for the road to by pass Tyndale village	The final route for the Woolgoolga to Ballina Pacific Highway Upgrade has already been determined and approved by the Department of Planning and Environment via an EIS process. This issue is outside the scope of the proposed Tyndale Borrow Site.
	Social amenity	Indicates use of borrow site would disrupt lifestyle	Disruption to our lifestyle	<p>The borrow site itself is located more than 450 metres from the closest receiver. The site will be access from the Pacific Highway via the construction corridor, north of the main town centre of Tyndale, and then onto the modified existing borrow site access track. Incidental traffic may use Sheehy's Lane until the new access from the Pacific Highway is constructed, however this will not include heavy vehicles.</p> <p>Specifically, our activities at the borrow site are required to be undertaken in accordance with the approved Construction Environmental Management Plan (and its associated sub plans), a site specific borrow site management plan and our Environment Protection Licence issued by the NSW EPA.</p>
	Blasting	Indicates blasting would incur damage to mental health	Panic attacks when a blast goes off	<p>As outlined in Section 5.3 of the approved Pacific Complete Construction Noise and Vibration Management Plan (CNVMP), residents and other receivers located within 500 metres of a blast location will be notified at least 24 hours prior to each blast. The information that will be provided will include:</p> <ul style="list-style-type: none"> - the location of the blast

Feedback	Issue category	Summary of issue	Verbatim	Pacific Complete Response
				<p>- a schedule of blast times - details of an onsite contact person (name and telephone number) that can deal directly with any complaints and concerns. Typically this contact will be by telephone or face to face, however where contact cannot be made, a letterbox drop will be done.</p> <p>This notification process will provide residents with prior notice of any blasting to assist in alleviating concerns.</p>
	Blasting	Concerned debris from blasting may incur damage to person or property [limited information provided assumption made]	Fly rock will be of concern	<p>Blasting activities are managed, controlled and monitored by processes as detailed in the approved Pacific Complete Construction Environmental Management Plan (including the Construction Noise and Vibration Management Plan) and limits for noise and vibration associated with blasting have been set by the NSW Department of Planning and Environment (DPE) via the Project Approval and the NSW Environment Protection Authority via the Pacific Complete Environment Protection Licence. Blasting at the proposed borrow site would be undertaken by an appropriately qualified and experienced blasting contractor. All blasts will be planned and monitored to ensure compliance with the noise and vibration limits.</p>
W2B-TBS-FF-005	Local roads	Concerned Sheehy's Lane will be used for haulage of	Are they going to be using Sheehy's Lane or are they planning to use the road in front of our homes if so this road is not fit for heavy traffic little on 400 trucks per day. I'm against the trucks using this road as we have to access our homes	The proposed borrow site will be accessed from the existing Pacific Highway along the construction corridor, north of the main town centre of Tyndale, and then onto the modified existing borrow site access track. The majority of

Feedback	Issue category	Summary of issue	Verbatim	Pacific Complete Response
		materials from borrow site	with 400 trucks using this road I cannot see our we have our access	the extracted material would be transported via the construction corridor, or where required, material may also be transported via the existing highway. Incidental traffic may use Sheehy's Lane until the new access from the Pacific Highway is constructed, however this will not include heavy vehicles.
	Blasting	Suggests borrow site reopening and subsequent blasting may result in damage to property	Will the drilling and blasting damage my home as I'm planning to put my home on the market next year how will this affect my sale	<p>Pacific Complete and Roads and Maritime are committed to undertaking activities at the proposed borrow site so that they do not pose a risk to property, people or the environment.</p> <p>Blasting activities are managed, controlled and monitored by processes as detailed in the approved Pacific Complete Construction Environmental Management Plan (including the Construction Noise and Vibration Management Plan) and limits for noise and vibration associated with blasting have been set by the NSW Department of Planning and Environment (DPE) via the Project Approval and the NSW Environment Protection Authority via the Pacific Complete Environment Protection Licence. Blasting at the proposed borrow site would be undertaken by an appropriately qualified and experienced blasting contractor. All blasts will be planned and monitored to ensure compliance with the noise and vibration limits.</p>
W2B-TBS-FF-006			No additional comments provided	Noted.

Feedback	Issue category	Summary of issue	Verbatim	Pacific Complete Response
W2B-TBS-VF-007			No issues - advised wasn't concerned by the proposal	Noted.
W2B-TBS-VF-008	Legacy	Objects to the reopening of the borrow site as attempts to reopen the site previously had been rejected by the Land and Environment Court.	<p>Advised he had looked into his files and had confirmed he had been dealing with this for over 9 years</p> <p>"unfortunately I do understand. It would probably be better if I didn't understand"</p> <p>"it's not a proposal its an ultimatum."</p> <p>"The RMS does what the RMS wants to do. "</p> <p>"Its a misonoma to say its a proposal its an ultimatum"</p> <p>"The area you are talking about went to the Land and Environment Court"</p> <ul style="list-style-type: none"> - Advised that the owners at the time had wanted to reopen the quarry, however, they found out the quarry had been illegally established in the first place and so the Land and Environment Court ruled it could not be reopened. - Advised the land was subsequently sold. - Advised he thought it was odd the land was easily resold but had been advised at the time the person who purchased the land was subsequently sold. - Advised had been told that he was heavily involved with someone in government and now he "could join the dots and see what happened" - Advised he provided his last press release in 2007 and could look this up on the internet 	<p>Pacific Complete and Roads and Maritime will be seeking approval for the use of the Tyndale Borrow Site through the Department of Planning and Environment (DPE).</p> <p>We are committed to undertaking activities at the proposed borrow site so that they do not pose a risk to property, people or the environment. Our activities at the borrow site are required to be undertaken in accordance with the approved Construction Environmental Management Plan (and its associated sub plans), a site specific borrow site management plan and our Environment Protection Licence issued by the NSW EPA.</p>

Feedback	Issue category	Summary of issue	Verbatim	Pacific Complete Response
			Advised SY could "do what you wish" with the information provided.	

Appendix I 3D model of Tyndale Borrow Site

Open in Adobe to view this 3D model. Click on the centre of the page and use the mouse to move the model around to view the site from a variety of angles.

