



Planning & Environment

Planning Services
Resource Assessments
Contact: Nathan Heath
Phone: 8289 6817
Email: Nathan.heath@planning.nsw.gov.au

Jim Lawler
Project Director
Groundwork Plus Pty Ltd
PO BOX 1779
MILTON QLD 4064

Dear Mr Lawler

Planning Secretary's Environmental Assessment Requirements Pearlman Quarry (EAR 1331)

I refer to your request for the Planning Secretary's Environmental Assessment Requirements (SEARs) for the above development, which is designated local development under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Please find attached a copy of the SEARs for the Environmental Impact Statement (EIS) for the proposed development. These requirements have been prepared in consultation with relevant government agencies based on the information your company has provided to date. The agencies' comments are attached for your information (see Attachment 2). You must have regard to these comments in the preparation of the EIS.

In your request for SEARs, you have also indicated that the proposal is classified as integrated development under section 4.46 of the EP&A Act as it requires additional statutory authorisations. You are encouraged to consult with the relevant agencies with respect to licence/approval requirements. If further integrated approvals are required, you must undertake your own consultation with the relevant public authorities, and address their requirements in the EIS. In particular, the Department recommends that you consult further with the Environment Protection Authority (EPA) regarding the current environment protection licence on Lot 5, DP 755984.

The Department wishes to emphasise the importance of effective and genuine community consultation during the preparation of the EIS. This process should provide the community with a clear understanding of the proposal and its potential impacts and include active engagement with the community regarding key issues of concern.

Please contact the consent authority at least two weeks before you propose to submit your DA. This will enable the consent authority to:

- confirm the applicable fees; and
- determine the number of copies (hard-copy and digital) of the EIS that will be required for reviewing purposes.

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will also require separate approval under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Commonwealth Department of the Environment and Energy to determine if an approval under the EPBC Act is required (<http://www.environment.gov.au> or 6274 111).

You should contact the Mine Safety branch of the NSW Resources Regulator in regard to this and other matters relating to compliance with the *Work Health and Safety (Mines and Petroleum Sites) Act 2013*.

If you have any enquiries about these requirements, please contact Nathan Heath on the details listed above.

Yours sincerely

Howard Reed
Director
Resource Assessments
as delegate for the Planning Secretary

8.5.19

Planning Secretary's Environmental Assessment Requirements

Section 4.12(8) of the *Environmental Planning and Assessment Act 1979* and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

Designated Development

EAR Number	EAR 1331
Proposal	Extraction and processing of up to 490,000 tonnes of basalt per annum over a 5 year period
Location	1135 Croppa Creek Road, North Star, NSW (Lot 5 and 17 DP 755984)
Applicant	Quarry Solutions Pty Ltd
Date of Issue	8 May 2019
Date of Expiry	8 May 2021
General Requirements	<p>The Environmental Impact Statement (EIS) for the development must comply with the requirements in Clauses 6 and 7 of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i>.</p> <p>In particular, the EIS must include:</p> <ul style="list-style-type: none"> • an executive summary; • a comprehensive description of the development, including: <ul style="list-style-type: none"> - a detailed site description and history of any previous quarrying on the site, including a current survey plan; - identification of the resource, including the amount, type, composition; - the layout of the proposed works and components (including any existing infrastructure that would be used for the development); - an assessment of the potential impacts of the development, as well as any cumulative impacts, including the measures that would be used to minimise, manage or offset these impacts; - a detailed rehabilitation plan for the site; - any likely interactions between the development and any existing/approved developments and land uses in the area, paying particular attention to potential land use conflicts with nearby residential development; - a list of any other approvals that must be obtained before the development may commence; - the permissibility of the development, including identification of the land use zoning of the site; - identification of sensitive receivers likely to be affected by the development using clear maps/plans, including key landform areas, such as conservation areas and waterways; • a conclusion justifying why the development should be approved, taking into consideration: <ul style="list-style-type: none"> - alternatives; - the suitability of the site; - the biophysical, economic and social impacts of the project, having regard to the principles of ecologically sustainable development; and - whether the project is consistent with the objects of the <i>Environmental Planning and Assessment Act 1979</i>; and • a signed declaration from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.
Consultation	<p>In preparing the EIS for the development, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers and any surrounding landowners or Crown land stakeholders that may be impacted by the development.</p> <p>The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.</p>
Key Issues	The EIS must assess the potential impacts of the proposal at all stages of the development, including the establishment, operation and decommissioning of the development.

The EIS must address the following specific issues:

- **Noise** – including a quantitative assessment of potential:
 - construction and operational noise and off-site transport noise impacts of the development in accordance with the *Interim Construction Noise Guideline*, *NSW Noise Policy for Industry* and *NSW Road Noise Policy* respectively;
 - reasonable and feasible mitigation measures to minimise noise emissions; and
 - monitoring and management measures;
- **Blasting & Vibration** – including:
 - a description of the proposed blasting hours, frequency and methods; and
 - an assessment of the likely blasting and vibration impacts of the development, having regard to the relevant ANZEC guidelines and paying particular attention to impacts on people, buildings, livestock, infrastructure and significant natural features;
- **Air** – including an assessment of the likely air quality impacts of the development in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*. The assessment is to give particular attention to potential dust impacts on any nearby private receivers due to construction activities, the operation of the quarry and/or road haulage;
- **Water** – including:
 - a detailed site water balance and an assessment of any volumetric water licensing requirements, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply infrastructure and water storage structures;
 - identification of any licensing requirements or other approvals required under the *Water Act 1912* and/or *Water Management Act 2000*;
 - demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP)
 - a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant Water Sharing Plan or water source embargo;
 - an assessment of activities that could cause erosion or sedimentation issues, and the proposed measures to prevent or control these impacts;
 - an assessment of any likely flooding impacts of the development;
 - an assessment of potential impacts on the quality and quantity of existing surface and ground water resources, including a detailed assessment of proposed water discharge quantities and quality against receiving water quality and flow objectives, particularly surface water discharge into Tackinbri Creek, having regard to advice received from DoI Crown Lands (see Attachment 2); and
 - a detailed description of the proposed water management system, water monitoring program and other measures to mitigate surface and groundwater impacts;
- **Biodiversity** – including:
 - accurate predictions of any vegetation clearing on site; including the location and amount of clearing and types of communities and species affected;
 - an assessment of the potential biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems undertaken in accordance with Sections 7.2 and 7.7 of the *Biodiversity Conservation Act 2016*, having regard to advice received from OEHL and Council (see Attachment 2); and
 - a detailed description of the proposed measures to maintain or improve the biodiversity values of the site in the medium to long term, as relevant.
- **Heritage** – including:
 - an assessment of the potential impacts on Aboriginal heritage (cultural and archaeological), having regard to OEHL advice (see Attachment 2); and
 - identification of Historic heritage in the vicinity of the development and an assessment of the likelihood and significance of impacts on heritage items, having regard to the relevant policies and guidelines listed in Attachment 1;
- **Traffic & Transport** – including:
 - accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for transportation of quarry products;
 - an assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road networks, detailing the nature of the traffic generated, transport routes, traffic volumes and potential impacts on local and regional roads;
 - a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network (particularly the proposed transport routes) over the life of the development, including consideration of cumulative road network impacts from operation of Tikitere and Pearlman Quarries, having regard to advice received from RMS (see Attachment 2);
 - evidence of any consultation with relevant roads authorities, regarding the establishment of agreed contributions towards road upgrades or maintenance; and
 - a description of access roads, specifically in relation to nearby Crown roads and fire trails;
- **Land Resources** – including:

	<ul style="list-style-type: none"> - an assessment of potential impacts on soils and land capability (including potential erosion and land contamination) and the proposed mitigation, management and remedial measures (as appropriate); - an assessment of potential impacts on landforms (topography), paying particular attention to the long-term geotechnical stability of any new landforms (such as overburden dumps, bunds etc); - consideration of Crown Land assets located to the south of the proposed quarry, having regard to advice received from DoI Crown Lands (see Attachment 2); and - consideration of the compatibility of the development with other land uses in the vicinity of the development, in accordance with the requirements of Clause 12 of <i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i>, including surrounding pastoral lands; • Waste – including estimates of the quantity and nature of the waste streams that would be generated or received by the development and any measures that would be implemented to minimise, manage or dispose of these waste streams; • Hazards – including an assessment of the likely risks to public safety, paying particular attention to potential bushfire risks, and the transport, storage, handling and use of any hazardous or dangerous goods; • Visual – including an assessment of the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, including with respect to any new landforms; • Social & Economic – an assessment of the likely social and economic impacts of the development, including consideration of both the significance of the resource and the costs and benefits of the project; and • Rehabilitation – including: <ul style="list-style-type: none"> - a detailed description of the proposed rehabilitation measures that would be undertaken throughout the development and during quarry closure; - a detailed rehabilitation strategy for the site, including justification for the proposed final landform and consideration of the objectives of any relevant strategic land use plans or policies; and - the measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy, recognising that a rehabilitation bond will likely be required as a condition of any future development consent.
Environmental Planning Instruments	<p>The EIS must take into account all relevant State Government environmental planning instruments, guidelines, policies, and plans. While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies and plans that may be relevant to the environmental assessment of this development.</p> <p>During the preparation of the EIS you must also consult the Department's EIS Guideline – Extractive Industries – Quarries. This guideline is available at http://www.planning.nsw.gov.au/~media/Files/DPE/Guidelines/extractive-industries-quarries-eis-guideline-1996-10.ashx.</p> <p>In addition, the EIS must assess the development against the <i>Gwydir Local Environmental Plan (LEP) 2013</i> and any relevant development control plans/strategies.</p>

ATTACHMENT 1

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:

<http://www.planning.nsw.gov.au>

<http://www.bookshop.nsw.gov.au>

<http://www.publications.gov.au>

Environmental Planning Instruments, Policies, Guidelines & Plans

Environmental Planning Instruments - General

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (Infrastructure) 2007

Gwydir LEP 2013

Risk Assessment

AS/NZS 4360:2004 Risk Management (Standards Australia)

HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)

Land

State Environmental Planning Policy No. 55 – Remediation of Land

Agricultural Land Classification (DPI)

Rural Land Capability Mapping (OEH)

Soil and Landscape Issues in Environmental Impact Assessment (NOW)

Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC)

Guidelines for Consultants Reporting on Contaminated Sites (EPA)

Agricultural Issues for Extractive Industry Development (DPI)

Water

NSW Aquifer Interference Policy 2012 (NOW)

NSW State Groundwater Policy Framework Document (NOW)

NSW State Groundwater Quality Protection Policy (NOW)

NSW State Groundwater Quantity Management Policy (NOW)

Groundwater

NSW State Groundwater Dependent Ecosystems Policy (NOW)

Australian Groundwater Modelling Guidelines 2012 (Commonwealth)

National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)

Risk Assessment Guidelines for Groundwater Dependent Ecosystems (NOW)

Guidelines for the Assessment & Management of Groundwater Contamination (EPA)

NSW Water Extraction Monitoring Policy (NOW)

NSW State Rivers and Estuary Policy (NOW)

NSW Government Water Quality and River Flow Objectives (EPA)

Using the ANZECC Guideline and Water Quality Objectives in NSW (EPA)

National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)

National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)

Surface Water

Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (EPA)

Managing Urban Stormwater: Soils & Construction (Landcom) and associated Volume 2E: Mines and Quarries (DECC)

Managing Urban Stormwater: Treatment Techniques (EPA)

Managing Urban Stormwater: Source Control (EPA)

Technical Guidelines: Bunding & Spill Management (EPA)

A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)

NSW Guidelines for Controlled Activities (NOW)

Flooding

Floodplain Development Manual (OEH)

Biodiversity	<p>Biodiversity Assessment Method (OEH 2017)</p> <p>Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH 2017)</p> <p>Ancillary rules: Biodiversity conservation actions</p> <p>Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying variation rules</p> <p>NSW Guide to Surveying Threatened Plants (OEH 2016)</p> <p>Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECC 2009)</p> <p>Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004)</p> <p>Threatened Species Assessment Guideline – The Assessment of Significance (DECC 2007)</p> <p>OEH principles for the use of biodiversity offsets in NSW</p> <p>NSW State Groundwater Dependent Ecosystem Policy (NOW)</p>
Heritage	<p>The Burra Charter (The Australia ICOMOS charter for places of cultural significance)</p> <p>Guide to investigation, assessing and reporting on Aboriginal cultural heritage in NSW (OEH) 2011</p> <p>Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH)</p> <p>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (OEH)</p> <p>Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (OEH)</p> <p>NSW Heritage Manual (OEH)</p> <p>Statements of Heritage Impact (OEH)</p>
Noise & Blasting	<p>NSW Noise Policy for Industry (EPA)</p> <p>Interim Construction Noise Guideline (EPA)</p> <p>NSW Road Noise Policy (EPA)</p> <p>Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC)</p> <p>Assessing Vibration: a technical guideline (EPA)</p>
Air	<p>Protection of the Environment Operations (Clean Air) Regulation 2002</p> <p>Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA)</p> <p>Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (EPA)</p> <p>Assessment and Management of Odour from Stationary Sources in NSW (DEC)</p> <p>National Greenhouse Accounts Factors (Commonwealth)</p>
Transport	<p>Guide to Traffic Generating Development (RTA)</p> <p>Road Design Guide (RMS) & relevant Austroads Standards</p>
Hazards	<p>State Environmental Planning Policy No. 33 – Hazardous and Offensive Development</p> <p>Hazardous and Offensive Development Application Guidelines – Applying SEPP 33</p> <p>Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis</p> <p>Planning for Bushfire Protection 2006 (RFS)</p>
Resource	<p>Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (JORC)</p>
Waste	<p>Waste Classification Guidelines (EPA)</p> <p>Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes 1999 (EPA)</p>
Rehabilitation	<p>Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth)</p> <p>Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth)</p> <p>Strategic Framework for Mine Closure (ANZMEC-MCA)</p>

ATTACHMENT 2

AGENCIES' CORRESPONDENCE



Our reference: SF17/21174; DOC19/366542
Contact: Rebecca Scrivener – 02 6773 7000 – armidale@epa.nsw.gov.au
Date: 1 May 2019

Mr Nathan Heath
Resource Assessments
Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Email: nathan.heath@planning.nsw.gov.au

BY EMAIL

Dear Mr Heath,

RE: REQUEST FOR REQUIREMENTS – EAR 1331 – PEARLMAN QUARRY - NORTH STAR

I refer to your email dated 11 April 2019 seeking our requirements to be addressed in an Environmental Assessment for the proposed Pearlman Quarry at North Star (EAR 1331).

The EPA notes the location for the proposed quarry is identified on your Form A as: 1135 Croppa Creek Road, North Star or alternatively as Lot 5 and 17, DP 755984.

As advised on 18 April 2019 and discussed on 1 May 2019, the EPA issued an Environment Protection Licence (EPL) to Quarry Solutions Pty Ltd for quarrying activities on Lot 5, DP755984, 1135 Croppa Creek, Road North Star, known as Tikitere Quarry, on 17 January 2019. Tikitere Quarry was approved by Gwydir Shire Council via DA 5/2018 in October 2018.

The EPA is not legally able to issue multiple EPLs on the same parcel of land. Accordingly, should the proponent seek and gain approval for proposed Pearlman Quarry, the EPA could only issue an EPL for Lot 17, DP 755984.

As the proposed activity is the same as that Tikitere Quarry, I have attached the EARs provided to Department of Planning and Environment on 15 September 2017 for your consideration in preparing EAR 1331. The only amendment is the reference to the *Industrial Noise Policy* (EPA, 2000) in paragraph 4.4 of the attachment. The *Industrial Noise Policy* (EPA, 2000) has been replaced by the *NSW Noise Policy for Industry* (EPA, 2017). Operational noise from all industrial activities (including private haul roads and private railway lines) to be undertaken on the premises should be assessed using the guidelines contained in the *NSW Noise Policy for Industry* (EPA, 2017).

Email: armidale@epa.nsw.gov.au
PO Box 494 Armidale NSW 2350
85 Faulkner Street, Armidale NSW 2350
Tel: (02) 6773 7000 Fax: (02) 6772 2336
ABN 43 692 285 758
www.epa.nsw.gov.au

Please contact me or Duncan McGregor on (02) 6773 7000 or by email to armidale@epa.nsw.gov.au if you wish to discuss this matter further.

Yours sincerely

A handwritten signature in dark ink, appearing to read 'Rebecca Scrivener'.

REBECCA SCRIVENER
Head Regional Operations Unit - Armidale
Environment Protection Authority

Encl: EPA letter reference – notice #1556562 – Environmental Assessment Requirements 1170 – proposed Tikitere Quarry.



Resource Assessments
Dept Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Genevieve Seed

Notice Number 1556562

Dear Ms Seed,

RE: ENVIRONMENTAL ASSESSMENT REQUIREMENTS 1170 - PROPOSED TIKITERE QUARRY

I refer to your request for the Environment Protection Authority's (EPA) requirements for the environmental assessment (EA) regarding the above proposal, received by EPA on 4 September 2017.

The EPA has considered the details of the proposal provided by the Department of Planning and Environment (DPE) and has identified the information it requires to consider its general terms of approval in **Attachment A**. In summary, the EPA's key information requirements for the proposal include an adequate assessment of:

- 1. Noise** - Proximity to sensitive receptors and impact of any sources associated with the project.
- 2. Air** - Dust generated and management of potential impacts on adjacent rural residences during the construction and operational phases.
- 3. Water** - Water management systems and the implementation of adequate erosion and sediment controls to control runoff from the quarry.

In carrying out the assessment, the proponent should refer to the relevant guidelines as listed in **Attachment B** and any relevant industry codes of practice and best practice management guidelines.

Based on the information provided to the EPA, if approval is granted, the applicant will require an environment protection licence (EPL) issued under the provisions of the *Protection of the Environment Operations Act 1997* (POEO Act) for the following: *Carrying out scheduled activities – Extractive Activities – Land-based extractive activity*. The applicant will need to make a separate application to the EPA for this licence. General information on licence requirements can be obtained from Environment Line on 131555 or on the EPA website at: <http://www.epa.nsw.gov.au/licensing/licencePOEO.htm>.

To assist the EPA in assessing the EA it is requested that the EA follow the format of the Department of Planning EIS guidelines and addresses the EPA's specific EA requirements outlined in the Attachments A and B of this letter. If the necessary information is not adequately provided in the EA then delays in the development application process may occur. The applicant should be made aware that any commitments made in the EIS may be formalised as approval conditions and may also be placed as formal licence conditions.



The applicant should be made aware that, consistent with provisions under Part 9.4 of the POEO Act, the EPA may require the provision of a financial assurance and/or assurances. The amount and form of the assurance(s) would be determined by the EPA and required as a condition of an EPL.

In addition, as a requirement of an EPL, the EPA will require the applicant to prepare, test and implement a Pollution Incident Response Management Plan and/or Plans in accordance with Section 153A of the POEO Act.

The EPA requests that the applicant provide one (1) electronic copy of the DA/EA/EIS when lodging its application with the EPA. These documents should be sent to the EPA's Armidale office by email to: armidale@epa.nsw.gov.au.

Please note that this response does not cover biodiversity or Aboriginal cultural heritage issues, which are the responsibility of the Office of Environment and Heritage.

If you have any queries regarding this matter, please contact Rebecca Scrivener on (02) 6773 7000.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'Robert O'Hern'.

.....
Robert O'Hern
Head Regional Operation Unit
North - Armidale
(by Delegation)

ATTACHMENT A: Environmental Assessment Requirements for Tikitere Quarry – North Star

1 Environmental impacts of the project

1.1. Impacts related to the following environmental issues need to be assessed, quantified and reported on:

- Air quality issues including dust generation
- Noise and vibration
- Waste including hazardous materials and radiation
 - General waste – disposal options
 - Hazardous materials and radiation
- Water and Soils
 - Sediment and Erosion controls

The Environmental Assessment (EA) should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines mentioned. A full list of guidelines is at **Attachment B**.

2 Licensing requirements

- 2.1. The development is a scheduled activity under the *Protection of the Environment Operations Act 1997* (POEO Act) and will therefore require an Environment Protection Licence (EPL) if approval is granted. The EIS should address the requirements of Section 45 of the POEO Act determining the extent of each impact and providing sufficient information to enable the EPA to determine appropriate limits and conditions for the EPL.
- 2.2. Should project approval be granted, the proponent will need to make an application to the EPA for its EPL for the proposed facility prior to undertaking any on site works. Additional information is available through the *EPA Guide to Licensing* document (www.epa.nsw.gov.au/licensing/licenceguide.htm).

SPECIFIC ISSUES

3 Air issues

The EIS should include an air quality impact assessment (AQIA). The AQIA should:

- 3.1. Assess the risk associated with potential discharges of fugitive and point source emissions for all stages of the proposal. Assessment of risk relates to environmental harm, risk to human health and amenity.
- 3.2. Justify the level of assessment undertaken based on risk factors, including but not limited to:
- proposal location;
 - characteristics of the receiving environment; and
 - type and quantity of pollutants emitted.

- 3.3. Describe the receiving environment in detail. The proposal must be contextualised within the receiving environment (local, regional and inter-regional as appropriate). The description must include but need not be limited to:
 - meteorology and climate;
 - topography;
 - surrounding land-use;
 - receptors; and
 - ambient air quality.
- 3.4. Include a detailed description of the proposal. All processes that could result in air emissions must be identified and described. Sufficient detail to accurately communicate the characteristics and quantity of all emissions must be provided.
- 3.5. Include a consideration of 'worst case' emission scenarios and impacts at proposed emission limits.
- 3.6. Account for cumulative impacts associated with existing emission sources as well as any currently approved developments linked to the receiving environment.
- 3.7. Include air dispersion modelling where there is a risk of adverse air quality impacts, or where there is sufficient uncertainty to warrant a rigorous numerical impact assessment. Air dispersion modelling must be conducted in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (2005) <http://www.epa.nsw.gov.au/resources/air/ammodelling05361.pdf>.
- 3.8. Demonstrate the proposal's ability to comply with the relevant regulatory framework, specifically the *Protection of the Environment Operations (POEO) Act (1997)* and the *POEO (Clean Air) Regulation (2010)*.
- 3.9. Detail emission control techniques/practices that will be employed by the proposal.

4 Noise and Vibration

In relation to noise, the following matters should be addressed (where relevant) as part of the Environmental Assessment.

General

- 4.1. Construction noise associated with the proposed development should be assessed using the *Interim Construction Noise Guideline* (DECC, 2009).
<http://www.epa.nsw.gov.au/noise/constructnoise.htm>
- 4.2. Vibration from all activities (including construction and operation) to be undertaken on the premises should be assessed using the guidelines contained in the *Assessing Vibration: a technical guideline* (DEC, 2006). <http://www.epa.nsw.gov.au/noise/vibrationguide.htm>
- 4.3. If blasting is required for any reasons during the construction or operational stage of the proposed development, blast impacts should be demonstrated to be capable of complying with the guidelines contained in *Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990).
<http://www.epa.nsw.gov.au/noise/blasting.htm>

Industry

- 4.4. Operational noise from all industrial activities (including private haul roads and private railway lines) to be undertaken on the premises should be assessed using the guidelines contained in the *NSW Industrial Noise Policy* (EPA, 2000) and *Industrial Noise Policy Application Notes*. <http://www.epa.nsw.gov.au/noise/industrial.htm>

Road

- 4.5. Noise on public roads from increased road traffic generated by land use developments should be assessed using the guidelines contained in the *Environmental Criteria for Road Traffic Noise* (EPA, 1999). <http://www.epa.nsw.gov.au/noise/traffic.htm>

5 Waste, chemicals and hazardous materials and radiation

- 5.1. Identify, characterise and classify all waste that will be generated onsite through excavation, demolition or construction activities, including proposed quantities of the waste.

Note: All waste must be classified in accordance with the *EPA's Waste Classification Guidelines* available at: <http://www.epa.nsw.gov.au/wasteregulation/classify-waste.htm>

- 5.2. Identify, characterise and classify all waste that is proposed to be disposed of to an offsite location, including proposed quantities of the waste and the disposal locations for the waste. This includes waste that is intended for re-use or recycling.

Note: All waste must be classified in accordance with the *EPA's Classification Guidelines* available at: <http://www.epa.nsw.gov.au/wasteregulation/classify-waste.htm>.

- 5.3. Include a commitment to retaining all sampling and classification results for the life of the project to demonstrate compliance with *EPA's Waste Classification Guidelines* available at: <http://www.epa.nsw.gov.au/wasteregulation/classify-waste.htm>.

- 5.4. Provide details of how waste will be handled and managed onsite to minimise pollution, including:

a) Stockpile location and management

- Labelling of stockpiles for identification, ensuring that all waste is clearly identified and stockpiled separately from other types of material (especially the separation of any contaminated and non-contaminated waste).
- Proposed height limits for all waste to reduce the potential for dust and odour.
- Procedures for minimising the movement of waste around the site and double handling.
- Measures to minimise leaching from stockpiles into the surrounding environment, such as sediment fencing, geofabric liners etc.

b) Erosion, sediment and leachate control including measures to be implemented to minimise erosion, leachate and sediment mobilisation at the site during works. The EA should show the location of each measure to be implemented. The Proponent should consider measures such as:

- Sediment traps
- Diversion banks
- Sediment fences
- Bunds (earth, hay, mulch)
- Geofabric liners
- Other control measures as appropriate

- 5.5. The Proponent should also provide details of:
- how leachate from stockpiled waste material will be kept separate from stormwater runoff;
 - treatment of leachate through a wastewater treatment plant (if applicable); and
 - any proposed transport and disposal of leachate off-site.
- 5.6. Provide details of how the waste will be handled and managed during transport to a lawful facility. If the waste possesses hazardous characteristics, the Proponent must provide details of how the waste will be treated or immobilised to render it suitable for transport and disposal.
- 5.7. Include details of all procedures and protocols to be implemented to ensure that any waste leaving the site is transported and disposed of lawfully and does not pose a risk to human health or the environment.
- 5.8. Include a statement demonstrating that the applicant is aware of the EPA's requirements with respect to notification and tracking of waste.
- 5.9. Include a statement demonstrating that the applicant is aware of the relevant legislative requirements for disposal of the waste, including any relevant Resource Recovery Exemptions, as gazetted by the EPA from time to time.
- 5.10. Outline contingency plans for any event that affects operations at the site that may result in environmental harm, including: excessive stockpiling of waste, volume of leachate generated exceeds the storage capacity available on-site etc.

6 Water and soils

6.1 Soils

The EA should include:

- 6.1.1. An assessment of potential impacts on soil and land resources should be undertaken, being guided by *Soil and Landscape Issues in Environmental Impact Assessment* (DLWC 2000). The nature and extent of any significant impacts should be identified. Particular attention should be given to:
- a. Soil erosion and sediment transport - in accordance with *Managing urban stormwater: soils and construction*, vol. 1 (Landcom 2004) and vol. 2 (A. Installation of services; B Waste landfills; C. Unsealed roads; D. Main Roads; E. Mines and quarries) (DECC 2008).
 - b. Mass movement (landslides) – in accordance with *Landslide risk management* guidelines presented in Australian Geomechanics Society (2007).
 - c. Urban and regional salinity – guidance given in the Local Government Salinity Initiative booklets which includes *Site Investigations for Urban Salinity* (DLWC, 2002).
- 6.1.2. A description of the mitigation and management options that will be used to prevent, control, abate or minimise identified soil and land resource impacts associated with the project. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented. Where required, add any specific assessment requirements relevant to the project.

6.2 Water

Describe Proposal

- 6.2.1. Describe the proposal including position of any intakes and discharges, volumes, water quality and frequency of all water discharges.
- 6.2.2. Demonstrate that all practical options to avoid discharge have been implemented and environmental impact minimised where discharge is necessary.
- 6.2.3. Where relevant include a water balance for the development including water requirements (quantity, quality and source(s)) and proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options.

Background Conditions

- 6.3.1. Describe existing surface and groundwater quality. An assessment needs to be undertaken for any water resource likely to be affected by the proposal.

Proponents are generally only expected to source available data and information. However, proponents of relatively large and/or high risk developments may be required to collect some ambient water quality / river flow / groundwater data to enable a suitable level of impact assessment. Issues to include in the description of the receiving waters could also include, for example:

- water chemistry
- a description of receiving water processes, circulation and mixing characteristics and hydrodynamic regimes
- lake or estuary flushing characteristics
- sensitive ecosystems or species conservation values
- specific human uses (e.g. fishing, proximity to recreation areas)
- a description of any impacts from existing industry or activities on water quality
- a description of the condition of the local catchment e.g. erosion, soils, vegetation cover, etc.
- an outline of baseline groundwater information, including, for example, depth to watertable, flow direction and gradient, groundwater quality, reliance on groundwater by surrounding users and by the environment
- historic river flow data

- 6.3.1. State the Water Quality Objectives for the receiving waters relevant to the proposal. These refer to the community's agreed environmental values and human uses endorsed by the NSW Government as goals for ambient waters (<http://www.environment.nsw.gov.au/ieo/index.htm>). Where groundwater may be impacted the assessment should identify appropriate groundwater environmental values.
- 6.3.2. State the indicators and associated trigger values or criteria for the identified environmental values. This information should be sourced from the ANZECC (2000) Guidelines for Fresh and Marine Water Quality (<http://www.environment.gov.au/water/policy-programs/nwqms/>).
- 6.3.3. State any locally specific objectives, criteria or targets which have been endorsed by the NSW Government.

Impact Assessment

No proposal should breach section 120 of the *Protection of the Environment Operations Act 1997* (i.e. pollution of waters is prohibited unless undertaken in accordance with relevant regulations).

6.4.1. Describe the nature and degree of impact that any proposed discharges will have on the receiving environment.

Depending on the nature, scale and/or risk of the proposal, this could include specific requirements to consider impacts on, for example:

- water circulation, current patterns, water chemistry and other appropriate characteristics such as clarity, temperature, nutrient and toxicants
- changes to hydrology (including drainage patterns, surface runoff yield, flow regimes, and groundwater)
- disturbance of acid sulphate soils and potential acid sulfate soils
- stream bank stability and impacts on macro invertebrates

Depending on the nature, scale and/or risk of the proposal, modelling, monitoring, or both, may need to be undertaken to assess the potential impact of discharges on the receiving environment. If modelling is required to assess the potential impact of any discharge(s), this could include, for example:

- a range of scenarios that encompass any variations in discharge quality and quantity as well as the relevant range of environmental conditions of the receiving waters. The scenarios could describe a set of worst-case conditions and typical conditions to ensure that both acute and chronic impacts are assessed,
- assumptions used in the modelling, including identification and discussion of the limitations and assumptions to ensure full consideration of all factors, including uncertainty in predictions.

6.4.2. Assess impacts against the relevant ambient water quality outcomes.

Demonstrate how the proposal will be designed and operated to:

- protect the Water Quality Objectives for receiving waters where they are currently being achieved; and
- contribute towards achievement of the Water Quality Objectives over time where they are not currently being achieved.

6.4.3. Where a discharge is proposed that includes a mixing zone, the proposal should demonstrate how wastewater discharged to waterways will ensure the ANZECC (2000) water quality criteria for relevant chemical and non-chemical parameters are met at the edge of the initial mixing zone of the discharge, and that any impacts in the initial mixing zone are demonstrated to be reversible.

6.4.4. Assess impacts on groundwater and groundwater dependent ecosystems.

6.4.5. Describe how stormwater will be managed both during and after construction.

6.4.6. Discharges from the site must be characterised with respect to their location, frequency, volume and likely water quality.

6.4.7. Outline sediment and erosion control measures directed at minimising disturbance of land, minimising water flow through the site and filtering, trapping or detaining sediment. Also include measures to maintain and monitor controls as well as rehabilitation strategies.

6.4.8. Provide details of how stormwater and runoff will be managed to minimise pollution, including measures to be implemented to minimise erosion, leachate and sediment mobilisation at the site during construction and operation phases of the project. The EA should show the location of each measure to be implemented. The proponent should consider the guidelines *Managing urban stormwater: soils and construction*, vol. 1 (Landcom 2004) and vol. 2 (A. Installation of services; C. Unsealed roads; D. Main Roads; E. Mines and quarries) (DECC2008) as well as control measures such as:

- Sediment traps
- Diversion banks
- Sediment fences
- Bunds (earth, hay, mulch)
- Geofabric liners
- Other control measures as appropriate.

Monitoring

6.5.1. Describe how predicted impacts will be monitored and assessed over time.

For relatively large and/or high risk developments, proponents should develop a water quality and aquatic ecosystem monitoring program to monitor the responses for each component or process that affects the Water Quality Objectives that includes, for example:

- adequate data for evaluating compliance with water quality standards and/or Water Quality Objectives,
- measurement of pollutants identified or expected to be present in any discharge.

Water quality monitoring should be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutant in NSW* (2004)

(<http://www.epa.nsw.gov.au/resources/legislation/approvedmethods-water.pdf>).

Attachment B – Guidance Material

Title	Web Address
<i>Contaminated Land Management Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+140+1997+cd+0+N
<i>Environmentally Hazardous Chemicals Act 1985</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+14+1985+cd+0+N
<i>Environmental Planning and Assessment Act 1979</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
<i>Protection of the Environment Operations Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
<i>Water Management Act 2000</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
Licensing	
EPA Guide to Licensing	www.epa.nsw.gov.au/licensing/licenceguide.htm
Air Issues	
Approved methods for modelling and assessment of air pollutants in NSW (2005)	http://www.epa.nsw.gov.au/resources/air/ammodelling05361.pdf
POEO (Clean Air) Regulation 2010	http://www.legislation.nsw.gov.au/maintop/view/inforce/subordleg+428+2010+cd+0+N
Noise and Vibration	
Interim Construction Noise Guideline (DECC, 2009)	http://www.epa.nsw.gov.au/noise/constructnoise.htm
Assessing Vibration: a technical guideline (DEC, 2006)	http://www.epa.nsw.gov.au/noise/vibrationguide.htm
Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC, 1990)	http://www.epa.nsw.gov.au/noise/blasting.htm
Industrial Noise Policy (EPA)	http://www.epa.nsw.gov.au/noise/industrial.htm
Industrial Noise Policy Application Notes	http://www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm
Environmental Criteria for Road Traffic Noise (EPA, 1999)	http://www.epa.nsw.gov.au/noise/traffic.htm
Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects (DECC, 2007)	http://www.epa.nsw.gov.au/noise/railinfranoise.htm
Environmental assessment requirements for rail traffic-generating developments	http://www.epa.nsw.gov.au/noise/railnoise.htm
Waste, Chemicals and Hazardous Materials and Radiation	
Waste	

Environmental Guidelines: Solid Waste Landfills (EPA, 1996)	http://www.epa.nsw.gov.au/resources/waste/envguidlns/solidlandfill.pdf
Draft Environmental Guidelines - Industrial Waste Landfilling (April 1998)	http://www.epa.nsw.gov.au/resources/waste/envguidlns/industrialfill.pdf
Waste Classification Guidelines (DECC, 2008)	http://www.epa.nsw.gov.au/waste/envguidlns/index.htm
EPA Resource recovery exemption	http://www.epa.nsw.gov.au/waste/RRecoveryExemptions.htm
Chemicals subject to Chemical Control Orders	
Chemical Control Orders (regulated through the EHC Act)	http://www.epa.nsw.gov.au/pesticides/CCOs.htm
National Protocol - Approval/Licensing of Trials of Technologies for the Treatment/Disposal of Schedule X Wastes - July 1994	Available in libraries
National Protocol for Approval/Licensing of Commercial Scale Facilities for the Treatment/Disposal of Schedule X Wastes - July 1994	Available in libraries
Water and Soils	
Acid sulphate soils	
Coastal acid sulfate soils guidance material	http://www.environment.nsw.gov.au/acidsulfatesoil/
Acid Sulfate Soils Planning Maps	http://www.environment.nsw.gov.au/acidsulfatesoil/riskmaps.htm
Contaminated Sites Assessment and Remediation	
Managing land contamination: Planning Guidelines – SEPP 55 Remediation of Land	http://www.planning.nsw.gov.au/assessingdev/pdf/gu_contam.pdf
Guidelines for Consultants Reporting on Contaminated Sites (EPA, 2000)	http://www.epa.nsw.gov.au/resources/clm/20110650consultantsglines.pdf
Guidelines for the NSW Site Auditor Scheme - 2nd edition (DEC, 2006)	http://www.epa.nsw.gov.au/resources/clm/auditorglines06121.pdf
Sampling Design Guidelines (EPA, 1995)	Available by request from EPA's Environment Line
National Environment Protection (Assessment of Site Contamination) Measure 1999 (or update)	http://www.scew.gov.au/nepms/assessment-site-contamination
Soils – general	
Managing land and soil	http://www.environment.nsw.gov.au/soils/landandsoil.htm
Managing urban stormwater for the protection of soils	http://www.environment.nsw.gov.au/stormwater/publications.htm
Landslide risk management guidelines	http://www.australiangeomechanics.org/resources/downloads/

Site Investigations for Urban Salinity (DLWC, 2002)	http://www.environment.nsw.gov.au/resources/salinity/booklet3siteinvestigationsforurbansalinity.pdf
Local Government Salinity Initiative Booklets	http://www.environment.nsw.gov.au/salinity/solutions/urban.htm
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	http://environment.gov.au/water/policy-programs/nwqms/index.html
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	Contact the EPA on 131555
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf



Office of
Environment
& Heritage

DOC19/352392

Mr Nathan Heath
Environmental Assessment Officer
Resource Assessments
Department of Planning and Environment
nathan.heath@planning.nsw.gov.au

Dear Mr Heath

Request for Input: Pearlman Quarry – 1135 Croppa Creek Road, North Star NSW - Designated Development - 1331

I refer to your email dated 11 April 2019 seeking input into the Department of Planning and Environment Environmental Assessment Requirements (EARs) for the preparation of an Environmental Impact Assessment (EIS) for Pearlman Quarry, North Star.

OEH has considered your request and provides EARs for the proposed development in **Attachments A and B**.

OEH recommends the EIS needs to appropriately address the following:

1. Biodiversity and offsetting
2. Aboriginal cultural heritage
3. Historic heritage
4. Water and soils
5. Flooding

Please note that for projects **not** defined as pending or interim planning applications under Part 7 of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* the Biodiversity Assessment Method (BAM) **must** be used to assess impacts to biodiversity in accordance with the *Biodiversity Conservation Act 2016* (BC Act). For this project the BAM **must** be used.

Specific Requirements

OEH advises that a rapid desktop assessment of the proposed area shows that the development area has potential for the site to impact threatened fauna that has been recorded in the area, as well as Aboriginal objects.

It is likely that this project will have to be assessed under the Biodiversity Offsets Scheme (BOS).

The EIS should include measures to avoid impacts to these entities. Where impacts cannot be avoided, efforts must be made to minimise impacts, and biodiversity offsets will be required for any direct and indirect impacts in accordance with the BAM.

If you have any questions regarding this matter, please contact Helen Knight on 02 6883 5327 or email helen.knight@environment.nsw.gov.au .

Yours sincerely

A handwritten signature in cursive script that reads "Samantha Wynn".

SAMANTHA WYNN
Senior Team Leader Planning - North West
Conservation and Regional Delivery

24 April 2018

Contact officer: HELEN KNIGHT
68835327

Attachment A - Environmental Assessment Requirements

Attachment B - Guidance Material

ATTACHMENT A

OEH's Recommended Environmental Assessment Requirements (EARs) for Pearlman Quarry

1. The Proposal

All components of the proposed development must be clearly described, including:

- the location of the proposed development and its context in the locality
- The rationale for the project
- the size, scale and type of the proposed development
- the pre-construction, construction, operational, and, where relevant, decommissioning phases of the proposed development, and the methods proposed to implement these phases
- plans and maps of the proposed development showing the locations of relevant phases and infrastructure
- the staging and timing of the proposed development
- the proposed development's relationship to any other proposals and developments

2. Environmental Impacts of the Proposal

The proponent must consider, assess, quantify and report on the likely environmental impacts of the proposal if applicable, particularly:

- Aboriginal cultural heritage
- Biodiversity
- OEH estate: land reserved or acquired under the *National Parks and Wildlife Act 1974*
- Flooding, floodplain issues and coastal erosion
- Historic heritage.
- Cumulative impacts

The Secretary's Environmental Assessment Requirements should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines mentioned. A full list of guidelines and reference material is presented in **Attachment 2**. Appropriate justification should be provided in instances where the matters below are not addressed.

3. Aboriginal Cultural Heritage

- The EIS must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the proposal. This may include the need for surface survey and test excavation. The identification of cultural heritage values must be conducted in accordance with the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (OEH 2010), and be guided by the *Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW* (DECCW, 2011) and consultation with OEH regional branch officers.
- Where Aboriginal cultural heritage values or potential values are present, these are to be assessed and documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR). An assessment under the Due Diligence process is not an Aboriginal Cultural Heritage Assessment Report. The ACHAR must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the ACHAR must

outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.

- Consultation with Aboriginal people must be undertaken and documented in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW) where an ACHAR is required. The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the ACHAR.

Note: Consultation is not only required where an AHIP will be required, but also when test excavations are carried out under the Code of Practice. These may not always require an AHIP but will trigger the need for an ACHAR.

- Where harm to an Aboriginal object or declared Aboriginal place cannot be avoided, an Aboriginal Heritage Impact Permit (AHIP) will be required from OEH under the *National Parks and Wildlife Act 1974*. You must apply to OEH for an AHIP prior to commencing works that will directly or indirectly harm an Aboriginal object or a declared Aboriginal place.

Note: Designated development where an AHIP is required should also be considered as an integrated development application (IDA). In these circumstances, OEH will issue General Terms of Approval (GTAs) to the consent authority to be included in conditions of development consent. OEH GTAs will address Aboriginal cultural heritage matters required to be addressed as part of an AHIP application. The matters outlined in the GTAs will be required to be assessed as part of an AHIP after development consent has been granted. OEH requires a valid development consent to accompany an AHIP application.

- The ACHAR must outline procedures to be followed if Aboriginal objects are found at any stage of the life of the development to formulate appropriate measures to manage unforeseen impacts.
- The ACHAR must outline procedures to be followed in the event Aboriginal burials or skeletal material is uncovered during construction to formulate appropriate protocols to manage the impacts to this material in accordance with the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (OEH 2010).

Project specific requirements

- If you do not know whether a proposal may harm Aboriginal objects or declared Aboriginal places, it may be appropriate to apply the due diligence procedure as prescribed under the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (OEH 2011). The due diligence must indicate whether further assessment under an Aboriginal Cultural Heritage Report (ACHAR) is required. An assessment under the Due Diligence process is not an ACHAR.
- The assessment of cultural heritage values must include a surface survey undertaken by a qualified archaeologist in areas with potential for subsurface Aboriginal deposits. The result of the surface survey is to inform the need for targeted test excavation to better assess the integrity, extent, distribution, nature and overall significance of the archaeological record. The results of surface surveys and test excavations are to be documented in the ACHAR.

4. Biodiversity

Biodiversity Assessment Methodology for the Biodiversity Offsets Scheme (BOS)

The EIS should include an assessment of the following:

- a. The EIS must assess the impact of the proposed development on biodiversity values to determine if the proposed development is “likely to significantly affect threatened species” for the purposes of Section 7.2 of the Biodiversity Conservation Act 2016 (BC Act), as follows:
 - a. The EIS must demonstrate and document how the proposed development exceeds, or does not exceed, the biodiversity offsets scheme threshold as set out in Section 7.4 of the BC Act 2016 and Clause 7.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation) by determining whether the proposed development involves:
 - i. **The clearing of native vegetation exceeds the thresholds** listed under Clause 7.23 of the BC Regulation, **or**
 - ii. The clearing of native vegetation, or other action, **on land included on the Biodiversity Values Map** published under Clause 7.23 of the BC Regulation (this map includes areas of outstanding biodiversity value, as declared under Section 3.1 of the BC Act).
 - b. If the proposal does not trigger any of the criteria in (a) above, then the EIS must determine whether the proposed development is likely to have a significant impact based on *‘the test for determining whether proposed development likely to significant affect threatened species or ecological communities’* in Section 7.3 of the BC Act.
 - c. Where there is reasonable doubt regarding potential impacts, or where information is not available, then a significant impact upon biodiversity should be considered likely when applying the test in Section 7.3 of the BC Act. Where it is concluded that there is no significant impact, the EIS must justify how the conclusion has been reached.
 - d. If the development exceeds the thresholds in (a) or (b), then the EIS must be accompanied by a biodiversity development assessment report (BDAR) prepared in accordance with Part 6 of the BC Act. That is, the Biodiversity Assessment Methodology applies.

Required Information

Where development is considered “likely to significantly impact on threatened species” and a Biodiversity Development Assessment Report is required, the following requirements apply:

- Biodiversity impacts related to the proposal are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method.
- The BDAR must document the application of the avoid, minimise and offset hierarchy including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.
- The BDAR must include details of the measures proposed to address the offset obligation as follows:
 - The total number and classes of biodiversity credits required to be retired for the proposal.
 - The number and classes of like-for-like biodiversity credits proposed to be retired.
 - The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules.
 - Any proposal to fund a biodiversity conservation action.
 - Any proposal to make a payment to the Biodiversity Conservation Fund.

- If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.

The BDAR must be prepared by a person accredited to apply the Biodiversity Assessment Method under s6.10 of the *Biodiversity Conservation Act 2016*.

Where a BDAR is not required and a threatened species assessment is prepared to support a conclusion of “no significant impact”, the EIS must include a field survey of the site, conducted and documented in accordance with the relevant guidelines including the Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW, 2009), Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft (DEC, 2004) and Guidelines for Threatened Species Assessment (Dept Planning, July 2005). The approach should also reference the field survey methods and assessment information on the OEH website including the Bionet Atlas, Threatened Species Profile and Bionet Vegetation Classification (see Attachment 2).

5. OEH Estate

Land reserved or acquired under the *National Parks and Wildlife Act 1974* (NPW Act)

If the proposed development is within, adjacent to, or in close proximity to, OEH-managed conservation estate (e.g. a national park, nature reserve, state conservation area, land which is declared wilderness under the *Wilderness Act 1987*), or is within, adjacent to, or in close proximity to, a watercourse that flows directly into OEH-managed conservation estate, then the EIS must address impacts upon such area/s.

Where OEH estate is likely to be impacted, the EIS should include:

- The following (as appropriate):
 - Evidence that the proponent has consulted with OEH on the legal permissibility of the proposal under the NPW Act.
 - In the case of proposals on land declared as wilderness under the *Wilderness Act 1987*, evidence that the proponent has consulted with OEH on the appropriateness of the proposal. That is, whether it is consistent with the objects of the *Wilderness Act 1987* (section 3) and the management principles for wilderness areas (section 9).
 - Alternative options that have been explored to avoid impacts on the OEH estate (on-park) and a clear justification of any on-park components of the proposal.
 - If on-park impacts are considered unavoidable, consideration of the issues, including details of any compensation proposal, consistent with the *OEH Revocation, Recategorisation and Road Adjustment Policy* (2012) for proposals that are located wholly or partly in a National Park or other land acquired or reserved under the *National Parks and Wildlife Act 1974*.
- Consideration of the matters identified in the *Guidelines for developments adjoining land managed by the Office of Environment & Heritage* (OEH 2013) where a proposal adjoins or is immediate vicinity of OEH estate, or is upstream of OEH estate, which include:
 - The nature of the impacts, including direct and indirect impacts
 - The extent of the direct and indirect impacts
 - The duration of the direct and indirect impacts
 - The objectives of the reservation of the land
- A description of the mitigation and management options that will be used to prevent, control, abate or minimise identified direct and indirect impacts associated with the proposal. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

6. Water

- The EIS must map features relevant to water, including:
 - Rivers, streams, estuaries (as described in s4.2 of the Biodiversity Assessment Method).
 - Wetlands (as described in s4.2 of the Biodiversity Assessment Method).
 - Groundwater.
 - Groundwater dependent ecosystems.
- The EIS must describe background conditions for any water resource likely to be affected by the proposal, including:
 - Existing surface and groundwater.
 - Hydrology
 - Water Quality Objectives (as endorsed by the NSW Government) including groundwater as appropriate that represent the community's uses and values for the receiving waters. Indicators and trigger values/criteria for the identified environmental values in accordance with the ANZECC (2000) *Guidelines for Fresh and Marine Water Quality* and / or local objectives, criteria or targets endorsed by the NSW Government
 - *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions* (OEHL/EPA, 2017).
- The EIS must assess the impacts of the proposal on water quality, including:
 - The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the proposal protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction.
 - Identification of proposed monitoring of water quality.
 - Consistency with any relevant certified Coastal Management Program (or Coastal Zone Management Plan).
- The EIS must assess the impact of the proposal on hydrology, including:
 - Water balance including quantity, quality and source.
 - Effects upon rivers, wetlands, estuaries, marine waters and floodplain areas.
 - Effects upon water-dependent fauna and flora including groundwater dependent ecosystems.
 - Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches).
 - Changes to environmental water availability, both regulated / licensed and unregulated / rules-based sources of such water.

Project specific requirements

Where the proposal is large or high risk with a heightened potential to impact on water quality and hydrology, the EIS should include the following:

- A description of existing water quality / hydrology based on suitable data (meaning data collection may be required) and must include:
 - Water chemistry.
 - A description of receiving water processes, circulation and mixing characteristics and hydrodynamic regimes.
 - Lake or estuary flushing characteristics.

- Sensitive ecosystems or species conservation values.
- Specific human uses and values (e.g. fishing, proximity to recreation areas).
- A description of any impacts from existing industry or activities on water quality.
- A description of the condition of the local catchment e.g. erosion, soils, vegetation cover.
- An outline of baseline groundwater information, including, for example, depth to water table, flow direction and gradient, groundwater quality, reliance on groundwater by surrounding users and by the environment.
- Historic river flow data.
- An assessment of the impacts of the proposal on water quality and hydrology including:
 - Water circulation, current patterns, water chemistry and other appropriate characteristics such as clarity, temperature, nutrient and toxicants, and potential for erosion.
 - Changes to hydrology
 - Stream bank stability and impacts on macro invertebrates.
 - Water quality and hydrology modelling and / or monitoring, where necessary.
- Proposed water quality monitoring in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DEC 2004). The water quality and aquatic ecosystem monitoring program must include:
 - Adequate data for evaluating maintenance, or progress towards achieving, the relevant Water Quality Objectives.
 - Measurement of pollutants identified or expected to be present.

7. Flooding

- The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including:
 - Flood prone land (i.e. land susceptible to the probable maximum flood event).
 - Flood planning area, the area below the flood planning level.
 - Hydraulic categorisation (floodway and flood storage areas).
 - Flood hazard.
- The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 10% Annual Exceedance Probability (AEP), 1% AEP flood levels and the probable maximum flood, or an equivalent extreme event.
- The EIS must model the effect of the proposal (including fill) on the current flood behaviour for a range of design events as identified above, and the 0.5% AEP and 0.2% AEP year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.
- All site drainage, stormwater quality devices and erosion / sedimentation control measures should be identified in the EIS and the onsite treatment of stormwater and effluent runoff and predicted stormwater discharge quality from the proposal should be detailed.
- Modelling in the EIS must consider and document:
 - Existing council flood studies in the area and examine consistency to the flood behaviour documented in these studies.
 - The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood (PMF), or an equivalent extreme flood.
 - Impacts of the proposal on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazard categories and hydraulic categories.

- Impacts of earthworks and stockpiles within the flood prone land up to the PMF level. The assessment should be based on understanding of cumulative flood impacts of construction and operational phases.
- Relevant provisions of the NSW Floodplain Development Manual 2005.
- The EIS must assess the impacts on the proposal on flood behaviour, including:
 - Whether there will be detrimental increases in the potential flood affectation of other properties, assets and infrastructure.
 - Consistency with Council floodplain risk management plans.
 - Consistency with any Rural Floodplain Management Plans.
 - Compatibility with the flood hazard of the land.
 - Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land.
 - Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site.
 - Whether there will be a direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.
 - Appropriate mitigation measures to offset potential flood risk arising from the proposal. Any proposed mitigation work should be modelled and assessed on the overall catchment basis in order to ensure it fits its purpose and meets the criteria of the Council where it is located, and to ensure it has no adverse impact to surrounding areas.
 - Any impacts the proposal may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the NSW SES and Council.
 - Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the NSW SES and Council.
 - Emergency management, evacuation and access, and contingency measures for the proposal during both construction and operational phases considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the NSW SES.
 - Any impacts the proposal may have on the social and economic costs to the community as a consequence of flooding.

8. Historic Heritage

Standard Requirements

The EIS must provide a heritage assessment including but not limited to an assessment of impacts to State and local heritage including conservation areas, natural heritage areas, places of Aboriginal heritage value, buildings, works, relics, gardens, landscapes, views, and trees. Where impacts to State or locally significant heritage items are identified, the assessment shall:

- outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the NSW Heritage Manual (1996)
- be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria)
- include a statement of heritage impact for all heritage items (including significance assessment)
- consider impacts including, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment (as relevant)

- where potential archaeological impacts have been identified develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations (terrestrial and maritime as relevant) and include the results of these test excavations.

ATTACHMENT B

Guidance Material

Title	Web address
<u>Relevant Legislation</u>	
<i>Biodiversity Conservation Act 2016</i>	https://www.legislation.nsw.gov.au/#/view/act/2016/63/full
<i>Coastal Management Act 2016</i>	https://www.legislation.nsw.gov.au/#/view/act/2016/20/full
<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
<i>Environmental Planning and Assessment Act 1979</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
<i>Fisheries Management Act 1994</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
<i>Marine Parks Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+64+1997+cd+0+N
<i>National Parks and Wildlife Act 1974</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
<i>Protection of the Environment Operations Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
<i>Water Management Act 2000</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
<i>Wilderness Act 1987</i>	http://www.legislation.nsw.gov.au/viewtop/inforce/act+196+1987+FIRST+0+N
<u>Aboriginal Cultural Heritage</u>	
Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010)	http://www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)	http://www.environment.nsw.gov.au/resources/cultureheritage/10783FinalArchCoP.pdf
Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011)	http://www.environment.nsw.gov.au/resources/cultureheritage/20110263ACHguide.pdf
Aboriginal Site Recording Form	http://www.environment.nsw.gov.au/resources/parks/SiteCardMainV1_1.pdf
Aboriginal Site Impact Recording Form	http://www.environment.nsw.gov.au/resources/cultureheritage/120558asirf.pdf
Aboriginal Heritage Information Management System (AHIMS) Registrar	http://www.environment.nsw.gov.au/contact/AHIMSRegistrar.htm
Care Agreement Application form	http://www.environment.nsw.gov.au/resources/cultureheritage/20110914TransferObject.pdf
<u>Biodiversity</u>	
Biodiversity Values Map	https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap
Biodiversity Assessment Method (OEH, 2017)	http://www.environment.nsw.gov.au/resources/bcact/biodiversity-assessment-method-170206.pdf
Biodiversity Offsets Scheme	https://www.environment.nsw.gov.au/biodiversity/offsetsscheme.htm

Title	Web address
Accredited Assessors	https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor
Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH, 2017)	http://www.environment.nsw.gov.au/resources/bcact/guidance-decision-makers-determine-serious-irreversible-impact-170204.pdf
Ancillary rules: Biodiversity conservation actions	http://www.environment.nsw.gov.au/resources/bcact/ancillary-rules-biodiversity-actions-170496.pdf
Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules	http://www.environment.nsw.gov.au/resources/bcact/ancillary-rules-reasonable-steps-170498.pdf
Ancillary rules: Impacts on threatened species excluded from application of the variation rules	http://www.environment.nsw.gov.au/resources/bcact/ancillary-rules-impacts-on-threatened-entities-excluded-from-variation-170497.pdf
OEH Threatened Species Profiles	http://www.environment.nsw.gov.au/threatenedspeciesapp/
BioNet Atlas	http://www.environment.nsw.gov.au/wildlifeatlas/about.htm
BioNet Vegetation Classification	http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx
Threatened Species Profile	http://www.environment.nsw.gov.au/threatenedSpeciesApp/
NSW Guide to Surveying Threatened Plants (OEH, 2016)	http://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-guide-to-surveying-threatened-plants
Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna - Amphibians (DECC, 2009)	www.environment.nsw.gov.au/resources/Threatenedspecies/09213amphibians.pdf
Threatened Species Assessment Guideline - The Assessment of Significance (DECC 2007)	www.environment.nsw.gov.au/resources/Threatenedspecies/tsaguide07393.pdf
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004)	http://www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf
Fisheries NSW policies and guidelines	http://www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals/fish-habitat-conservation
<u>OEH Estate</u>	
Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water (DECCW, 2010)	http://www.environment.nsw.gov.au/protectedareas/developmntadjoiningdecc.htm
List of national parks	http://www.environment.nsw.gov.au/NationalParks/parksearchatoz.aspx
Revocation, recategorisation and road adjustment policy (OEH, 2012)	http://www.environment.nsw.gov.au/policies/RevocationOfLandPolicy.htm
List of aquatic reserves	www.dpi.nsw.gov.au/fisheries/habitat/protecting-habitats/mpa
List of marine parks	www.mpa.nsw.gov.au/contact.html
<u>Water</u>	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm

Title	Web address
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	www.environment.gov.au/water/publications/quality/australian-and-new-zealand-guidelines-fresh-marine-water-quality-volume-1
Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions	http://www.environment.nsw.gov.au/research-and-publications/publications-search/risk-based-framework-for-considering-waterway-health-outcomes-in-strategic-land-use-planning
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	http://deccnet/water/resources/AWQGuidance7.pdf
Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales (DEC 2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf
Flooding	
Floodplain Development Manual	http://www.environment.nsw.gov.au/floodplains/manual.htm
Floodplain Risk Management Guidelines	http://www.environment.nsw.gov.au/topics/water/coasts-and-floodplains/floodplains/floodplain-guidelines
NSW Climate Impact Profile	http://climatechange.environment.nsw.gov.au/
Climate Change Impacts and Risk Management	Climate Change Impacts and Risk Management: A Guide for Business and Government, AGIC Guidelines for Climate Change Adaptation
Historic Heritage	
The Burra Charter (The Australia ICOMOS charter for places of cultural significance)	http://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf
Statements of Heritage Impact 2002 (HO & DUAP)	http://www.environment.nsw.gov.au/resources/heritagebranch/heritage/hmstatementsofhi.pdf
NSW Heritage Manual (DUAP) (scroll through alphabetical list to 'N')	http://www.environment.nsw.gov.au/Heritage/publications/

Nathan Heath

From: Patsy Cox <pcox@gwydir.nsw.gov.au>
Sent: Monday, 6 May 2019 9:05 AM
To: Nathan Heath
Subject: Pearlman Quarry EIS

Follow Up Flag: Follow up
Flag Status: Flagged

Good Morning Nathan

Council's main concerns will around the loss of further EEC Semi-Evergreen Vine Thicket that is known in the area (and any other flora, fauna or ecological community), will it be effected and how this will be offset, so I would think that a full Biodiversity Development Assessment Report will need to be completed with the amount of area that will need to be cleared. A full Traffic Assessment Report will need to be completed with reference to all the roads within the shire that are intended to be used for haulage, the estimated amount of haulage, the types of trucks to be used and the frequency. Any effect on ground water and over land flows from excavations. What rehabilitation will take place and how will this be funded. A full and proper Aboriginal heritage assessment report. Other than that, of course, the usual noise (especially if blasting), dust, amenity of neighbouring dwellings, compliance with the SEPP's and all other relevant Acts and Regs.

Cheers

Patsy Cox

Planning Officer
Email: pcox@gwydir.nsw.gov.au
Phone: 02 6724 2000
Mobile: 0418 579 538

PP Please consider the environment before printing this e-mail

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The Department of Industry (DoI) – Crown Lands has the following comments for the following proposal:-

Request for Requirements - EAR 1331 - Pearlman Quarry, North Star

Crown assets are located to the south of the proposed project area. These include Reserves and a Crown waterway (refer Fig 1).

The proposed development will involve significant excavation, interception and use of surface water.

The Department requires that full detail be provided in the Environmental Assessment regarding:

- the location of diversions to natural water flow paths
- location and capacity of surface water storage
- anticipated volume of harvested surface water to be used in operations
- water disposal points and overflow locations
- impacts on groundwater
- Location of site drainage into Tackinbri Creek
- Control measures for water quality management of discharge into Tackinbri Creek

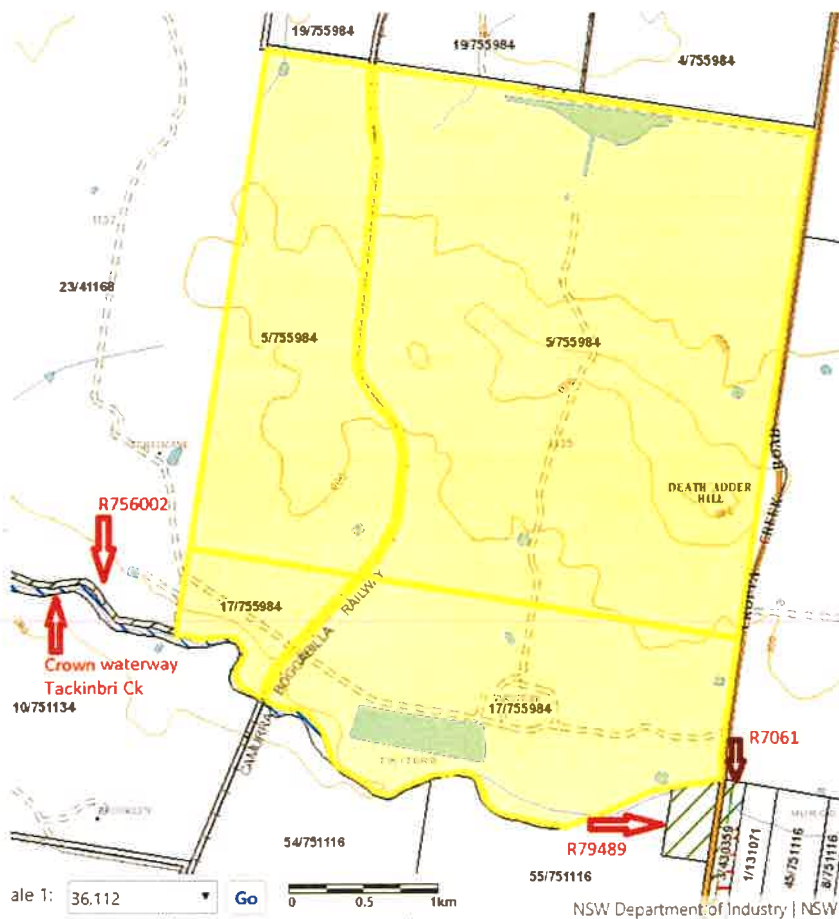


Fig 1. Crown Assets in the vicinity of proposed development



The department has legislative responsibilities to ensure Crown assets are managed according to the Principles of Crown Land Management.

Proposed development which may affect the volume and quality of water in a Crown waterway, particularly a waterway servicing Crown Reserves, must be fully understood in order to ensure the proposed development will not adversely impact the natural values and/or potential future use of Crown assets.



Planning &
Environment

23rd April 2019

Nathan Heath
Environmental Assessment Officer
Resource Assessments
Department of Planning & Environment
GPO Box 39
Sydney NSW 2001

Emailed: nathan.heath@planning.nsw.gov.au

Your Reference: EAR 1331
Our Reference: DOC19/327448

Dear Nathan,

**Re: Request for Secretary's Environmental Assessment Requirements
Pearlman Quarry, North Star – EAR 1331**

Thank you for the opportunity to provide advice on the Secretary's Environmental Assessment Requirements for the Pearlman Quarry proposal. This is a response from NSW Department of Planning & Environment – Division of Resources & Geoscience (the Division).

The building and construction industries in NSW require the ongoing replacement of supplies as current sources are exhausted. The continued sustainable development of existing and new quarries will facilitate the ongoing supply of construction materials to support affordable housing and infrastructure development for the growth of NSW. The resource in the subject area represents an important source of hard rock construction materials to support the local area and the Inland Rail Project.

It is in the best interests of both the proponent and the community to fully assess the resources which are to be extracted. This means that a thorough geological assessment should be undertaken to determine the nature, quality and extent of the resource. Failure to undertake such an assessment could lead to operational problems and possibly even failure of the proposal.

Basalt is not a prescribed mineral under the *Mining Act 1992*. Therefore, the Division has no statutory role in authorising or regulating the extraction of this commodity, apart from its role under the *Work Health and Safety Act 2011* and associated regulations and the *Work Health and Safety (Mine and Petroleum Sites) Act 2013* and associated regulations, for ensuring the safe operation of mines and quarries. However, the Division is the principal government authority responsible for assessing the State's resources of construction materials and for advising State and local government on their planning and management.

NSW Department of Planning and Environment
DIVISION of RESOURCES & GEOSCIENCE
PO Box 344 Hunter Region Mail Centre NSW 2310
E: landuse.minerals@geoscience.nsw.gov.au
Tel: 02 4063 6500
ABN 38 755 709 681

All environmental reports (EIS or similar) accompanying Development Applications for extractive industry lodged under the *Environmental Planning & Assessment Act 1979* should include a resource assessment **(as detailed in Attachment A)** which:

- **Documents the size and quality of the resource and demonstrates that both have been adequately assessed; and**
- **Documents the methods used to assess the resource and its suitability for the intended applications.**

The above information should be summarised in the EIS, with full documentation appended. If deemed commercial-in-confidence, the resource assessment summary included in the EIS should commit to providing the Division with full resource assessment documentation separately. Applications to modify, expand, extend or intensify an existing consent that has already been adequately reported using the above protocol in publicly available documents, may restrict detailed documentation to the additional resources to be used, if accompanied by a summary of past resource assessments and of past production.

The Division collects data on the quantity of construction materials produced annually throughout the State. Forms are sent to all operating quarries at the end of each financial year for this purpose. The statistical data collected is of great value to Government and industry in planning and resource management, particularly as a basis for analysing trends in production and for estimating future demand for particular commodities or in particular regions. Production data may be published in aggregated form, however production data for individual operations is kept strictly confidential.

In order to assist in the collection of construction material production data, the proponent should be required to provide annual production data for the subject site to the NSW Division of Resources and Geoscience as a condition of any new or amended development consent.

During the preparation of the EIS, The Division recommends that the proponent consult NSW Department of Planning & Environment's '*EIS Guideline - Extractive Industries – Quarries*'. This guideline is available from:

<http://www.planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/~media/4A89C0947A8C4D70A983F8EE1D7B9790.ashx>

The Division would appreciate the opportunity for early consultation in relation to the proposed location of any biodiversity offset areas (both on and off site) or any supplementary biodiversity measures to ensure there is no consequent reduction in access to prospective land for mineral exploration, or potential for sterilisation of mineral or extractive resources.

Queries regarding the above information should be directed to the Division of Resources & Geoscience - Land Use team at landuse.minerals@geoscience.nsw.gov.au.

Yours sincerely



Steven Palmer
A/Manager - Land Use

Encl. Attachment "A"

ATTACHMENT A**NSW Department of Planning & Environment
DIVISION OF RESOURCES & GEOSCIENCE****ENVIRONMENTAL and WORK HEALTH & SAFETY
ASSESSMENT REQUIREMENTS FOR
CONSTRUCTION MATERIAL QUARRY PROPOSALS**

It is in the best interests of both the proponent and the community to fully assess the resources which are to be extracted. This means that a thorough geological assessment should be undertaken to determine the nature, quality and extent of the resource. Failure to undertake such an assessment could lead to operational problems and possibly even failure of the proposal.

The following issues need to be addressed when preparing an environmental assessment (EA) or environmental impact statement (EIS) for a proposed construction materials (extractive materials) quarry:

Resource Assessment

1. A summary of the regional and local geology including information on the stratigraphic unit or units within which the resource is located.
2. The amount of material to be extracted and the method or methods used to determine the size of the resource (e.g. drilling, trenching, geophysical methods). Plans and cross-sections summarising this data, at a standard scale, showing location of drillholes and/or trenches, and the area proposed for extraction, should be included in the EA or EIS. Relevant supporting documentation such as drill logs should be included or appended. Major resource proposals should be subject to extensive drilling programs to identify the nature and extent of the resource.
3. Characteristics of the material or materials to be produced:
 - a) For structural clay/shale extraction proposals, ceramic properties such as plasticity, drying characteristics (e.g. dry green strength, linear drying shrinkage), and firing characteristics (e.g. shrinkage, water absorption, fired colour) should be described.
 - b) For sand extraction proposals, properties such as composition, grain size, grading, clay content and contaminants should be indicated. The inclusion of indicative grading curves for all anticipated products as well as the overall deposit is recommended.
 - c) **For hard rock aggregate proposals, information should be provided on properties such as grain size and mineralogy, nature and extent of weathering or alteration, and amount and type of deleterious minerals, if any.**
 - d) For other proposals, properties relevant to the range of intended uses for the particular material should be indicated.

Details of tests carried out to determine the characteristics of the material should be included or appended. Such tests should be undertaken by NATA registered testing laboratories.

4. An assessment of the quality of the material and its suitability for the anticipated range of applications should be given.
5. The amount of material anticipated to be produced annually should be indicated. If the proposal includes a staged extraction sequence, details of the staging sequence needs to be provided. The intended life of the operation should be indicated.
6. If the proposal is an extension to an existing operation, details of history and past production should be provided.
7. An assessment of alternative sources to the proposal and the availability of these sources. The impact of not proceeding with the proposal should be addressed.
8. Justification for the proposal in terms of the local and, if appropriate, the regional context.
9. Information on the location and size of markets to be supplied from the site.
10. Route(s) used to transport quarry products to market.
11. Disposal of waste products and the location and size of stockpiles.
12. Assessment of noise, vibration, dust and visual impacts, and proposed measures to minimise these impacts.
13. Proposed rehabilitation procedures during, and after completion of, extraction operations, and proposed final use of site.
14. Assessment of the ecological sustainability of the proposal.

Health and Safety Issues

In relation to the health and safety of mining and quarrying operations, the following must be addressed:

1. All mining operations are to comply with the following legislation:
 - a. *Work Health and Safety Act 2011*
 - b. *Work Health and Safety Regulation 2017*
 - c. *Work Health and Safety (Mine and Petroleum Sites) Act 2013*
 - d. *Work Health and Safety (Mine and Petroleum Sites) Regulation 2014*
 - e. *Explosives Act 2003*
 - f. *Explosives Regulation 2013.*
2. The mine holder must appoint a mine operator and notify the Department in writing as required by clause 7 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* before commencing any mining operations.

3. Other duties and notification and reporting requirements exist under the WHS laws and duty holders must ensure they understand and comply with these requirements.

Mineral Ownership

The *Mining Act 1992* applies to those commodities prescribed by the regulations of the Act (Schedule 2, *Mining Regulation 2016*). Most construction materials are not prescribed minerals under the *Mining Act 1992*. In general terms, this means these materials are owned by the Crown where they occur on Crown land and by the landowner in the case of freehold land. A Mining Title is not required for their extraction although a Crown Lands licence is required where they occur on Crown land.

Construction materials such as *sand (other than marine aggregate), loam, river gravel, and coarse aggregate materials such as basalt, sandstone, and granite* are not prescribed minerals under the *Mining Act 1992*. Therefore, the Division has no statutory responsibility for authorising or regulating the extraction of these commodities, apart from its role under the WHS laws with respect to the safe operation of mines and quarries. However, the Division is the principal government authority responsible for assessing the State's resources of construction materials and for advising State and local government on their planning and management.

Some commodities, notably *structural clay (ie clay for brick, tile and pipe manufacture), dimension stone (except for sandstone), quartzite, kaolin, limestone and marine aggregate* are prescribed minerals under the *Mining Act 1992*. Minerals which are prescribed as minerals under the terms of the Mining Act may, in some cases belong either to the Crown or to an individual, depending on a number of factors including the date on which the mineral was proclaimed and the date of alienation of the land.

The proponent needs to determine whether the material is privately owned or Crown mineral (publicly owned). If it is privately owned, then either a mining lease or mining (mineral owner) lease would be required. If it is a Crown mineral, an application for a mining lease will have to be lodged.

If you are unsure whether a mining title is required for your proposal you should contact NSW Department of Planning & Environment, Division of Resources & Geoscience.

Nathan Heath

To: Sarah Harris
Subject: RE: Request for Requirements - EAR 1331 - Pearlman Quarry, North Star

From: Megan Hobbs
Sent: Tuesday, 30 April 2019 11:08 AM
To: Sarah Harris <sarah.harris@planning.nsw.gov.au>
Subject: RE: Request for Requirements - EAR 1331 - Pearlman Quarry, North Star

Hi Nathan,

Compliance Operations have no comment as this is not a mineral recognised under the Mining Act.

Regards,

Megan Hobbs
Inspector Environment
Compliance Operations
Resources Regulator
516 High Street | Maitland NSW 2320
T: 02 4063 6714 M: 0488 499 824
www.resourcesregulator.nsw.gov.au



**Planning &
Environment**

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NSW RURAL FIRE SERVICE



The Secretary
NSW Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Your Ref: EAR 1331
Our Ref: D19/1227
DA19041118257 PC

ATTENTION: Nathan Heath

2 May 2019

Dear Mr Heath,

Request for Environmental Assessment Requirements – Pearlman Quarry, Lots 5 & 17 DP 755984, 1135 Croppa Creek Road, North Star

I refer to the NSW Environment and Planning correspondence dated 11 April 2019 seeking comment from the NSW Rural Fire Service on matters to be included in the Secretary's Environmental Assessment Requirements for the above proposal.

The subject land is partly mapped as bush fire prone land by Gwydir Shire Council. The NSW Rural Fire Service considers that the environmental assessment for the development should address the following matters relating to bush fire:

- the aim and objectives of 'Planning for Bush Fire Protection 2006';
- identification of potential ignition sources during construction and operation of the development;
- storage of fuels and other hazardous materials (e.g. explosives for blasting);
- proposed bush fire protection measures for the development, including vegetation management and fire suppression capabilities;
- operational access to the site for fire fighting appliances; and
- emergency and evacuation planning.

For any queries regarding this correspondence please contact Paul Creenaune on 6691 0400.

Yours sincerely,

Alan Bawden

Team Leader – Development Assessment & Planning

Postal address

Records
NSW Rural Fire Service
Locked Bag 17
GRANVILLE NSW 2142

Street address

NSW Rural Fire Service
Planning and Environment Services (North)
Suite 1, 129 West High Street
COFFS HARBOUR NSW 2450

T (02) 6691 0400

F (02) 6691 0499

www.rfs.nsw.gov.au

Email: pes@rfs.nsw.gov.au



Transport Roads & Maritime Services

File No: NTH19/00067
Your Ref: EAR 1331

The Manager
Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Nathan Heath

Dear Sir / Madam,

Secretary's Environmental Assessment Requirements for EAR 1331 – Pearlman Quarry. 1135 Croppa Creek Road North Star.

I refer to your email of 11 April 2019 requesting input to the Secretary's Environmental Assessment Requirements (EARs) for the proposed quarry.

Roles and Responsibilities

The key interests for Roads and Maritime Services are the safety and efficiency of the road network, traffic management, the integrity of infrastructure assets and the integration of land use and transport.

Roads and Maritime is given the opportunity to review and provide comment on the subject development under Clause 16 of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*.

Roads and Maritime Response

Roads and Maritime requests that the Environmental Assessment be supported by a Traffic Impact Assessment (TIA) prepared by a suitably qualified person in accordance with the Austroads Guide to Traffic Management Part 12, the complementary Roads and Maritime Supplement and RTA Guide to Traffic Generating Developments. The TIA is to address the following;

- The cumulative impact of the Tikitere and the proposed Pearlman Quarries on the road network with consideration for a 10 year horizon.
- The volume and distribution of traffic generated by the Tikitere and the proposed Pearlman Quarries.
- Intersection sight distances at key intersections along the primary haul routes.
- Existing and proposed site access standards.
- Details of proposed improvements to affected intersections.
- Impact of rail corridors on the road network and details of proposed interface treatments.
- Details of servicing and parking arrangements.
- Impact on public transport (public and school bus routes) and consideration for alternative transport modes such as walking and cycling.
- Impacts of road traffic noise and dust generated along the primary haul route/s.

- Consideration for Clause 16(1) of the Mining SEPP regarding;
 - Impact on school zones and residential areas.
 - Code of Conduct for haulage operators
 - Road safety assessment of key haulage route/s

Should the Department wish to condition the preparation of an Operational Traffic Management Plan (OTMP) it should include a Code of Conduct for haulage operators. This could include, but not be limited to;

- a. A map of the primary haulage routes highlighting critical locations.
- b. Safety initiatives for haulage through residential areas and/or school zones.
- c. An induction process for vehicle operators & regular toolbox meetings.
- d. A complaint resolution and disciplinary procedure.
- e. Any community consultation measures for peak haulage periods.

Where road safety concerns are identified at a specific location along the identified haulage route/s, Roads and Maritime suggests the TIA should be supported by a targeted Road Safety Audit undertaken by suitably qualified persons.

Due to the remoteness of the site it would be desirable for the TIA to include photographs of the site, access, road junctions and sight lines at key intersections along the haulage routes.

The current Austroads Guidelines, Australian Standards and Roads and Maritime Supplements are to be adopted for any proposed works on the classified road network.

The Developer would be required to enter into a 'Works Authorisation Deed' (WAD) with Roads and Maritime for any works deemed necessary on the state classified road network. The developer would be responsible for all costs associated with the works and administration for the WAD

Further information on undertaking private developments adjacent to classified roads can be accessed at:

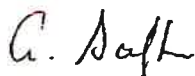
<http://www.rms.nsw.gov.au/projects/planning-principles/index.html>

Advice to the Consent Authority

Roads and Maritime highlights the Consent Authority is responsible for considering the environmental impacts of any road works which are ancillary to the development. This includes any works which form part of the proposal and/or any works deemed necessary to include as requirements in the conditions of development consent.

If you have any further enquiries regarding the above comments please contact Greg Sciffer, Development Assessment Officer Northern on (02) 6640 1362 or via email at: development.northern@rms.nsw.gov.au

Yours faithfully,



For Cheryl Sisson
A/Manager Land use Assessment, Northern
17 April 2019

3 May 2019

Mr Nathan Heath
Environmental Assessment Officer
Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

Contact: Lachlan Browne
Phone: 02 6763 3917
Email: lachlan.browne@waternsw.com.au
Our ref: D2019/44622

Dear Mr Heath,

**Re: EARs ID No.1331 – Pearlman Quarry
Lot 5 and 17 in DP755984, 1135 Croppa Creek Road Road, North Star NSW.**

WaterNSW has reviewed the supporting documentation accompanying the request for Secretary's Environmental Assessment Requirements (SEARs) and provides the following comments below, and further detail in **Attachment A**.

It is recommended that the EIS be required to include:

Access to surface and groundwater resources

- Annual volumes of surface water and groundwater proposed to be taken by the activity (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan.
- Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project).
- Assessment of the impact and approvals (Works and Use Approvals under the WMA 2000) required for the taking or storage of water.
- The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.
- A detailed and consolidated site water balance.

Impact on surface and groundwater resources

- Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.
 - Full technical details and data of all surface and groundwater modelling.
 - Proposed surface and groundwater monitoring activities and methodologies.
 - Proposed management and disposal of produced or incidental water
-

Flood Works

If the proposal includes any earthwork, embankment or levee, wherever situated or proposed to be constructed that is reasonably likely to affect the flow of water to or from a river or watercourse then the assessment is required to address potential impacts detailed further in Attachment A.

Please direct any questions or correspondence to myself at
lachlan.browne@waternsw.com.au.

Yours sincerely



Lachlan Browne
Water Regulation Officer

WaterNSW General Assessment Requirements

The following detailed assessment requirements are provided to assist in adequately addressing the assessment requirements for this proposal.

For further information visit www.waternsw.com.au or www.industry.nsw.gov.au/water.

Key Relevant Legislative Instruments

This section provides a basic summary to aid proponents in the development of an Environmental Impact Statement (EIS), and should not be considered a complete list or comprehensive summary of relevant legislative instruments that may apply to the regulation of water resources for a project.

The EIS should take into account the objects and regulatory requirements of the *Water Management Act 2000* (WMA 2000), and associated regulations and instruments, as applicable.

Water Management Act 2000 (WMA 2000)

Key points:

- Volumetric licensing in areas covered by water sharing plans
- SSD & SSI projects are exempt from requiring water supply work and use approvals as a result of the *Environmental Planning & Assessment Act 1979* (EP&A Act).
- No exemptions for volumetric licensing apply as a result of the EP&A Act.
- Maximum penalties of \$2.2 million plus \$264,000 for each day an offence continues apply under the WMA 2000

Water Management (General) Regulation 2018

Key points:

- Provides various exemptions for volumetric licensing and activity approvals
- Provides further detail on requirements for dealings and applications.

Water Sharing Plans – these are considered regulations under the WMA 2000

Access Licence Dealing Principles Order 2004

Harvestable Rights Orders

Water Sharing Plans

It is important that the proponent understands and describes the ground and surface water sharing plans, water sources, and management zones that apply to the project. Multiple water sharing plans may apply and these must all be described.

The EIS is required to:

- Demonstrate how the proposal is consistent with the relevant rules of the Water Sharing Plan including rules for access licences, distance restrictions for water supply works and rules for the management of local impacts in respect of surface water and groundwater sources, ecosystem protection (including groundwater dependent ecosystems), water quality and surface-groundwater connectivity.
 - Provide a description of any site water use (amount of water to be taken from each water source) and management including all sediment dams, clear water diversion structures with detail on the location, design specifications and storage capacities for all the existing and proposed water management structures.
 - Provide an analysis of the proposed water supply arrangements against the rules for access licences and other applicable requirements of any relevant WSP, including:
-

- Sufficient market depth to acquire the necessary entitlements for each water source.
- Ability to carry out a “dealing” to transfer the water to relevant location under the rules of the WSP.
- Daily and long-term access rules.
- Account management and carryover provisions.
- Provide a detailed and consolidated site water balance.
- Further detail on licensing requirements is provided below.

Relevant Policies and Guidelines

The EIS should take into account the following policies (as applicable):

- NSW Guidelines for Controlled Activities on Waterfront Land (NOW, 2012)
- Risk Assessment Guidelines for Groundwater Dependent Ecosystems (NOW, 2012)
- Australian Groundwater Modelling Guidelines (NWC, 2012)
- NSW State Rivers and Estuary Policy (1993)
- NSW Wetlands Policy (2010)
- NSW State Groundwater Policy Framework Document (1997)
- NSW State Groundwater Quality Protection Policy (1998)
- NSW State Groundwater Dependent Ecosystems Policy (2002)
- NSW Water Extraction Monitoring Policy (2007)

Licensing Considerations

The EIS is required to provide:

- Identification of water requirements for the life of the project in terms of both volume and timing (including predictions of potential ongoing groundwater take following the cessation of operations at the site – such as evaporative loss from open voids or inflows).
- Details of the water supply source(s) for the proposal including any proposed surface water and groundwater extraction from each water source as defined in the relevant Water Sharing Plan/s and all water supply works to take water.
- Explanation of how the required water entitlements will be obtained (i.e. through a new or existing licence/s, trading on the water market, controlled allocations etc.).
- Information on the purpose, location, construction and expected annual extraction volumes including details on all existing and proposed water supply works which take surface water, (pumps, dams, diversions, etc).
- Details on all bores and excavations for the purpose of investigation, extraction, dewatering, testing and monitoring. All predicted groundwater take must be accounted for through adequate licensing.
- Details on existing dams/storages (including the date of construction, location, purpose, size and capacity) and any proposal to change the purpose of existing dams/storages
- Details on the location, purpose, size and capacity of any new proposed dams/storages.
- Applicability of any exemptions under the *Water Management (General) Regulation 2018* to the project.

Water allocation account management rules, total daily extraction limits and rules governing environmental protection and access licence dealings also need to be considered.

The Harvestable Right gives landholders the right to capture and use for any purpose 10 % of the average annual runoff from their property. The Harvestable Right has been defined in terms of an equivalent dam capacity called the Maximum Harvestable Right Dam Capacity (MHRDC). The MHRDC is determined by the area of the property (in hectares) and a site-specific run-off factor. The MHRDC includes the capacity of all existing dams on the property that do not have a current water licence. Storages capturing up to the harvestable right capacity are not required to be licensed but any capacity of the total of all storages/dams on the property greater than the MHRDC may require a licence.

For more information on Harvestable Right dams, including a calculator, visit:

<https://www.waternsw.com.au/customer-service/water-licensing/basic-water-rights/harvestable-rights-dams>

Surface Water Assessment

The predictive assessment of the impact of the proposed project on surface water sources should include the following:

- Identification of all surface water features including watercourses, wetlands and floodplains transected by or adjacent to the proposed project.
- Identification of all surface water sources as described by the relevant water sharing plan.
- Detailed description of dependent ecosystems and existing surface water users within the area, including basic landholder rights to water and adjacent/downstream licensed water users.
- Description of all works and surface infrastructure that will intercept, store, convey, or otherwise interact with surface water resources.
- Assessment of predicted impacts on the following:
 - flow of surface water, sediment movement, channel stability, and hydraulic regime,
 - water quality,
 - flood regime,
 - dependent ecosystems,
 - existing surface water users, and
 - planned environmental water and water sharing arrangements prescribed in the relevant water sharing plans.

Flooding

If the proposal is for a work, situated on a floodplain or in the vicinity of a river, estuary or lake and is likely to have an effect on the flow of water to or from a river, estuary or lake and/or the distribution or flow of floodwater in times of flood the assessment is required to address potential impacts detailed below.

- the contents of any relevant floodplain management plan or any other relevant Government policy,
 - the need to maintain the natural flood regimes in wetlands and related ecosystems and the preservation of any habitat, animals (including fish) or plants that benefit from periodic flooding,
 - the effect or likely effect on water flows in downstream river sections,
 - any geographical features, or other matters, of Aboriginal interest that may be affected by a controlled work,
 - the effect or likely effect of the works on the passage, flow and distribution of any flood waters,
-

- the effect or likely effect of the works on existing dominant flood ways or exits from flood ways, rates of flow, flood water levels and the duration of inundation, the protection of the environment

Groundwater Assessment

To ensure the sustainable and integrated management of groundwater sources, the EIS needs to include adequate details to assess the impact of the project on all groundwater sources including:

- Works likely to intercept, connect with or infiltrate the groundwater sources.
- Any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes.
- Bore construction information is to be supplied to WaterNSW by submitting a "Form A" template. WaterNSW will supply "GW" registration numbers (and licence/approval numbers if required) which must be used as consistent and unique bore identifiers for all future reporting.
- A description of the water table and groundwater pressure configuration, flow directions and rates and physical and chemical characteristics of the groundwater source (including connectivity with other groundwater and surface water sources).
- Sufficient baseline monitoring for groundwater quantity and quality for all aquifers and GDEs to establish a baseline incorporating typical temporal and spatial variations.
- The predicted impacts of any final landform on the groundwater regime.
- The existing groundwater users within the area (including the environment), any potential impacts on these users and safeguard measures to mitigate impacts.
- An assessment of groundwater quality, its beneficial use classification and prediction of any impacts on groundwater quality.
- An assessment of the potential for groundwater contamination (considering both the impacts of the proposal on groundwater contamination and the impacts of contamination on the proposal).
- Measures proposed to protect groundwater quality, both in the short and long term.
- Measures for preventing groundwater pollution so that remediation is not required.
- Protective measures for any groundwater dependent ecosystems (GDEs).
- Proposed methods of the disposal of waste water and approval from the relevant authority.
- The results of any models or predictive tools used.

Where potential impact/s are identified the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on:

- Any proposed monitoring programs, including water levels and quality data.
 - Reporting procedures for any monitoring program including mechanism for transfer of information.
 - An assessment of any groundwater source/aquifer that may be sterilised from future use as a water supply as a consequence of the proposal.
 - Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category).
-

- Description of the remedial measures or contingency plans proposed.
- Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period.

Groundwater Dependent Ecosystems

The EIS must consider the potential impacts on any Groundwater Dependent Ecosystems (GDEs) at the site and in the vicinity of the site and:

- Identify any potential impacts on GDEs as a result of the proposal including:
 - the effect of the proposal on the recharge to groundwater systems;
 - the potential to adversely affect the water quality of the underlying groundwater system and adjoining groundwater systems in hydraulic connections; and
 - the effect on the function of GDEs (habitat, groundwater levels, connectivity).
- Provide safeguard measures for any GDEs.

Watercourses, Wetlands and Riparian Land

The EIS should address the potential impacts of the project on all watercourses likely to be affected by the project, existing riparian vegetation and the rehabilitation of riparian land. It is recommended the EIS provides details on all watercourses potentially affected by the proposal, including:

- Scaled plans showing the location of:
 - wetlands/swamps, watercourses and top of bank;
 - riparian corridor widths to be established along the creeks;
 - existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed);
 - the site boundary, the footprint of the proposal in relation to the watercourses and riparian areas; and
 - proposed location of any asset protection zones.
- Photographs of the watercourses/wetlands and a map showing the point from which the photos were taken.
- A detailed description of all potential impacts on the watercourses/riparian land.
- A detailed description of all potential impacts on the wetlands, including potential impacts to the wetlands hydrologic regime; groundwater recharge; habitat and any species that depend on the wetlands.
- A description of the design features and measures to be incorporated to mitigate potential impacts.
- Geomorphic and hydrological assessment of water courses including details of stream order (Strahler System), river style and energy regimes both in channel and on adjacent floodplains.
- Works on waterfront land may be subject to Controlled Activity Approval (CAA) under the *Water Management Act 2000*. This is managed by the Natural Access Resource Regulator. Further information can be obtained from the Industry Water's website: <https://www.industry.nsw.gov.au/water>

Drill Pad, Well and Access Road Construction

- Any construction activity within 40m of a watercourse, should be designed by a suitably qualified person, consistent with the NSW *Guidelines for Controlled Activities on Waterfront Land* (July 2012).
-

- Construction of all wells/bores must be undertaken in accordance with the *Minimum Construction Requirements for Water Bores in Australia* (3rd edition 2012) by a driller holding a bore drillers' licence valid in New South Wales.
- The length of time that a core hole is maintained as an open hole should be minimised.

Landform rehabilitation (including final void management)

Where significant modification to landform is proposed, the EIS must include:

- Justification of the proposed final landform with regard to its impact on local and regional surface and groundwater systems;
- A detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape;
- Outline of proposed construction and restoration of topography and surface drainage features if affected by the project;
- Detailed modelling of potential groundwater volume, flow and quality impacts of the presence of an inundated final void (where relevant) on identified receptors specifically considering those environmental systems that are likely to be groundwater dependent;
- An outline of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation; and
- The measures that would be established for the long-term protection of local and regional aquifer systems and for the ongoing management of the site following the cessation of the project.

Consultation and general enquiries

General licensing enquiries can be made to the Customer Helpdesk:
customer.helpdesk@waterNSW.com.au or on 1300 662 077



Department of
Primary Industries

INT19/71970

05/09/2018

Nathan Heath
GPO Box 39
Sydney NSW 2001
nathan.heath@planning.nsw.gov.au

Dear Nathan

SEAR's Request – Pearlman Quarry – North Star- Gwydir Shire Council EAR ID No. 1331

Thank you for the opportunity to provide Environmental Assessment Requirements (EAR) for the above proposal as per your correspondence dated 11 April 2019.

The NSW Department of Primary Industries (NSW DPI) Agriculture is committed to the protection and growth of agricultural industries, and the land and resources upon which these industries depend. Important issues for extractive industries are the potential impact on limited agricultural resources and the ability to rehabilitate the land to enable continued agricultural investment post extraction.

NSW DPI Agriculture provides EARs (Attachment 1) and a range of publications to assist consent authorities, community and proponents in addressing the recommended EARs (Attachment 2).

Should you require clarification on any of the information contained in this response, please contact Resource management Officer Andrew Scott on (02) 6763 1142.

Yours sincerely

Wendy Goodburn
Manager Agricultural Land Use Planning

Attachment 1: SEARs Recommendations

Issue and desired outcome	Detail / Requirement
Site Suitable for development	<ul style="list-style-type: none"> • Include a map to scale showing the above operational and infrastructure details including separation distances from sensitive receptors.
Consideration for impacts to agricultural resources and land	<ul style="list-style-type: none"> • Describe the current and potential Strategic and/or <i>Important Agriculture Land</i> on the proposed development site and surrounding locality including the land capability and agricultural productivity. • Demonstrate that all significant impacts on current and potential agricultural developments and resources can be reasonably avoided or adequately mitigated. • Consider cumulative effects to agricultural enterprises and landholders. • Detail the expected life span of the proposed development
Suitable and secure water supply	<ul style="list-style-type: none"> • Estimated water demand and water availability should be clearly outlined in the proposal. • Outline any impacts to water use for agriculture and mitigation measures if required.
Biosecurity Standards met	<ul style="list-style-type: none"> • Include a weed risk assessment outlining the likely plant risks. • Develop a weed response plan to deal with identified risks as well as contingency plans for any failures. Including monitoring and mitigation measures (particularly for any soil stockpiles to be used for future rehabilitation) and adjacent roadsides (to avoid spreading weeds off site).
Visual amenity achieved	<ul style="list-style-type: none"> • Amenity impacts are assessed and any necessary response to mitigate visual impacts is described and illustrated.
Land stewardship met	<ul style="list-style-type: none"> • Develop Rehabilitation and Decommissioning/Closure Plans that describes the design criteria of the final land use and landform along with the expected timeline for the rehabilitation program. • Outline monitoring and mitigation measures to be adopted for rehabilitation remedial actions.
Adequate Consultation with surrounding rural community to prevent future land use conflict	<ul style="list-style-type: none"> • Consult with the owners / managers of affected and adjoining neighbours and agricultural operations in a timely and appropriate manner about; the proposal, the likely impacts and suitable mitigation measures. • Consultation program needs to consider and avoid key periods for Agricultural activities such as Harvest, Sowing, Sales and Holiday periods. • Establish a complaints register that includes reporting and investigating procedures and timelines, and liaison with Council in relation to complaint issues.

Attachment 2: Guidelines to assist development of plans and their assessment

Title	Location
Land Use Conflict Risk Assessment Guide	www.dpi.nsw.gov.au/content/agriculture/resources/lup/development-assessment/lucra
Agricultural Issues for Extractive industry Development	http://www.dpi.nsw.gov.au/content/agriculture/resources/lup/development-assessment/extractive-industries
Infrastructure proposals on rural land	https://www.dpi.nsw.gov.au/data/assets/pdf_file/0020/359030/infrastructure-proposals-on-rural-land.pdf



Natural Resources Access Regulator

Contact: Tim Baker
Phone: (02) 6841 7403
Email: Tim.Baker@dpi.nsw.gov.au

Our ref: V15/2812-2#84
File No:
Your Ref:

Nathan Heath
Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

13 May 2019

email: Nathan.Heath@planning.nsw.gov.au

Dear Nathan

Re: Pearlman Quarry – Environmental Assessment Requirements ID No. 1331 - Designated Development

Thank you for your email of 11 April 2019 seeking input to Secretary Environmental Assessment Requirements (SEARs) for the above development. The Natural Resources Access Regulator (NRAR) has reviewed the supporting documentation accompanying the request for SEARs and recommends the EIS be required to include the following.

- Annual volumes of surface water and groundwater proposed to be taken by the activity (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan.
- Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project).
- Existing and proposed water licensing requirements in accordance with the *Water Act 1912/Water Management Act 2000* (whichever is relevant). This is to demonstrate that existing licences and/or approvals and licensed uses are appropriate, and to identify where additional licences and/or approvals are required.
- The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.
- A detailed and consolidated site water balance.
- Assessment of impacts on surface and groundwater sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.
- Proposed surface and groundwater monitoring activities and methodologies.
- Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts.

- Consideration of relevant policies and guidelines eg. "*Guideline for Controlled Activities on Waterfront Land*".
- A statement of where each element of the SEARs is addressed in the EIS in the form of a table.
- Full technical details and data of all surface and groundwater modelling.
- Details of licensing requirements under the *Water Management Act 2000* or the *Water Act 1912*.
- Where groundwater may be intercepted or impacted a detailed assessment against the NSW Aquifer Interference Policy (2012) using DoI Water's assessment framework. Justification is required to support a statement that groundwater is not to be intercepted
- Full technical details and data of all surface and groundwater modelling used, and an independent peer review.
- Details of the final landform of the site, including final void management (where relevant) and rehabilitation measures.

For further information please contact Tim Baker, Water Regulation Officer at NRAR (Dubbo) on t: (02) 6841 7403; e: Tim.Baker@dpi.nsw.gov.au

Yours sincerely

A handwritten signature in black ink, appearing to read 'T. Baker', with a long horizontal flourish extending to the right.

Tim Baker
Senior Water Regulation Officer
Natural Resources Access Regulator

PEARLMAN QUARRY ENVIRONMENTAL MANAGEMENT PLAN

Prepared for:
Quarry Solutions Pty Ltd

Date:
August 2019

Reference:
2291.600.001

Document Control

Project/ Report Details

Document Title:	Pearlman Quarry Environmental Management Plan
Principal Authors:	Rowan McKay
Client:	Quarry Solutions Pty Ltd
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FIGURES

Site Location Plan	<i>Drawing No. 2286.DRG.001</i>
Concept Layout Plan	<i>Drawing No. 2286.DRG.003</i>
Site and Surrounds	<i>Drawing No. 2286.DRG.002</i>

ATTACHMENTS

Attachment 1	Incidents and Complaints Procedure
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1. Introduction

1.1 Project Overview

Groundwork Plus has been commissioned to prepare an Environmental Management Plan (EMP) on behalf of Quarry Solutions Pty Ltd (Quarry Solutions) for the Pearlman Quarry (the site). The EMP has been prepared for activities including extraction, stockpiling and processing of hard-rock materials, the site is primarily on land described as Lot 5 DP755984 and 17 on DP755984 located at 1135 Croppa Creek Rd, North Star, New South Wales (refer **Drawing 2291.DRG.001 – Site Location Plan**).

Quarry Solutions are proposing to operate the hard-rock quarry on behalf of the proponent, Alan Pearlman.

1.2 Site Details

Alan Pearlman (the proponent) proposes to establish a hard rock quarry at Croppa Creek Road, North Star, New South Wales on the land formally identified as Lot 5 DP755984 and Lot 17 DP755984 (the site). The site is approximately 10 kilometres south of North Star and 13 kilometres north of Croppa Creek, in north-west New South Wales. For the specific site layout (refer **Drawing 2291.DRG.003 – Concept Layout Plan**).

1.3 Relevant Legislation

The *Protection of the Environment Operations Act 1997* (POEO Act) is the key piece of environment protection legislation administered by the Environment Protection Authority. The *POEO Act* sets the framework for regulation of scheduled activities under Schedule 1 of the Act, which requires certain activities to hold an Environmental Protection Licence (EPL). Extractive activities are identified as a scheduled activity under Section 19 of Schedule 1 of the POEO Act as 'land based extractive activities that involve extraction, processing or storage of more than 30,000 tonnes per year of extractive materials'. As the site satisfies this definition and it is proposed to undertake a scheduled activity, an EPL is required to be held. As such an EPL for the operation of the Pearlman Quarry is being sought from the NSW EPA.

1.4 Purpose of Environmental Management Plan

This EMP is a management document that links the potential environmental impacts with commitments and measures to safeguard the surrounding environment. It is the principal management tool for guiding environmental management at the site, by providing the framework for environmental management at the operational level to prevent or minimise environmental impacts. The objective of the EMP is also intended to comply with development consent and EPL requirements.

The structure of the EMP comprises a series of procedures for ease of implementation. The elements of the EMP are based on a standard format that may be applied to manage a particular issue or activity, addressing the purpose, performance targets, relevant conditions, strategies/mitigation measures and monitoring.

1.5 Potential Environmental Impacts

The identification of activities and potential impacts is fundamental to designing and implementing procedures and measures proposed in the EMP. Activities associated with carrying out extractive industry have been tabulated against potential environmental impacts to provide a focus for preparing the EMP, refer to **Table 1 – Identification of Potential Environmental Impacts**.

The location of the nearest sensitive receptors is shown in **Drawing 2286.DRG.002 – Site and Surrounds**.

Table 1 – Identification of Potential Environmental Impacts

ACTIVITY/EQUIPMENT	Noise	Air Quality	Water Quality	Traffic	Visual Amenity	Social and Economic Factors	Land Contamination	Soils	Stormwater and Soil Erosion	Fauna and Flora	Waste
Vegetation Clearing	•	•	•			•		•	•		
Construction	•	•	•	•	•	•		•	•		
Topsoil Stripping	•	•	•					•	•		
Overburden Stripping	•	•	•						•		•
Raw Material Extraction	•		•						•		
Raw Material Stockpiling and Loading	•		•						•		
Raw Material Hauling	•		•	•					•		
Raw Material Unloading	•		•						•		
Washing and Screening	•		•						•		•
Product Stockpiling	•	•	•						•		
Product Handling	•	•	•						•		
Maintenance Activities	•		•				•		•		•
Handling and storage of oils, greases, fuels and chemicals			•				•	•	•		•
Rehabilitation Activities	•	•	•		•	•		•	•		•
Stormwater Management			•						•		
Waste Management			•				•				
Extracting water from extraction pit for dust control and wash plant use	•										
Stormwater Discharge	•		•		•	•			•		

• potential risk if inappropriately managed

2. Procedures and Policies

2.1 Environmental Policy

Site management is committed to being environmentally responsible and to conduct activities in compliance with environmental legislation and strives to achieve a sound practice of environmental management. In the process of implementing this policy, management shall:

- Implement work programs to protect the surrounding environment.
- Meet the requirements of all laws, acts, regulations and standards relevant to its operations and activities.
- Make the most efficient use of natural resources taking due regard of environmental issues and ensuring land maintains long term productivity.
- Implement a program to train all employees in general environmental issues and individual workplace environmental responsibilities.
- Continually improve environmental practices to reflect changing legislation, new technology and scientific advances, lessons learned from environmental incidents and increasing knowledge and experience of site-specific issues.
- Allocate necessary resources to ensure the implementation of the environmental policy.

2.2 Implementation and Training

Implementation of the EMP will require:

- Commitment by the Owners, Managers and employees of the site.
- Access to technical expertise for tasks such as environmental monitoring, modelling or assessment, as needed.

Management shall ensure that sufficient funding is provided to implement the EMP. All employees and sub-contractors will be inducted on the environmental management procedures and practices to be carried out at the quarry and be informed of the environmental management objectives and the specifics of the EMP including protection of buffer areas, impact minimisation measures, operational practices, maintenance measures, reporting measures, and individual responsibilities. They shall also be made aware of penalties if development conditions are breached and reporting requirements for incidents involving environmental harm and safety in accordance with the relevant environmental legislation.

A record of all employee training/inductions will be maintained on-site. Each employee shall be responsible for implementing environmental policies within the scope of their duty statement or job description.

The currency of the EMP should be checked regularly (at least every three years) or as a result of significant change(s) to operations, to ensure up-to-date versions are available and to avoid confusion and mistakes.

2.3 Incidents and Complaints Procedure

The objective of the Incidents and Complaints Procedure is to ensure that incidents and complaints are reported, investigated and appropriate action is taken. A summary of the Incidents and Complaints Procedure is provided below in **Diagram 1 – Incidents and Complaints Procedure Summary**. For further details regarding each element of the procedure refer to **Attachment 1 – Incidents and Complaints Procedure**.



Diagram 1 – Incidents and Complaints Procedure Summary

2.4 Monitoring Requirements

The controls nominated in this EMP will require regular surveillance and review, to ensure that performance aligns with design criteria and also reflects the dynamic nature and changing needs of the operation. The monitoring requirements are contained in each management plan, as outlined in **Section 3.0**.

All instruments used to measure or monitor parameters required under the relevant conditions of development and operational requirements are to be calibrated, maintained and operated appropriately. All monitoring is to be undertaken by a person or body possessing appropriate experience and qualifications to perform the required measurements.

2.5 Records and Reporting

All environmentally relevant documentation, including policies, procedures, forms, records, and reports required to be kept as per this EMP shall be available at the approved/licensed premises for a period of at least five (5) years and be available for inspection by an authorised person.

If monitoring is required following a complaint or incident, the report shall:

- Record the date and time of sampling.
- Be endorsed by a person or body possessing appropriate experience and qualifications to perform the required measurements on all records of analysis results.
- Record the results of all analyses, measurements and observations and interpretations (if appropriate).
- Be made available on request to any authorised person who must be permitted to make copies thereof.

3. Management Plans

3.1 Air Quality (Dust) Management Plan

Purpose

This Air Quality (Dust) Management Plan has been prepared to control potential air quality impacts occurring as a result of land disturbance and operations necessary for the extractive industry operation.

Quarry activities have the potential to generate dust that, if inadequately controlled, has the potential to cause nuisance to surrounding sensitive receptors. Activities that may generate dust emissions include:

- Crushing and screening operations.
- Rock drilling and blasting.
- Wind action on topsoil / overburden and material stockpiles and disturbed areas.
- Topsoil / overburden stripping.
- Extraction and transportation of raw materials (e.g. earthmoving machinery-ground interaction, materials digging, loading / unloading, haul truck and light vehicle movements on unsealed roads, material spillage from haul trucks).
- Product stockpiling and dispatch (e.g. stockpiles and stockpile pads, product loading, truck tyre-road interaction, material spillage from trucks).
- Rehabilitation works.

Performance Targets

Dust and particulate matter not exceeding the following levels when measured at any sensitive receptor:

- Dust deposition of 4 g/m²/month (130 mg/m²-day), when monitored in accordance with Australian Standard AS 3580.10.1 *Methods for sampling and analysis of ambient air – Determination of particulates – Deposited matter – Gravimetric method*; and
- An aerodynamic diameter of less than 10 µm (PM₁₀) suspended in the atmosphere of 50 µg/m³ over a 24 hour averaging time when monitored in accordance with Australian Standard AS 3580.9.6 *Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM₁₀ high volume sampler with size-selective inlet – Gravimetric method*.

Relevant Conditions

Refer to EPL once issued.

Strategies/mitigation measures

Strategies/mitigation measures for the management of dust emissions will be implemented in accordance with the relevant conditions of development and may include the following:

Disturbed Areas

- Dampen down cleared areas, extraction working areas, stockpiles and other hardstand areas by water spraying or chemical dust suppressant products when visual surveillance indicates excessive dust generation and propagation from point or mobile sources.
- Limit clearing, topsoil and overburden removal at any one time to that necessary whilst providing for effective production of the resource.
- Monitor meteorological conditions to time particular activities with favourable weather conditions.
- Restrict vehicle and mobile machinery movements to designated routes and standing areas to the extent practicable.
- Maintain the buffer between operational areas and the site boundaries where possible.

3.1 Air Quality (Dust) Management Plan

Processing Plant

- Dampen down work areas.
- Dampen materials prior to transport.
- Use water sprays at the processing plant.
- Use shielding and/or windbreaks where possible.
- Maintain vehicles and equipment in accordance with the original equipment manufacturers' specifications.

Stockpiles

- Use water sprays or chemical dust suppressant products as required during high wind conditions likely to generate dust releases.
- Stabilise and revegetate topsoil and overburden stockpiles where possible.
- Use dust suppressants and shielding where possible.
- Limit the height and slope of stockpiles.

Trafficable Areas

- Water haul and access roads at a rate of approximately 2 litres/m²/hr at times when dust emissions are visible from vehicle movements.
- Enforce speed limits on unsealed haul and internal roads.
- Keep trafficable areas as clean as possible.
- Maintain road surfaces in good condition.

Material Transport and Transport Vehicles

- Ensure signage is installed to advise drivers to contain and cover all loads of material prior to leaving the site.
- Ensure loads are appropriately contained and covered prior to leaving the site.
- Dampen down the load prior to transport where necessary and practicable.
- Clear spillages from side rails, tailgates and draw bars of trucks (following loading and tipping).
- Level loads prior to truck exit from the site (e.g. via shaker pad) where possible.
- Securely fix tailgates of all material transport vehicles prior to loading to prevent material.

Screening Equipment

- Install windshields, enclosures and/or barriers where possible.
- Maintain material in moistened state.

Rehabilitation

- Progressively rehabilitate the site as areas become available.
- Minimise windblown dust during any rehabilitation activities.
- Ensure vehicles use established roads and tracks where possible and limit access to any rehabilitated areas.

Other

- The rock drill is to have an appropriate dust extraction system with collector fitted to the rig and/or wet drilling system via water sprays.

3.1 Air Quality (Dust) Management Plan

Monitoring

- Blasting should be limited to periods of favourable weather conditions where possible (apart from observing prescribed blasting times).
- Employees and contractors are to be made aware of dust management practices.
- Ensure sufficient onsite water supply is available for dust suppression.
- Apply good housekeeping practices.

The controls nominated will require regular monitoring and review to ensure that performance accords with design criteria and also reflect the dynamic nature and changing needs of the operation.

Daily visual surveillance will be undertaken by all employees to ensure dust generation on-site is controlled appropriately.

Dust and particulate monitoring if requested by the regulator in response to a dust complaint from a sensitive receptor. Monitoring will be carried out at a place relevant to the potentially affected, nuisance-sensitive place. Monitoring is to be undertaken by a suitably qualified person in accordance with:

- Australian Standard AS3580.10.1 of 2003 – *Determination of particulate matter – Deposited matter – Gravimetric method* (or most recent edition).
- *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2001).
- *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (EPA 2001).

When requested to undertake monitoring, results are to be provided to the administering authority following completion of the monitoring event. Monitoring shall be carried out at a place(s) relevant to the potentially affected dust sensitive place and must include:

- For a complaint alleging dust nuisance, dust deposition.
- For a complaint alleging adverse health effects caused by dust, the concentration per cubic metre of particulate matter with an aerodynamic diameter of less than 10 micrometre (μm) (PM_{10}) suspended in the atmosphere over a 24hr averaging time.

3.2 Water Management Plan

Purpose

This Water Management Plan has been prepared to control potential environmental impacts occurring as a result of land disturbance, necessary for the extractive industry operation, and to facilitate the site's compliance with Section 120 of the POEO Act. Section 120 of the POEO Act states that:

A person who pollutes any waters is guilty of an offence.

Extractive industry operations have the potential to impact on surface runoff water quality as a result of the following activities:

- Vegetation clearing.
- Topsoil stripping.
- Overburden removals.
- Extraction pit development.
- Construction and maintenance of internal roads and hardstands.
- Stockpiling of topsoil, raw feed and product.
- Spillage during handling of materials.
- Use and storage of oils, greases, fuels and other chemicals.

Performance Targets

- To ensure pollutants are not directly, or indirectly, released from the site to any waters, or the bed and banks of any waters.
- To ensure no environmental nuisance complaints are received.
- To ensure the quality of surface water discharged from the site does not cause environmental harm.

Relevant Conditions

Refer to EPL once issued.

Strategies/mitigation measures

General

The stormwater control principles for the site comprise:

- Ensure the disturbance activities at the site include the installation of stormwater management, erosion and sediment controls to ensure stormwaters are adequately managed. Sedimentation basins shall be installed where required.
- A general philosophy that any overland flow from disturbed areas is considered to be contaminated with sediment/suspended solids therefore requires treatment prior to release.
- Divert clean catchment overland flow around and away from disturbed areas to the extent practicable using a diversion bank and natural contours.
- Overland flows from the disturbed areas within the quarry area are to be captured in the quarry sump/pit and/or sediment basins for treatment prior to discharging (naturally or pumped) as either concentrated flow into an existing drainage line or as sheet flow over the adjacent vegetated buffer areas.
- Sediment basins are to be designed in accordance with *Managing Urban Stormwater, Soils and Construction – Volume 1 – Blue Book and Volume 2E – Mines and Quarries* (NSW Department of Environment and Climate Change, 2008).
- Manage stormwater by use of preventative procedures such as using a perimeter bund, diversion banks or drains, containment, recycling, treatment and by use of corrective procedures such as maintenance, de-silting and revegetation of disturbed areas.
- Within 120 hours of the most recent significant rainfall event, the required freeboard capacity within the site's sediment basins should be reinstated for the capture and storage of stormwater runoff from the next rainfall event.

3.2 Water Management Plan

Stormwater Contamination Management

Measures to be taken to minimise the potential for contamination of stormwater overland flow from Site are as follows:

- Treat access roads and hardstand areas using a layer of gravel where possible.
- Prevent and/or minimise the contact of incidental rainfall and stormwater runoff with wastes or other contaminants.
- Clean up any spillage of wastes, contaminants or other materials as quickly as practicable.
- Direct surface water runoff from disturbed areas to the quarry sump/pit and sediment basins for treatment prior to release off-site.
- Recycle water collected in the quarry sump/pit and sediment basins to the maximum extent practical (e.g. dust suppression, irrigation).
- Undertake any necessary onsite maintenance in an area where contaminants cannot be directly released to any receiving waterways or on-site sediment basins.
- Store all hazardous materials, chemicals and wastes generated on-site in bunded areas and under cover where possible or with appropriate safeguards.
- Undertake progressive rehabilitation of disturbed areas to the extent practicable.
- Dispose of wastes off-Site on a regular basis.

Erosion Control Measures

Reasonable and practicable erosion control measures will be implemented on-site to limit soil erosion, including stabilising and vegetating road embankments and batters, temporary overburden and topsoil stockpiles and diversion banks or perimeter bunds.

Strategies/mitigation measures for the management of surface runoff, surface water quality, groundwater quality and erosion and sediment transport from the site will be implemented in accordance with best practice and any relevant conditions of approval and may include the following measures:

- Divert clean catchment runoff using a series of suitable banks and/or diversion drains.
- Stabilise permanent bunds via revegetation.
- Minimise land disturbance to the extent practicable.
- Limit exposure duration of unprotected batters and slopes.
- Install stormwater drainage devices as soon as practical and in a logical progression.
- Implement a monitoring program to assess the effectiveness of erosion and sediment control methods and devices.
- Diversion or catch drain outlets will be treated appropriately unless otherwise stated.
- Install silt fences to control sheet runoff and sediment traps to treat concentrated flows if necessary.
- Construct internal roads with an appropriate cross fall to direct runoff from the road surface into drains, then to the sediment basins where necessary.
- Use flocculation or coagulant agents, such as gypsum, to assist in the settling of suspended solids if required.
- Induct and train staff on the prevention and control of erosion.
- Monitor the water quality of the stormwater released in accordance with approval requirements.
- Design, construct and maintain bunded fuel storage and handling areas and roofed storage with holding capacities to conform to the appropriate regulatory requirement or the provisions of Australian Standard AS1940-2004 - *The Storage and Handling of Flammable and Combustible Liquids*, or most recent edition.

3.2 Water Management Plan

Monitoring

The stormwater controls nominated will require regular monitoring and review to ensure that performance accords with design criteria and also reflects the dynamic nature and changing needs of the operation.

Monitoring of surface water will be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DECCW, 2004).

The Quarry Manager shall carry out monthly surveillance of onsite water storages and treatment systems. Inspection of Site water storages and treatment systems shall also be carried out by the Quarry Manager immediately prior to anticipated runoff-producing rainfall and as soon as practicable following the event.

Monitoring will consist primarily of visual inspection of the site, particularly with regards to erosion control structures during storm events and/or extended periods of heavy rain. Observations of the performance of the various components of the system will be made and ameliorative action taken to rectify underperformance.

The Quarry Manager may engage the services of a suitably qualified person to conduct any water quality sampling and/ or review monitoring results to provide advice in relation to water quality management.

A summary schedule of the various inspections, performance criteria and responses that shall be performed on-site is shown in **Table 2 – Action Plan for the Surveillance and Maintenance of Stormwater Control Devices**.

Table 2 – Action Plan for the Surveillance and Maintenance of Stormwater Control Devices

Inspection	Minimum Frequency	Performance Criteria	Response
Inspect drainage lines including catch drains, contour drains and diversions	Quarterly	<ul style="list-style-type: none"> Erosion in areas adjacent to water conveyancing structures. Overtopping of water conveyancing structures (identified by the scouring of the drain batters perpendicular to the direction of flow). 	<ul style="list-style-type: none"> Eroded areas shall be treated appropriately (e.g. rock lined) as soon as practicable. Drains to be cleaned of sediments and retreated as necessary to original design specifications. Treatment of the drains may be required to reduce sediment loadings of runoff e.g. Grassing, rock lining etc.
Inspect potential sediment storage capacity of sediment dams and structures	Quarterly or following major rainfall events	<ul style="list-style-type: none"> Storage capacity maintained. 	<ul style="list-style-type: none"> Sediment to be removed from the structure when required to re-instate capacity and reused on-site where possible. Recycle or treat/ discharge sediment basin waters to ensure adequate free storage is maintained for the collection and holding of runoff.
Waste containers	Quarterly	<ul style="list-style-type: none"> Waste to be stored in appropriate containers. 	<ul style="list-style-type: none"> Ensure waste materials are stored and disposed of appropriately and in accordance with approved conditions and/ or legislative requirements.
Spill response stations	Quarterly and following use	<ul style="list-style-type: none"> Equipment to be properly maintained and stocked. 	<ul style="list-style-type: none"> Maintain equipment. Replace / restock equipment as necessary.
Maintenance / refuelling area	Quarterly	<ul style="list-style-type: none"> Fuel, oil spills. Contractor maintenance. Fuel storage integrity maintained. 	<ul style="list-style-type: none"> Clean up spills and investigate spill source. Maintain contractor maintenance records. Investigate and repair potential leaks.

3.3 Noise Management Plan

Purpose

Uncontrolled or unmitigated site noise has the potential to be a nuisance at sensitive receptors. Site equipment or activities that have potential to generate significant noise have been identified and include:

- Excavators (clearing vegetation, stripping topsoil, raw product handling, rehabilitation).
- Drilling rigs.
- Processing plant (processing of raw materials).
- Front end loaders (product haulage, loading).
- Haul trucks (haulage of raw material to the processing plant).
- Water truck (water cartage, dust suppression).
- Face loaders (raw product handling).
- Road trucks (product delivery).
- Light vehicles (employee vehicles, maintenance vehicles, service vehicles).
- Maintenance activities.
- Ancillary plant and equipment (e.g. pumps, welders).

Section 3.4 – Blasting Management Plan addresses vibration and overpressure associated with site blasting activities.

Performance Targets

Noise from the site must not cause an environmental nuisance at any nuisance sensitive place or commercial place.

The level of continuous noise emanating from the operation of the plant or processes (LAeq) measured for at least 15 minutes in or on the premises shall not exceed the background noise level LA90) by more than 5 dBA, when measured at any point within one metre of any residential boundary or other noise sensitive area.

Relevant Conditions

Refer to EPL once issued.

Strategies/mitigation measures

Strategies/mitigation measures for the management of noise emissions from the site will include the following where required:

- Hours of operation will be restricted to the following:
 - 6 am to 6 pm Monday to Friday and 6am to 1pm Saturday and no work Sunday or Public Holidays.
- Hours of blasting will be restricted to the following:
 - 9 am to 3 pm Monday to Friday
- No operations are proposed on Sundays and Public Holidays.
- Enclose fixed engines, pumps and compressors where practicable.
- Maintain equipment in accordance with the original equipment manufacturer's specifications.
- Shut down equipment when not in use.
- Reduce vehicle speed on internal access roads.
- Heavy mobile equipment (e.g. front-end loaders, dozers, haul trucks, excavators) shall be fitted with broadband reversing alarms to mitigate potential nuisance from tonal characteristics of traditional beeper alarms.
- Avoid unnecessary operation of plant or revving of mobile or stationary motors and engines.
- Fixed and mobile plant and equipment operated at the site should be selected and maintained to minimise noise emissions.

3.3 Noise Management Plan

Wherever practicable materials shall be stockpiled at locations that shield noise from internal traffic routes and truck loading areas from the nearest residences.

All raw material haul truck trays are to be lined with an appropriate absorptive material.

The rock pick shall be operated at the most shielded location practically available within the pit to provide acoustic shielding to the north and east.

The internal traffic routes will be shielded by topographic cut, earth bund and/or acoustic barrier where possible.

All internal roads for road haulage and off-road trucks shall be constructed and maintained to avoid excessive noise associated with uneven surfaces and potholes.

Monitoring

The Quarry Manager will:

- Ensure regular surveillance of the site to qualitatively assess noise generation from plant and machinery.
- Ensure all plant and machinery and vehicles are serviced in accordance with, or more frequently than, manufacturers' specifications.
- Initiate a noise survey when requested by the administering authority, or as otherwise deemed necessary, to investigate a non-vexatious noise complaint.

Methods for measurements and reporting of noise monitoring will comply with the current edition of the *NSW Industrial Noise Policy*.

The measurement and reporting of noise levels will be undertaken by a person or body possessing both the qualifications and the experience appropriate to perform the required measurements. Monitoring will be undertaken in accordance with the method agreed to with the administering authority.

3.4 Blasting Management Plan

Purpose

Blasting will be required to fragment rock to a manageable size that can be transported and fed into the processing plant. Blasting practice has the potential to generate excessive overpressure and vibration impacts that may cause annoyance and discomfort to sensitive receptors.

Performance Targets

Blasting activities must not exceed the limits for peak particle velocity and air blast overpressure in **Table 3 – Blasting Noise Limits** when measured at any sensitive place.

Table 3 – Blasting Noise Limits

Blasting criteria	Blasting limits
Airblast overpressure	115dB (Linear) Peak for 95% of blasts initiated and not greater than 120dB (Linear Peak) at any time.
Ground vibration peak particle velocity	5mm/second peak particle velocity for 95% of blasts and not greater than 10mm/second peak particle at any time.

Relevant Conditions

Refer to EPL once issued.

Strategies/mitigation measures

The following control measures may be implemented to assist in mitigating potential noise nuisance from blasting associated with the site activities:

- Unless prior approval is obtained from the EPA blasting is only permitted during the following hours:
 - 9 am to 3 pm Monday to Friday
 - No blasting at any time on Sundays or public holidays.
- Handling, transport and use of explosives shall be carried out in accordance with the requirements of *Australian Standard AS2187*, and the *Explosives Act 2003* and *Explosives Regulation 2013*.
- Only suitably experienced and qualified blasting personnel shall be employed or contracted to provide blasting services.
- Blast volumes shall be maximised to reduce the frequency of disturbances to the neighbouring properties whilst maintaining legislative limits. Orientate blasts with free faces not directly facing the sensitive receivers, to assist with airblast overpressure control.
- A blast plan shall be prepared for each blast, containing blast hole layout, initiation sequence, charging, stemming type and height, charge weight and any other design element, required for good blasting practice.
- Blast areas may be dampened down prior to blasting to minimise dispersion of dry and fine materials where practicable, or where it is identified as a source of potential dust nuisance.

Monitoring

Monitoring of blasting activities must be undertaken in accordance with the *NSW Industrial Noise Policy* and the Australian and New Zealand Environmental Council (ANZECC, 1990) *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration*. Permanent blast monitoring locations will be established at the two (2) closest neighbouring properties.

Airblast overpressure and ground vibration monitoring

For the purposes of checking compliance with the airblast overpressure conditions and ground vibration conditions and for investigating complaints of noise and vibration

3.4 Blasting Management Plan

annoyance, monitoring must be undertaken and at least the following descriptors, characteristics and conditions determined:

1. Maximum instantaneous charge (MIC) in kg.
2. Location of the blast within the quarry (including which bench level).
3. Airblast overpressure level, dB (linear) peak.
4. Peak particle velocity (mms-1).
5. Location, date and time of recording.
6. Meteorological conditions (including temperature, relative humidity, temperature gradient, cloud cover, wind speed and direction).
7. Distance/s from the blast site to noise-affected building/s, structure/s or the boundary of any noise-sensitive place.

Where a nuisance complaint regarding airblast overpressure or ground vibration is received, consideration will be given to available monitoring results and locations, and if required or advantageous, a monitor will be installed at an appropriate location in consultation with the administering authority. All monitoring and reporting shall be undertaken by a person or body possessing both the qualifications and the experience appropriate to perform the required measurements.

3.5 Hydrocarbons and Chemical Management Plan

Purpose

The Hydrocarbons and Chemicals Management Plan has been prepared to control the potential for spills or leaks from chemicals and hydrocarbons associated with the extraction activities.

Site operations have the potential to contaminate land and water in and surrounding the site by the release of various chemicals used and/or stored on site. These chemicals could include:

- Distillate (e.g. fuel for stationary and mobile engines).
- Oils and greases (e.g. lubricants and hydraulic oils for stationary and mobile equipment).
- Miscellaneous chemicals (e.g. herbicide, paint, solvents).

Performance Targets

The following performance targets are relevant:

- No land contamination that would require notification to the EPA.
- No serious spills of oils, greases, fuels or other hazardous chemicals (for this purpose, hydrocarbon spill incidents have been classified as follows: minor spill ≤ 5 L, major spill 5 L to 20 L, and serious spill ≤ 20 L).
- No preventable release of hydrocarbons and chemicals to the environment.

Relevant Conditions

Refer to EPL once issued.

Strategies/mitigation measures

Strategies/mitigation measures for the management of hydrocarbons and chemicals at the site will be implemented in accordance with the relevant conditions of development and may include the following:

General

- Spills are to be cleaned up immediately.
- Undertake refuelling and equipment maintenance within designated hardstand or paved areas where practicable.
- Maintain all Safety Data Sheets (SDSs) and information relating to the storage, use and handling of chemicals at the site office.
- Ensure employees are familiar with proper fuelling and spill clean-up procedures.
- Induct all new employees on the use of handling of chemicals used on site.
- Maintain the site in a neat and tidy condition.
- Discourage "topping off" of fuel tanks.
- Use drip pans during refuelling and equipment maintenance.

Spill Kits

- Maintain appropriate spill kits at locations known to all employees (e.g. refuelling locations, chemical storage facilities, mobile equipment).
- Ensure employees are familiar with proper spill clean-up procedures.

Bunding and Storage

- All chemical storage facilities on-site must meet specifications of Australian Standard AS 1940 - *The storage and handling of flammable and combustible liquids*.
- Bunding will be constructed of material which is impervious to the material stored and transferred therein.

3.5 Hydrocarbons and Chemical Management Plan

- Bunds will be kept in good condition (e.g. no cracks, gaps or leaks).
- Roofed storage facilities will be provided where practicable.
- Stormwater captured within bunding is to be removed as soon as practicable and disposed of as contaminated water. Prior to removal, the water is to be free from contaminants.
- Empty hydrocarbon and chemical containers are to be stored with closures in place on a concrete hardstand or within a bunded area.
- Where vehicle access to the bunded area is required, access must be by way of a rollover bund.
- Bunds and/or drains are to be in place to exclude surface waters from washing/degreasing areas.

Disposal

- Hydrocarbon contaminated materials are to be appropriately disposed of at a licensed facility.
- If the material is a Classified Liquid Waste, it will be transported and disposed of by a licenced transport contractor.
- Oily waste materials, including liquid hydrocarbons, should be segregated from general wastes for disposal off-site by a licensed contractor.
- Records are to be kept on disposal of waste for all Hazardous Waste Materials.

Monitoring

Areas where handling of hydrocarbons and chemicals occur (e.g. refuelling or minor on-site servicing) shall be regularly inspected by the Quarry Manager. All employees will be responsible for the safe day-to-day handling, use and temporary storage of chemicals being used on site.

3.6 Waste Management Plan

Purpose

This Waste Management Plan has been prepared to ensure wastes produced on-site are appropriately managed. Unmanaged wastes can detract from the amenity of the site and locality and can increase operational costs. The principal wastes that may be generated from the site operations may include, but are not necessarily limited to:

- Classified Liquid and Non-Liquid Wastes (e.g. batteries, oil filters, waste oil/hydrocarbons and containers, oil/water emulsions and tyres).
- Metal and used or faulty parts and equipment.
- Food scraps, packaging and consumables (e.g. paper, cardboard).
- Green waste.

The *Protection of the Environment Operations (Waste) Regulation 2014* is the legislation governing waste management in NSW and the *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes (EPA, 1999)* guide the classification and management of wastes. The waste management hierarchy nominates a preferred order of waste management as follows:

- (a) AVOID unnecessary resource consumption;
- (b) REDUCE waste generation and disposal;
- (c) RE-USE waste resources without further manufacturing;
- (d) RECYCLE waste resources to make the same or different products;
- (e) RECOVER waste resources, including the recovery of energy;
- (f) TREAT waste before disposal, including reducing the hazardous nature of waste; and
- (g) DISPOSE of waste only if there is no viable alternative.

Performance Targets

The following performance targets are relevant:

- Apply the waste management hierarchy to the minimisation of waste.
- Maintain a record of any disposal of Classified Wastes in accordance with the *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes 1999*.
- No unlawful disposal of wastes on or off site.

Relevant Conditions

Refer to EPL once issued.

Strategies/mitigation measures

Strategies/mitigation measures for the management of waste materials at the site will be implemented in accordance with the relevant legislation and guidelines and may include the following:

Waste Avoidance

Waste avoidance relates to preventing the generation of waste or reducing the amount of waste generated. Reasonable and practicable measures for achieving waste avoidance may include, but are not necessarily limited to:

- Input substitution (using recyclable materials instead of disposable materials, for example using oil delivered in recyclable steel drums instead of non-recyclable plastic containers).
- Increased efficiency in the use of raw materials, energy, water or land (purchasing consumables in bulk (large containers) rather than in small quantities).

3.6 Waste Management Plan

- Improved maintenance and operation of equipment (keep equipment in good working order to reduce wear and overhaul).
- Undertaking an assessment of waste minimisation opportunities from time to time.

Waste Re-use

Waste re-use refers to re-using waste, without first substantially changing its form. Reasonable and practicable measures for reusing waste may include, but are not necessarily limited to:

- Recovering and separating solvents, metals, oil, or components or contaminants and reusing separated solvents for degreasing plant and equipment.
- Applying waste processing fines to land in a way that gives agricultural and ecological benefits (using fine sediments in rehabilitation activities).
- Using overburden for constructing bunds and landforming.
- Reusing silt/sediment on-site to the maximum practicable extent.

Waste Recycling

Waste recycling refers to treating waste that is no longer useable in its present form and using it to produce new products. Reasonable and practicable measures may include, but are not necessarily limited to:

- Recovering oils, greases and lubricants for collection by a licensed oil recycling contractor, recovering, separating and recycling packaging (including paper, cardboard, steel and recyclable plastics).
- Recycling used plant and equipment to the maximum practicable extent.
- Finding alternatives to disposal of non-recyclable materials (using conveyor belts for noise attenuation, mudflaps, utility vehicle tray liners).
- Providing suitable receptacles and storage areas for collection of materials for recycling.

Energy Recovery from Waste

This refers to recovering and using energy generated from waste. Due to the small scale of the operation, energy recovery is not considered viable.

Waste Disposal

This refers to disposing of waste which cannot otherwise be reused, recycled or used for energy recovery. Reasonable and practicable measures may include, but are not necessarily limited to:

- Regulated wastes must be transported and disposed of in accordance with the *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes*.
- Disposal to a licensed waste disposal facility (i.e. landfill or transfer station).

Waste Storage

Waste storage containers or areas to be provided and located at safe and convenient locations at the site. Each container will be identified with the type of wastes which may be disposed of in each container. Each container or area will be designed to prevent the escape of materials.

3.6 Waste Management Plan

Classified Waste and Licenced Waste Transport

Classified waste is commercial or industrial waste, whether or not it has been immobilised or treated and is of a type or contains a constituent of a type listed in *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes 1999*.

The *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* sets out the process by which wastes are classified. These will be followed for Classified Wastes.

All Classified Wastes will be transported by a licensed commercial transporter.

Monitoring

The Quarry Manager will undertake a monthly visual inspection to ensure the waste management hierarchy is being effectively implemented.

All employees and contractors shall be responsible for ensuring wastes are stored and removed from the site on a regular basis (e.g. daily or weekly). The Quarry Manager shall ensure that required waste treatment measures are implemented at the site.

The Quarry Manager shall ensure waste receptacles are provided and the waste type identified and that temporary waste storage areas are signed, recycling bins are emptied when full and materials which may cause land contamination are not disposed of on the site.

The Quarry Manager shall keep a record of Classified Waste generated at the site, treatment and disposal methods, licenced contractors for transporting and disposing of waste and the location of the facility for accepting the waste.

3.7 Fauna and Flora Management Plan

Purpose

This Flora and Fauna Management Plan has been developed to protect fauna and flora within the site. In general, the area required to be disturbed for the project is of low ecological value and includes parts already cleared of native vegetation. Adjacent areas of native vegetation are protected from clearing and development via exclusion from the development area.

Performance Targets

This Flora and Fauna Management Plan has been prepared to meet the following objectives:

- No unapproved loss in biodiversity values over and above those impacts permitted through project approvals.
- No vegetation clearing outside the specified, pre-approved boundaries.
- Final searches for fauna and their relocation as appropriate is to be carried out prior to all vegetation clearance.
- Minimise injury or death of wildlife.
- Appropriate signage to keep construction activities outside retained habitat areas.
- No increase in level of weed and pest infestation as a result of activities.
- Downstream habitats are not degraded by sediment deposition, scouring or water quality degradation
- Downstream flow changes remain within natural fluctuations.
- Zero penalty infringement notices received from the administering authority.
- Zero harm and or fatalities of fauna.

Relevant Conditions

Refer to EPL once issued.

Strategies/mitigation measures

Restrict disturbance and access to areas absolutely necessary for the construction and the operation of the Quarry. Clearly cordon off all adjacent vegetation and buffer extents that are not to be disturbed from clearing activities, creating 'no go zones' for vehicles, materials, machinery, workers, excavated soil or fallen timber.

- Implement strict controls on construction and operational/maintenance activities that encroach into buffer areas around wetlands and known populations/habitats of significant species.
- Implement measures to avoid the spill of earth and rock downslope of the quarry footprint into areas of retained vegetation.
- Design and install temporary erosion control measures to avoid impacts on retained vegetation downslope of the quarry footprint.
- Leave ground layer vegetation (grasses and herbs) in situ wherever possible to assist soil stability. Mulching of heavily disturbed areas can assist in reducing soil erosion. Where necessary, temporary interception devices such as hay bales or geotextile fabric fencing can be employed to slow stormwater and intercept sediment.
- Non-millable vegetation can be mulched and used in rehabilitation or soil stabilisation works, provided that no weeds are incorporated into the mulch.
- Consider the installation of nest boxes in areas where hollow-bearing trees must be removed and relocate large fallen logs and boulder piles to adjacent habitat to increase sheltering opportunities for displaced animals where it is not feasible to avoid such features during clearing.

3.7 Fauna and Flora Management Plan

Strategies/mitigation measures (continued)

- Where required, ensure a fauna spotter/catcher is present during clearing and site preparation works to:
 - check habitat (vegetation, logs, rock outcrops) for fauna and breeding sites,
 - check any stored materials, including stockpiled timber, prior to removal,
 - check temporary excavations for trapped fauna, and
 - ensure appropriate treatment of injured/orphaned animals through liaison with local Wildlife Carers.
- Establish 'go slow zones' for vehicles and machinery where non-gazetted roads or tracks are located adjacent to patches of native vegetation communities.
- Limit construction and operational work to daylight hours as far as practicable, and any lighting within outdoor areas should comply with relevant Australian Standards and be of low spillage, with no or limited upward spillage.
- Minimise vehicle and machinery access and subsequent soil compaction and weed transfer risk within and adjacent to retained vegetation.
- Undertake regular monitoring of the health and condition of retained vegetation and habitat, and the health of significant plant specimens.
- Undertake regular monitoring of road kills.
- Educate the workforce on the location of significant/sensitive communities and species and potential impacts from unauthorised activities.

Monitoring

All employees on-site shall carry out general daily visual surveillance for cordoned off areas within the quarry. The Quarry Manager shall:

- Conduct a weekly inspection of all areas and access routes on-site to ensure that cordoned off areas are maintained in an undisturbed state.

Disturbance of cordoned off areas will be reported to senior management and corrective action taken to protect the disturbed area.

3.8 Weed Management Plan

Purpose

This Weed Management Plan has been developed to ensure adequate control measures are implemented to control the spread and infestations of weeds and declared plant species within the site. Weed impacts that may occur due to the extractive industry operations include:

- Areas of exposed earth available for weed colonisation including topsoil stockpiles.
- Spread of existing weed infestations due to disturbance and vehicle traffic.
- Unsuccessful or weed-infested revegetated areas.

The *Biosecurity Act 2015* provides for the identification, classification and control of noxious weeds. The Biosecurity Act imposes obligations on occupiers of land to control noxious weeds declared for their area.

Performance Targets

Prevent the introduction and spread of noxious weeds on the site.

Relevant Conditions

Refer to EPL once issued.

Strategies/mitigation measures

Specific control measures to be implemented may include, but not necessarily be limited to the following strategies.

General

- Noxious weed infestations are to be controlled as soon as possible to prevent further spread of weeds.
- Maintain groundcover for as long as possible by minimising land disturbance at any one time, where practicable.
- Annual weed spraying campaigns should be implemented at the site, with additional spraying campaigns (e.g. spot spray, bi-annual sprays, etc.) undertaken if necessary.
- Noxious weeds identified on-site will be prioritised for weed management according to the class of weeds identified, and the cause of the weed establishment will be determined to prevent or minimise further introduction and spread.
- Weed plant materials and seed should be disposed of at a Council refuse station, or buried at an appropriate depth on site, whenever possible.
- Employees should be trained appropriately to recognise existing and potential weeds present on-site and within the surrounding area to ensure they are not inadvertently brought onto the site via items contaminated by seed (e.g. vehicles, machinery, hand tools, soil, mulch or livestock).
- Obtain pest free certification for any soil, fill, mulch, etc. entering the site.
- Appoint a person responsible for regularly monitoring for potential pest occurrences (and treatment if required) of equipment, vehicles, machinery and materials (including soil, mulch, fill) entering the site.
- If areas containing noxious weeds are encountered, clean all equipment, vehicles and machinery prior to leaving the area.
- Species-specific control methods are to be used in accordance with State government guidelines.

3.8 Weed Management Plan

Access Roads/Hardstand areas

- All access routes and hard stand areas will be maintained in a weed-free or weed-reduced state, to lessen the spread of weed seed by vehicle movements.
- Established roads and tracks should be used wherever possible and noxious weed-infested areas / sites are to be avoided.

Topsoil Management

- Visual surveys will be undertaken prior to all topsoil stripping operations and, if necessary, control mechanisms will be undertaken to reduce the risk of the contamination of topsoil stockpiles with seed and vegetative weed material.
- Weed control mechanisms may include separate stockpiling, herbicide spraying of stripped soils, or disposal as fill of soil materials infested with weeds.
- Weed control mechanism strategies will be implemented to control weed infestation if required, both before and after use of top-dressing material in the rehabilitation program.
- All topsoil stockpiles will be regularly monitored and managed for weed infestation.

Rehabilitation

- Implement progressive rehabilitation as soon as practical as areas become available.
- Avoid importing topsoil onto the site where possible.
- Prior to the establishment of vegetation:
 - A spraying campaign may be required to prevent migration or establishment of weed species into the area under rehabilitation.
 - Alternative methods for controlling both grasses and weeds may be used, including manual weeding, burning, slashing, weed matting and mulching, where practicable.

Weed Control Methods

As a guide to assist in planning weed control, a summary of weed control options that may be implemented are presented in **Table 4 – General Weed Control Options**

Monitoring

All employees on-site shall carry out general daily visual surveillance for weeds within the quarry and ensure that vehicles leaving site are free of soil and vegetation.

The Quarry Manager shall:

- Conduct weekly inspections of all access routes on-site to ensure they are maintained weed free or in a reduced state to lessen the spread of weed seed by vehicle movements.
- Conduct inspection of any area/s and treat any weed infestations prior to topsoil removal.
- Carry out at least four thorough inspections per year of the quarry to identify:
 - Effectiveness of weed control measures implemented and whether an amendment is required.
 - New areas where weed control is required.
 - Infestations of new weed species.
 - Areas where rehabilitation should be carried out.

Note: The frequency of inspections will vary depending on the identified weed species on-site and what management requirements are necessary for those species.

Table 4 – General Weed Control Options

Infestation Level	Biological	Chemical	Mechanical	Physical
Low (Canopy cover between 1% and 10%)	Not suitable.	Spot-spraying by hand with a registered herbicide.	Not suitable.	Hand grubbing (remove roots and burn plant).
Medium (Canopy cover between 11% and 50%)	Release of biological control agents.	Spot-spraying by hand with a registered herbicide.	Chaining, rolling, raking or back-ploughing, then burning.	Follow up control of seedlings – could include physical removal.
High (Over 50% canopy cover)	Inspect infestation to see if, and what, bio-control agents are already present. If necessary, release biological control agents and monitor their progress.	Aerial spraying with a registered herbicide.	Chaining, rolling or raking. Use fire to kill any regrowth and break seed dormancy.	Follow up control of seedlings – could include physical removal.

3.9 Rehabilitation Management Plan

Purpose

This Rehabilitation Management Plan has been prepared to guide planning, landforming, revegetation, maintenance and environmental management associated with land disturbed by extraction activities at the site. Extractive industry is a temporary land use - designing and implementation of rehabilitation works is therefore an important element of an extractive industry. Integration of rehabilitation and extractive operations assists in cost control as well as minimising potential environmental impacts. Potential impacts resulting from extractive industry include:

- Soil erosion.
- Pollution of stormwater run-off.
- Sedimentation of waterways.
- Increased nutrient loads in waterways.
- Introduction of weed species.
- Potential clearing of vegetation.
- Potential loss of habitat and biodiversity.

The requirement to develop and implement detailed rehabilitation plans would be triggered 12 months prior to the event that terminal faces of the quarry are achieved.

Performance Targets

Performance targets nominated for rehabilitation of the site are to:

- Return the site to a safe, stable, non-polluting state, suitable for reinstatement of previous land use (i.e. rural – cattle grazing).
- Maintain the general amenity (visual, air quality, water quality, etc.) of the surrounding area.
- Prevent the degradation of non-operational areas.
- Limit land disturbance to that which is necessary at any one time.
- Identify any land contamination and implement appropriate remediation or management where necessary.
- Ensure progressive rehabilitation is carried out during the progression of quarry activities where practicable and commence progressive rehabilitation as areas become available.
- Select suitable plant species for revegetation.
- Reinstatement of stable drainage patterns.
- Prevent the introduction or spread of declared weeds and pest species.

Relevant Conditions

Refer to EPL once issued.

Strategies/mitigation measures

Strategies/mitigation measures for the management of rehabilitation activities at the site will be implemented in accordance with the relevant conditions of development and may include the following:

Rehabilitation Staging

The staging of the rehabilitation works will follow the sequence of quarry development as terminal benches are reached. As the development of the quarry is in a generally westwards direction, these benches will remain active in the foreseeable future and therefore be rehabilitated at the end of the life of the quarry.

3.9 Rehabilitation Management Plan

Final Land Use

The following measures shall ensure that the landform created by extraction activities is stable and is connected into the surrounding landscape:

- Using earthmoving equipment to progressively shape and trim the workings to the desired design profiles and flattening the gradients of selective batters to a stable angle of repose on reaching the terminal limits of extraction.
- Rounding or marrying the contours into the natural ground surface.
- Scaling down loose rock.
- Topsoiling and grassing of contours.
- Providing access to the terminal workings to allow maintenance of rehabilitation works.
- Designing landform and drainage to control erosion for the particular hydrological regime.
- Where necessary, planting media should be spread and shaped over selected rock faces and topsoiled to assist in retaining precipitation and controlling sediment movement.

Terminal quarry benches shall be battered to varying slopes depending on the geotechnical properties of the substrate.

Once quarry operations are completed, the extraction floor will either be contoured to a gentle grade to establish a free draining platform or, if the final extraction area results in an area below grade, then an artificial lake will be created with a surrounding area free draining into the lake. The free draining area will be covered in topsoil to a suitable depth and seeded with paddock grass species to return the land to its current use of cattle grazing.

Topsoil Management

Topsoil and any overburden / remaining extracted material on-site will be used as part of the rehabilitation of the final landform. Topsoil supports and promotes plant growth, soil micro-organisms, organic matter and nutrients. Topsoil is defined as the organic rich, friable layer beneath the natural ground surface. The physical properties of topsoil are important for promoting and supporting plant growth.

The following measures should be implemented for topsoil stripping:

- Topsoil should not be stripped when it is too wet or too dry.
- Topsoil when stripped should be used directly for rehabilitation to the maximum practicable extent, or stockpiled and preserved for future use.
- Stockpiling of topsoil will be stockpiled in low mounds and should be shaped (i.e. batters no greater than 2:1) and revegetated to protect the soil from erosion and weed infestation.
- Stockpiles should be maintained in a free draining condition and long-term soil saturation should be avoided.
- Runoff waters external to the areas to be stripped should be diverted away from the working area.
- Stripping of topsoil should be limited to the minimum area necessary.

The following measures should be implemented for topsoil spreading:

3.9 Rehabilitation Management Plan

- Whenever possible, stripped topsoil should be directly placed on an area undergoing rehabilitation.
- Areas to be topsoiled should be re-shaped prior to placing topsoil.
- Equipment used to spread topsoil should be scheduled to avoid compaction.
- Before resspreading the topsoil, loosen the subsoil to break up any compacted or surface sealing and to enable keying of the two (2) soils.
- On slopes less than 3:1, loosen lightly compacted subsoil with a tined implement ensuring all ripping operations occur along the contour.
- Topsoil is to be removed from stockpiles in a manner that avoids vehicles travelling over the stockpiles.
- Topsoil is to be resspread in the reverse sequence to its removal so that the original upper soil layer is returned to the surface to re-establish the entrapped seed content of the soil.
- Ensure all exposed subsoils are covered.
- Topsoil is to be resspread over selected batters, contours, bunds and disturbed areas to a minimum thickness of 100 mm.
- After spreading topsoil, ensure the surface is left in a roughened state to assist moisture infiltration and inhibit soil erosion.
- Prior to any planting, cultivate any compacted or crusted topsoil surfaces.
- Soil spreading is to be immediately followed by seeding or planting if applicable.
- Straw or organic mulch may be spread over the soil to minimise potential soil erosion until the area is revegetated.
- If erosion occurs on treated surfaces, the area is to be re-topsoiled and sown with cover grass.

Revegetation

There are a range of methods for establishing vegetation that may include; natural regeneration, hydro-mulching, seed broadcasting, seedling planting and direct seeding. Natural regeneration followed by seed broadcasting shall be the preferred method of establishing vegetation. All methods shall be accompanied by appropriate weed control to prevent rehabilitated areas from being overrun with weed species.

The quarry floor and former stockpile areas will be revegetated using suitable pasture species in order to return the area to its former use of cattle grazing.

Weed and Pest Control

Any materials (e.g. earth, soil, mulch and straw) brought onto the site for rehabilitation shall be inspected to ensure the materials are free from weeds and pests. Prior to the establishment of vegetation, a spraying campaign may be required to control weeds to prevent migration of weed species into areas under rehabilitation. Alternative methods for controlling both grass and weeds include manual weeding, slashing, weed matting and mulching. Predation (e.g. grazing animals, birds, kangaroos, hares, and insects) are risks for revegetation. Depending on the situation, specific measures may be required to protect the works from predation such as fencing, barriers, etc.

Buffers

- Site perimeter to be fenced to the extent necessary.
- Work areas to be clearly defined.
- Vehicles limited to defined tracks.

3.9 Rehabilitation Management Plan

Monitoring

Once rehabilitation commences, the Quarry Manager shall undertake a monitoring program to review the ongoing success of the rehabilitation treatment. Rehabilitation measures including landform stability, long-term sediment and erosion controls and revegetation of profiled final land surfaces will be visually monitored by the Quarry Manager and, where relevant, assessed by technical experts to determine the effectiveness of measures implemented. The Quarry Manager may engage a suitably qualified consultant to monitor the establishment of vegetation and land stability.

The key parameters to be measured as part of the monitoring program will include:

- Erosion.
- Groundcover.
- Vegetation species (richness of desired species).
- Weed presence.

The Quarry Manager shall conduct regular inspections of any rehabilitated areas to ensure timely maintenance works are carried out as necessary. Maintenance works may include fertilising, watering, repairs to barriers, guards and plant failure replacements, refer to **Table 5 – Maintenance Schedule for Revegetation Works**.

Table 5 – Maintenance Schedule for Revegetation Works

Item	Activity	Frequency
Weed Control Site Preparation (where necessary) Ongoing Weed Management Supplementary Weeding	Application of herbicide and / or slashing. Application of herbicide. Application of herbicide.	One (1) treatment at least two (2) weeks prior to seeding / planting. As required.
Revegetation Management	Monitor performance and conduct any necessary maintenance. Replace diseased or dead plants. Fertilise (if applicable). Apply mulch (if available).	<ul style="list-style-type: none"> • One month after seeding / seedling planting. • Three (3) months after seeding / seedling planting. • Six (6) months after seeding / seedling planting. • 12 months after seeding / seedling planting. OR <ul style="list-style-type: none"> • following significant rainfall events (e.g. >25 mm). As necessary following maintenance inspections Two (2) months after topsoil spreading or seeding. One-off around plantings.
Weed Control Site Preparation (where necessary) Ongoing Weed Management	Application of herbicide and / or slashing Application of herbicide	One (1) treatment at least two (2) weeks prior to seeding / planting. As required
Pasture Management Grass Height Grass Vigour	Slashing Fertilise	Biannually until established Annually (if necessary)

3.10 Cultural Heritage Management Plan

Purpose

To ensure any unexpected European or Aboriginal Heritage finds are dealt with appropriately. Provide workforce with a procedure to follow in the event of an unexpected find.

Performance Targets

- No damage to culturally significant relics, items or places is to occur as a result of quarry operations.
- Stakeholder consultation occurs to ensure that expectations are met and the correct processes can take place.

Strategies/mitigation measures

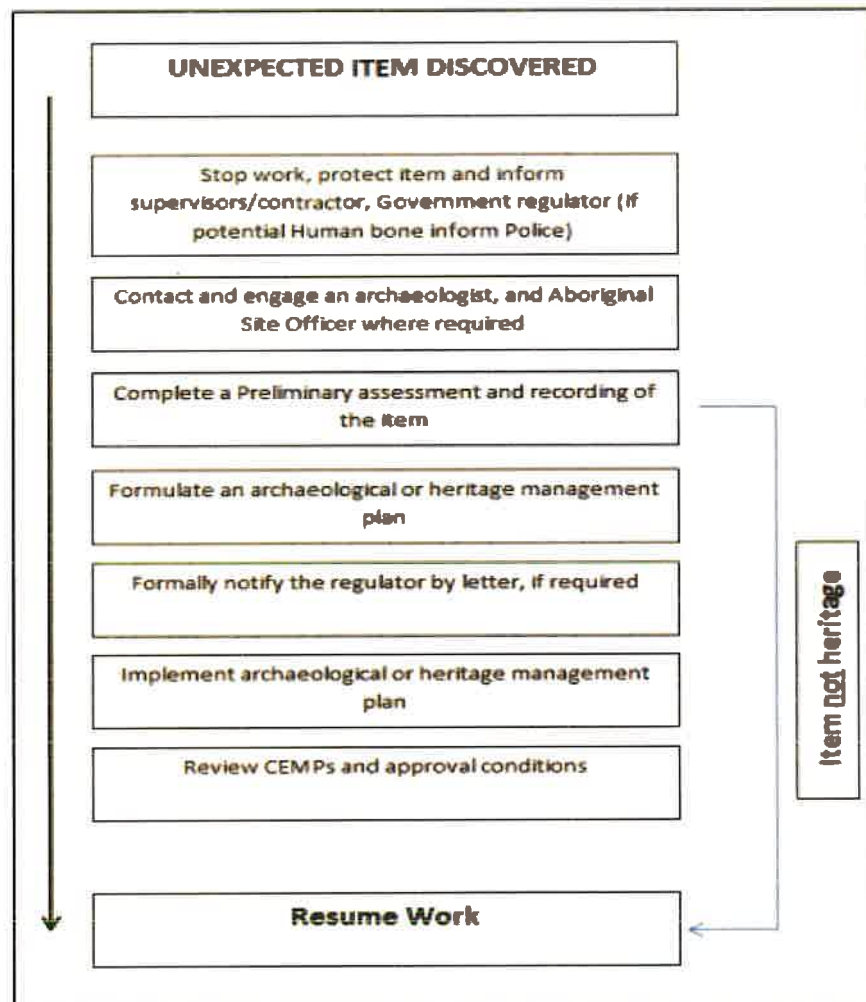
Workforce training

All workers arriving at site are to be inducted on environmental matters including aboriginal heritage. Workers should be trained on their legal obligations and what to look out for in the during quarry operations. In the event of the an unexpected find the Quarry manager should be notified immediately and the procedure below should be followed.

Unexpected finds procedure

- During land disturbance activities, due care will be taken to monitor activities to determine if any unexpected object or materials are being disturbed.
- If an unexpected relic, object or item is observed the work will cease to seek further clarification on the find. Aboriginal objects are defined as *'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'*
- To remove any doubt if the find may or may not be a culturally significant, disturbance work in the area should cease to prevent any damage, the site should be secured, and advice sought from the project archaeologist to confirm the significance of the find.
- Once the significance of the find has been confirmed, the project archaeologist will confirm the notification requirements including Office of Environment and Heritage (OEH). If the find includes human remains the NSW police service and the Coroner's Office will be required to be notified immediately. If the origin of the human remains is thought to be from aboriginal descent, then the local aboriginal party will be contacted.
- Works will not recommence in the area until confirmation has been provided from the project archaeologist following clearance from the regulators.
- If the find is significance written confirmation may be required to be provided to OEH and a plan developed around the salvage or preservation of the site as per the flow chart below;

3.10 Cultural Heritage Management Plan



Unexpected finds flow chart (adapted from Advitech 2019).

3.11 Emergency Response Plan / Pollution Incident Response Management Plan

Purpose	The Pearlman Quarry Pollution Incident Response Management Plan (PIRMP) will provide the site workers with guidance on what is required in the event of a pollution event.
Performance Targets	Prevention of major environmental incidents through proactive site management principles. Workforce is trained correctly on the response to emergency situations to minimise the extent and impact of the event.
Relevant Conditions	Refer to EPL once issued.
Strategies/mitigation measures	Pollution hazards on-Site include chemical and fuel spills, dust emissions and water contamination. These are shown in Table 2 – Pollution Hazard Identification, Likelihood and Pre-emptive Actions with the likelihood of the incidence and the pre-emptive actions taken by the site to reduce the risk or prevent an incidence from occurring.

Table 2 – Pollution Hazard Identification, Likelihood and Pre-emptive Actions

Hazard	Likelihood	Pre-emptive Actions Taken
Hydrocarbon spills during maintenance and refuelling	Moderate	<ul style="list-style-type: none"> • Refuelling will be via mobile equipment. • Fuel or hazardous material is used for its intended use only (as specified on the Safety Data Sheets (SDS)). • SDS are reviewed and available for reference for the correct clean up procedures. • Compliance with the Workplace Health and Safety Management Plan. • Maintenance activities and refuelling are undertaken on a concrete slab, where practicable. • Supervision is provided when refuelling to ensure that overfilling does not occur. • Vehicles are maintained in good condition and as per manufactures' specifications. • Pre-start checks are completed on plant and equipment daily which include inspection for oil leaks. • Good housekeeping and tidy work areas are kept to help prevent accidents and spills.
Stored chemicals leakage and/or spillage causing contamination	Low	<ul style="list-style-type: none"> • Hazardous materials are stored in a covered area and on appropriate drip trays where practicable. • Fuel or hazardous material is used for its intended use only (as specified on the SDS). • SDSs are reviewed and available for reference for the correct handling and clean up procedures. • Compliance with the Workplace Health and Safety Management Plan. • Good housekeeping and tidy work areas are kept to help prevent accidents and spills.

		<ul style="list-style-type: none"> See Table 3 – Hazardous Materials Inventory for list of chemicals stored on-Site)
Fire	Low	<ul style="list-style-type: none"> Store flammable and combustible liquids in an undercover area on appropriate drip trays. Fuel is not to be stored by permanent installations on-Site. Refuelling is undertaken only in designated areas where possible. Provision of appropriate spill kits and staff trained in their use. SDS are reviewed and available for reference for the correct fire prevention and fighting procedures. Compliance with the Workplace Health and Safety Management Plan. Good housekeeping and tidy work areas are kept to help prevent accidents and spills. Fire extinguishers are provided and staff are trained in their use. Staff and visitors to Site are instructed of the emergency procedures and evacuation points.
Discharge of water with elevated suspended solid levels	Low	<ul style="list-style-type: none"> Settling time is provided for waters within the settlement ponds prior to discharge. Clean and contaminated runoff is segregated. Sediment control measures are implemented and maintained. Water monitoring is undertaken in accordance with licence conditions.
Dust emissions from operations	Low	<ul style="list-style-type: none"> Hardstand areas and roads are kept in a damp state with the use of a water truck. Crushing and screening plant is enclosed with water sprays operating at transfer points. All loads are covered during transport.
General waste generated on-Site incorrectly managed and entering the surrounding environment	Low	<ul style="list-style-type: none"> General waste and recycle bins are provided at the office and lunchroom. General waste is taken to Council Landfill as necessary. Waste oil from machinery maintenance is stored correctly and disposed of at an oil recycler. Unserviceable machinery parts are reused or recycled where possible or waste metal sold to scrap metal merchant. Wastewater from the on-Site sewage and amenities wastewater treatment tank is chlorinated and used to irrigate the office garden.

Drawing 2286.DRG.001 – Site and Surrounds shows the location of the site relative to the surrounding sensitive receptors. This drawing shows the sensitive receptors surrounding the site.

Pre-emptive Actions to be taken

Quarry Solutions Quarry Workplace Health and Safety Management Plan and EMP identifies and outlines all necessary pre-emptive actions to prevent, minimise and manage all potential safety and environmental hazards. Quarry Solutions has in place WorkCover compliant methods for the following:

1. Chemical storage.
2. Chemical spill management.
3. Schedule of Safety Equipment and Personal management of pollution incidents:
 - I. Spill kit.
 - II. Safety Data Sheet Register.
 - III. Fire Extinguishers.
 - IV. Hard Hats.
 - V. Steel Cap Boots.
 - VI. Dust Mask.
 - VII. Eye protection.
 - VIII. Rigger Gloves.
 - IX. Long Sleeve Shirts.

Inventory of Pollutants

As part of the site establishment phase. A Hazardous Materials Register will be developed. This will include an inventory of all hazardous substances that are brought to site and the corresponding Safety Data Sheet (SDS). Prior to the chemicals arriving at the site the SDS will be checked to determine the following;

- Safe storage requirements
- Compatibility of storage around other hazardous substances
- Quantity and concentration of active ingredients in substances
- PPE requirements for handling
- Environmental considerations for use on the site
- Disposal requirements at end of use
- Product expiry dates
- Particular transportation requirements

Following the assessment of this information a risk assessment will be undertaken prior to accepting the chemicals at the site to determine if any changes are required to ensure safety is maintained. Changes may include additional PPE, additional storage areas or ventilation upgrades on existing stores, exclusion areas for use around watercourses, establishment of new waste providers etc.

Incident Contact Details

External Contacts

1. Emergency Services – 000
2. Environment Protection Authority – 13 15 55
3. Public Health Unit - Dubbo - (02) 6809 8979 or (0418 866 397 after hours)
4. Gwydir Shire Council – 0417 792 650 (including after hours)
5. Essential Energy - 13 20 80

Communications to Adjoining Landowner Occupiers`

The surrounding land is comprised of rural residential properties. Due to the distances of surrounding residences, should a severe incident occur, 2-way radio or mobile phone calls will attempted in the first instance and a door knock will be the alternative means of contacting residents.

Communications with the Community

Project updates will take place via the following;

- Local Newspaper.
- Letter box drop.
- Door knock.

The extent of the communications with the neighbours and the community will depend on the:

- Magnitude of the incident.
- Type of pollutant.
- What that pollutant may impact - water, land and air.
- The potentially impacted area.
- Weather conditions.
- Potential duration of the impact.

These factors will be considered in determining who will be contacted.

Emergency Management Key Responsibilities (pre-emergency).

The Quarry Manager or delegate is responsible for:

- The effectiveness and accuracy of the Emergency Plan, procedures and relevant emergency documentation.
- Maintenance of staff training in emergency preparedness, emergency information lists and emergency-related plant and equipment necessary for emergency evacuation compliance.
- Co-ordination of evacuation exercises.
- Post-emergency/exercise review.

Emergency Management Methods

- The Site has an emergency plan.
- A complete copy of the plan shall be displayed in all the main work areas.
- This plan forms part of the Workplace Health and Safety Plan.

Chief Emergency Controller (during and post-emergency)

Responsibilities include:

- Immediately responding to any emergency situation.
- Ascertaining the nature of the emergency and determining appropriate actions.
- Ensuring the appropriate emergency services have been notified.
- Co-ordinating the deployment of staff and any internal specialist resources.
- Where safe to do so take steps to contain or control the hazard.
- Ensuring that appropriate senior management are kept updated on the situation.

- Co-ordinating post-incident recovery strategies.

Staff, Employees and Contractors

Responsibilities include:

- Attendance of any emergency preparedness training.
- In the event of emergency event, report all emergency incidents to the Quarry Manager
- Follow instructions given in the event of an emergency.
- Co-operate with emergency personnel in the event of an emergency.
- When safe to do so take steps to contain or control the hazard.

Emergency Resources

Emergency Warning and Communications System

- Radios in all plant, weighbridge and vehicles, mobile phones, verbal.
- Communication with staff.
- In the event of a failure of the radio, landline telephone, emergency warning system and messages may be relayed via mobile phone or runner/driver.

Fire-Fighting Appliances

The site facilities are equipped with various fire-fighting appliances which are strategically located throughout the site offices and plant as per the Emergency Response Plan.

Location of Extinguishers

Fire extinguishers are found in the following locations:

- On plant and in all Site offices as required.
- Next to fuel installation.
- The equipment shall comply with the relevant Australian Standards and be appropriately signposted.

All employees and contractors shall be competent in the use of the equipment.

All fire-fighting equipment shall be regularly checked and serviced. This will involve both internal inspections as well as external tests conducted by approved experts.

The Quarry Manager acts as the Fire Warden.

Incident and Accident Reporting

In the event that an injury is sustained to an employee or an incident occurs, contactor or visitor, the following contingencies have been put into place:

- Trained and accredited First Aid Officers will be in the workplace and shall be present on every shift.
- Contact number of the First Aid Officer is displayed on the site office.
- All injuries shall be reported to the supervisor immediately and recorded on the injury report form as soon as practicable after injury.

- All injuries will also be investigated immediately and corrective actions instigated in accordance with Quarry Solutions Workplace Health and Safety Management Plan.

First Aid Equipment Locations

- Site Office.
- Quarry Vehicle.
- Loader.

All workplace injuries must be reported to the quarry manager and WHS delegate.

Emergency Response and Evacuation Plan

Discovering a Dangerous Situation

- Move persons away from danger if safe to do so.
- Contact relevant emergency services (i.e. Ambulance/Fire/Police).
- Announce evacuation if dangerous situation requires (Radio/Runner).
- Contact the Quarry Manager.

Reporting an Emergency Externally

When reporting an emergency to an external agency, the following information should be included:

- Name of organisation.
- Exact nature of emergency - are there any casualties?
- Exact location (including address and location on site).
- Name of person reporting emergency.
- Contact number (where applicable).

This information is on display in the site office.

External reporting is to be carried out by the Quarry Manager, but, in that person's absence, may be carried out by their delegate.

Evacuation Alert

Verbal instructions for evacuation are executed by calling out "emergency, emergency, emergency" over the radio system or verbal directive issued by the appropriate personnel from the Quarry Manager will constitute the evacuation signal.

Assembly Areas

In the event of an evacuation, persons should assemble at the nearest safe assembly area as stated in the Quarry Safety Management Plans.

First Aid

If First Aid assistance is required contact the relevant First Aid attendant. First Aid attendant lists can be found in the site office.

Any injured people who can be moved safely should be taken to the nearest assembly area (whichever is more appropriate) for treatment. Those people who are trapped or unable to be removed immediately must be protected and given First Aid on the spot (providing it is safe to do so).

Media Liaison

No person other than the following can authorise or divulge any information to the media:

- General Manager.
- Director.

Any form of contact from the media should be referred to those mentioned above under all circumstances.

Should any staff be approached by media representatives for comment, the staff member must refer them to the Quarry Manager or the person authorised to speak on their behalf such as a media officer.

Actions to be taken during or immediately after Pollution Incident

During a Pollution Incident

All actions taken during and after a pollution incident will vary depending on the nature of the pollutants and severity of the incident.

Any action taken shall be in accordance with any Workplace Health and Safety requirements and the EMP.

Detailed records/evidence collection shall be carried out, provided it is safe to do so and with approval of the person in control of the site. Evidence may include photographs or samples taken and written notes.

Follow all directives given by the Emergency Controller.

Follow only safe work practices.

Emergency Termination

Only the Emergency Controller may deem the emergency terminated. This action shall take place once all emergency services have concluded their involvement.

Only the Emergency Controller may deem the site safe to enter.

Incident Reporting

Reporting of the incidents to the EPA shall include the follow purposes:

- For recording of Pollution Complaints.
- For notification of Environmental Harm.
- For preparing a written report to EPA.

Site Personnel Competency

Management to ensure staff are competent in key functional areas, that ongoing training will be provided and currency of training monitored throughout their period of employment with Quarry Solutions.

Records of training currency are maintained by the Quarry Manager. The Quarry Manager monitors expiry dates and arranges appropriate training as necessary and annual employee reviews are conducted to identify all required training needs.

Management will ensure Contractors are competent in key functional areas. Ongoing currency of skills will be monitored throughout the period of the contract with Quarry Solutions.

All personal are trained in activity and site based Safe Work Method Statements.

Weekly toolbox meetings are undertaken for quarry activities. All new Site employees and contractors shall be made aware of the PIRMP.

figures

attachments

Attachment 1

Incidents and Complaints Procedure

Incidents and Complaints Procedure

The objective of the Incidents and Complaints Procedure is to ensure that incidents and complaints are reported, investigated and appropriate action is taken. A summary of the Incidents and Complaints Procedure is provided below in **Diagram 1 – Incidents and Complaints Procedure Summary**.



Diagram 1 – Incidents and Complaints Procedure Summary

Receiving Complaints/Recording Incidents

The Quarry Manager will be responsible for ensuring that all employees at the site are familiar with the procedure for incidents and complaint recording. The Quarry Manager will liaise personally with the complainant to discuss the nature of the complaint, identify possible causes and explain actions to prevent further complaints.

All complaints received or any employee involved in an incident having environmental implications or who becomes aware of any situation that develops into an incident, shall be reported to the Quarry Manager or delegate as soon as practicable. Employees are to show respect and understanding to complainants.

The following details shall be recorded at the receipt of an incident or complaint:

- date, time, location and nature of the incident or complaint
- type of communication (telephone, letter, email, personal, etc.)
- name, contact address and contact telephone number of the person reporting the incident or complaint (i.e. note: if the complainant does not wish to be identified then '*not identified*' is to be recorded)
- details of incident or complaint
- response and investigation undertaken as a result of the incident or complaint
- name of person responsible for receiving and/or investigating the complaint
- response and investigation undertaken as a result of the complaint
- action taken as a result of the complaint investigation and signature of responsible person.

Step 1. Notification

When an environmental incident/complaint occurs, the Quarry Manager will notify the administering authority via telephone on **131 555** (Pollution Hotline) or local office as soon as practicable after becoming aware of any release of contaminants not in accordance with the conditions of the approval. A standard form for such notification is attached see below – **INITIAL NOTIFICATION FORM**.

Step 2. Investigation

All incidents and complaints should be investigated. The investigations should include:

- determining what activities (and equipment) were being carried out or operated at the time of the complaint/incident
- determining whether, at the time of the complaint, normal day to day activities were conducted
- identifying whether equipment or activities on-site were the source of complaint (or whether other activities in the locality were the cause of the complaint)

- determining what potential actions may be carried out to resolve complaint and/or minimise the likelihood of further complaint or release of contaminants to the environment.

Appropriate action is to be undertaken as soon as practical, but no longer than two days, to either determine the source of the complaint, and/or minimise further impact in the case of an incident. Corrective action is to be implemented and an assessment conducted to determine what, if any, preventative action can be implemented to prevent a similar incident from occurring again. All incidents and complaints reported shall be filed in a complaint/incident register available on the site.

The incident/complaint form shall be checked by the Quarry Manager two (2) weeks after receipt of complaint to ensure appropriate corrective action has been taken and that the issue has been resolved. If monitoring is undertaken to investigate a complaint the Quarry Manager, or the consultant commissioned to undertake the study/survey, an objective summary of the results of the study/survey shall be provided to the complainant.

Step 3. Reporting

Within 14 days of the incident/emergency, in addition to the information provided in the initial notification form, provide further information to the administering authority as shown in the attached form (see **FURTHER NOTIFICATION FORM**).

Within fourteen (14) days of the incident/emergency the written advice of the results of any environmental monitoring (not previously supplied) in relation to the incident/emergency shall be supplied to the relevant regulatory authority.

EMERGENCY AND INCIDENT

Environment Protection Authority **Initial Notification Form**

This form is to be completed when notifying the EPA of any emergency or incident, which has or may cause environmental harm. The EPA is to be contacted by telephone or facsimile (of this form) within 24 hours after becoming aware of the emergency or incident.

Date:

Environmental Protection Licence (EPL) Number:

Operator's name:

Your name:

Site location:

Name and telephone number of contact person:

.....

Location of emergency or incident within Site:

.....

Time of the emergency / incident / event:

Time that operators became aware of the emergency / incident / event:

The suspected cause of the emergency / incident / event:

.....

The environmental harm caused, threatened, or suspected to be caused by the emergency / incident / event:

.....

.....

.....

Actions taken to prevent further environmental harm and mitigate any environmental harm caused by the emergency / incident / event:

.....

.....

.....

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.....

.....

Name:

Signature:

EMERGENCY AND INCIDENT

Environment Protection Authority **Further Notification Form**

Not more than 14 days following the initial notification of an emergency or incident, the holder of the EPL must provide the following written advice along with the initial notification form.

This record must be kept for a period of five (5) years.

EPL Number

Designated contact person:

Date of Event:/...../.....

Time of Event: am/pm

Proposed action to prevent a recurrence of the emergency / incident / event:

.....
.....
.....

Outcomes of actions taken at the time to prevent or minimise environmental harm and / or environmental nuisance:

.....
.....
.....

Results of any environmental monitoring performed:

.....
.....
.....

Further comments:

.....
.....
.....
.....
.....
.....
.....

Name:

Signature:



Report

Biodiversity Development Assessment Report

Pearlman's Quarry

Quarry Solutions

23 December, 2019

Rev 3 (Final)

Report Details

Biodiversity Development Assessment Report - Pearlman's Quarry

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History

Date	Revision	Comments
31 July, 2019	0	Draft issue
2 August, 2019	1	Draft issue
24 September, 2019	2	Revision following consent authority feedback
23 December, 2019	3	Final issue including results of seasonal surveys

Endorsements

Function	Signature	Name and Title	Date
Field Assistance and Preparation of Report		Jed Field Ecologist	23 December, 2019
Preparation and Certification of the Assessment		Dr Rod Bennison Lead Environmental Scientist / Biodiversity Accredited Assessor-BAAS19023	23 December, 2019

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ABBREVIATIONS

Abbreviation	Meaning
AOBV	Area of Outstanding Biodiversity Value
AoS	Assessment of Significance
ASC	Australian Soil Classification
BAAS	Biodiversity Accredited Assessor Scheme
BAM	Biodiversity Assessment Act
BAMC	Biodiversity Assessment Method Calculator
BCAR	Biodiversity Certification Assessment Report
BC Act	<i>Biodiversity Conservation Act 2016</i>
BC Regulation	Biodiversity Conservation Regulation 2017
BCT	Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
BRW	Biodiversity Risk Weighting
BSSAR	Biodiversity Stewardship Site Assessment Report
DBH	Diameter at breast height (measured at 1.3 m above ground)
DoEE	Department of Energy and Environment (Federal)
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
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>
GDE	Groundwater Dependant Ecosystems
GIS	Geographic Information Systems
GSG	Great Soil group
HTE	High Threat Exotic
IBRA	Interim Biogeographic Regionalisation for Australia
KTP	Key Threatening Process
LEP	Local Environment Plan
LLS	Local Land Services
LLS Act	<i>Local Land Services Act 2013</i>
MNES	Matters of national Environmental Significance
NPWS	National Parks and Wildlife Services
OEH	Office of Environment and Heritage (now DPIE)
PCT	Plant Community Type
PMST	Protected Matters Search Tool
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Planning Policy
SIX	Spatial Information Exchange Maps
SPRAT	Species Profiles and Threats Database
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
TSC Act	<i>Threatened Species Conservation Act 1995</i> (now succeeded by the BC Act)
VIS	Vegetation Integrity Score

1. INTRODUCTION

Advitech Pty Limited (trading as Advitech Environmental) was engaged by Groundwork Plus Pty Ltd (Groundwork Plus) on behalf of Quarry Solutions Pty Ltd (Quarry Solutions). Groundwork Plus are compiling several Environmental Impact Statements for Quarry Solutions, which intends to supply the Australian Rail Track Corporation with extractive materials for the construction of the Melbourne to Brisbane Inland Rail project. This Biodiversity Development Assessment Report (BDAR) has been completed in accordance to the Biodiversity Assessment Methodology (BAM). The Pearlman's Quarry proposal is considered Designated Development under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). As such, this BDAR supports the Environment Impact Statement (EIS) completed in accordance with the Planning Secretary's environmental assessment requirements (EAR 1331).

In accordance with Section 6.15 of the *Biodiversity Conservation Act 2016* (BC Act), this BDAR, certified by Dr Rod Bennison (the accredited person) has been prepared on the basis of the requirements of (and information provided under) the BAM. This BDAR, including biodiversity credit calculations made using the Biodiversity Assessment Method Calculator was originally lodged on the NSW Biodiversity Accredited Assessor System (BAAS) on 12 September, 2019. Under Section 6.14 of the BC Act, this Biodiversity Assessment Report has been modified at the request of the client who commissioned the report to include results of seasonal surveys for candidate species and address feedback provided by the Biodiversity and Conservation Division in the Department of Planning, Industry and Environment (DPIE). This modification (submitted through BASS on 23 December, 2019) precedes any planning approval or vegetation clearing approval of the proposed development.

It should be noted that this report was prepared by Advitech Pty Limited for Quarry Solutions ('the customer') in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

1.1 Project Background

Quarry Solutions propose to develop and operate a hard rock quarry operation on the property 'Tikitere', located approximately 70 km north east of Moree (a site map is provided in **Figure 1.1**). The property has historically been used for mixed cultivation and grazing operations. The Pearlman's Quarry is one of several possible sources of ballast material for the Inland Rail project. The quarry proposes to extract up to 490,000 tonnes of material per annum over a five year period. While the proposed area includes an area of 9.25 ha, a number of existing tracks are present through this area. Overall, the proposed clearing will only impact on 8.70 ha of existing native vegetation.

The proposed project exceeds the threshold for clearing under the *Biodiversity Conservation Regulation 2017*, above which the BAM and NSW Biodiversity Offsets Scheme apply. The proposed works would include:

- Construction and operation of a new hard rock quarry;
- Preparation of materials (crushing and stockpiling) in a manner required by the Inland Rail project;
- Transport of materials off the property to a rail loading point within the rail corridor; and
- Rehabilitation of the quarry to a suitable landform for continuing rural activities and plant community restoration.

1.2 Site Description

The proposed Pearlman's Quarry is located in the New England North West region within New South Wales, approximately 70 km north east of Moree and 45 km south of Boggabilla. The township of North Star is approximately 10 km north. The approximate area of the proposal site is 1695 hectares, with 9.25 hectares comprising the extraction area and 7.00 hectares comprising the stockpile area (see **Figure 1.1**). The quarry lies on Lot 5 DP755984 on land zoned RU1 Primary Production within Gwydir Shire Council. Two kilometres east of the proposed quarry, on a separate lot, but still apart of the Pearlman's property, the Camurra Boggabilla Railway line runs north-south through the property.

The predominant land use within the study area is rural. Fertile soils support livestock production and cropping. The proposed quarry location is situated on a narrow, vegetated ridge line surrounded by cultivated fields. Death Adder Hill, located just east of the proposed quarry rises approximately 340 m in elevation and forms a part of an isolated ridge restricted to the proposal site. Vegetation in the study area is sparse, often associated with low rises or consisting of scattered trees along road reserves or water courses. At the proposal site, linear vegetated corridors, sometimes partly broken by cleared areas provide some level of habitat connectivity south to Tackinbri Creek riparian corridor.

Vegetation within the proposal area is in relatively good condition and consists of open forest dominated by *Eucalyptus melanophloia* (Silver-leaved Ironbark) and western vine thicket consisting by a low closed canopy of *Geijera parviflora* (Wilga), *Notelaea microcarpa* (Native Olive) and *Ehretia membranifolia* (Peach Bush). A location map showing site features including Plant Community Types (PCTs) mapped in the assessment area (1500 m of the proposal site) is provided in **Figure 1.2**.

The following definitions are used throughout this report to refer to locations in the project area:

- The 'proposal site/area' is the development footprint comprising all areas that would be directly impacted by the works;
- The 'study area' includes the proposal site and the areas adjacent to the proposal site that may be indirectly impacted by the proposed works; and
- The 'search area' refers to a 20 km area surrounding the proposal site for the purpose of database searches.

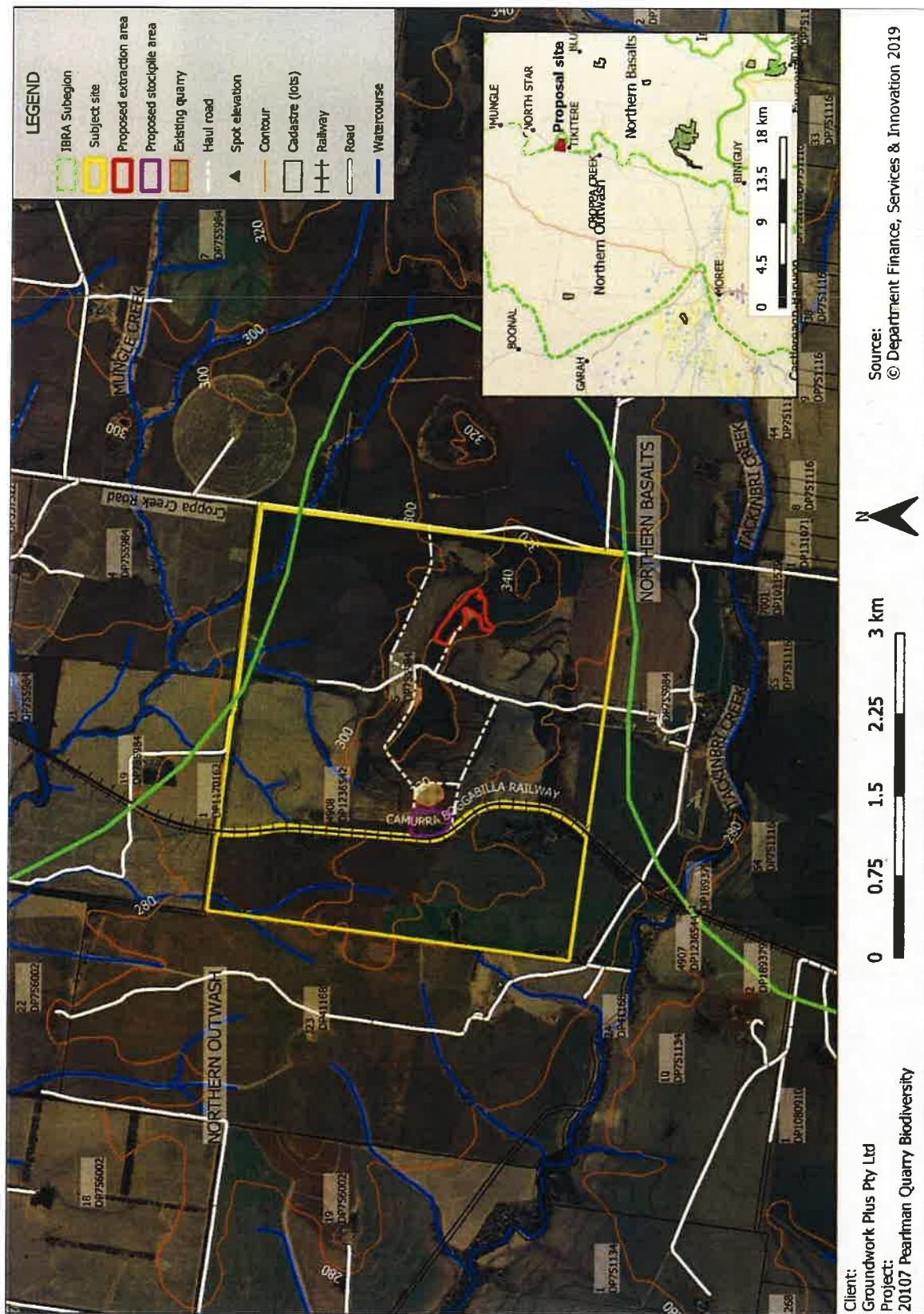


Figure 1.1: Site Map and insert, IBRA subregion boundaries.

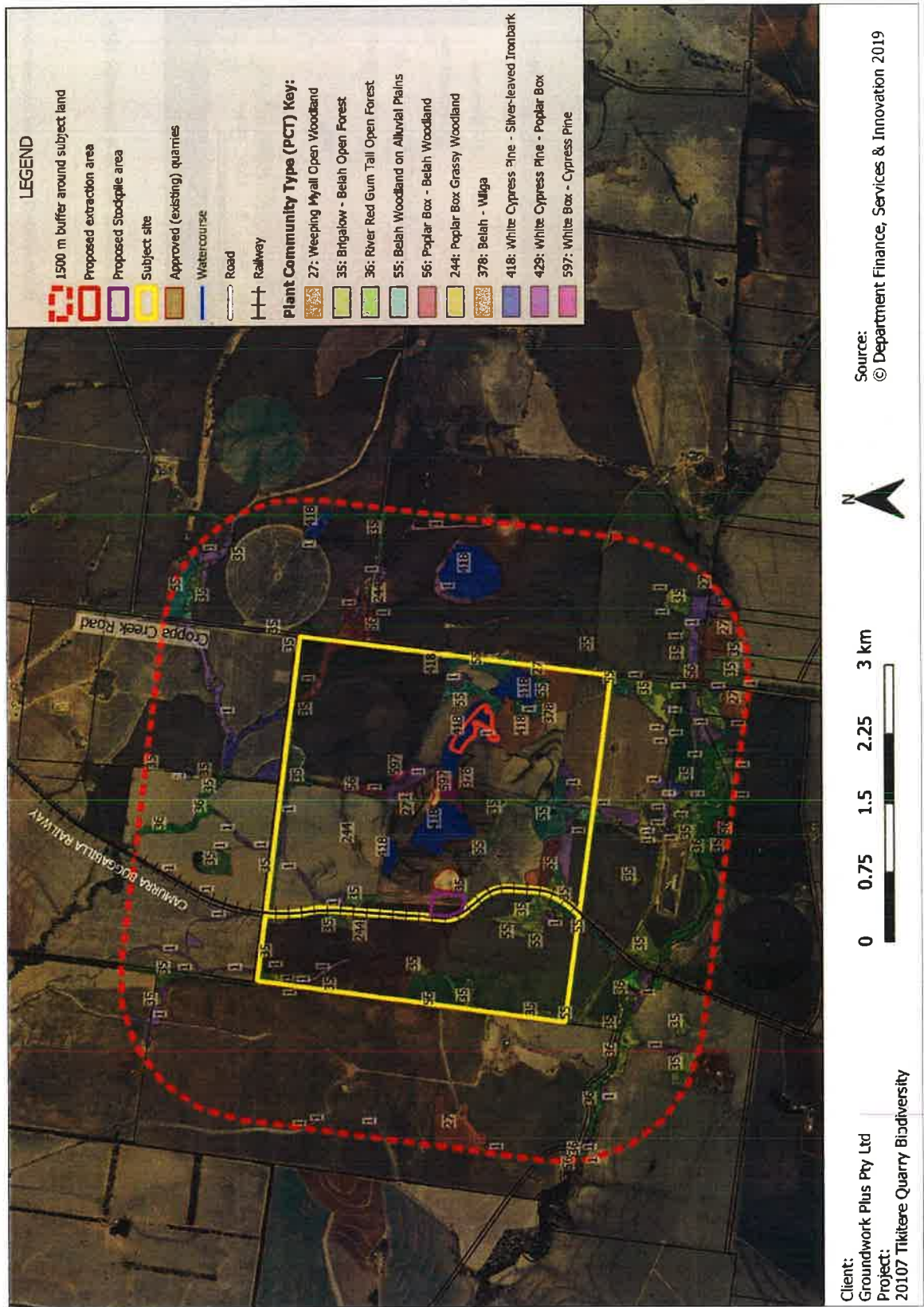


Figure 1.2: Location Map showing habitat connectivity and indicative PCTs Mapped (Border Rivers Gwydir / Namoi Region VIS 4467).

Biodiversity Development Assessment Report

Quarry Solutions

20288 Pearlman's Quarry BDAR Rev3.docx

23 December, 2019



1.3 Secretary's Environmental Assessment Requirements

This report will be appended to an Environmental Impact Statement (EIS) which must comply with the requirements of Clause 6 and 7 of the *Environmental Planning and Assessment Regulation 2000*, and which addresses environmental considerations identified in the Planning Secretary's Environmental Assessment Requirements (SEARs) (EAR 1331) relevant to biodiversity.

The SEARs notes the following requirements for biodiversity assessment including:

- Accurate predictions of any vegetation clearing on site;
- A detailed assessment of the potential biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems undertaken in accordance with Sections 7.2 and 7.7 of the *Biodiversity Conservation Act 2016*; and
- A detailed description of the proposed measures to maintain or improve the biodiversity values of the site in the medium to long term, as relevant.

1.4 Study Aims

This study aims to assess the potential impacts of the proposed works on the biodiversity values of the local area. Specifically, it aims to:

- Address relevant biodiversity requirements as set out in the SEARs;
- Describe the existing environment and assess site biodiversity values;
- Determine whether the proposed development is likely to significantly affect threatened species or ecological communities protected under Federal and State legislation;
- Assess all direct and indirect potential impacts and, recommend measures to avoid and minimise any potential impacts on biodiversity values; and
- Determine offset requirements using the BAM calculator.

1.5 Legislative Context

1.5.1 Commonwealth Legislation

Under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), referral is required to the Australian Government for proposed actions that have the potential to significantly impact on Matters of National Environmental Significance (MNES) or the environment of Commonwealth land. The assessment of the proposal's impact on MNES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant MNES or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment and Energy (DoEE) under the EPBC Act.

1.5.2 New South Wales Legislation

1.5.2.1 Biodiversity Conservation Act 2016

The proposed project exceeds the threshold for clearing listed under Clause 7.23 of the Biodiversity Conservation Regulation 2017 (BC Regulation) (**Table 1.1**). Subsequently, biodiversity impacts related to the proposal are to be assessed in accordance with the Biodiversity Assessment Method (BAM) (OEH, 2017) and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must be prepared by an accredited assessor (BC Act, S.6.10) and include information in the form detailed in the BC Act (S.6.12), BC Regulation (s6.8) and the BAM.

The BAM sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land in order to:

- identify the biodiversity values on land subject to proposed development;
- determine the impacts of proposed development on biodiversity values; and
- quantify and describe the biodiversity credits required to offset the residual impacts of proposed development on biodiversity values.

Table 1.1: Offset Scheme Thresholds – Vegetation Clearing Area Criteria

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha, and less than 40 ha	0.5 ha or more
40 ha, and less than 1000 ha	1 ha or more
1000 ha or greater	2 ha or more

1.5.2.2 Environmental Planning and Assessment Act 1979

Development in NSW is subject to the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and its associated regulations and planning instruments. Developments requiring consent, such as the Pearlman's Quarry proposal, are assessed under Part 4 of the EP&A Act. As the proposed quarry is designated development, the application for development must be accompanied by an environmental impact assessment in the form prescribed by the accompanying regulations, and as stipulated in the SEARs detailed above. Where extractive industries, including quarries, generate more than 30,000 cubic metres per year and or disturb greater than 2.0 ha of land, consent under Schedule 3 (Part 19) of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) is also required.

1.5.2.3 Local Planning Instruments

Development at the site is regulated under the Gwydir Shire Council Local Environmental Plan 2013. These policies determine which development is permissible, prohibited, exempt or complying. As the proposed quarry is on land zoned RU1 Primary Production, an extractive industry located at the proposal site would be permissible with development consent.

2. METHODOLOGY

This chapter outlines the methods (desktop and field survey investigations) used to determine the biodiversity values of the proposal site.

2.1 Key Personnel

Key personnel responsible for the assessment are detailed in **Table 2.1**

Table 2.1.: Key Personnel

Name	Role	Experience
Jed Field <i>BEnvSc&Mgt (Hons.I)</i>	Field work and author	Graduate ecologist with 5 years experience in ecological restoration and assisting in vegetation surveys. Associate member of the Ecological Consultants Association of NSW.
Luke Pickett <i>BEnvSci</i> <i>MWldMgt (Habitat)</i>	Field work and document review	Over 14 years of experience in the environmental and ecological consulting industry. Practicing member of the Ecological Consultants Association of NSW and accredited assessor (BAAS 17100).
Dr Rod Bennison <i>JP BSc MEnvStudies</i> <i>GCPTT PhD FLS</i>	Certification of the assessment	Over 15 years of experience in a consulting environment, with particular expertise in construction management. Practicing member of the Ecological Consultants Association of NSW and accredited assessor (BAAS19023).

2.2 Database Searches and Literature Reviews

A desktop assessment was undertaken that included searches of databases and a review of literature relevant to the site and local area, particularly:

- NSW Department of Planning, Industry and Environment (DPIE) (formerly Office of Environment and Heritage (OEH)):
 - BioNet Atlas of NSW (licensed) for records of threatened species and endangered ecological communities which have been recorded within a 20 km radius (locality) of the subject site (July, 2019);
 - BioNet Vegetation Classification database:
<https://www.environment.nsw.gov.au/research/Visclassification.htm>
 - Threatened Biodiversity Data Collection (TBDC), available through Bionet;
 - eSPADE v2.0 (soil profile and soil map);
 - State Vegetation Type Map: Border Rivers Gwydir / Namoi Region Version 2.0. VIS ID 4467;
 - BioNet NSW Landscapes version 3.1.
- Australian Government Department of the Environment and Energy (DoEE):
 - Protected Matters Search Tool for Matters of National Environmental Significance (MNES) listed under the EPBC Act within a 20 km radius from the site (July, 2019);
 - Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0;
 - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (Department of the Environment, Water, Heritage and the Arts), 2013 EPBC Act Policy

- Species Profiles and Threats Database (SPRAT)
<http://www.environment.gov.au/cgibin/sprat/public/sprat.pl>;
- Australian Bureau of Meteorology (BOM):
 - National Atlas of Groundwater Dependent Ecosystems:
<http://www.bom.gov.au/water/groundwater/gde/index.shtml>.
- Spatial Information Exchange (SIX) Aerial Imagery for Map production.

2.3 Site Assessment

A site assessment was undertaken from 21 May to 23 May, 2019 by Advitech Environmental's Senior Ecologist and accreditor assessor (BAAS17100), Luke Pickett, and ecologist, Jed Field. During this period, targeted searches for candidate fauna and flora species were undertaken, including vegetation plots. To determine presence/absence of candidate species that could not be reliably detected during the initial site assessment, an additional survey was undertaken from 28 October to the 1 November 2019 by Jed Field and Advitech Environmental scientist Kane Hoskins. A further site visit assessment targeting candidate flora was undertaken on the 9th December 2019 by Jed Field and Luke Pickett.

2.3.1 Flora

A number of sampling techniques were used to ensure the site was adequately sampled. The site was scoped using the 'Random Meander Technique' described by Cropper (1993). This involved walking in a random meander throughout the proposal site, visiting the full range of habitats and recording every plant species observed. Vegetation quadrat and transects were established according to **Section 2.3.1.1** and consistent with the *Biodiversity Assessment Method Operational Manual - Stage 1*. Plant community types (PCTs) were determined by comparing the floristic structure and composition of the vegetation on site with vegetation profiles described within the VIS database and community descriptions of endangered ecological communities known to occur in the local area. A list of all plant species recorded during fieldwork is listed in **Appendix I**. The location of the vegetation surveys is shown in **Figure 2.1**.

2.3.1.1 Vegetation Plots

Eight plots were used to assess the composition, structure and function components of vegetation integrity. **Table 2.2** shows that two PCTs were identified on site. Around a central 50 m transect, a 20 x 20 metre quadrat was established to record floristic diversity and combined with a 20 x 50 metre quadrat for recording fauna habitat and forest regeneration. Within the 20 x 50 m plot area, five 1.0 m² plots were also established to assess groundcover composition.

Data collected within each plot/transect includes:

- Flora diversity and composition;
- Vegetation structure (including canopy, sub-canopy, shrub and groundcovers);
- Fauna habitats (including hollow trees, fallen timber);
- Regeneration of canopy species;
- Landscape features (including slope, gully, and aspect);
- Soil features (including soil type, rocks, organic matter); and
- Geographical coordinates and a photographic record.

Table 2.2: Vegetation plots undertaken

PCT/ Zone	Patch size (ha)	Area(ha) of impact	Minimum plots required	Plots completed
147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion				
Zone 1 (very good condition)		1.13	1	2 (Q3,5)
Zone 2 (very good condition)		0.60	1	1 (Q8)
418: White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion				
Zone 1 (very good condition)		5.43	3	3 (Q2,4,6)
Zone 2 (good condition)		1.36	1	1 (Q1)
Zone 3 (poor condition)		0.19	1	1 (Q7)
TOTAL	> 100	8.70¹	7	8

¹ Note, while the proposal area is 9.25 ha, only 8.09 ha of native vegetation would be impacted. This is attributed to cleared agriculture tracks throughout the proposal area, as shown in **Figure 2.1**.

2.4 Fauna

Fauna surveys targeted species that may occur within the habitat available within the proposal area. The sampling methods used to survey fauna habitat within the survey area are detailed below in **Table 2.3**. A list of all fauna species observed during fieldwork is provided in **Appendix I**. The location of targeted fauna surveys is shown in **Figure 2.1**.

Table 2.3: Fauna surveys conducted

Fauna Group	Surveys	Period Survey Undertaken	Methods
Diurnal birds	Area search	May, October-November and December 2019	A search was undertaken to identify any birds present. Birds were identified from observations or call identification. A search for nests was also undertaken during the survey.
Herpetofauna	Habitat search	May, October-November and December 2019	Opportunistic active searches reptiles were undertaken during the survey within suitable habitat (i.e. leaf litter, under rocks).
Microchiropteran bats	Song Meter recording	May 2019	Echo-location recording (conducted over two separate nights) targeting microchiropteran bats over the nearest waterbody to the proposal area (a farm dam; see Figure 2.1).
Owls, nocturnal birds, reptiles and marsupials	Spotlight search	May, October-November and December 2019	One hour after sunset, half an hour was spent searching for eye shine of fauna (conducted over five separate nights) in the proposal area.

Fauna Group	Surveys	Period Survey Undertaken	Methods
Owls, nocturnal birds, reptiles, marsupials and microchiropteran bats	Stag watching	May, October-November and December 2019	From 30 minutes before dusk to 30 minutes after dusk, trees with hollows were watched for any fauna activity.
Diurnal birds, nocturnal birds, reptiles and marsupials	Camera trap	October and December 2019	Cameras set in areas with dead wood with hollow ends. Cameras were run continuously for five days on camera/video mode
All	Opportunistic sightings	May, October-November and December 2019	Any opportunistic sightings and indications of fauna on site were recorded.

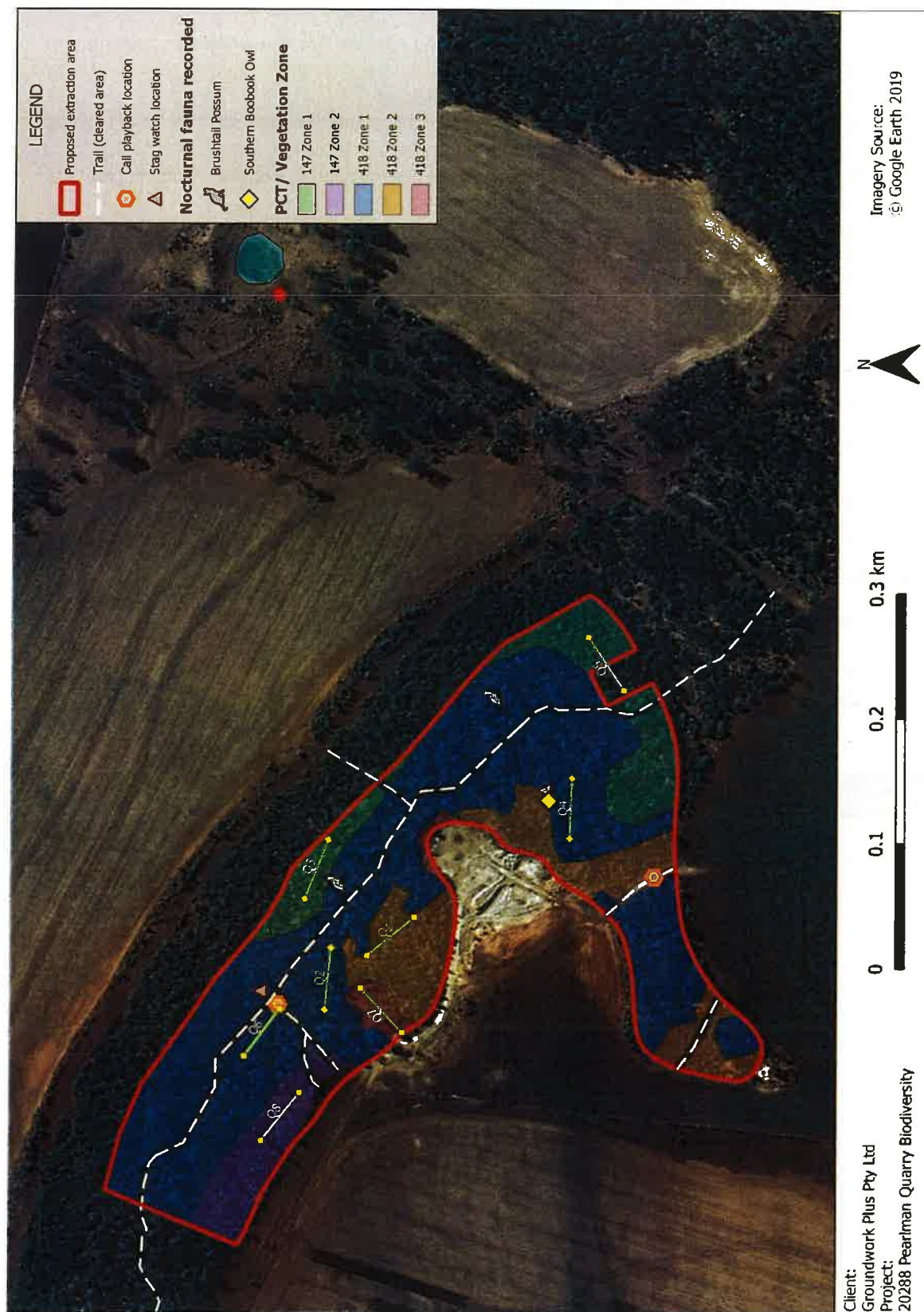


Figure 2.1: Location of quadrats and targeted fauna surveys (May 2019).

2.5 Threatened species data searches

Three data sources were used to compile a list of threatened species that may potentially occur at the proposal site. They include:

1. BAM calculator list of predicted and candidate species;
2. Atlas of NSW Wildlife database (BioNet) records of threatened species within a 20 km radius (locality) of the subject site; and
3. Commonwealth Department of the Environment and Energy (DoEE) website - Protected Matters Search Tool (PMST).

The BAM calculator may not import all potential threatened species that may occur at the proposal site. BioNet and PMST sources were used to provide a more complete list of threatened species recorded in the search area of the proposal site. For each threatened species recorded from BioNet and PMST searches, the habitat suitability of the proposal site was assessed taking into account a number of factors including:

- Structural and floral diversity;
- Occurrence and extent of habitat types in the general vicinity;
- Continuity with similar habitat adjacent to the site, or connection with similar habitat off site by way of corridors;
- Key habitat features such as tree hollows, water bodies, caves and crevices, rocky areas;
- Degree of disturbance and degradation; and
- Topographic features such as aspect and slope.

Each species was assigned with a rating (**Table 2.4**) based on their likelihood to occur within the proposal site. The habitat assessment is provided in **Appendix II**.

Table 2.4: Likelihood of occurrence criteria

Likelihood Rating	Criteria
Known	The species was recorded within the study area during site surveys.
High	It is likely that a species would inhabit or utilise habitat within the proposal site. Criteria for this category may include: <ul style="list-style-type: none">■ Species recently and/or regularly recorded in contiguous or nearby habitat.■ High quality habitat types or resources present within study area.■ Species is known or likely to maintain a resident population surrounding the study area.■ Species is known or likely to visit during migration or seasonal availability of resources.
Moderate	Potential habitat for a species occurs within the proposal site. Criteria for this category may include: <ul style="list-style-type: none">■ Species previously recorded in contiguous habitat albeit not recently (>10 years).■ Poor quality, depauperate or modified habitat types and/or resources present within study area.

Likelihood Rating	Criteria
	<ul style="list-style-type: none"> Species has potential to utilise habitat during migration or seasonal availability of resources. Cryptic flora species with potential habitat available within the proposal site that have not been seasonally targeted by surveys.
Low	<p>It is unlikely that the species inhabits the area and would likely be considered a transient visitor if ever encountered. Criteria for this category may include:</p> <ul style="list-style-type: none"> The proposal site or study area lacks specific habitat types or resources required by the species. The proposal site is beyond the current distribution of the species or is isolated from known populations. Non cryptic flora species that were found to be absent during targeted surveys. The proposal site only contains common habitat which would not be considered important for the local survival of a threatened species.
Unlikely	The habitat within proposal site and study area is unsuitable for the species.

2.6 Limitations

The effectiveness of a survey detecting a given species will be influenced by a range of factors. For this type of survey, such limitations are generally related to the short period of time in which the fieldwork was carried out during a single season. Given the small period spent within the study area, the detection of certain species may be limited by:

- Seasonal migration (particularly migratory birds);
- Seasonal flowering periods (some species are cryptic and are unlikely to be detected outside of the known flowering period);
- Seasonal availability of food such as blossoms;
- Weather conditions during the survey period (some species may go through cycles of activity related to specific weather conditions, for example some microchiropteran bats, reptiles and frogs can be inactive during cold weather); and
- Species lifecycle (cycles of activity related to breeding).

These limitations have been overcome by applying the precautionary principle in all cases where the survey methodology or impeded access to the impact area may have given a false negative result. All species have been assessed based on the presence of their habitat and the likely significance of that habitat to a viable local population.

3. LANDSCAPE CONTEXT

In accordance with Section 4.2 of the BAM (2017), this chapter identifies the landscape features within the proposal site and the assessment area surrounding the proposal site. **Table 3.1** provides an overview of the landscape context of the study area.

Table 3.1: Environmental context summary

Attribute	Description
LGA	Gwydir Shire Council
Local Land Service Division	North-West
Zoning	RU1 (Primary Production)
Catchment	Namoi River
IBRA Bioregion	Brigalow Belt South
IBRA Subregion	Northern Outwash
Characteristic landforms¹	Sloping plains with alluvial fans that are coarser and steeper than the Gwydir Fans downstream.
Typical Soils²	<p>Gurley (guo): This soil landscape covers level plains to undulating rises of Pleistocene alluvium adjacent to bedrock hills forming extensive alluvial/colluvial fans in the eastern Moree Plains. This soil landscape covers most of the subject site (excluding the crests of hills). Soils are very deep (>150 cm), moderately well-drained to imperfectly drained, Epipedal to self-mulching, Brown and Grey Vertosols. Local relief varies 1-9 m with slopes 1-3%.</p> <p>Manamoi (moj): This soil landscape Footslopes and gently undulating rises to low hills of Tertiary basalt. At the subject site it is restricted to Death Adder Hill. Soils are deep to very deep (>150 cm), moderately well-drained, self-mulching Black Vertosols (Black Earths) on slopes and imperfectly to poorly-drained self-mulching Grey Vertosols (Grey Clays) on lower slopes. Local relief varies 5-50 m with slopes 3-10%.</p> <p>Black Hill (bhw): This soil landscape covers isolated rolling rises of Tertiary basalt caps and stony outcrops. At the subject site it is restricted to an existing quarry located on an isolated hill, west of Death Adder Hill. Soils are Shallow to moderately deep (<150 cm), well-drained to moderately well-drained Brown, Grey and Black. Local relief varies 10-50 m with slopes 10-25%.</p>
BioNet NSW Landscapes	Kaputar Slopes (Kps) and Liverpool Alluvial Plains (Lip)
Groundwater Dependent Ecosystems (GDE)	No GDEs are known to occur at the subject site.
Rivers and streams	No rivers or streams cross the proposal site. Tackinbri Creek flows just outside of the subject site along the southern boundary.
Wetlands	Not applicable
Areas of Geological Significance and Soil Hazards	Not applicable
Areas of Outstanding Biodiversity Value	Not applicable
Nearest NPWS reserve	Planchonella Nature Reserve, located 25 km south east

¹ Description from Brigalow Belt South - Northern Outwash subregion (OEH, 2018).

² Description from SLAM Soil Landscape Report for Moree Plains v 1.0.1

3.1 Connectivity

At the proposal site, linear vegetated corridors, partly broken by cleared areas provide fragmented connectivity south to Tackinbri Creek riparian corridor. Paddock trees and tree coverage in road corridors provide 'stepping stones' which help support highly mobile species such as birds move across the landscape. Impacts to habitat connectivity are discussed in **Section 6.4.1**.

3.2 Assessing native vegetation cover

Using the Border Rivers Gwydir / Namoi Region (Version 2.0) VIS ID 4467, native vegetation cover on the proposal site and within 1500 m of the outside boundary was considered as per the BAM. The total assessment area is 4129.43 ha, **Table 3.2** shows that 10 PCTs occur and cover a total area of 853.53 ha. Native vegetation cover was assigned as 20.67% in the BAM calculator. Note, vegetation cover in the assessment area is based on aerial photo interpretation recorded in the Croppa Creek area in 2009. The cover of native vegetation in the assessment is likely to be < 20.67% due to incremental clearing of native vegetation since the year 2009.

Table 3.2: Vegetation in the 1500 m assessment area

PCTs in the assessment area	Sum of area (ha)	% of cover
WOODY VEGETATION COVER		
27	91.85	2.22
35	226.39	5.48
36	63.42	1.54
55	82.61	2.00
56	51.68	1.25
224	9.45	0.23
378	0.94	0.02
418	100.38	2.43
429	0.19	0.00
597	13.37	0.32
Total woody vegetation cover	640.27	15.51%
NON-WOODY VEGETATION COVER		
Candidate Native Grasslands	213.27	5.16
Total Native Vegetation Cover	853.53	20.67
Not Native	3275.90	79.33
GRAND TOTAL	4129.43	100

3.3 Assessing patch size

The area of intact native vegetation that occurs on the development site and adjoining land that is not part of the development site was calculated. In assessing patch size, as per the BAM, patches of woody vegetation were assessed as separate patches when > 100 m from the next area of moderate to good condition native vegetation. One isolated patch of vegetation was identified on the ridge line with a patch size > 100 ha, that is the proposal area (see **Figure 1.2**).

4. NATIVE VEGETATION

This chapter identifies and describes the most likely PCTs and TECs within the proposal site and assesses vegetation integrity based on methods detailed in **Section 2.3.1**.

4.1 Plant community types

Two PCTs were identified within the proposal area, a description is provided in **Table 4.1** and **4.2**. A full list of species recorded during the field survey is provided in **Appendix I**.

Table 4.1: Description of Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion on site

PCTID	PCT 147
Estimate of % cleared	83% (based on the VIS classification database)
Area (ha)	1.73
BC Act Status	Endangered: Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions (Part)
EPBC Act Status	Endangered: Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions (Part)
Vegetation Formation	Rainforests
Vegetation Class	Western Vine Thickets
Identifying features and occurrence on site	This PCT occurs along the lower slopes of the ridge. At the proposal site, the community resembles a dry rainforest made up of vines, shrubs and trees. The community occurs in two different condition classes (discussed below). Vegetation is well developed and includes mature trees. Low canopy species include <i>Geijera parviflora</i> (Wilga), <i>Ehretia membranifolia</i> (Peach Bush) and <i>Notelaea macrocarpa</i> (Native Olive). Emergent <i>Eucalyptus melanophloia</i> (Silver-leaved Ironbark) occurs infrequently in Zone 1, while is characteristic in Zone 2. The shrub stratum includes <i>Carissa ovata</i> (Currant Bush) and <i>Croton phebaloides</i> (while the ground layer consists of various chenopods and grasses including <i>Enchylaena tomentosa</i> (Ruby Saltbush) and <i>Paspalidium gracile</i> (Slender Panic).
Emergent (to 10m)	<i>Geijera parviflora</i> (Wilga), <i>Notelaea macrocarpa</i> (Native Olive), <i>Ehretia membranifolia</i> (Peach Bush) and <i>Alstonia constricta</i> (Quinine Tree).
Shrubs (0.5 0-2m)	<i>Croton phebaloides</i> , <i>Eremophila mitchellii</i> (Budda), <i>Beyeria viscosa</i> (Sticky Wallaby Bush), <i>Abutilon oxycarpum</i> (Straggly Lantern-bush), <i>Spartothamnella juncea</i> (Bead Bush), <i>Capparis mitchellii</i> (Wild Orange) and <i>Carissa ovata</i> (Currant Bush).
Goundcover (0-0.5m)	<i>Enchylaena tomentosa</i> (Ruby Saltbush), <i>Rhagodia spinescens</i> (Fragrant Saltbush), <i>Sclerolaena diacantha</i> , <i>Einadia nutans</i> (Climbing Saltbush), <i>Portulaca oleracea</i> (Purslane), <i>Aristida ramosa</i> (Purple Wiregrass), <i>Austrostipa scabra</i> (Speargrass), <i>Chloris ventricosa</i> (Tall Chloris) and <i>Paspalidium gracile</i> (Tussock Grass).
Vines	<i>Parsonsia eucalyptophylla</i> (Gargaloo), <i>Pandorea pandorana</i> (Wonga Wonga Vine), <i>Jasminum lineare</i> (Desert Jasmine) and <i>Desmodium varians</i> (Slender Tick-trefoil).

Weeds	<p>Weed occurrence was relatively minor, however groundcover weeds occur in high density in areas where the subject to ground disturbance and where canopy is open. Species include: <i>Brassica tournefortii</i> (Mediterranean Turnip), <i>Malvastrum americanum</i> (Spiked Malvastrum), <i>Medicago laciniata</i>, <i>Physalis ixocarpa</i> (Ground Cherry), <i>Brassicaceae sp.</i> and <i>Sonchus oleraceus</i>. <i>Lycium ferocissimum</i> (African Boxthorn) and <i>Optunia sp.</i> occur in relative low density.</p>
Condition	<p>Two condition classes of vegetation are described:</p> <ul style="list-style-type: none"> Zone 1: Very good condition occurs on the north west side of the proposal area (see Photo 1). A total of 45 native species were recorded in quadrats. Vegetation is structurally complex with a presence of large trees, dead wood and leaf litter. The canopy is dominated by <i>Ehretia membranifolia</i> (Peach Bush), <i>Geijera parviflora</i> (Wilga) and <i>Notelaea macrocarpa</i> (Native Olive). Zone 2: Very good condition vegetation occurs on the south east side of the proposal area (see Photo 2). A total of 31 native species were recorded in quadrats. The canopy is dominated by <i>G. parviflora</i> (Wilga), <i>E. melanophloia</i> (Silver-leaved Ironbark) also occurs frequently as an emergent.



Photo 1: PCT 147 Zone 1 (very good condition).



Photo 2: PCT 147 Zone 2 (very good condition).

Table 4.2: 418: White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion

PCTID	PCT 418
Estimate of % cleared	25% (based on the VIS classification database)
Area (ha)	6.98
BC Act Status	N/A
EPBC Act Status	N/A
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation Class	North-west Slopes Dry Sclerophyll Woodlands
Identifying features and occurrence on site	This PCT occurs along the central ridge line of the proposal area. At the proposal site, the community resembles a tall open forest dominated by <i>Eucalyptus melanophloia</i> (Silver-leaved Ironbark). Most <i>E. melanophloia</i> trees > 50 cm in stem diameter are hollow bearing. Low canopy species including <i>Notolaca macrocarpa</i> (Native Olive), <i>Alstonia constricta</i> (Quinine Tree) and <i>Geijera parviflora</i> (Wilga) are interspersed throughout all condition classes of the PCT. <i>Callitris glaucophylla</i> (White Cypress Pine) and <i>Casuarina cristata</i> (Belah) occur infrequently, however are more common in the south west proportion of the project area. The shrub stratum is dominated by <i>Beyeria viscosa</i> (Sticky Wallaby Bush) and <i>Croton phebaloides</i> , while the ground layer consists of various grasses and forbs including <i>Aristida ramosa</i> (Purple Wiregrass) and

	<i>Tetragonia tetragonioides</i> (Native Spinach). The community occurs in three different condition classes (described below).
Trees (to 20m)	<i>Eucalyptus melanophloia</i> (Silver-leaved Ironbark), <i>Notelaea macrocarpa</i> (Native Olive), <i>Alstonia constricta</i> (Quinine Tree) <i>Callitris glaucophylla</i> (White Cypress Pine) <i>Casuarina cristata</i> (Belah) and <i>Brachychiton populneus</i> (Kurrajong).
Low Canopy (to 15m)	<i>Notelaea macrocarpa</i> (Native Olive), <i>Alstonia constricta</i> (Quinine Tree) and <i>Geijera parviflora</i> (Wilga)
Shrubs (0.5-4m)	<i>Acacia buxifolia</i> (Box-leaf Wattle), <i>Beyeria viscosa</i> (Sticky Wallaby Bush) and <i>Croton phebaloides</i> , <i>Spartothamnella juncea</i> (Bead Bush) and <i>Euphorbia tannensis subsp. eremophila</i> (Desert Spurge).
Groundcover (0-0.5m)	<i>Aristida ramosa</i> (Purple Wiregrass), <i>Tetragonia tetragonioides</i> (Native Spinach), <i>Austrostipa verticillata</i> (Slender Bamboo Grass), <i>Sigesbeckia australiensis</i> , <i>Cynoglossum australe</i> , <i>Enchylaena tomentosa</i> (Ruby Saltbush), <i>Digitaria brownie</i> and <i>Einadia nutans</i> (Climbing Saltbush).
Vines	<i>Parsonsia eucalyptophylla</i> (Gargaloo), <i>Marsdenia viridiflora subsp. viridiflora</i> (Native Pear), <i>Jasminum lineare</i> (Desert Jasmine) and <i>Glycine clandestina</i> .
Weeds	Weed occurrence was relatively minor, however groundcover weeds occur in high density in areas where the subject to ground disturbance and where canopy is open. Species include: <i>Brassica tournefortii</i> (Mediterranean Turnip), <i>Malvastrum americanum</i> (Spiked Malvastrum), <i>Medicago laciniata</i> , <i>Physalis ixocarpa</i> (Ground Cherry), <i>Brassicaceae sp.</i> and <i>Sonchus oleraceus</i> . <i>Lycium ferocissimum</i> (African Boxthorn) and <i>Optunia sp.</i> occur in relative low density.
Condition	<p>Three condition classes of vegetation are described:</p> <ul style="list-style-type: none"> Zone 1: Very good condition vegetation occurs in the centre of the ridge line. (see Photo 1). A total of 50 native species were recorded in quadrats. This community is characterised by many large, hollow bearing <i>E. melanophloia</i> (Silver-leaved Ironbark) trees. Areas of this condition class include emergent <i>Callitris glaucophylla</i> (White Cypress Pine) and <i>Casuarina cristata</i> (Belah). Zone 2: Good condition vegetation occurs around the southern edges of the proposal area (see Photo 2). A total of 31 native species were recorded in quadrats. This area has been previously disturbed, and the community is regenerating and is characterised by low canopy species and shrubs such as <i>Acacia buxifolia</i> and <i>Geijera parviflora</i>. Groundcover is dominated by exotic forbs. Trees > 5 cm were absent from this vegetation zone and no regenerating <i>E. melanophloia</i> saplings were observed. Zone 3: Poor condition vegetation occurs in a small (0.19 ha) area on the southern edges of the proposal area (see Photo 3). A total of 21 native species were recorded in quadrats, including only one tree species (<i>Alstonia constricta</i>). The understorey is dominated by <i>Aristida ramosa</i> and exotic forbs such as <i>Medicago laciniata</i> and <i>Brassica tournefortii</i>.



Photo 3: PCT 418 Zone 1 (very good condition).



Photo 4: PCT 418 Zone 2 (good condition).



Photo 5: PCT 418 Zone 3 (poor condition).

4.2 PCT Selection

The State Type Vegetation Map (Border Rivers Gwydir / Namoi Region VIS 4467) indicated that PCT 418 (*White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion*) occurs across the proposal site. This PCT was found not to be representative of vegetation located on certain slopes along the ridgeline where a Western Vine Thicket forest was identified. These vegetation zones were identified as belonging to PCT 147 (*Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion*). Vegetation in these zones was consistent with the floristics of PCT 147, landform element and reported pre-European distribution. The State Type Vegetation Map also listed PCT 147 as the second most likely PCT identifier (as derived from a spatial model) over the proposal area. This PCT was also found to be consistent with both the State (BC Act) and Federally (EPBC Act) listed Endangered TEC: *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions*. The PCT meets all key characteristics of the EEC listed in **Section 4.3**.

4.3 Threatened Ecological Communities

PCT 147 (both vegetation zones recorded in the proposal area) is consistent with both the State (BC Act) and Federally (EPBC) listed Endangered TEC: *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions*. The PCT meets all key characteristics of the EEC listed in **Table 4.3**, identified by OEH (2010).

Table 4.3: Key characteristics of the Semi-evergreen Vine Thicket EEC

Diagnostic feature	Comments
Is the site in the Brigalow Belt South or Nandewar bioregions of NSW?	Yes, Brigalow Belt South
Is the vegetation a low dry rainforest or 'scrub' with vines present?	Yes, vines are common
Is the site on deep, loamy soils derived from basalt or other volcanic rocks?	Yes, basalt rock
Does the rainforest tree layer contain red olive plum, wilga, native olive or peach bush, often under a taller layer of white box, silver-leaved ironbark, belah, kurrajong and/or white cypress pine?	Yes, Wilga, Native Olive, Peach Bush, Belah, Kurrajong, Silver-leaved Ironbark and White Cypress Pine are present
Are there any plant species present at the site from those listed as characteristic?	Yes, dominant plants recorded are characteristic

All vegetation identified as belonging to PCT 147 is considered consistent with the Semi-evergreen Vine Thicket EEC. An Assessments of Significance for this EEC is provided in **Appendix III**. No other EECs that occur in the Northern Outwash sub region were identified within the proposal area.

4.4 Vegetation Integrity

Eight vegetation condition plots were undertaken within the proposal site and the summary of plot data is provided in **Table 4.4**. Plots were randomly positioned within the proposal area using random coordinates generated using geographical information system (GIS) software. Plots were randomly selected in each vegetation zone. The default bearing of each plot was south east, this was modified if vehicle trails or other recent anthropogenic disturbance to vegetation occurred inside plot boundaries.

Table 4.4: Vegetation integrity scores

	Composition						Structure				Function						
Plot ID	Tree	Shrub	Grass & grass like	Forb	Fern	Other	Tree	Shrub	Grass & grass like	Forb	Fern	Other	Number of large trees	Litter cover	Total length of fallen logs	Stems <5 cm DBH?	Vegetation integrity score & assigned class
Benchmark: PCT 147	5	12	7	8	1	5	64	41	29	4	0	5	6	70	48	Present	100
Plot 3	3	15	5	8	0	7	32	89.7	15.1	3.9	0	15.3	6	42	41	Present	82 -Zone 1
Plot 5	3	9	5	6	0	8	25	78.1	9.2	14.3	0	46	3	45	41	Present	
Plot 8	4	13	5	4	0	5	19.1	52.9	11.3	7.2	0	21.7	8	68	40	Present	76.2 - Zone 2
Benchmark: PCT 418	5	8	9	11	1	3	60	21	31	7	1	2	3	50	33	Present	100
Plot 2	3	8	7	6	0	1	30	23.3	9.2	4.4	0	0.5	2	48.8	47	Present	76.5 - Zone 1
Plot 4	3	13	5	5	0	3	23	13.2	12.7	4.5	0	15.2	3	28	87	Present	
Plot 6	3	8	6	7	0	3	20	48.5	20.5	23.4	0	1.2	2	46	38	Present	
Plot 1	2	12	6	8	1	2	4.5	17.8	11.1	2.1	0.1	0.4	0	12.2	6	Present	35.3 - Zone 2
Plot 7	1	7	7	4	0	2	1	7.7	18.8	0.8	0	0.2	0	4.4	0	Present	30.1 - Zone 3

4.5 Fauna habitat

Fauna habitat resources are present throughout the proposal site, including within the proposal footprint. Key habitat features recorded within the proposal site include:

- Trees and shrubs may provide foraging and nesting habitat for a range of birds, mammals and reptiles, in particular;
- Hollow bearing trees provide nesting and shelter habitat for birds, owls, possums and microchiropteran bats;
- Fallen timber including hollow logs provide habitat for fauna including invertebrate species dependent on decaying wood;
- Ground cover including leaf litter, grassy tufts, and dead wood may provide habitat and cover for a range of small terrestrial species; and
- Rocks including loose boulders provide shelter for small terrestrial species such as the Prickly Gecko (**Photo 6**).



Photo 6: Prickly Gecko (*Heteronotia binoei*) found sheltering under a small loose boulder.

4.5.1 Habitat Trees

A total of 40 hollow bearing trees with 81 hollows were recorded within the proposal area (marked in **Figure 4.1**). This estimation does not include all potential habitat trees in the proposal area or at the proposal site. Most *Eucalyptus melanophloia* (Silver-leaved Ironbark) trees > 50cm in stem diameter contained at least one hollow. **Table 4.5** shows that out of the 81 hollows recorded in the proposal area, 42 had a small entrance diameter (2-5cm), 17 had medium entrances (5-10cm) and 22 had large entrances (>10cm).

Table 4.5: Hollow bearing trees recorded in the proposal area

Tree No. (Figure 4.1)	Footprint	Easting	Northing	Veg zone	Species	DBH	S ¹	M ²	L ³
1	Y	242148	6787442	418_Z1	<i>Eucalyptus melanophloia</i>	52	2		
2	Y	242110	6787442	418_Z1	Stag	65	2		1
3	Y	242122	6787437	418_Z1	<i>E. melanophloia</i>	75		1	1
4	Y	242130	6787442	418_Z1	Stag	26			1
5	Y	242142	6787503	418_Z1	<i>E. melanophloia</i>	65			2
6	Y	242141	6787503	418_Z1	<i>E. melanophloia</i>	100		1	1
7	Y	242146	6787484	418_Z1	<i>E. melanophloia</i>	48			1
8	Y	242233	6787457	147_Z1	<i>E. melanophloia</i>	52	1		
9	Y	242231	6787463	147_Z2	Stag	27		2	
10	Y	242294	6787253	418_Z1	<i>E. melanophloia</i>	72		1	2
11	Y	242256	6787245	418_Z1	<i>E. melanophloia</i>	54	2		
12	Y	242266	6787241	418_Z1	<i>E. melanophloia</i>	49	1	1	
13	Y	242267	6787263	418_Z1	<i>E. melanophloia</i>	66	2		1
14	Y	242319	6787260	418_Z1	<i>E. melanophloia</i>	57		2	1
15	Y	242333	6787256	418_Z1	<i>E. melanophloia</i>	80	1	1	1
16	N	242390	6787206	147_Z1	<i>Notelaea microcarpa</i>	38	2		
17	Y	242111	6787491	418_Z1	<i>E. melanophloia</i>	52	1		
18	Y	242095	6787496	418_Z1	Stag	27	1		
19	Y	242077	6787502	418_Z1	<i>E. melanophloia</i>	59	1		
20	Y	242069	6787534	418_Z1	<i>E. melanophloia</i>	70			1
21	Y	242054	6787519	418_Z1	<i>E. melanophloia</i>	79		1	
22	Y	242046	6787537	418_Z1	<i>E. melanophloia</i>	72			1
23	Y	242036	6787494	147_Z2	<i>E. melanophloia</i>	62			1
24	Y	242377	6787308	418_Z1	<i>E. melanophloia</i>	75	1	3	
25 (bats) ⁴	Y	242085	6787418	418_Z1	Stag	44	4		
26	Y	242178	6787179	418_Z1	<i>E. melanophloia</i>	90	2		1
27	Y	242309	6787162	418_Z1	<i>E. melanophloia</i>	90		2	1
28	N	242363	6787315	Outside	Stag	80			1
29	Y	242351	6787189	418_Z1	<i>E. melanophloia</i>	80			1
30	Y	242087	6787421	147_Z1	Stag	50	1		1
31	Y	242011	6787494	418_Z1	Stag	80	4		
32	Y	242022	6787502	147_Z2	<i>E. melanophloia</i>	52	1	1	
33	Y	242029	6787500	147_Z2	<i>E. melanophloia</i>	58	1		
34	Y	242092	6787404	147_Z2	<i>E. melanophloia</i>	54	2		
35	Y	242148	6787442	418_Z1	<i>E. melanophloia</i>	108	1		1
36	Y	241999	6787606	418_Z1	<i>E. melanophloia</i>	50-79	1		
37	Y	242006	6787608	418_Z1	<i>E. melanophloia</i>	50-79	2		

38	Y	241979	6787562	418_Z1	<i>E. melanophloia</i>	50-79	2		
39	Y	242370	6787261	418_Z1	<i>E. melanophloia</i>	>80	3	1	1
40	Y	242349	6787328	418_Z1	Stag	30-49	1		
Total number of hollows recorded (inside the proposal area)							40	17	21
Total number of hollows recorded							42	17	22

¹ Small sized hollow openings (i.e. 2-5cm) suitable for species such as microchiropteran bats

² Medium sized hollow openings (i.e. 5-10cm) suitable for species such as gliders and possums

³ Large sized hollow openings (i.e. >10cm) suitable for large birds and owls

⁴ 114 microbats were observed leaving multiple small hollows/fissures in this stag



Photo 7: Common Brushtail Possum (*Trichosurus vulpecula*) resting on a *Eucalyptus melanophloia* (Silver-leaved Ironbark) in the proposal area. The Common Brushtail Possum requires large tree hollows (>10 cm) for shelter and nesting.

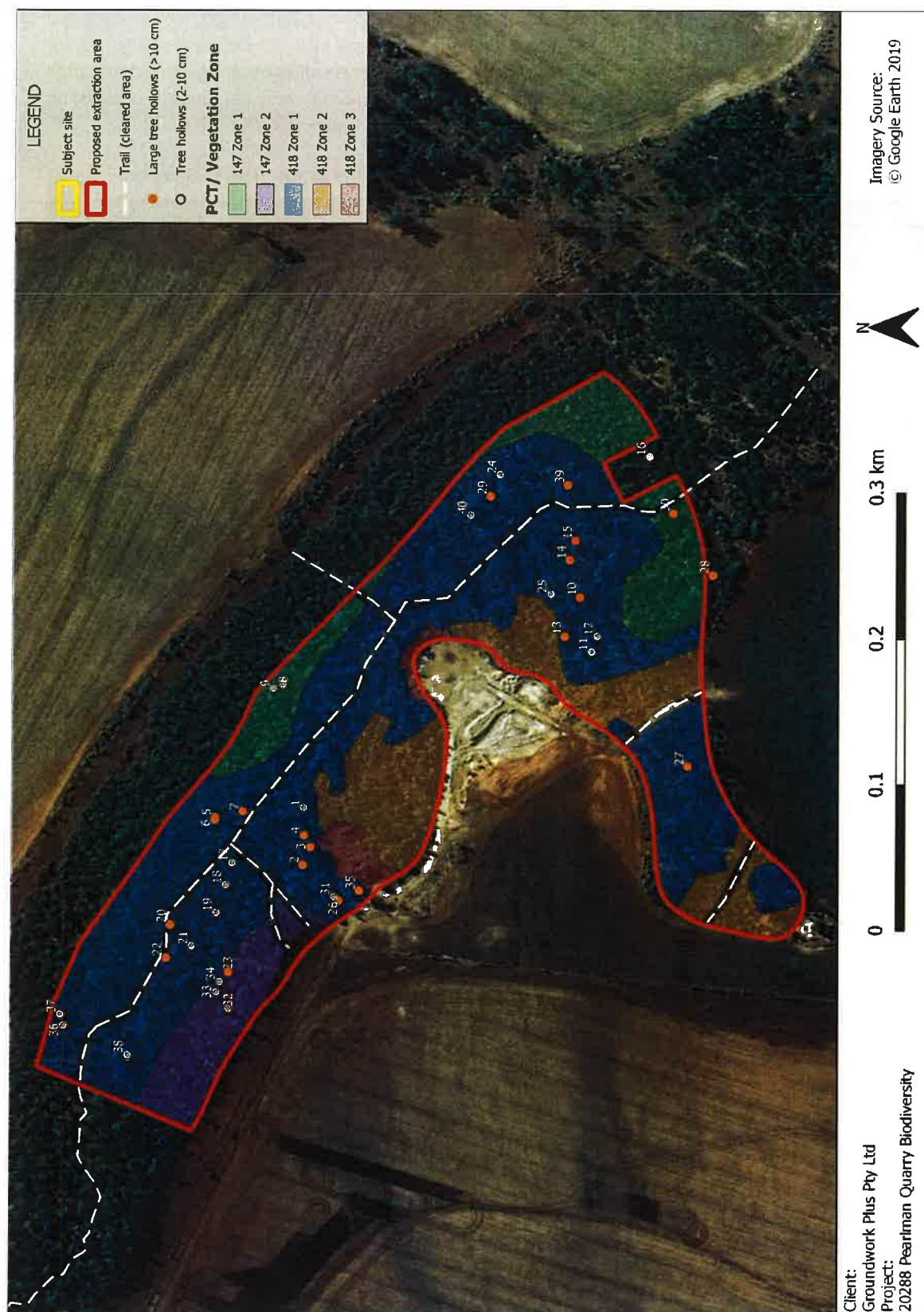


Figure 4.1: Location of hollow bearing trees recorded in the proposal area.

4.6 Weeds

Three State priority weed species were recorded within the proposal site. The control categories for each of these species are detailed below in **Table 4.6**. Priority weeds should be managed in accordance with the *North-West LLS Regional Strategic Management Plan* (2017) and safeguards detailed in **Section 6** to minimise their impact and ensure compliance with the *Biosecurity Act 2015*.

Table 4.6: Priority weeds recorded in the proposal area for the North-West LLS region.

Species	State priority	Mandatory Measure ¹	WoNS? ²	HTE? ³	Occurrence
<i>Lycium ferocissimum</i> (African boxthorn)	Asset Protection	A person must not, import into the State or sell.	Y	Y	Occurs in low density throughout the proposal area
<i>Opuntia stricta</i> (Prickly Pear)	Asset Protection	A person must not, import into the State or sell.	Y	Y	Occurs in low density throughout the proposal area

¹ Mandatory Measure (Division 8, Clause 33, *Biosecurity Regulation 2017*)

² Weed of National Significance

³ High Threat Exotic (HTE) cover is assigned in the function attribute of the BAM calculator. A list of HTE is available from: <https://www.lmbc.nsw.gov.au/bamcalc>

Weeds on site require appropriate controls in order to comply with the *Biosecurity Act 2015*. Groundwork Plus and any contractors must ensure that all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

5. THREATENED SPECIES

This chapter assesses habitat suitability for threatened species including ecosystem credit species associated with habitat and species credit species associated with the site context. The results of targeted surveys for candidate threatened species are also provided.

5.1 Threatened Species for Assessment

Using six criteria (listed below), the BAM Credit Calculator identified that 12 candidate species (species credit species) and 21 predicted species (ecosystem credit species) that required consideration for assessment. This preliminary list is generated where all six criteria were met. The calculator maintains assessment species where information for a species was not available for a certain criterion.

The BAM Credit Calculator determined candidate species for assessment based on the following six criteria (BAM, 2017):

1. The distribution of the species includes the IBRA subregion which the subject land is mostly located in (Northern Outwash IBRA subregion);
2. The study area is within any geographic constraints of the distribution of the species within the IBRA subregion;
3. The species is associated with any of the PCTs identified within the study area;
4. The native vegetation cover within an assessment area including a 1500m buffer around the study area is equal to or greater than the minimum required for the species;
5. The patch size that each vegetation zone is part of is equal to or greater than the minimum required for that species; and
6. The species is identified as an ecosystem or species credit species in the Threatened Biodiversity Data Collection.

5.1.1 Species Credit Species

Species credit species cannot be confidently predicted by vegetation surrogates and landscape features; however, can be reliably detected by survey (BAM, 2017). These species are assessed according to habitat suitability and are recorded as either present or absent. Species may be recorded as present if detected during field assessment or assumed as present (including by expert report). Where a species is assumed present during a BDAR (not by expert report), the species polygon must encompass the entire vegetation zone/s within which the candidate species is predicted to use/occur.

Species credit species were assessed as absent from the proposal site if:

- There were habitat/geographical constraints (including those generated from the BAM calculator);
- The species was not recorded during site assessment visits (during the specified survey period); or
- If according to BAM Section 6.4.1.17, habitat was assessed as substantially degraded, such that the species is unlikely to utilise the proposal site (or specific vegetation zones).

Table 5.1 outlines the assessment of limitations to determine whether or not species were maintained as candidate species. Surveys were undertaken during May, October and December. All candidate species were surveyed in the required survey periods specified in the BAM calculator. No candidate species were identified in the proposal area.

Table 5.1: Validation of species credit (candidate) species

Scientific name/ Common name	BAM habitat constraints	BAM geographic limitations	Habitat degraded?	BAM required period(s) surveyed	Confirmed candidate species?	Species habitat, ecology and justification of candidate species status
FAUNA						
<i>Calyptorhynchus lathamii</i> Glossy Black-Cockatoo	Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground.	-	-	May	No: surveyed	The Glossy Black-Cockatoo inhabits open forest and woodlands and feeds on the seeds of <i>Casuarina</i> and <i>Allocasuarina</i> species. <i>Casuarina cristata</i> , a known food plant and at least 20 trees with large hollows > 5 m above the ground were identified at the proposal site. Despite the presence of suitable habitat, this species was not recorded during field assessments.
<i>Hoplocephalus bitorquatus</i> Pale-headed Snake	-	-	Yes	November, December	No: Habitat degraded (and surveyed)	The Pale-headed Snake is a cryptic species that can spend weeks at a time hidden in tree hollows. It is found mainly in dry eucalypt forests, woodlands, and cypress forest. This species is predicted to occur within 500 m of moderate to good vegetation.
<i>Lophoictinia isura</i> Square-tailed Kite	-	-	-	October	No: surveyed	The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. No large stick nests indicative of historical breeding was recorded within the proposal area. Kites need to be present to determine breeding.
<i>Ninox connivens</i> Barking Owl	Living or dead trees with hollows greater than 20cm diameter.	-	-	May, October and December	No: surveyed	22 large tree hollows, which may support the Barking Owl were recorded in the proposal area. In addition, tree hollows (including hollows with large entrances) were recorded in vegetation surrounding the proposal area. The proposal area contains suitable habitat in which the Barking Owl is predicted to use for breeding, shelter or foraging.

Scientific name/ Common name	BAM habitat constraints	BAM geographic limitations	Habitat degraded?	BAM required period(s) surveyed	Confirmed candidate species?	Species habitat, ecology and justification of candidate species status
<i>Phascogale</i> <i>cinereus</i> Koala	-	-	-	May, October and December	No: surveyed, (and geographical constraints)	Vegetation in the proposal area is isolated from large habitat patches with known Koala populations. Woody native vegetation cover in the assessment area is low (15.5%) which may limit movement of individuals to the proposal site. There are isolated recordings of Koalas at North Star and Croppa Creek from as recent as 2015. A small number of <i>Eucalyptus populinea</i> (Bimble Box), a Koala feed tree were recorded in the proposal area. No evidence of Koala occupation was observed at the proposal site.
<i>Pteropus</i> <i>poliocephalus</i> Grey-headed Flying-fox (Breeding)	Breeding camps	-	-	-	No: habitat constraints (no known local breeding camps)	The Grey-headed Flying-fox is a dual credit because foraging habitat is broad ranging but breeding camps are localised. No breeding camps were recorded within the subject site or are known from the local area.
<i>Hieraeetus</i> <i>morphnoides</i> Little Eagle (Breeding)	Nest trees - live (occasionally dead) large old trees within vegetation.	-	-	October	No: surveyed	The Little Eagle requires nest trees - live (occasionally dead) large old trees within vegetation. Paddock trees are known to provide important breeding habitat. Breeding habitat includes the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy. No large stick nests indicative of historical breeding was recorded within the proposal area.
<i>Haliaeetus</i> <i>leucogaster</i> White-bellied Sea-Eagle	-	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	-	October	No: surveyed	The White-bellied Sea-Eagle is highly selective in nesting locations. Breeding habitat is live large old trees within 1km of a rivers, lake, large dams (present at the proposal site) or creeks, wetlands and coastlines. Presence of a large stick nest within tree canopy is required; or an adult with nest material; or adults observed duetting within breeding period. No large stick nests indicative of historical breeding was recorded within the proposal area.

FLORA



<i>Scientific name</i> Common name	BAM habitat constraints	BAM geographic limitations	Habitat degraded?	BAM required period(s) surveyed	Confirmed candidate species?	Species habitat, ecology and justification of candidate species status
<i>Homopholis belsonii</i> Belson's Panic	-	-	-	December	No: surveyed	Belson's Panic grows under shrubs and trees and tends to prefer slightly modified environments. The habitat and ecology of this species is poorly known. This species was not recorded during field assessments.
<i>Dichanthium setosum</i> Bluegrass	-	-	-	May	No: surveyed	Bluegrass is an upright grass less than 1 m tall. The grass is often found in moderately disturbed areas and is associated with heavy basaltic black soils and red-brown loams with clay subsoil. Marginal habitat that could support this species is available at the proposal site. This species was not recorded during field assessments.
<i>Polygala linarifolia</i> Native Milkwort	-	-	-	October, December	No: surveyed	Native Milkwort is an annual or perennial herb about 20 cm high with upright branches. The plant grows on sandy soils in dry eucalypt forest and woodland with a sparse understorey and has been recorded from the Inverell-Torrington districts and Pilliga area (not near the proposal site). This species was not recorded during field assessments.
<i>Tylophora linearis</i>	-	-	-	May	No: surveyed	<i>Tylophora linearis</i> is a slender, almost hairless twiner with purple flowers. The species grows in low-altitude sedimentary flats in dry woodlands of <i>Eucalyptus fibrosa</i> , <i>E. sideroxylon</i> , <i>E. albens</i> , <i>Callitris endlicheri</i> , <i>C. glaucophylla</i> and <i>Allocasuarina luehmannii</i> . Landform/species assemblage at the proposal site is not consistent with habitat the twiner is associated with. This species was not recorded during field assessments.

5.1.2 Ecosystem Credit Species

Targeted surveys are not required for ecosystem credit species because the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features (BAM, 2017). The BAM calculator determines biodiversity credits for these species using the vegetation integrity score for each vegetation zone. **Table 5.2** lists ecosystem credit species predicted to occur on site. Potential habitat is available for all predicted species; hence, they were maintained as ecosystem credits in the calculator.

One ecosystem species, the Black-striped Wallaby (*Macropus dorsalis*) was recorded in the proposal area. This species was frequently encountered during diurnal and nocturnal searches, including identified with pouch young (see **Photo 8**).

Table 5.2: Ecosystem candidate species

Species	NSW listing status ¹ (BC Act)	National listing status ¹ (EPBC Act)
FAUNA		
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	V	
<i>Calyptorhynchus lathamii</i> Glossy Black-Cockatoo	V	
<i>Chalinolobus picatus</i> Little Pied Bat	V	
<i>Chthonicola sagittata</i> Speckled Warbler	V	
<i>Circus assimilis</i> Spotted Harrier	V	
<i>Daphoenositta chrysoptera</i> Varied Sittella	V	
<i>Grantiella picta</i> Painted Honeyeater	V	V
<i>Hieraaetus morphnoides</i> Little Eagle (Foraging)	V	
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	V	
<i>Lophoictinia isura</i> Square-tailed Kite	V	
<i>Macropus dorsalis</i> Black-striped Wallaby	E	
<i>Melanodryas cucullata cucullata</i> Hooded Robin (south-eastern form)	V	
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater (eastern subspecies)	V	

Species	NSW listing status ¹ (BC Act)	National listing status ¹ (EPBC Act)
<i>Neophema pulchella</i> Turquoise Parrot	V	
<i>Nyctophilus corbeni</i> Corben's Long-eared Bat	V	V
<i>Ninox connivens</i> Barking Owl	V	
<i>Phascolarctos cinereus</i> Koala	V	V
<i>Pomatostomus temporalis temporalis</i> Grey-crowned Babbler (eastern subspecies)	V	
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheathtail-bat	V	
<i>Stagonopleura guttata</i> Diamond Firetail	V	

¹ E - Endangered; V - Vulnerable



Photo 8: A Black-striped Wallaby (with a joey in the pouch) recorded during a nocturnal survey in the proposal area

5.2 Threatened Species Search Area Results

Table 5.3 shows that database searches for the proposal site identified 29 threatened species with the potential to occur within the search area (20 km radius around the proposal site). Three out of the twelve candidate species were recorded in the search area, including:

- *Homopholis belsonii* (Belson's Panic);
- *Phascolarctos cinereus* (Koala); and
- *Hieraaetus morphnoides* (Little Eagle).

An additional 26 threatened species were identified in the search area results but not on the BAM candidate species list. A habitat assessment determining the likelihood of these species to be impacted by the proposed works is provided in **Appendix II**. Given habitat and geographic constraints, none of these additional threatened species were considered likely to occur at the proposal site. Species identified with a moderate or high potential at occurring in the proposal area were either candidate species already considered in this assessment or classified as ecosystem species.

Table 5.3: Threatened species that may occur in the local area

Scientific Name	Common Name	BC Act ¹	EPBC Act ¹	Records ²	Potential occurrence
Flora					
<i>Cadellia pentastylis</i>	Ooline	V	V	0	Low
<i>Desmodium campylocaulon</i>	Creeping Tick-trefoil	E		1	Low
<i>Dichanthium setosum</i>	Bluegrass	V	V	0	Low
<i>Digitaria porrecta</i>	Finger Panic Grass	E		1	Low
<i>Homopholis belsonii</i>	Belson's Panic	E	V	4	Low
<i>Thesium australe</i>	Austral Toadflax	V	V	0	Low
<i>Tylophora linearis</i>		V	E	0	Low
Aves					
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	0	Low
<i>Callidris ferruginea</i>	Curlew Sandpiper	E	CE	0	Low
<i>Chthonicola sagittata</i>	Speckled Warbler	V		1	Moderate
<i>Circus assimilis</i>	Spotted Harrier	V		2	Moderate
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		2	Moderate
<i>Erythrorhynchus radiatus</i>	Red Goshawk	CE	V	0	Low
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	CE	V	0	Low
<i>Grantiella picta</i>	Painted Honeyeater	V	V	4	Moderate
<i>Hieraaetus morphnoides</i>	Little Eagle	V		2	Moderate
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		2	Moderate
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		3	Moderate
<i>Rostratula australis</i>	Australian Painted Snipe	E	E	0	Low
Fish					
<i>Maccullochella peelii</i>	Murray Cod		V	0	Low
Mammalia					
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat		V	0	Low
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	0	Low
<i>Macropus dorsalis</i>	Black-striped Wallaby	E		3	Low

<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	0	Moderate
<i>Phascogale carolinensis</i>	Koala	V	V	11	Moderate
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	0	Low
<i>Saccolaimus flaviventris</i>	Yellow-bellied Shearwater	V		1	High
Reptilia					
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	E	V	0	Low
<i>Urolophosaurus</i>	Border Thick-tailed Gecko	V	V	0	Low

¹ Status Abbreviations: V - Vulnerable, E - Endangered, CE - Critically Endangered.

² Number of OEH wildlife atlas records in selected area Approx. 20km radius [North: -28.70 West: 149.99 East: 150.81 South: -29.31]

5.3 Results of Targeted Field surveys for Candidate Species

To determine the impacts of development on candidate species identified at the proposal site, the BAM Calculator assesses the habitat condition within mapped species polygons and biodiversity risk weighting for species contained in the Threatened Biodiversity Collection. Based on the species sensitivity to loss, the BAM Credit Calculator generates credit calculations. No candidate species were recorded in the proposal area; hence no species credits are required to be offset.

5.3.1 Survey Effort

A summary of the time spent during fieldwork and the prevailing weather conditions is summarised below in **Table 5.4**. Weather data is recorded from Moree Aero (station 053115), located 71 km south west of the proposal site.

Table 5.4: Survey dates, times, activities and weather conditions

Date	Time	Activity	Weather (Temp/ relative humidity)		
			9am	3pm	Rain mm
21.05.19	11.00-19.30	General site inspection	Mostly clear	Mostly clear	0
		Vegetation survey	11.4°C	21.6°C	
		Opportunistic searches and sightings	56%	33%	
		Targeted candidate species survey (according to Table 5.5, 5.6)			
		Stag watching			
		Nocturnal survey			
22.05.19	08.00-19.30	Vegetation survey	Mostly clear	Mostly clear	0
		Diurnal bird search	12.9°C	20.0°C	
		Opportunistic searches and sightings	55%	33%	
		Stag watching			
		Nocturnal survey			
23.05.19	07.30-12.00	Vegetation survey	Mostly clear	Mostly clear	0
		Opportunistic searches and sightings	13.9°C 55%	23.5°C 29%	

Date	Time	Activity	Weather (Temp/ relative humidity)		
			9am	3pm	Rain mm
28.10.19	14:00-21:00	▪ Opportunistic searches and sightings	Mostly clear 22.2°C	Mostly clear 30.5°C	0
		▪ Targeted candidate species survey (according to Table 5.5, 5.6)	36%	8%	
29.10.19	15:00-21:00		Mostly clear 21.5°C	Mostly clear 29.8°C	0
			45%	8%	
30.10.19	16:00-21:00		Mostly clear 20.9°C	Mostly clear 26.7°C	0
			52%	19%	
31.10.19	17:00-21:30		Mostly clear 24.4°C	Mostly clear 28.7°C	0
			42%	34%	
1.11.19	17:00-21:00		Partly cloudy 22.2°C	Partly cloudy 30.9°C	0
			45%	21%	
09.12.19	5:30-19:30	▪ Opportunistic searches and sightings	Mostly clear 27.2	Mostly clear 37.9	0
		▪ Targeted candidate species survey (according to Table 5.5, 5.6)	43%	17%	

5.3.2 Flora

No threatened/candidate flora species were recorded at the proposal site during seasonal surveys undertaken in May, October and December 2019. All four candidate flora species were surveyed during months listed on the BAM-C/species Bionet profiles. The survey methodology followed any survey requirement (see Table 5.5) including in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). A list of all plant species recorded during fieldwork is listed in Appendix I.

Table 5.5: Survey methodology undertaken for candidate flora species

Species	Survey requirements ¹	Period surveyed and effort ²	Survey methodology/ results	Outcome
<i>Homopholis belsonii</i> Belson's Panic	Use flowers to locate. Species grows under shrubs and trees and can be easily overlooked.	December 1 day/ 6 hours (three people)	Parallel field traverses (10 m apart): The proposal site was drought affected at the time of survey. A total of 30.4 mm of rain was recorded (from Moree) in the four weeks leading up to the survey. However, there was little evidence to suggest rain reached the proposal site. Targeted searches for this species included searching for inflorescences and looking under shrubs and trees.	Species assessed as absent
<i>Dichanthium setosum</i> Bluegrass	Use seed-head to identify. Survey Nov - May, 3 to 4 weeks after effective rainfall.	May 3 days/ 43 hours (two people)	Plots, random meander and parallel field traverses (10 m apart): A total of 21.4 mm of rain was recorded at Moree 19-23 days prior to field assessment in May. Groundcover plants were actively growing (including fruiting/ flowering) during the field assessment.	Species assessed as absent

			Given these conditions, rainfall prior to the field assessment was considered effective to record the presence or absence of Bluegrass. Targeted searches for this species included searching for seed heads throughout the proposal area.	
<i>Polygala linariifolia</i> Native Milkwort	Use flowers to identify, as easily confused with <i>Polygala japonica</i> . Reliably flowering, Oct - Feb, but will flower sporadically at other times throughout the year.	October, December 6 days/ 36 hours	Parallel field traverses (10 m apart) and random meander: Targeted searches for this species included searching for flowers and glabrous herbs throughout the proposal area.	Species assessed as absent
<i>Tylophora linearis</i>	Use flowers and fruit to locate and identify. Easily confused with other climbers when not in flower or fruit.	May 3 days/ 43 hours	Plots, random meander and parallel field traverses (10 m apart): Targeted searches included looking at the trunks of trees/shrubs to identify climbing twiners (including searches for flowers/fruit) throughout the proposal area. All twiners encountered were identified.	Species assessed as absent

¹ According to the Survey Months Conditions Spreadsheet (Version 1.1) available on the BAM-C webpage

² Refers to total person hours (between two-ecologist and/ or one other participant)

5.3.3 Fauna

No candidate fauna species were recorded at the proposal site during undertaken in May, October or December 2019. See **Section 5.1.2** for discussion of Ecosystem credit species encountered. The survey methodology for candidate species is listed below in **Table 5.6**. The results of targeted surveys for nocturnal candidate species is provided in **Table 5.7**. A list of all fauna species recorded during fieldwork is listed in **Appendix I**.

Table 5.6: Fauna survey techniques and survey effort for species not assessed with geographic/ habitat constraints

Candidate species	Survey technique	No. of sites	Survey effort per site	Survey period	Total survey effort ¹
Hollow nesting birds ▪ <i>Calyptorhynchus lathamii</i> (Glossy Black-Cockatoo)	Diurnal bird survey	Throughout proposal area	Identification of birds sighted/ heard calling, observation of all tree hollows in the proposal area.	May 2019	3 days, 43-hrs
Raptors ▪ <i>Lophoictinia isura</i> (Square-tailed Kite) ▪ <i>Hieraaetus morphnoides</i> (Little Eagle) ▪ <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)	Diurnal bird survey including searching for stick nests	Throughout proposal area	Observation of all tree crowns in the proposal area.	October 2019	5 days, 28 hrs

Candidate species	Survey technique	No. of sites	Survey effort per site	Survey period	Total survey effort ¹
Large forest owls ▪ <i>Ninox connivens</i> (Barking Owl) (Note, further discussion is provided in Section 5.3.3.1)	Pellet search	Throughout proposal area under potential roost/nest trees	Searches for pellets under potential roost / nest trees.	May, October 2019	> 20 trees
	Call Playback	2	Five-minute playback and listening for the, Barking Owl, Masked Owl and Southern Boobook Owl undertaken twice.	May, October 2019	May: 2 nights, 1 hr October: 4 nights, 2.5-hrs November: 1 night 0.5 hrs
	Stag watching (targeting large tree hollows)	13	From 30 minutes before dusk to 30 minutes after dusk.	May, October 2019	May: 2 nights, 4 hrs October: 4 nights, 8-hrs November: 1 night, 3 hrs
	Spotlight search	Throughout proposal area	At least 0.5 hours of spotlighting.	May, October 2019	May: 2 nights, 2 hrs October: 4 nights, 11-hrs November: 1 night, 1.5 hrs
Reptiles <i>Hoplocephalus bitorquatus</i> Pale-headed Snake (Note, further discussion is provided in Section 5.3.3.2)	Habitat search	Throughout proposal area	At least 30-minute search/day targeting specific habitat (lifting logs and rocks).	May, October and December 2019	May: 3 days, 3 hrs October: 5 days, 5 hrs December: 1 day, 1 hr
	Spotlight search	Throughout proposal area	At least 0.5 hours of spotlighting.	October, November 2019	October: 4 hrs, November: 1 night, 1.5 hrs
	Camera trap	3	Four days active in the field targeting animal tracks, areas with dead wood.	October/ November 2019	12 trap nights in October

¹ Refers to total person hours (between two-ecologist and/ or one other participant)

5.3.3.1 Large Forest Owls: *Ninox connivens*

DEC (2004) recommend at least 5 visits per site for *Ninox connivens* (Barking Owl). In total, seven sampling sessions were undertaken for large forest owls in the current assessment (including two nights in May and five nights in October 2019). The results of these surveys are detailed below in **Table 5.7**. This assessment included thorough coverage of the proposal area and intensive sampling effort, including stag watching 10/20 trees identified with large tree hollows (potential breeding habitat) in the proposal area. According to the Victorian Department of Sustainability and Environment (DSE) (2011), for owls in general, higher levels of detectability close to the core of the owls' territory or close to the nest site or regular roost site is expected. The Victorian guidelines suggest that if five surveys are conducted at a site on different nights, under good conditions, with no success, it is unlikely that those owls would be nesting or roosting regularly close to that site.

In accordance with DEC (2004) guidelines, during each session, call playback was undertaken for *N. connivens* twice. Call playback was also undertaken for *N. boobook* (Southern Boobook) following identification of an individual in the proposal area during both nights in May 2019 (location shown in **Figure 2.1**). This individual was observed perched on a stag, attentively watching microbats fly in and out fissures (marked as tree #25 in **Table 4.5**). Subsequently, this individual did not respond to call playback nor was identified during surveys undertaken in October 2019. No other large forest owls were observed during targeted surveys or heard calling.

Table 5.7: Results of nocturnal surveys

Night (sampling session)	Observer ¹	Stagwatching		Call play back	Spotlighting
		Tree ²	Results		
21.05.19	LP	6	-	-	Southern Boobook Owl
	JF	5	-		Prickly Gecko (commonly seen)
22.05.19	LP, JF	25	44 microbats	-	2 Brushtail Possums Southern Boobook Owl Prickly Gecko (commonly seen)
28.10.19	JF, KH	25	104 microbats	-	12 Brushtail Possums Prickly Gecko (commonly seen)
29.10.19	JF	5	-	-	7 Brushtail Possums
	KH	6	3 microbats		Prickly Gecko (commonly seen)
30.10.19	JF	2	1 microbat	-	4 Brushtail Possums
	KH	35	Brushtail Possum		Prickly Gecko (commonly seen)
31.10.19	JF	30	-	-	8 Brushtail Possums
	KH	39	-		Prickly Gecko (commonly seen)
1.11.19	JF	40	1 microbat	-	7 Brushtail Possums
	KH	14,15	-		Prickly Gecko (commonly seen)
	V	25, 10	114 microbats (tree 25)		
Total no. of unique trees watched		11			

¹ LP (Luke Pickett), JF (Jed Field), KH (Kane Hoskins), V (Volunteer)

² Refer to **Figure 4.1** for location of trees

5.3.3.2 Reptiles: *Hoplocephalus bitorquatus*

The Pale-headed Snake (*Hoplocephalus bitorquatus*) is a nocturnal tree climbing elapid. The snake is seldom encountered by humans, because it spends long periods of time sequestered (hidden) in tree hollows for potentially weeks or months at a time (Fitzgerald *et al*, 2010). The snake is recorded from a range of forest and woodland habitats. West of the Great Dividing Range in NSW, this includes sites dominated by Narrow-leaved Ironbark (*Eucalyptus. crebra*) forest with Cypress Pine (*Callitris spp.*), Black Box (*E. largiflorens*) and Silver-leaf Ironbark (*E. melanophloia*) and Coolabah (*E. coolabah*) woodland (Fitzgerald *et al.*, 2010). Available data suggest populations of the Pale-headed Snake are associated with watercourses, billabongs and other flood prone areas.

The Pale-headed Snake is listed as a landscape management species under the Saving our Species (SoS) program. The key threats to this species are at the landscape scale; fragmentation and loss of large hollow bearing trees and degradation of riparian habitat across its geographic range (DPIE, 2019).

Fitzgerald *et al*, (2010) suggests major riverine floodplain habitats may represent core habitat for Pale-headed Snakes. Fitzgerald *et al*, (2010) studied the ecology of the Pale-headed Snake at a riparian site on the Namoi River between Pilliga and Burren Junction in a River Red Gum - Coolabah woodland. At this location, no snake was located >160 m from the river, despite searches extending >200 m from the river. Frogs have also been found to be a major component of the diet. 20 of the 26 food items (≈77%) recorded in museum specimens of the Pale-headed Snake were found to be frogs (Fitzgerald *et al*, 2010).

The proposal area occurs on an isolated ridgeline and does not form a part of any core habitat described by Fitzgerald *et al*, (2010). Habitat constraints listed for this species in the Threatened Biodiversity Data Collection include 'within 500 m of moderate to good vegetation' and '11-30% of habitat retained' (in the assessment area). Woody native vegetation cover was calculated to be relatively low (15.5%). Habitat connectivity to the proposal site is poor. Linear vegetated road corridors/wind breaks that extend south of the proposal site to the Tackinbri Creek riparian corridor are broken by cleared areas. The snake has not been recorded within 20 km of the proposal site and occurs outside of a priority management area, identified by the SoS program (based on information about the species geographic range, habitat distribution or area of occupancy). Nevertheless, the Pale-headed Snake was subject to targeted searches.

Three site visits were undertaken (May, October-November and December 2019) which included habitat searches (for all periods) and nocturnal searches (for all periods except December) for the Pale-headed Snake. According to the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (DEC, 2004), the suggested survey period for reptiles is November to March. Survey effort during the second site visit (28 October to 1 November) and third site visit (9 December) was considered to be undertaken during suitable periods. **Table 5.8** details the survey effort undertaken during these two visits.

Table 5.8: Survey effort undertaken for the Pale-headed Snake, based on DEC (2004).

Method	Effort per stratification unit	Visit 2 survey effort/ results (28th October- 1st November)	Visit 3 survey effort/results (9 th December)
Habitat search	30 minute search on two separate days targeting specific habitat	A total of 5 person hours targeting specific habitat (lifting logs and rocks).	1.5 total person hours targeting specific habitat (lifting logs and rocks). A snake skin of the Common Death Adder (<i>Acanthophis antarcticus</i>) was found in the proposal area.
Pitfall traps with drift nets	24 trap nights, preferably using six traps for a minimum of four consecutive nights	Pitfall traps were not appropriate at the proposal site, given the area was generally covered by a rocky surface layer.	
Spotlighting	30-minute search on two separate nights targeting specific habitat	5 consecutive nights spotlighting (total of 5.5 person hours). No snakes identified, despite focus on searching trees, especially with hollows. During this assessment, another reptile, the Prickly Gecko (<i>Heteronotia binoei</i>) was commonly sighted in the proposal area.	No spotlighting undertaken

An additional survey guideline for the Pale-headed Snake (listed on the Threatened Biodiversity Data Collection) states that surveys should be undertaken '1-2 days after rainfall and on humid nights'. Given the prolonged drought, these conditions were not likely available (according to nearby weather stations) during the month of November and up to 23 December at the proposal site. **Table 5.4** shows that relative humidity (at 15:00), ranged between 8-34% during the October to November 2019 site assessment. In comparison, Fitzgerald *et al*, (2010) captured snakes where humidity varied from 30% to 61%.

In accordance with Section 6.4 of the BAM (*Steps for identifying habitat suitability for threatened species*), after carrying out a field assessment of the habitat constraints, habitat has been assessed as substantially degraded such that the Pale-headed Snake is unlikely to utilise the subject land. This is supported by a combination of habitat feature assessments (including review of literature) and targeted searches (including habitat searches and spotlighting). Given the snake primarily feeds on frogs (Fitzgerald *et al*, 2010), the absence of watercourses, billabongs and other flood prone areas is regarded as a significant habitat constraint. No habitat for frogs is available in the proposal area. In addition, the species distribution has not been mapped at the proposal site (according to the SoS program) and no signs of the snake or thereof (such as snake skins) were recorded in the proposal area.



Photo 9: Dry site conditions during targeted searches undertaken in December 2019.

5.3.3.3 Camera traps

Three motion detector cameras (model: Nextech QS8043) were left running on photo/video modes between 28th October 1st November 2019. Cameras were set in areas with dead or along areas that appeared frequently used by animals, see **Figure 5.1** and **Photo 10**. Three species (not recorded) through other methods were detected by the cameras including the Short-beaked Echidna, European Red Fox and a Dragon (*Tympanocryptis spp*). In addition, the Swamp Wallaby and Eastern Grey Kangaroo and Rabbits were frequently recorded. No threatened species were recorded by the cameras.



Photo 10: Screenshot of a Short-beaked Echidna investigating a hollow log (captured 1/11/19)

5.3.3.4 Microchiropteran Bats

Using echo-location over two separate nights, at least three species of microchiropteran bats were recorded at the proposal site. Table 5.9 shows that these bats were recorded at the farm dam (using the Song Meter SM4) and in the proposal area (using the Echo Meter Touch 2 PRO Handheld Bat Detector).

Table 5.9: Microchiropteran Bats recorded at the proposal site using echo-location

Scientific name	Common Name	Roosting habitat ¹	Ecosystem credit species	Comments
<i>Mormopterus petersi</i>	Inland Freetail Bat	Tree hollows	No	Recorded at the farm dam and proposal site.
<i>Nyctophilus sp.</i>		Tree hollows	Yes (possible)	Possibly <i>Nyctophilus corbeni</i> , an ecosystem credit species listed in NSW and Federally as Vulnerable. <i>Nyctophilus sp.</i> cannot be separated to species level by call (Pennay <i>et al.</i> , 2004). Recorded at the farm dam and proposal site.
<i>Vespadelus darlingtonia</i>	Large Forest Bat	Tree hollows	No	Recorded at the farm dam and proposal site.

¹ From Churchill (2008).

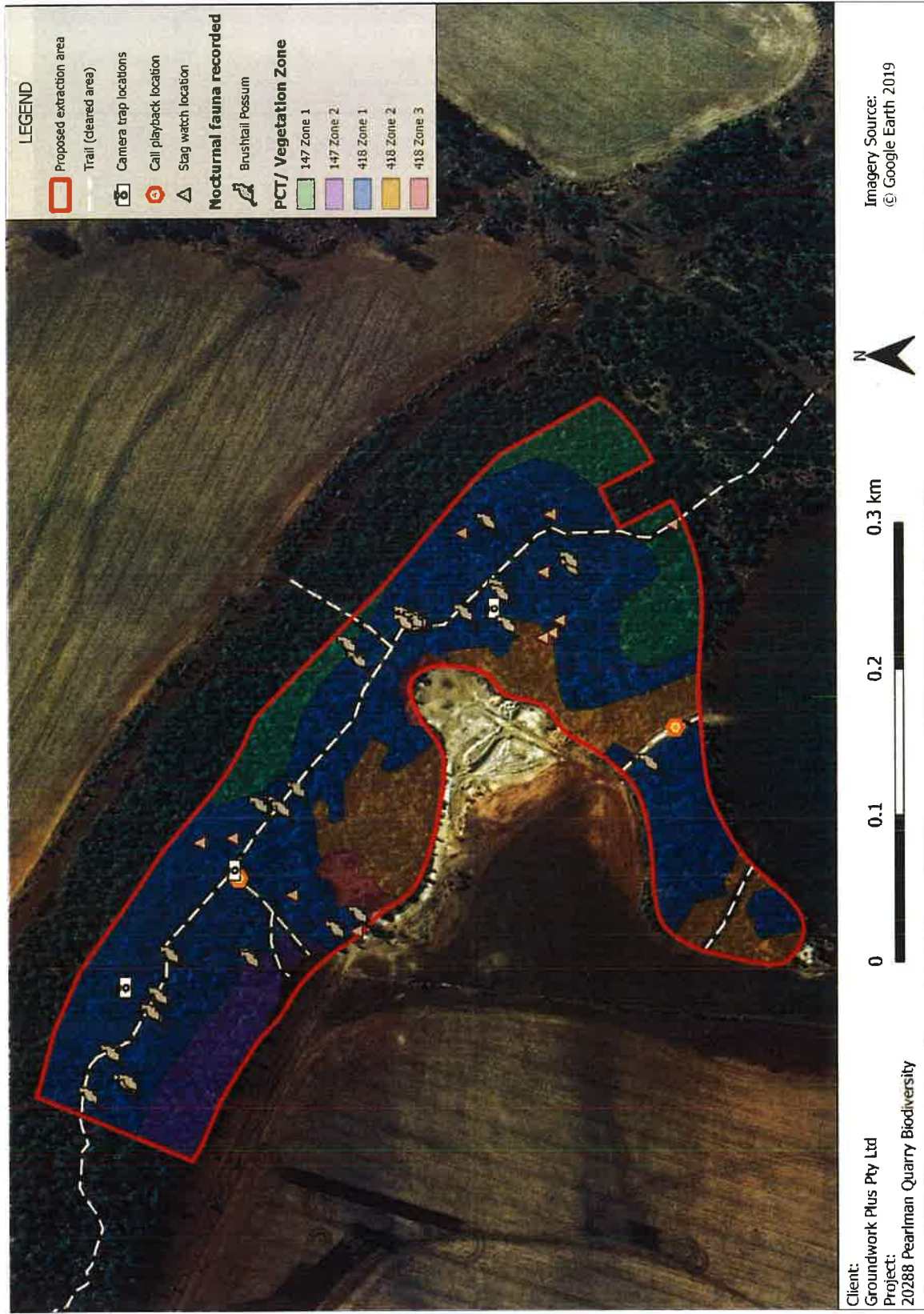


Figure 5.1: Location of targeted fauna candidate species surveys (October-November, 2019)

6. IMPACT ASSESTMENT

This chapter focuses on Stage 2 of the BAM (Impact Assessment). Stage 2 applies the avoid, minimise and offset hierarchy and assesses direct, indirect and prescribed biodiversity impacts associated with proposed activities.

6.1 Avoid and Minimise Potential Impacts

This proposal requires access to hard rock resources to provide ballast and other materials for the Inland Rail project. The extraction footprint of the quarry (9.25 ha) would impact two PCTs, one of which is consistent with a TEC (Semi-evergreen Vine Thicket Forest) listed as endangered (BC Act and EPBC Act). Using information collected during desktop investigations and field assessments, the proposal has been modified to avoid and minimise impacts on native vegetation and habitat. The original proposal considered by Advitech, included an additional extraction area located east of the current extraction area subject to this assessment (see **Figure 6.1**). This extraction area (located on the eastern ridge) would have impacted an additional 4.39 ha of vegetation, including vegetation consistent with the Semi-evergreen Vine Thicket Forest TEC description. Provision of a haul road to this extraction area would have also impacted vegetation and habitat.

In summary, the proposal has avoided and minimised clearing of native vegetation and habitat by:

- No longer considering an additional quarry located on the Eastern Ridge;
- Maintaining a minimum 50m buffer of vegetation (which is primarily consistent with the Semi-evergreen Vine Thicket TEC) around the northern boundary of the extraction area to provide habitat connectivity (see **Section 6.4.1**);
- Maintaining the haul road to the proposed extraction area to existing tracks; and
- Locating the stockpile area in a cultivated paddock and avoiding impact to native vegetation.

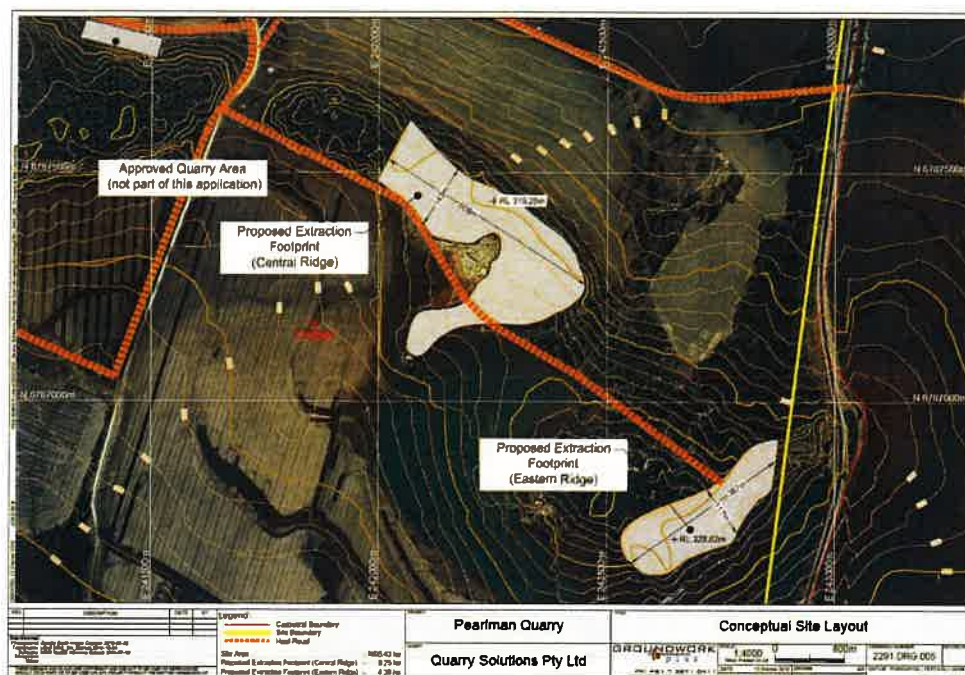


Figure 6.1: The original proposal was considering an additional extraction area located on the Eastern Ridge. The current proposal is restricted to the Central Ridge and has been modified to maintain a 50 m buffer of vegetation around the northern boundary to help maintain habitat connectivity.

6.2 Avoiding and minimising prescribed biodiversity impacts during project planning

The BC Regulation (Division 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme, they include:

- *Impacts of development on the following habitat of threatened species or ecological communities:*
 - *Karst, caves, crevices, cliffs and other geological features of significance; or*
 - *Rocks; or*
 - *Human made structures; or*
 - *Non-native vegetation.*
- *Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range;*
- *Impacts of development on movement of threatened species that maintains their lifecycle,*
- *Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development);*
- *Impacts of wind turbine strikes on protected animals; and*
- *Impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.*

There are no occurrences of karst, caves, crevices, cliffs or other geological features of significance at the proposal site. No threatened species or ecological communities that are dependent on these habitat features will be impacted by the proposed works. In addition, there are no known impacts to water quality, water bodies and hydrological processes that sustain threatened species or threatened ecological communities. Wind farm development is not applicable to the proposal.

Prescribed impacts that are relevant to the proposal (including; rock removal, habitat connectivity and movement of animals and vehicle strikes) are assessed below.

6.3 Direct Impacts

6.3.1 Loss of Vegetation and Habitat

The potential loss of vegetation and habitat associated with the proposal is summarised in **Table 6.1**.

Table 6.1: Vegetation to be impacted by the proposed works

Plant Community Type and Vegetation Zone	Listing		Potential Direct Impact (ha) ¹
	BC Act	EPBC Act	
147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion			

Zone 1 (very good condition)	E ¹	E ¹	1.13
Zone 2 (very good condition)	E ¹	E ¹	0.60
TOTAL			1.73
418: White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion	N/A	N/A	
Zone 1 (very good condition)			5.43
Zone 2 (good condition)			1.36
Zone 3 (poor condition)			0.19
TOTAL			6.98
GRAND TOTAL			8.70²

¹ PCT 147 (Zone 1 and 2) is consistent with a Semi-evergreen Vine Thicket EEC. Both vegetation zones meet the benchmark requirements of the EEC (see **Table 4.3** and **4.4**).

² Note, while the proposal area is 9.25 ha, only 8.70 ha of native vegetation would be impacted. This is attributed to cleared agriculture tracks throughout the proposal area (see **Figure 2.1**).

The proposed extraction area would impact two vegetation zones of PCT 147 and three vegetation zones of PCT 418, totalling an area of 8.70 ha (**Table 6.1**). The habitat patch located at the proposed extraction area subject to the current proposal has high conservation value, considering it:

- Contains areas of vegetation that is associated with a TEC;
- Contains areas of vegetation in very good condition that includes large old trees with hollows; and
- Provides habitat for a range of fauna including non-threatened species, but locally important species such as the Brushtail Possum (which is reported by Russel (2013) as declining throughout its natural range).

The proposed stockpile site (for crushing and stockpiling of hard rock) is located in between the Camurra Boggabilla (Narrabri to NorthStar) Railway line and an existing approved hard rock quarry at the proposal site (**Figure 1.2**). The stockpile area is approximately 7.0 ha in area and comprises mostly cultivated land used for cropping, as shown in **Photo 11**. In the middle of the proposed stockpile area, running down the fenceline, there is a small, isolated linear stretch of native vegetation (0.2 ha in area ranging in widths from 5.0 m to 15.0 m). This area of native vegetation characterised by emergent *Callitris glaucophylla* (White Cypress Pine) and *Casuarina cristata* (Belah) will not be impacted by the proposal.



Photo 11: The proposed stockpile area is located on cultivated land

6.3.2 Habitat Removal

6.3.2.1 Habitat trees

A total of 40 hollow bearing trees containing 81 hollows were recorded within the proposal area (note, the actual number of hollows in the proposal area is likely significantly greater than this, due to the large area/abundance of hollow bearing trees, not all potential hollow bearing trees were counted, especially trees with small or medium size hollows). A range of hollows with different entrance diameters were recorded, including 42 with a small entrance diameter (2.0 - 5.0 cm), 17 with a medium entrance diameter (5.0 - 10.0 cm) and 22 with a large entrance diameter (> 10.0 cm).

The high diversity of tree hollows recorded in the proposal area may help support a range of obligate or opportunistic hollow users such as micobats, birds, owls, reptiles and arboreal marsupials. Studies have determined that these obligate or opportunistic hollow users tend to select a hollow with an entrance width close to body width (Gibbons and Lindenmayer, 2002).

6.3.2.2 Bush rocks

The proposal will result in the removal of natural surface deposit of rock from areas of native vegetation. Bushrock removal is a prescribed impact requiring consideration and is listed as a key threatening process (KTP) under the BC Act. Bushrock removal may remove or disturb habitat of native species which may find shelter under rocks or use rocks for basking. *Uvidicolus sphyrurus* (Border Thick-tailed Gecko, a threatened reptile recorded in the search area requires surface rock. There are no known populations of the species in the study area or records <20 km of the proposal area. No other threatened species considered are likely to be adversely impacted by the proposed removal of bushrock from the site.

6.4 Indirect Impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat

beyond the subject land. Impacts may also result from changes to landuse patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat. **Table 6.2** describes and assesses the impacts of the proposal on native vegetation and habitat beyond the subject site as detailed in Section 9.1.4.2 of the BAM.

Table 6.2: Assessment of indirect impacts on adjacent habitat

Indirect Impact	Extent and Duration	Threatened species, TECs and their habitats likely to be affected.	Consequences of the impacts for the bioregional persistence of the threatened species, TECs and their habitats.
(a) inadvertent impacts on adjacent habitat or vegetation	Edge effects including weed growth and disturbance by vehicles (quarry trucks) may impact retained vegetation around the extraction area (see Section 6.4.1).	Semi-evergreen Vine Thicket EEC	These impacts may degrade areas of retained EEC. Mitigation measures (Table 6.5) including weed management and fencing off retained areas of vegetation (where practicable) will help manage these impacts.
(b) reduced viability of adjacent habitat due to edge effects	As above.	Semi-evergreen Vine Thicket EEC	As above.
(c) reduced viability of adjacent habitat due to noise, dust or light spill	The quarry activities, including truck movements at the proposal site may exacerbate noise and dust impacts.	Semi-evergreen Vine Thicket EEC	Dust deposition on vegetation may affect plant health through reduced ability to photosynthesize. Noise may also impact fauna that shelter in habitat adjacent to the extraction area.
(d) transport of weeds and pathogens from the site to adjacent vegetation	The proposal has the potential to introduce or increase weeds occurrence in adjacent habitat.	Semi-evergreen Vine Thicket EEC	This site is already subject to moderate weed infestation. Implementation of weed and pathogen control measures (Table 6.5) will help manage these impacts.
(e) increased risk of starvation, exposure and loss of shade or shelter	The proposal has the potential to impact threatened fauna dependent on habitat within and adjacent to the proposal area.	N/A (no threatened species were recorded during an assessment in May 2019).	Native fauna including birds, reptiles and mammals will lose shade and shelter resources.
(f) loss of breeding habitats	The proposal has the potential to impact breeding habitat important to threatened species in the local area.	N/A (no threatened species were recorded during an assessment in May 2019).	Native fauna will lose breeding habitat, including tree hollows (see Section 6.3.2.1).

Indirect Impact	Extent and Duration	Threatened species, TECs and their habitats likely to be affected.	Consequences of the impacts for the bioregional persistence of the threatened species, TECs and their habitats.
(g) trampling of threatened flora species	No threatened flora species were identified within the proposal area.	N/A	Implementation of management measures (Table 6.5) should help prevent trampling in areas where vegetation is retained.
(h) inhibition of nitrogen fixation and increased soil salinity	The site is already substantially disturbed, and it is unlikely the proposal would further exacerbate these issues.	N/A	N/A
(i) fertiliser drift	It is unlikely the proposal would further exacerbate these issues.	N/A	N/A
(j) rubbish dumping	This issue is not likely to affect the proposal site.	N/A	N/A
(k) wood collection	This issue is not likely to affect the proposal site.	N/A	N/A
(l) bush rock removal and disturbance	Assessed as a direct impact in Section 6.3.2.2.		
(m) increase in predatory species populations	It is unlikely that the proposal works will influence or alter predatory populations.	N/A	N/A
(n) increase in pest animal populations	It is unlikely that the proposal will influence or alter pest species populations. Pest animals are likely present within the proposal site and adjacent habitats.	N/A	N/A
(o) increased risk of fire	The proposal is unlikely to increase the risk of fire in the local area.	N/A	N/A
(p) disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	No specialist breeding or foraging habitat is present in or adjacent to the proposal area.	N/A	N/A

6.4.1 Wildlife Connectivity and Habitat Fragmentation

The removal of vegetation for the proposed works will add to the incremental fragmentation of vegetation within the local area. The vegetation on site is connected (although canopy cover is often fragmented by roads or cleared areas) to the Tackinbri Creek riparian corridor. This corridor may support the movement and migration of fauna on a regional scale.

Vegetation in the proposal area currently provides connectivity that supports the movement of fauna across the ridgeline at the proposal site. At the northern boundary of the proposal area, a corridor with a minimum width of 50 m is retained to help support the movement of fauna across the proposal area to reach habitat patches located east and west of the proposal area. This is important to help support population regulation of extant species (such as Brushtail Possums) at the proposal site including the need to reach habitat resources which may be located on either side of the proposal area.

6.4.2 Weeds

The proposal would involve clearing and earthworks in areas subject to moderate weed infestation. During construction, there is potential to disperse weed seeds and plant material into adjoining remnant vegetation. Increased weed growth has the potential to result in decreased native species diversity and can further degrade local native flora and fauna habitats.

6.4.3 Injury and Mortality of Fauna

Injury and mortality of fauna could occur during vegetation clearing and vehicle movements across the proposal site. Fauna potentially impacted by vegetation clearing include birds and reptiles that may shelter in vegetation and woody debris. If any habitat trees are impacted, a qualified ecologist will be required to be onsite for trimming or removal of habitat trees. Macropods and birds are susceptible to vehicle strikes. Given limited vegetation cover along the haul road, impacts to fauna crossing the haul road are likely to be avoided through application of and strict adherence to site speed limits (40 km/h) and responsible driver behaviour.

6.5 Other Relevant Legislation or Planning Policies

6.5.1 SEPP 44 - Koala Habitat

An assessment of koala habitat under SEPP 44 is provided below. In addressing SEPP 44, there are two questions that need to be considered:

a) Is the land "Potential Koala Habitat"?

'Potential Koala Habitat' is defined in SEPP 44 as, "...an area of native vegetation where trees of the type listed in Schedule 2 (Koala feed tree species) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component"; and

b) Is the land "Core Koala Habitat"?

"Core Koala habitat" is defined as an area of land with a resident population of koalas, evidenced by attributes such as breeding females (females with young), recent sightings and historical records of a Koala population.

One primary Koala food tree, *Eucalyptus populnea* (Bimble Box), was identified in the proposal area. This food tree was uncommon at the proposal site and does not form more than 15% of the upper and lower stratum.

Vegetation in the proposal area is isolated from large habitat patches with known Koala populations. Woody native vegetation cover in the assessment area is low (15.5%) which may limit movement of individuals to the proposal site. No evidence of Koala usage was recorded in the proposal area, despite targeted scat searches undertaken during the vegetation survey. Additionally, no scratches indicative of Koalas were observed on any of the trees in the proposal area. The proposal site does not support potential or core Koala habitat under the definitions of SEPP 44.

6.5.2 Matters of National Environmental Significance

The EPBC Act requires approval of the Commonwealth Minister representing the Department of the Environment and Energy (DoEE), for actions that may have a significant impact on Matters of National Environmental Significance (MNES).

6.5.2.1 Listed threatened species and ecological communities

One EPBC threatened community listed as Endangered (*Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions*) will be impacted by the proposal. It is unlikely this action constitutes a significant impact given the relatively small area (1.73 ha) of vegetation within the construction footprint. A test of significance for impact to this TEC is provided in **Appendix III**.

6.5.2.2 Migratory Species Protected Under International Agreements

Nine nationally listed migratory terrestrial or wetland bird species were recorded on the DoEE protected matters database (see **Appendix IV**) or are considered to have potential habitat available within 20 km of the proposal site, as listed in **Table 6.3**.

Table 6.3: Listed migratory species with the potential to occur in the local area

Species name	Common name
<i>Actitis hypoleucos</i>	Common Sandpiper
<i>Apus pacificus</i>	Fork-tailed Swift
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper
<i>Calidris ferruginea</i>	Curlew Sandpiper
<i>Calidris melanotos</i>	Pectoral Sandpiper
<i>Gallinago hardwickii</i>	Latham's Snipe
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Motacilla flava</i>	Yellow Wagtail
<i>Myiagra cyanoleuca</i>	Satin Flycatcher

None of the above migratory species were recorded on site during the field survey. The proposed works are unlikely to impact on any area considered to be 'important habitat' for the above migratory species, or likely to impact a significant proportion of a migratory population.

6.6 Assessment of Significance

Assessments of Significance (AoS) have been conducted for the following species and are provided in **Appendix III**. **Table 6.4** provides a summary of the outcomes of the assessment of significance under the BC and EPBC Act.

Table 6.4: Assessments of significance summary

BC Act significance assessments						
Threatened species, or communities	Significance assessment question ¹					Likely significant impact?
	a	b	c	d	e	
<i>Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions EEC</i>	X	Y	Y	N	Y	No

EPBC Act significance assessments		
Threatened species, or communities	Important population	Likely significant impact?
<i>Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions EEC</i>	N/A	No

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable.

1. *Significance Assessment Questions as set out in the Biodiversity Conservation Act 2016/ Environmental Planning and Assessment Act 1979.*
 - a *in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*
 - b *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*
 - c *in relation to the habitat of a threatened species, population or ecological community:*
 - (i) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*
 - (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
 - (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,*
 - d *whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),*
 - e *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

6.7 Mitigation and Management Measures

The following mitigation measure identified in **Table 6.5** would be implemented to assist with minimising the impacts of the project on biodiversity during construction and operation of the quarry.

Table 6.5: Mitigation and management measures

Impact	Measure	Risk of failure ¹	Responsibility
Pre-Construction			
General	<p>A Flora and Fauna Management Plan will be prepared in and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and weed management areas; Pre-clearing survey requirements; Procedures for unexpected threatened species finds and fauna handling; and Protocols to manage weeds and pathogens. 	Low	Contractor
Fauna handling	Before on ground works commence, contact an animal rescue agency/wildlife care group or vet before works start to ensure they are willing and available to be involved in fauna rescue and assist with injured animals. If any fauna handling is required, it must be undertaken by a licenced wildlife carer or ecologist.	Low	Contractor
Vegetation clearing	The limits of clearing including where isolated trees are to be retained within areas of existing native vegetation will be delineated using appropriate signage and barriers, identified on site construction drawings and during construction staff induction.	Low	Contractor
Vegetation protection	Where feasible, areas of vegetation to be retained surrounding the extraction area or along haul roads are to be fenced off to help prevent unintentional damage to these areas.	Low	Contractor
Habitat connectivity	A minimum 50m buffer of vegetation (between the boundary of the quarry and the edge of a farm access track) must be retained along the northern boundary of the proposal area to support the dispersal and movement of fauna across the proposal area.	Low	Contractor
Disturbance to fallen timber and dead wood	All woody debris are not to be mulched or chipped but will be re-used on site for habitat improvement. Woody debris will not be dragged but lifted and placed appropriately outside the construction footprint in an adjacent area of project sites to enhance habitat. If long logs are required to be cut to assist relocation, logs must be cut away from hollow ends.	Low	Contractor
Invasion and spread of pathogens and disease	Pathogen control protocols shall be developed and implemented in accordance with the requirements of the <i>Biosecurity Act 2015</i> .	Low	Contractor
Invasion and spread of weeds	Weed control protocols shall be developed and implemented as part of the CEMP quarry operation plan. For example, any regeneration of African Boxthorn (e.g. along disturbed edges of the quarry/ in the corridor area to be retained) should be controlled before plants reach maturity and set seed.	Low	Contractor

Impact	Measure	Risk of failure ¹	Responsibility
<i>During operation</i>			
Water quality	Potential water quality impacts to farm dams arising from run off are to be managed through appropriate sediment control measures specified in the CEMP quarry operation plan.	Low	Contractor
Threatened species protection	If unexpected threatened fauna or flora species are discovered, works must stop immediately until threatened flora or fauna species are reviewed and assessed by ecologists.	Low	Contractor
Fauna protection	Due care should be made by all vehicle operators to take care and avoid any potential collision with fauna, such as macropods (Kangaroos) that may transverse the project site. A site speed limit of 40 km/h should be observed.	Low	Contractor
Pest Animal monitoring/ control	Pest animals such as rodents, foxes, rabbits, wild dogs, feral cats and pigs are controlled on a needs basis.	Moderate Biophysical risk: Pest animals may continue to colonise the proposal site from surrounding areas	Contractor
<i>Post operation</i>			
Preparation of a site rehabilitation plan	A rehabilitation plan in accordance with the land manager needs to be prepared prior to quarry shut down.	Low	Contractor

¹ Risk of failure including constraints to implementation such as financial, biophysical and resource availability

7. IMPACT SUMMARY

This chapter summarises the impact to PCTs and the number of credit classes required for ecosystem and species credits. The BAM Calculator report is provided in **Appendix V**.

7.1 Impact to Vegetation Integrity

Table 7.1 summarises the impact of the proposal to the vegetation integrity score of each PCT on site. The TEC identified on site is not subject to a Potential Serious and Irreversible Impact (SAII).

Table 7.1: Impact to the vegetation integrity score of each PCT

PCT/ Vegetation Zone	Listing		Current score	Future score	Change in score	BRW ¹
	BC	EPBC				
147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion						2.5 high sensitivity
Zone 1 (very good condition)	E	E	82	0	-82	
Zone 2 (very good condition)	E	E	76.2	0	-76.2	
418: White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion						1.5 high sensitivity
Zone 1 (very good condition)			76.5	0	-76.5	
Zone 2 (good condition)			35.3	0	-35.3	
Zone 3 (poor condition)			30.1	0	-30.1	

¹ Biodiversity Risk Weighing (for ecosystem credits). The biodiversity risk weighting for a TEC or a PCT containing threatened species habitat is based on the sensitivity to loss class of the TEC/PCT and the highest sensitivity to gain class of the predicted threatened species. For further explanation, see Appendix 7 of the BAM (2017).

7.2 Ecosystem Credits

The ecosystem credits required to offset the proposal are provided in **Table 7.2**. A total of 245 credits are required to offset the development.

Table 7.2: Ecosystem credits summary

PCT	Vegetation Zone	Area Impacted (ha)	Credits required
147: Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion	1	1.13	46
	2	0.60	23
TOTAL		1.73	69
418: White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion	1	5.43	156
	2	1.36	18
	3	0.19	2
TOTAL		6.98	176
TOTAL ECOSYSTEM CREDITS REQUIRED			245

The following like-for-like offset rules apply for PCT 147:

1. Any PCT associated with the TEC Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions (including PCT's 55, 147, 228, 378, 442, 452, 547, 627, 1124 and 1519);
2. In the IBRA subregions: Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts, or
3. Any IBRA subregion that is within 100 kms of the outer edge of the impacted site; and
4. Contains hollow bearing trees.

The following like-for-like offset rules apply for PCT 418:

1. North-west Slopes Dry Sclerophyll Woodlands (including PCT's 228, 380, 381, 382, 384, 385, 386, 389, 390, 391, 393, 394, 412, 413, 418, 429, 432, 435, 453, 506, 517, 527, 529, 543, 549, 555, 562, 563, 564, 573, 587, 588, 591, 594, 595, 596, 597, 598, 856, 1165, 1306, 1308, 1317, 1387, 1560, 1586, 1587, 1605, 1606, 1607, 1611, 1613);
2. In the IBRA subregions: Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts, or
3. Any IBRA subregion that is within 100 kms of the outer edge of the impacted site; and
4. Contains hollow bearing trees.

7.3 Species Credits

No species credits are required to offset the proposal.

7.4 Offset

Advitech Environmental understands that the proponent seeks the following condition of consent from Gwydir Shire Council as means to retire biodiversity credits generated by the Pearlman's Quarry proposal.

Under the Biodiversity Offset Scheme, the total ecosystem credits generated for the site are 245, including 69 credits for PCT 147 and 176 credits for PCT 418. It is proposed that ecosystem credits will be retired in instalments of 14 credits per year for PCT 147 and 49 credits per year for PCT 418 over the lifecycle of the quarry.

Should the quarry life be reduced from the proposed five year period, the balance of remaining credits would be paid to the Biodiversity Conservation Trust in full in the final year of operation. A bank guarantee for the total amount of payable offset credits will be provided prior to the commencement of works.

8. CONCLUSION

Through application of the BAM, this BDAR has assessed impacts on biodiversity values including threatened species and threatened ecological communities. The Pearlman's Quarry, located 70 km north east of Moree between Croppa Creek and North Star, proposes to extract up to 490,000 tonnes of ballast material/ per annum over 5 years for the Inland Rail project. The proposal has a footprint of approximately 16.25 ha, including 9.25 ha for the extraction area and 7.0 ha for the stockpile site. The proposal may result in clearing of up to 8.70 ha of existing vegetation.

Field assessments have identified that two PCTs (418 and 147), of which the latter is associated with the TEC, *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions* will be impacted by the proposal. This TEC is listed as Endangered under the NSW BC Act, and Federally under the EPBC Act.

The proposed construction footprint would impact two condition classes of PCT 147 (both in very good condition) with a combined impact area of 1.73 ha. While up to 6.98 ha of PCT 418 (White Cypress Pine - Silver-leaved Ironbark) would also be impacted by the proposal. Three condition classes (vegetation zones) of this PCT were identified at the proposal site, ranging in condition from poor to very good. Very good condition vegetation, located at the proposed extraction area was typified by the presence of large, mature hollow bearing *Eucalyptus melanophloia* (Silver-leaved Ironbark) trees. Collectively, these trees provide a significant number of hollows that may support fauna including microbats, arboreal marsupials and forest owls, all of which were identified in the proposal area.

This project has avoided impacts to biodiversity values at the project site by reducing the footprint of the proposal from two extraction areas to only one. The proposal has also been designed to retain habitat connectivity across the ridgeline to support the movement of birds and other fauna across the proposal site to reach habitat resources.

The BAM calculator identified a total of 12 candidate species (species credit species) and 21 predicted species (ecosystem credit species) required consideration for assessment. The Black-striped Wallaby, an ecosystem credit species listed as Endangered was often sighted in the proposal area. This species preferred habitat includes dense, shrubby vegetation found in the proposal area. No other threatened species (including candidate listed species) were identified in the proposal area following site assessments in May, October-November and December 2019. Out of the 12 candidate species (**Section 5.1**), ten were surveyed and found to be absent and two species were assessed as absent (because habitat was assessed as degraded).

Key safeguard and management measures identified to minimise and avoid biodiversity impacts include but are not limited to; detail delineation of vegetation clearing limits, relocation of woody debris into remnant habitat and development of protocols/management plans to control invasion and spread of pathogens and weeds.

A total of 245 ecosystem credits are required to offset the clearing of 8.70 ha of PCT 147 and 418. To acquit the liability of credits, the proponent intends to retire biodiversity credits to the Biodiversity Conservation Trust in instalments over the lifecycle of the quarry (see **Section 7.4**).

The assessments identified that the proposed development is unlikely to significantly impact on any Matters of National Environment Significance.

9. REFERENCES

The following information was used in the preparation of this report:

- Auld, B.A. and Medd, R.W. (1996). *Weeds: An Illustrated Botanical Guide to the Weeds of Australia*. Inkata Press, Sydney.
- Barker, J., Grigg, G.C. and Tyler, M.J. (1995). *A Field Guide to Australian Frogs*. Surrey, Beatty & Sons, New South Wales.
- Churchill, S. (2008). *Australian Bats*. Reed New Holland, Sydney.
- Commonwealth of Australia (2013). *Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*.
- Cunningham, G.M., Mulham, W.E., Milthorpe, P.L. and Leigh, J.H. (2011). *Plants of Western New South Wales*. Soil Conservation Service, Sydney.
- Department of Environment and Climate Change (2007). *Threatened species assessment guidelines: the assessment of significance*. NSW, Sydney South.
- Department of Primary Industries (2013). *Grasses of the NSW Slopes and Adjacent Plains*. Tocal College, Paterson NSW.
- Fitzgerald, M., Lazell, B. and Shine, R. (2010). Ecology and conservation of the Pale-headed Snake (*Hoplocephalus bitorquatus*, Elapidae). *Australian Zoologist*. 2010, Vol. 35, No. 2, pp. 283-290.
- Gibbons, P. and Lindenmayer, D. (2002). *Tree Hollows and Wildlife Conservation in Australia*. CSIRO Publishing, Melbourne.
- Harden, G (1991-2000). *Flora of New South Wales. Vols 1-4*. NSW University Press.
- NSW Department of Environment and Conservation (2004). *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities*. Working Draft.
- NSW Department of Planning, Industry and Environment (2019). Saving Our Species Program: Pale-headed Snake (*Hoplocephalus bitorquatus*). Available from: <https://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10412>, Assessed: December 2019.
- OEH (2010). *Semi-evergreen Vine Thicket EEC guidelines*. NSW, Sydney South.
- OEH (2017). *Biodiversity Assessment Method*. NSW Office of Environment and Heritage, Sydney.
- OEH (2018). <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>, Office of Environment and Heritage Threatened Species Profiles website
- OEH (2018). <https://www.environment.nsw.gov.au/bioregions/BrigalowBeltSouth-Subregions.htm> Office of Environment and Heritage Brigalow Belt South - subregions website, Date: December 2018.

- OEH (2019). *Atlas of NSW Wildlife Database*. Licenced database accessed July 2019
- OEH (2019b). *Biodiversity Assessment Calculator*. Webpage: <https://www.lmhc.nsw.gov.au/bamcalc>. Accessed: July 2019. NSW Office of Environment and Heritage, Hurstville.
- Pennay, M., B. Law, and L. Reinhold. (2004). *Bat Calls of New South Wales*. NSW Department of Environment and Conservation.
- Richardson, F., Richardson, R. and Sheppard, R. (2011). *Weeds of the South-East - An Identification Guide for Australia*. WeedInfo, Victoria.
- Russell, T.C., Geraghty, E. and Wilks, S. (2013). Brushtail possums: do present law, policy and management approaches meet the needs of this species in all its contexts? *Australian Journal of Zoology* 2013;61:95
- Simpson, K. and Day, N. (2010). *Field Guide to the Birds of Australia*. Penguin Publishing, Camberwell Victoria.
- Van Dyck, S., Gynther, I. and Baker, A. (Eds) (2013). *Field Companion to The Mammals of Australia*. New Holland Publishing, Sydney.
- Triggs, B. (1996). *Tracks, Scats and Other Traces - A Field Guide to Australian Mammals*, Oxford University Press, Melbourne.
- Umwelt (2017). *Australian Rail Track Corporation Inland Rail Narrabri to North Star EIS*, Vol 1 - Main Report.
- Wilson, S. and Swan, G. (2010). *A Complete Guide to the Reptiles of Australia*. New Holland Publishing, Sydney, New South Wales.

APPENDIX I: Flora and Fauna Species List

AI.1. FLORA SPECIES LIST

The following is a list of all flora species recorded within the site. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora. A period of some years is often required to identify all species present in an area, particularly for cryptic or seasonally detectable species (such as orchids, some grasses and grass-like herbs).

Note, weeds are listed as 'EXOTIC' under the column BAM Growth Form Group

FAMILY	Scientific Name	Common Name	BAM Growth Form Group
ACANTHACEAE	<i>Brunoniella australis</i>	Blue Trumpet	Forb
ADIANTACEAE	<i>Cheilanthes sp.</i>		Fern
AIZOACEAE	<i>Tetragonia tetragonioides</i>	Native Spinach	Forb
APOCYNACEAE	<i>Alstonia constricta</i>	Quinine Tree	Tree
	<i>Carissa ovata</i>		Other
	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush	EXOTIC
	<i>Marsdenia pleiadenia</i>		Other
	<i>Marsdenia viridiflora subsp. viridiflora</i>	Native Pear	Other
	<i>Parsonsia eucalyptophylla</i>	Gargaloo	Other
	<i>Parsonsia lanceolata</i>		Other
ASTERACEAE	<i>Sigesbeckia australiensis</i>		Forb
	<i>Silybum marianum</i>	Silybum Thistle	EXOTIC
	<i>Sonchus oleraceus</i>		EXOTIC
	<i>Sonchus sp.</i>		EXOTIC
	<i>Verbesina encelioides</i>		EXOTIC
	<i>Vittadinia cuneata</i>		Forb
BIGNONIACEAE	<i>Pandorea pandorana</i>	Wong Wonga Vine	Other
BORAGINACEAE	<i>Ehretia membranifolia</i>	Peach Bush	Shrub
	<i>Cynoglossum australe</i>		Forb
BRASSICACEAE	<i>Brassica tournefortii</i>	Mediterranean Turnip	EXOTIC
	<i>Brassicaceae sp.</i>		EXOTIC
CACTACEAE	<i>Optunia sp.</i>	Prickly Pear	EXOTIC
CAPPARACEAE	<i>Apophyllum anomalum</i>	Warriorbush	Shrub
	<i>Capparis lasiantha</i>	Nepine	Other
	<i>Capparis mitchellii</i>	Wild Orange	Shrub
CASUARINACEAE	<i>Casuarina cristata</i>	Belah	Tree
CHENOPODIACEAE	<i>Atriplex semibaccata</i>	Creeping Saltbush	Shrub
	<i>Dysphania pumilio</i>	Small Crumbweed	Forb
	<i>Einadia nutans</i>	Climbing Saltbush	Forb
	<i>Enchylaena tomentosa</i>		Shrub

	<i>Rhagodia spinescens</i>		Shrub
	<i>Salsola australis</i>		Shrub
	<i>Sclerolaena diacantha</i>		Shrub
	<i>Sclerolaena muricata</i>	Black Rolypoly	Shrub
	<i>Sclerolaena sp.</i>		Shrub
CUCURBITACEAE	<i>Citrullus lanatus</i>	Watermelon	EXOTIC
CYPERACEAE	<i>Cyperus gracilis</i>	Slender Flat-sedge	Grass
EUPHORBIACEAE	<i>Beyeria viscosa</i>	Sticky Wallaby Bush	Shrub
	<i>Croton phebaloides</i>		Shrub
	<i>Euphorbia tannensis</i>		Shrub
FABACEAE	<i>Acacia buxifolia</i>		Shrub
	<i>Acacia harpophylla</i>		Shrub
	<i>Desmodium brachypodium</i>	Large Tick-trefoil	Forb
	<i>Desmodium varians</i>	Slender Tick-trefoil	Other
	<i>Glycine clandestina</i>		Other
	<i>Indigofera brevidens</i>		Shrub
	<i>Medicago laciniata</i>	Cut-leaved Medic	EXOTIC
	<i>Senna barclayana</i>	Smooth Senna	Forb
	<i>Vachellia farnesiana</i>	Common Sensitive Plant	Shrub
LAMIACEAE	<i>Salvia reflexa</i>		EXOTIC
	<i>Spartothamnella juncea</i>	Bead Bush	Shrub
MALVACEAE	<i>Abutilon fraseri</i>	Dwarf Lantern-flower	Forb
	<i>Abutilon oxycarpum</i>	Straggly Lantern-bush	Shrub
	<i>Malva parviflora</i>	Cheese Weed	EXOTIC
	<i>Malvastrum americanum</i>	Spiked Malvastrum	EXOTIC
	<i>Sida corrugata</i>		Forb
MYOPORACEAE	<i>Eremophila mitchellii</i>		Shrub
MYRTACEAE	<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark	Tree
	<i>Eucalyptus populnea</i>	Bimble-box	Tree
OLEACEAE	<i>Jasminum lineare</i>	Desert Jasmine	Other
	<i>Notelaea microcarpa</i>	Native Olive	Tree
ORCHIDACEAE	<i>Cymbidium canaliculatum</i>		Other
OXALIDACEAE	<i>Oxalis perennans</i>		Forb
PITTOSPORACEAE	<i>Bursaria spinosa</i>	Blackthorn	Shrub
POACEAE	<i>Ancistrachne uncinulata</i>	Hooky Grass	Grass
	<i>Aristida ramosa</i>	Purple Wiregrass	Grass
	<i>Austrostipa scabra</i>	Speargrass	Grass
	<i>Austrostipa sp.</i>		Grass
	<i>Austrostipa verticillata</i>	Slender Bamboo Grass	Grass
	<i>Chloris ventricosa</i>	Tall Chloris	Grass

	<i>Dichanthium sericeum</i>		Grass
	<i>Digitaria brownii</i>		Grass
	<i>Digitaria ramularis</i>		Grass
	<i>Enneapogon gracilis</i>		Grass
	<i>Eremochloa sp.</i>		Grass
	<i>Eriochloa pseudoacrotricha</i>		Grass
	<i>Paspalidium gracile</i>	Slender Panic	Grass
	<i>Paspalum distichum</i>	Water Couch	Grass
	<i>Tragus australianus</i>		Grass
PORTULACACEAE	<i>Portulaca oleracea</i>	Puslane	Forb
RHAMNACEAE	<i>Ventilago viminalis</i>	Supplejack	Tree
RUBIACEAE	<i>Psydrax odorata</i>	Shiny-leaved Canthium	Shrub
RUTACEAE	<i>Geijera parviflora</i>	Wilga	Shrub
SAPINDACEAE	<i>Atalaya hemiglauc</i>	Whitewood	Tree
SOLANACEAE	<i>Lycium ferocissimum</i>	Box Thorn	EXOTIC
	<i>Physalis ixocarpa</i>	Ground Cherry	EXOTIC
	<i>Solanum amblymerum</i>		Shrub
	<i>Solanum prinophyllum</i>	Forest Nightshade	Forb
	<i>Solanum sp.</i>		EXOTIC
	<i>Solanum nigrum</i>		EXOTIC
STERCULIACEAE	<i>Brachychiton populneus</i>	Kurrajong	Tree
VERBENACEAE	<i>Verbena supina</i>	Trailing Verbena	EXOTIC
ZYGOPHYLLACEAE	<i>Tribulus terrestris</i>		EXOTIC
	<i>Zygophyllum apiculatum</i>	Gallweed	Forb

AI.2. FAUNA SPECIES LIST

The following is a list of all fauna species recorded within the site during the survey period.

Observation Type:		
O - Observed	B - Burnt	F - Tracks/scratchings
T - Trapped or netted	H - Hair, feathers, or skin	Y - Bone or teeth
R - Road kill	P - Scat	D - Dog kill
W - Heard call	C - Cat kill	Z - In raptor/owl pellet
V - Fox kill	E - Nest/roost	K - Dead
M - Miscellaneous	X - In scat	U - Bat Recording

Notes

* - Indicates an introduced species.

Family	Scientific Name	Common Name	BC Act	EPBC Act	Observation Type
AVES					
Acanthizidae	<i>Acanthiza nana</i>	Yellow Thornbill			O

Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle	O
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	O
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie	O
Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella	O
Cacatuidae	<i>Eolophus roseicapilla</i>	Gallah	O
Cacatuidae	<i>Nymphicus hollandicus</i>	Cockatiel	O
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	O
Corcoracidae	<i>Corcorax melanorhamphos</i>	White-winged Chough	O
	<i>Struthidea cinerea</i>	Apostlebird	O
Corvidae	<i>Corvus coronoides</i>	Australian Raven	O
Falconidae	<i>Falco cenchroides</i>	Australian Kestrel	O
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	O
	<i>Manorina melanocephala</i>	Noisy Miner	O
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	O
Psittaculidae	<i>Aprosmictus erythropterus</i>	Red-winged Parrot	O
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	O
Strigidae	<i>Ninox boobook</i>	Southern Boobook	O
INSECTA			
Idiopidae	<i>Aganippe sp.</i>	Trapdoor Spider	O
Lycosidae	<i>Lycosidae sp.</i>	Wolf Spider	O
Nymphalidae	<i>Junonia villida</i>	Meadow Argus	O
Pieridae	<i>Belenois java</i>	Caper White Butterflies	O
MAMMALS			
Canidae	<i>Vulpes vulpes</i>	Red Fox	O (camera trap)
Leporidae	<i>Lepus capensis</i>	Brown Hare	O
Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	O
	<i>Macropus robustus</i>	Common Wallaroo	O
	<i>Notamacropus dorsalis</i>	Black-striped Wallaby	E O
	<i>Wallabia bicolor</i>	Swamp Wallaby	O (camera trap)

Molossidae	<i>Mormopterus petersi</i>	Inland Freetail Bat	U
Phalangeridae	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	O
Suidae	<i>*Sus scrofa</i>	Feral Pig	R
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Echidna	O (camera trap)
Vespertilionidae	<i>Nyctophilus sp.</i>		U
Vespertilionidae	<i>Vespadelus darlingtonia</i>	Large Forest Bat	U
REPTILE			
Agamidae	<i>Tympanocryptis spp.</i>	Dragon	O (camera trap)
Diplodactylidae	<i>Heteronotia binoei</i>	Prickly Gecko	O
Elapidae	<i>Acanthophis antarcticus</i>	Common Death Adder	H
Gekkonidae	<i>Gehyra sp.</i>	Dtella species	O



APPENDIX II: Habitat Assessment for Threatened Species

Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey.
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (20km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.

Scientific Name	Common Name	Habitat requirements	BC Act ¹	EPBC Act ¹	Records ²	Likelihood of occurrence
Flora						
<i>Cadellia pentastylis</i>	Ooline	In NSW, Ooline, a medium-sized spreading tree occurs along the western edge of the North West Slopes from north of Gunnedah to west of Tenterfield. The natural range is from 24°S to 30°S in the 500 to 750 mm per annum rainfall belt. Ooline occurs on low- to medium-nutrient soils of sandy clay or clayey consistencies.	V	V	0	Low
<i>Desmodium campylocaulon</i>	Creeping Tick-trefoil	The Creeping Tick-trefoil is a prostrate twining herb or erect perennial forb to 1 m high. In NSW it grows on cracking black (clay) soils in the Narrabri, Moree and Walgett local government areas.	E		1	Low
<i>Dichanthium setosum</i>	Bluegrass	Assessed as a candidate species in Section 5 - Table 5.1.	V	V	0	Low

<i>Digitaria porrecta</i>	Finger Panic Grass	Finger Panic Grass is a loosely tufted grass growing to 60 cm tall. The grass occurs in native grassland, woodlands or open forest with a grassy understorey, on richer soils. Plants die back each year to the tussock base from which it resprouts in late summer.	E	1	Low
<i>Homopholis belsonii</i>	Belson's Panic	Assessed as a candidate species in Section 5 - Table 5.1.	E	V	Low There are records of this plant from 1988, 5.7 km east of the proposal site.
<i>Thesium australe</i>	Austral Toadflax	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Occurs in grassland or grassy woodland, often found in damp sites in association with Kangaroo Grass (<i>Themeda triandra</i>).	V	V	Low
<i>Tylophora linearis</i>		Assessed as a candidate species in Section 5- Table 5.1.	V	E	Low
Aves					
<i>Anthochaera phrygia</i>	Regent Honeyeater	Inhabits eucalypt open forests and woodlands, predominantly box-ironbark types, but also Spotted Gum and Swamp Mahogany on the coast. The species also inhabits River She-oak gallery forest with <i>Amyema cabbagei</i> (Needle-leaf Mistletoe). It is estimated that the NSW population of Regent Honeyeaters may now be fewer than 250 mature individuals.	CE	CE	Low Important habitat for this species is not known to occur in the local area.
<i>Callidris ferruginea</i>	Curlew Sandpiper	Occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration.	E	CE	Low This species is unlikely to occur given the lack of suitable wetlands at the project site.
<i>Chthonicola sagittata</i>	Speckled Warbler	Lives in a wide range of eucalypt-dominated vegetation that typically includes scattered native tussock	V	1	Moderate

		grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. This species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast.			May forage or rest within proposal site but not considered important habitat for this species.
<i>Circus assimilis</i>	Spotted Harrier	Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	V	2	Moderate May forage or rest within proposal site but no nests indicative of breeding were observed. Not considered important habitat for this species.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	A sedentary bird, in NSW distribution is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	V	2	Moderate Common habitat present. May forage or rest within proposal site but not considered important habitat for this species.
<i>Erythratorchis radiatus</i>	Red Goshawk	The species is very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. The bird prefers a mosaic of vegetation types and is often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	CE	V 0	Low Non preferred habitat is present. Not considered important habitat for this species.
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	In NSW this medium-sized ground-dwelling pigeon is found in the North West Slopes extending down to the Liverpool Plains and Dubbo. The pigeon is found in	CE	V 0	Low Common habitat present. May

		grassy woodlands and plains, preferring sandy areas and usually close to water.			forage or rest within proposal site but not considered important habitat for this species.
<i>Grantiella picta</i>	Painted Honeyeater	Nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird are from the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. Inhabits Boree/Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) and Box-Gum Woodlands and Box-Ironbark Forests.	V	V	4
					Moderate Common habitat present. May forage or rest within proposal site but not considered important habitat for this species.
<i>Hieraaetus morphnoides</i>	Little Eagle	Assessed as a candidate species in Section 5 - Table 5.1.	V		2
					Moderate May forage or rest within proposal site but no nests indicative of breeding were observed. Not considered important habitat for this species.
<i>Melanodryas cucullata</i>	Hooded Robin (south-eastern form)	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	V		2
					Moderate May forage or rest within proposal site but no nests indicative of breeding were observed. Not considered important habitat for this species.
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler (eastern subspecies)	In NSW, eastern sub-species of the Grey-crowned Babbler occurs on the western slopes of the Great Dividing Range. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. It builds and maintains	V		3
					Moderate Common habitat present. May forage or rest within proposal site but not considered

		several conspicuous, dome-shaped stick nests about the size of a football.		important habitat for this species.
<i>Rostratula australis</i>	Australian Painted Snipe	Most records are from the south east, particularly the Murray Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	E E 0	Low This species is unlikely to occur given the lack of suitable wetlands at the project site.
Fish				
<i>Maccullochella peelii</i>	Murray Cod	The Murray Cod occurs naturally in the waterways of the Murray-Darling Basin and is known to live in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs.	V 0	Low Habitat not present.
Mammalia				
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW.	V 0	Low Habitat in the form of cliffs or caves not found in the subject area.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites with basking and latrine sites often nearby.	V E 0	Low
<i>Macropus dorsalis</i>	Black-striped Wallaby	On the north west slopes of NSW, The Black-striped Wallaby occurs in Brigalow remnants to south of Narrabri. Preferred habitat is characterised by dense woody or shrubby vegetation within three metres of the	E 3	Low Marginal habitat present. The nearest record was recorded in 1979 at Croppa Creek.

<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	ground. This dense vegetation must occur near a more open, grassy area to provide suitable feeding habitat.	Inhabits a variety of vegetation types, including mallee, bullock <i>Allocasuarina leucomanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	V	V	0	Moderate Common habitat present. May forage or rest within proposal site but not considered important habitat for this species.
<i>Phascogalea cinerea</i>	Koala	Assessed as a candidate species in Section 5 - Table 5.1.		V	V	11	Moderate There are isolated recordings of Koalas at North Star and Croppa Creek from as recent as 2015. A small number of <i>Eucalyptus populnea</i> (Bimble box), a Koala feed tree were recorded in the proposal area. No evidence of Koala occupation was observed at the proposal site.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Assessed as a candidate species in Section 5 - Table 5.1.		V	V	0	Low May forage or rest within proposal site but not considered important habitat for this species. No roosting areas were observed on site.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	The Yellow-bellied Sheath-tail-bat is a wide-ranging species found across northern and eastern Australia. In NSW, there are scattered records of this species		V		1	High This species was recorded on the subject site during

across the New England Tablelands and North West Slopes. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.		a biodiversity assessment undertaken by Advitech in 2017. This species was not recorded during the current assessment.	
Reptilia			
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	<p>Patchy distribution on the North West Slopes and Plains of north-east NSW. Close to or on the lower slopes of slight rises in grassy White Box woodland on moist black soils, and River Red Gum-Coolibah-Bimble Box woodland on deep cracking loose clay soils. May also occur in grassland areas and open paddocks with scattered trees. The worm-skink lives in deep soil cracks, coming close to the surface under fallen timber and litter, especially partially buried logs.</p>	<div>E</div> <div>V</div> <div>0</div>
<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko	<p>Found only on the tablelands and slopes of northern NSW. Most common in the granite country of the New England Tablelands. Occurs at sites ranging from 500 to 1100 m elevation. Populations are mostly fragmented, with over 50 discrete sites currently known that are separated by at least 2 km. Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Occupied sites often have a dense tree canopy that helps create a sparse understorey.</p>	<div>V</div> <div>V</div> <div>0</div>
		Low	

¹ Status Abbreviations: V - Vulnerable, E - Endangered, CE - Critically Endangered.

² Number of OEH wildlife atlas records in selected area Approx. 20km radius [North: -28.70 West: 149.99 East: 150.81 South: -29.31]

APPENDIX III: Assessments of Significance

Considerations under Section 7.3 of the BC Act 2016 (Five-Part Test)

Endangered Ecological Communities and threatened species that have the potential to be impacted by the proposed works have been assessed under the guidelines of Section 7.3 of the Biodiversity Conservation Act (2016) and this is provided below in the form of a five-part test. Assessments of significance are provided for:

- The EEC, *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregion*
- a) **In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.**

N/A

- b) **In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:**
 - i. **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
 - ii. **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

Some native vegetation located on the slopes of the ridgeline at the extraction area was consistent with the EEC, *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions* (SEVT). The proposed quarry works have the potential to impact about 1.73 ha of this community.

Within 1500 m buffer area surrounding the proposal site, this represents (according to the State Vegetation Type Map):

- Approximately 2.07% (/ 83.55 ha) impact to vegetation mapped as associated (not partially subset of) with the SEVT EEC This includes PCTs 55 and 378.

Note, PCT 147 is not mapped in the assessment area, despite vegetation on site as being consistent with this PCT. It is likely some vegetation in the assessment area that is not currently mapped as a Semi-evergreen Vine Thicket community, is consistent with this EEC. Considering this, it is likely < 2.07% of the EEC extent in the assessment area would be impacted by the proposal.

Whilst the proposal will contribute to the decline of this EEC in the local area, the relatively minor extent of vegetation removal (2.07% within 1500 m of the proposal site) is not likely to place the local occurrence of this EEC at risk of extinction. Works within the site will be restricted to identified areas. However, edge effects may modify the composition of any retained areas of EEC around the boundary of the project area.

- c) **In relation to the habitat of a threatened species, population or ecological community:**
 - i. **the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
 - ii. **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and**
 - iii. **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions

- | | |
|------|--|
| i) | The proposed development would impact approximately 2.07% or 1.73 ha of very good condition vegetation of this EEC within 1500 m of the proposal site (according to calculations made using the State Vegetation Type Map). |
| ii) | The proposal site is isolated by rural land uses and not connected (through canopy cover) to continuous patches of vegetation. The proposed works may result in minor impacts on site habitat links but are unlikely to substantially increase fragmentation of this EEC. |
| iii) | The development proposes to clear up to 2.07% of the mapped extent of the EEC in the local area. The ridgeline is locally important, containing a number of shelter, nesting and breeding habitat resources for fauna. The proposed development footprint is unlikely to impact habitat important for the long-term survival of this EEC in the local area. The proposal retains a significant extent of the EEC at the proposal site, including a 50 m corridor of vegetation that runs across the proposal area. Retention of SEVT community around buffer areas of the quarry, may help support the rehabilitation of the quarry site once quarry operations conclude by providing a local source of propagules such as seeds for the TEC's recovery. |

- d) **Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**

No declared area of outstanding biodiversity value would be impacted by the proposed works.

- e) **Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**

The 'Key Threatening Processes' currently listed under Schedule 3 of the BC Act which are relevant to the project are listed below:

- Clearing of native vegetation;
- Removal of dead wood and dead trees;
- Infection of native plants by *Phytophthora cinnamomi*; and
- Invasion of native plant communities by exotic perennial grasses.

Where relevant, mitigation measures for the proposed works will be implemented to minimise the impact of these key threatening processes. The proposed development is unlikely to significantly exacerbate the impact of these KTPs in the local area.

Conclusion

Based on the considerations above, the proposed works are unlikely to have a significant impact on any threatened species, population or EEC such that a local population is placed at risk of extinction.

Considerations under the EPBC Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires approval of the Commonwealth Minister representing the Department of the Environment, for actions that may have a significant impact on Matters of National Environmental Significance (MNES). The EPBC Act also requires Commonwealth approval for certain actions on Commonwealth land.

MNES protected under the EPBC Act include:

- World Heritage properties;
- National Heritage places;
- RAMSAR wetlands of international importance;

- Threatened species or ecological communities listed in the EPBC Act;
- Migratory species listed in the EPBC Act;
- The Great Barrier Reef Marine Park;
- Commonwealth marine environment; and
- Nuclear actions.

With regard to flora and fauna, the only MNES relevant to the study area are nationally listed threatened species and migratory species. The DoEE protected matters search for the site is provided in **Appendix IV**. An assessment has been made to determine whether or not the proposal will have, or is likely to have, a significant impact on these MNES and is provided below.

One endangered ecological community, *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions* was recorded at the proposal site. This EEC has been assessed below in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (DoEE, 2013).

No other EECs or threatened species were recorded within the proposal site. Other species assessed were considered to have low potential of occurring within in the study area and no further assessment under the provisions of the EPBC Act is warranted for these species

EPBC Act Assessment of Significance - Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions EEC

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **reduce the extent of an ecological community**

1.73 ha of vegetation would be impacted by the proposed action. Within 1500 m buffer surrounding the proposal site, according to the State Vegetation Type Map, approximately 83.55 ha of the EEC *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions* may be present. The proposed action would reduce the extent to the EEC by 2.07% within 1500 m of the proposal site. The proposed action is unlikely to have a significant impact on the extent of the EEC on the ridgeline (at the patch level) and potentially, in the local area.

- **fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines**

The proposal site is isolated by rural land uses and not connected (through canopy cover) to continuous patches of vegetation. The proposed works are restricted to a corner of the existing habitat patch and will not increase the fragmentation of this EEC in the local area.

- **adversely affect habitat critical to the survival of an ecological community**

The proposed action would impact 1.73 ha of habitat suitable for the EEC. Given only a minor extent of the habitat patch that supports the EEC would be impacted and not all of the patch is included a part of the proposed development, the development is unlikely to significantly affect habitat critical to the survival of the EEC.

- **modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns**

The proposed action is unlikely to modify or destroy abiotic factors necessary for survival of this EEC in the local area given the restriction of works to a local habitat patch.

- **cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting**

The development may have a minor impact on the EEC at the patch scale by increasing edge effects. The nature of the proposed work is unlikely to cause a substantial change in the species composition of the EEC vegetation recorded within the study area. Quadrat sampling determined that vegetation composition is relatively similar to adjacent habitat outside of the proposal footprint.

- **cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:**
 - **assisting invasive species, that are harmful to the listed ecological community, to become established, or**
 - **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

Recommendations regarding the management of weeds are provided in **Section 6** of the BDAR. Provided safeguards regarding weed management are implemented, the proposed works are unlikely to result in increased weed incursion or management detrimental to the adjacent EEC vegetation.

- **interfere with the recovery of an ecological community.**

The proposed works will have a minor impact on the recovery of this EEC by impacting 1.73 ha of vegetation in very good condition. The habitat in the proposal footprint potentially has a high potential to gain (improve in integrity) if reserved for conservation purposes where appropriate management actions are implemented. The proposal is considered unlikely to significantly interfere with the recovery of this EEC given the relative scale of the proposed action.

Migratory Species

According to the MNES in **Appendix IV**, 10 migratory species have the potential to occur in the local area and are listed in the Table below.

Migratory species with the potential to occur in the local area

Species name	Common name
<i>Actitis hypoleucos</i>	Common Sandpiper
<i>Apus pacificus</i>	Fork-tailed Swift
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper

Species name	Common name
<i>Calidris ferruginea</i>	Curlew Sandpiper
<i>Calidris melanotos</i>	Pectoral Sandpiper
<i>Gallinago hardwickii</i>	Latham's Snipe
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Motacilla flava</i>	Yellow Wagtail
<i>Myiagra cyanoleuca</i>	Satin Flycatcher
<i>Pandion haliaetus</i>	Osprey

None of the above migratory species were recorded on site during the field survey. The proposed works are unlikely to impact on any area considered to be 'important habitat' for the above migratory species, or likely to impact a significant proportion of a migratory population.



APPENDIX IV: Matters of National Environmental Significance Search



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 01/07/19 08:39:13

[Summary](#)

[Details](#)

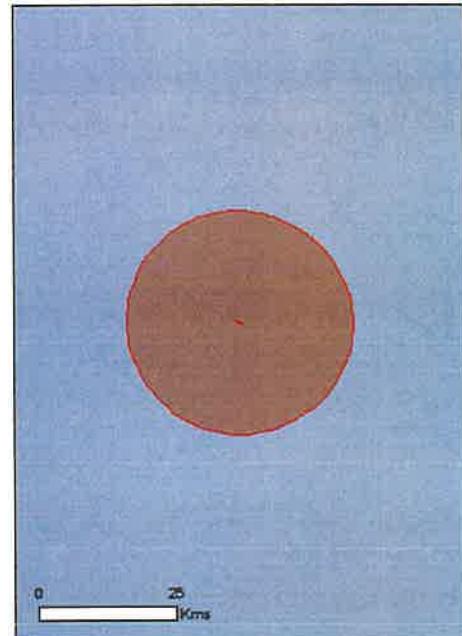
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

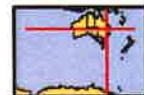
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 20.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	19
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	27
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	1000 - 1100km
Riverland	1000 - 1100km
The coorong, and lakes alexandrina and albert wetland	1200 - 1300km

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythroriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Geophaps scripta scripta		
Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Grantiella picta		
Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis		
Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Phascogale cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Cadellia pentastylis		
Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum		
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Homopholis belsonii		
Belson's Panic [2406]	Vulnerable	Species or species habitat may occur within area
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Tylophora linearis		
[55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Anomalopus mackayi		
Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat may occur within area
Uvidicolus sphyrurus		
Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species

Name	Threatened	Type of Presence habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		within area Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
<i>Sturnus vulgaris</i> Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
<i>Rhinella marina</i> Cane Toad [83218]		Species or species habitat may occur within area
Mammals		
<i>Bos taurus</i> Domestic Cattle [16]		Species or species habitat likely to occur within area
<i>Canis lupus familiaris</i> Domestic Dog [82654]		Species or species habitat likely to occur within area
<i>Capra hircus</i> Goat [2]		Species or species habitat likely to occur within area
<i>Felis catus</i> Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
<i>Lepus capensis</i> Brown Hare [127]		Species or species habitat likely to occur within area
<i>Mus musculus</i> House Mouse [120]		Species or species habitat likely to occur within area
<i>Oryctolagus cuniculus</i> Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
<i>Rattus rattus</i> Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
<i>Sus scrofa</i> Pig [6]		Species or species habitat likely to occur within area
<i>Vulpes vulpes</i> Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
<i>Asparagus asparagoides</i> Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
<i>Lycium ferocissimum</i> African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
<i>Opuntia</i> spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
<i>Pinus radiata</i> Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
<i>Rubus fruticosus</i> aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
<i>Salix</i> spp. except <i>S. babylonica</i> , <i>S. x calodendron</i> & <i>S. x reichardtii</i> Willows except Weeping Willow, Pussy Willow and		Species or species

Name	Status	Type of Presence
Sterile Pussy Willow [68497]		habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Tamarix aphylla		
Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-29.01356 150.348002,-29.013542 150.348044,-29.012904 150.348366,-29.012359 150.348903,-29.012397 150.349096,-29.013692 150.352958,-29.016506 150.356542,-29.018402 150.35225,-29.017595 150.351907,-29.016957 150.353345,-29.015362 150.3521,-29.01356 150.348002

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Department of Land and Resource Management, Northern Territory](#)
- [Department of Environmental and Heritage Protection, Queensland](#)
- [Department of Parks and Wildlife, Western Australia](#)
- [Environment and Planning Directorate, ACT](#)
- [Birdlife Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- [Natural history museums of Australia](#)
- [Museum Victoria](#)
- [Australian Museum](#)
- [South Australian Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [Geoscience Australia](#)
- [CSIRO](#)
- [Australian Tropical Herbarium, Cairns](#)
- [eBird Australia](#)
- [Australian Government – Australian Antarctic Data Centre](#)
- [Museum and Art Gallery of the Northern Territory](#)
- [Australian Government National Environmental Science Program](#)
- [Australian Institute of Marine Science](#)
- [Reef Life Survey Australia](#)
- [American Museum of Natural History](#)
- [Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

APPENDIX V: BAM Credit Summary

BAM Credit Summary Report

Proposal Details

Assessment Id	00017009/BAAS19023/19/00017010	Proposal Name	Pearlmans BDAR	BAM data last updated *	26/11/2019
Assessor Name		Report Created	23/12/2019	BAM Data version *	22
Assessor Number		BAM Case Status	Finalised	Date Finalised	23/12/2019
Assessment Revision	0	Assessment Type	Part 4 Developments (General)		

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with BioNet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion								
1	147_Zone1	82.2	1.1	0.25	High Sensitivity to Potential Gain	2.00		46
2	147_Zone2	76.2	0.6	0.25	High Sensitivity to Potential Gain	2.00		23
Subtotal								69

BAM Credit Summary Report

White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion						
3 418_Zone1	76.5	5.4	0.25	High Sensitivity to Potential Gain	1.50	156
4 418_Zone2	35.3	1.4	0.25	High Sensitivity to Potential Gain	1.50	18
5 418_Zone3	30.1	0.2	0.25	High Sensitivity to Potential Gain	1.50	2
Subtotal						176
Total						245

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAI	Species credits
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Report

Aboriginal Cultural Heritage Assessment

Pearlman Quarry

Quarry Solutions Pty Ltd

21 August, 2019

Rev 0 (Final)

Report Details

Aboriginal Cultural Heritage Assessment - Pearlman Quarry

Job #: J0191023, Folder #: F20107, Revision: 0 (Final), Date: 21 August, 2019

Filename: 20107 QS Pearlman Quarry Aboriginal Cultural Heritage Assessment Rev 0.docx

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History

Date	Revision	Comments
27 June, 2019	A	Draft
16 July, 2019	B	Draft issued to client for review
22 July, 2019	C	Draft for registered Aboriginal parties to review
21 August, 2019	0	Final issue to client

Endorsements

Function	Signature	Name and Title	Date
Prepared by		Jake Brown Archaeologist	21 August, 2019
Checked by		Jessica Blackman Archaeologist	21 August, 2019
Authorised for Release by		Dr Rod Bennison Lead Environmental Scientist	21 August, 2019

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1. INTRODUCTION

Advitech Pty Limited (trading as Advitech Environmental) was engaged by Groundwork Plus Pty Ltd (Groundwork Plus) on behalf of Quarry Solutions Pty Ltd (Quarry Solutions). Groundwork Plus are compiling several Environmental Impact Statements (EIS) for Quarry Solutions, which intends to supply the Australian Rail Track Corporation with extractive materials for the construction of the Melbourne to Brisbane Inland Rail project. This ACHAR has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) dated 8 May, 2019 (EAR 1331). The Pearlman's Quarry proposal is considered Designated Development under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). As such, this ACHAR supports the EIS completed in accordance with the SEARs.

It should be noted that this report was prepared by Advitech Pty Limited for Quarry Solutions ('the customer') in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

1.1 Project Background

Quarry Solutions propose to develop and operate a hard rock quarry operation on the property 'Tikitere', located approximately 70 km north east of Moree (a site map is provided in **Figure 1**). The property has historically been used for mixed cultivation and grazing operations. The Pearlman's Quarry is one of several possible sources of ballast material for the Inland Rail project. The quarry proposes to extract up to 490,000 tonnes of material per annum over a five year period.

The proposed works would include:

- Construction and operation of a new hard rock quarry;
- Preparation of materials (crushing and stockpiling) in a manner required by the Inland Rail project;
- Transport of materials off the property to a rail loading point within the rail corridor; and
- Rehabilitation of the quarry to a suitable landform for continuing rural activities and plant community restoration.

1.2 Qualifications of the Investigators

Jake Brown, Archaeologist, has 2 years of experience in Aboriginal archaeological assessments, research, reporting, analysis and consultation. This experience has included cataloguing stone artefacts from the Hunter region, conducting field surveys, and monitoring of potential find sites during surface/subsurface disturbance across central and northern Queensland. Jake's educational qualifications include a *Bachelor of Social Science (Hons)* in Sociology and Anthropology, University of Newcastle 2015, and a *Graduate Certificate of Archaeology* from Flinders University 2017. Jake is a member of the Australian Archaeological Association.

Jessica Blackman, Archaeologist, has 6 years of experience in Aboriginal archaeological assessment, cultural heritage management, reporting, analysis, and community consultation. Jessica's training in the mining and minerals industry has allowed her to gain extensive experience in field heritage survey and assessment, artefact and cultural site identification and cataloguing, and land access facilitation through meeting internal and regulatory compliance obligations. Jessica has worked in Queensland, New South

Wales and the Northern Territory. Jessica holds a *Bachelor of Arts* with an extended major in archaeology and anthropology (University of Queensland 2011) and a *Native Title Masterclass Certificate* (James Cook University 2015). Jessica is a member of the Australian Archaeological Association (AAA), the Australian Society for Historical Archaeology (ASHA), The Lithics Studies Society and the World Archaeological Congress.

2. PLANNING CONTEXT

2.1 Purpose of this Assessment Report

The purpose of this report is to assess potential Aboriginal heritage issues from the operation and construction of the proposed quarry and, where required, identify feasible and reasonable mitigation measures. The proposal is designated development under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and, as such, this statement has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs).

2.2 Secretary's Environmental Assessment Requirements

This report will be appended to an Environmental Impact Statement (EIS) which must comply with the requirements of Clause 6 and 7 of the Environmental Planning and Assessment Regulation 2000, and which addresses environmental considerations identified in the Secretary's Environmental Assessment Requirements (SEARs) (EAR1331) relevant to heritage. The SEARs state that the heritage assessment should be undertaken with a view to the:

- *an assessment of the potential impacts on Aboriginal heritage (cultural and archaeological), having regard to OEH advice;*

Those relevant policies and guidelines used in the preparation of this report are:

- The Burra Charter (The Australia ICOMOS charter for places of cultural significance);
- *Guide to investigation, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011);
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH 2010);
- *Code of Practice for Archaeological investigation of Aboriginal Objects in NSW* (OEH 2010); and
- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (OEH 2010).

Further, in regard to Aboriginal heritage, the Office of Environment and Heritage provided recommendations to inform the SEARs:

- *The EIS must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the proposal. This may include the need for surface survey and test excavation. The identification of cultural heritage values must be conducted in accordance with the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (OEH 2010), and be guided by the Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW (DECCW, 2011) and consultation with OEH regional branch officers.*
- *Where Aboriginal cultural heritage values or potential values are present, these are to be assessed and documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR). An assessment under the Due Diligence process is not an Aboriginal Cultural Heritage Assessment Report. The ACHAR must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the ACHAR must*

outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.

- *Consultation with Aboriginal people must be undertaken and documented in accordance with the Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW) where an ACHAR is required. The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the ACHAR.*

Note: Consultation is not only required when an AHIP will be required, but also when test excavations are carried out under the Code of Practice. These may not always require an AHIP but will trigger the need for an ACHAR.

- *Where harm to an Aboriginal object or declared Aboriginal place cannot be avoided, an Aboriginal Heritage Impact Permit (AHIP) will be required from OEH under the National Parks and Wildlife Act 1974. You must apply to OEH for an AHIP prior to commencing works that will directly or indirectly harm an Aboriginal object or a declared Aboriginal place.*

Note: Designated development where an AHIP is required should also be considered as an integrated development application (IDA). In these circumstances, OEH will issue General Terms of Approval (GTAs) to the consent authority to be included in conditions of development consent. OEH GTAs will address Aboriginal cultural heritage matters required to be addressed as part of an AHIP application. The matters outlined in the GTAs will be required to be assessed as part of an AHIP after development consent has been granted. OEH requires valid development consent to accompany an AHIP application.

- *The ACHAR must outline procedures to be followed if Aboriginal objects are found at any stage of the life of the development to formulate appropriate measures to manage unforeseen impacts.*
- *The ACHAR must outline procedures to be followed in the event Aboriginal burials or skeletal material is uncovered during construction to formulate appropriate protocols to manage the impacts to this material in accordance with the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (OEH 2010).*
- *If you do not know whether a proposal may harm Aboriginal objects or declared Aboriginal places, it may be appropriate to apply the due diligence procedure as prescribed under the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (OEH 2011). The due diligence must indicate whether further assessment under an Aboriginal Cultural Heritage Report (ACHAR) is required. An assessment under the Due Diligence process is not an ACHAR.*
- *The assessment of cultural heritage values must include a surface survey undertaken by a qualified archaeologist in areas with potential for subsurface Aboriginal deposits. The result of the surface survey is to inform the need for targeted test excavation to better assess the integrity, extent, distribution, nature and overall significance of the archaeological record. The results of surface surveys and test excavations are to be documented in the ACHAR.*

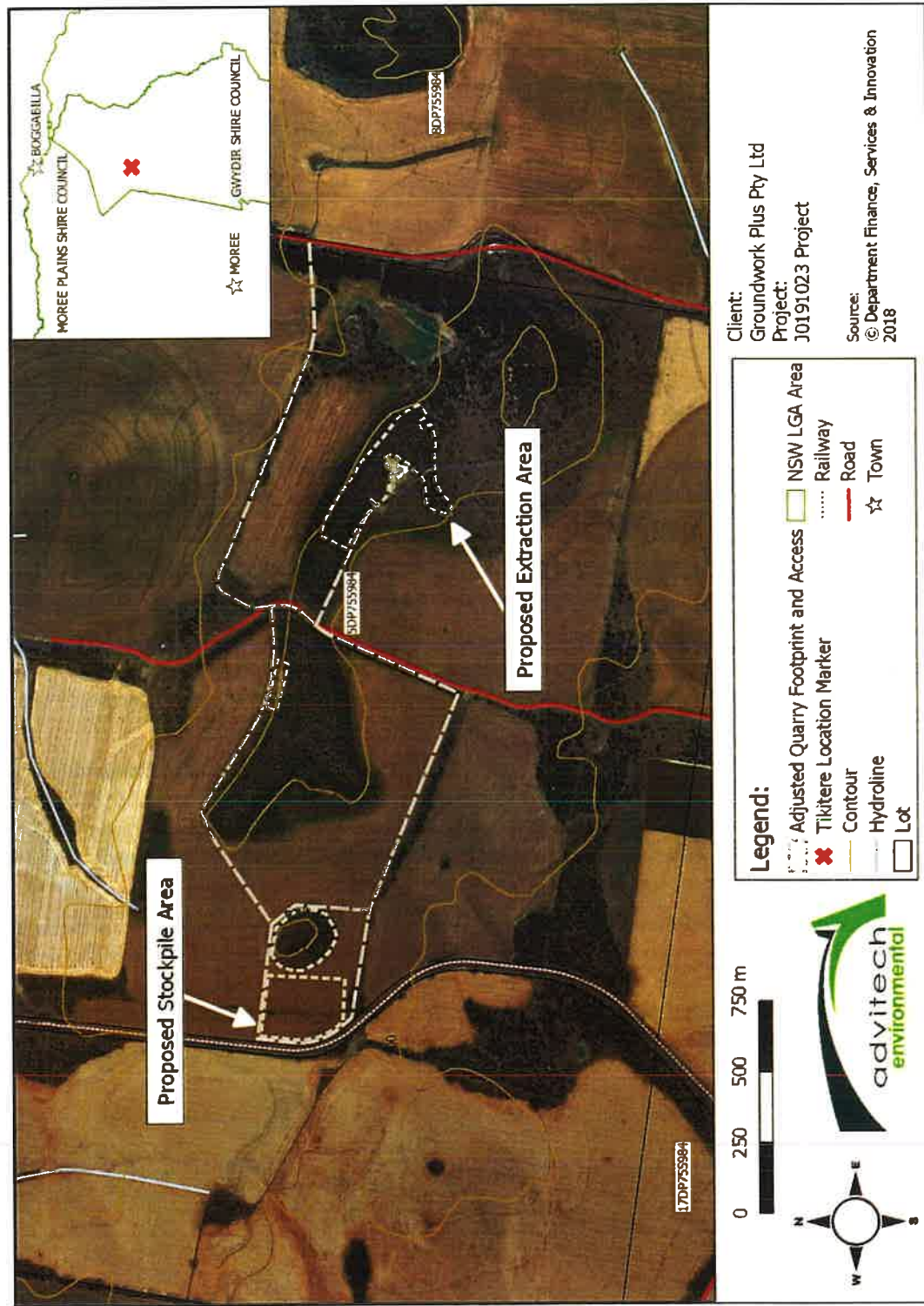


Figure 1: Site Location Map

2.3 New South Wales legislation

2.3.1 Environmental Planning and Assessment Act 1979

Development in NSW is subject to the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and its associated regulations and planning instruments. Developments requiring consent, such as the Pearlman Quarry, are assessed under Part 4 of the EP&A Act. As the proposed quarry is designated development, the application for development must be accompanied by an environmental impact assessment in the form prescribed by the accompanying regulations, and as stipulated in the SEARs detailed above. Where extractive industries, including quarries, generate more than 30,000 cubic metres per year and or disturb greater than 2.0 ha of land, consent under Schedule 3 (Part 19) of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) is also required.

2.3.2 National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 (the NPW Act) aims to conserve and manage natural resources and Aboriginal heritage. This is through conservation and protection of wildlife including threatened species and their habitat as well as identification, conservation and protection of Aboriginal objects and places. The Act allows for conservation agreements, conservations areas, prevention of harm including research and monitoring of heritage and environmental values. Further values able to be protected include buildings, places and objects of non-Aboriginal cultural values on land referred to under this Act.

2.3.3 Heritage Act 1977

The *Heritage Act 1977* (the Heritage Act) aims to conserve and manage the State's heritage, whether they are places, buildings, works, relics, moveable objects or precincts of local or State heritage significance. A property is a heritage item if it is listed in the heritage schedule of the Local Council's Local Environmental Plan or on the State Heritage Register, a register of places and items of particular importance to the people of NSW. If an item of heritage value was identified, then consultation would be undertaken with Gwydir Shire Council and an assessment undertaken in accordance with OEH guidelines for *Assessing Heritage Significance* (Heritage Office, 2001). The heritage statement is the basis for policies and management structures that will affect an item's future.

2.3.4 Local Planning Instruments

Development at the site is regulated under the Gwydir Shire Council Local Environmental Plan (GLEP) 2013. These policies determine which development is either permissible, prohibited, exempt or complying. As the proposed quarry is on land zoned RU1 Primary Production, an extractive industry located at the proposal site would be permissible with development consent. Further, Schedule 5 lists all items of environmental heritage.

2.4 Commonwealth legislation

Under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), referral is required to the Australian Government for proposed actions that have the potential to significantly impact on Matters of National Environmental Significance (MNES) or the environment of Commonwealth land. The assessment of the proposal's impact on MNES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant MNES or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment and Energy (DoEE) under the EPBC Act.

2.5 The Project

The Aboriginal heritage assessment has been prepared in accordance with:

- NPW Act;
- EP&A Act;
- Heritage Act;
- EPBC Act;
- GLEP 2013;
- The Burra Charter (The Australia ICOMOS charter for places of cultural significance);
- NSW Heritage Manual; and
- All relevant Local and State policies and guidelines, including the Environmental Planning and Assessment Regulation 2000, and all other relevant government regulations.

3. PHYSICAL CONTEXT

3.1 Climate

The climate of the study area is located in the subtropical climate zone, bordering the temperate climate zone (**Figure 2**). The mean temperature range record at (Moree is the closest station) is a maximum of 34.2°C and a minimum of 4.5°C, while mean rainfall is 77.8mm (high) and 23.4mm (low) further details in **Table 1** (BOM 2019).

Table 1: BOM Moree climate statistics 1995-2019 (red = high - blue = low)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean max temperature (°C)	34.2	33.3	31.1	27.3	22.6	19	18.2	20.5	24.5	28.1	30.8	32.8	26.9
Mean minimum temperature (°C)	20.4	19.7	17.3	12.8	8.2	6	4.5	5.2	9	12.8	16.4	18.8	12.6
Mean Rainfall (mm)	77.8	66.5	52.9	23.4	27.9	39.7	35.5	25.8	34.0	47.3	75.1	66.6	576.3

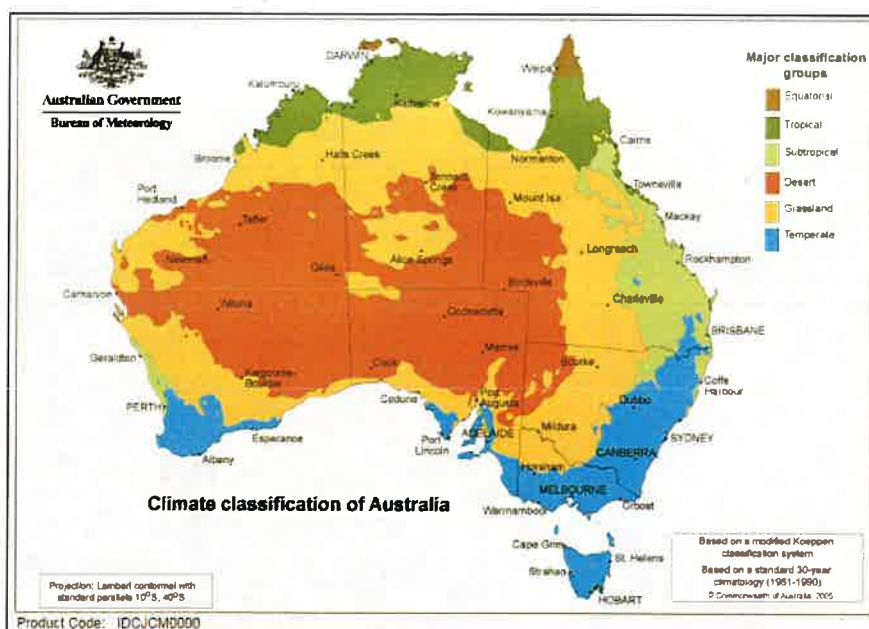


Figure 2: Climate classification map of Australia

3.2 Topography

The proposed extraction areas generally sit on elevated positions, with the easternmost extraction area situated on a hill at approximately 340m above sea level (ASL) and the entrance to the access track sitting at approximately 280m ASL (see Figure 1). The topography mostly slopes away from the proposed extraction areas; however, the westernmost extraction area is located on mostly flat ground with little to no undulation.

3.3 Hydrology

The development site is situated at the northern end of the Brigalow Belt South Bioregion within the Northern Outwash sub region. The closest perennial river is the Croppa River which is approximately 12 km south west of the study area. To the north of Pearlman Quarry is Mungle Creek which is non-perennial and has offshoots that enter the northern side of Lot 5 DP 755984. To the south is Tackinbri Creek which defines the boundary of Lot 17 DP 755984. The area is a part of the Border Rivers catchment which covers 49,500 km² of which 24,500 km² is in NSW (Green et al, 2012) (see Figure 1).

3.4 Geology/Soils/Geomorphology

The Great Soil Group map of NSW (OEH 2017) indicates Black earths, Chocolate soils and Grey, Brown and Red Clays - with good surface condition across the lot and quarry footprint (see Figure 3). The Northern Outwash subregion is characterised by Red loams and heavy brown clays (NPWS 2003, pp. 136). Geological mapping of the study area indicates Tb (Basalt, undifferentiated basaltic flows), Jox (fine to coarse grained lithic and labile wackie, interbedded with siltstone, mudstone and minor coal).

The Brigalow Belt South Bioregion contains large volcanic attributes such as the Liverpool Range and Warrumbungles (NPWS 2003, pp. 132). The subregion is the Northern Outwash with geologically contain tertiary and Quaternary alluvial fans and stream terraces (NPWS 2003, pp. 136). Characteristic landforms of the Northern Outwash include sloping plains with alluvial fans which are steeper and coarser than the Gwydir Fans downstream (NPWS 2003, pp. 136). The Gwydir River runs from west of

Armidale for 480km to the Barwon River near Collarenebri (Murray-Darling Basin Authority n.d.). The Gwydir is approximately 55km south of the study area.

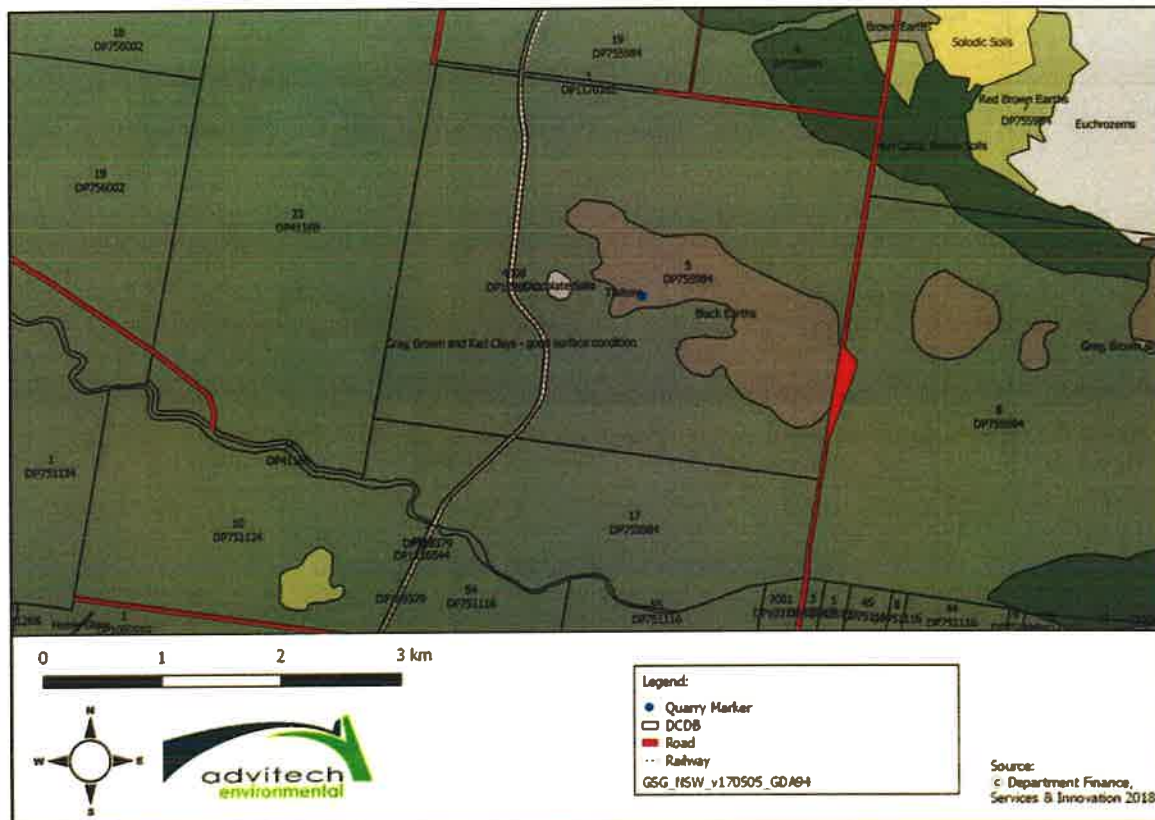


Figure 3: Soil Map with DCDB

3.5 Flora and Fauna

The majority of the landscape in the study has been cleared for agricultural purposes. The Subregion of Northern Outwash in the Brigalow Belt South Bioregion is classified as having flora including: *Poplar box with white cypress pine, wilga and budda on red soils, belah and brigalow on brown clays.* (NSW NPWS 2003 136).

The fauna includes both native and introduced species. Introduced species such as pigs, goats, foxes, rabbits, wild dogs, feral cats and carp have been noted in the bioregion (Bastin 2008, pp. 4-5).

Flora and fauna characteristics are discussed in the accompanying biodiversity impact assessment report 2019.

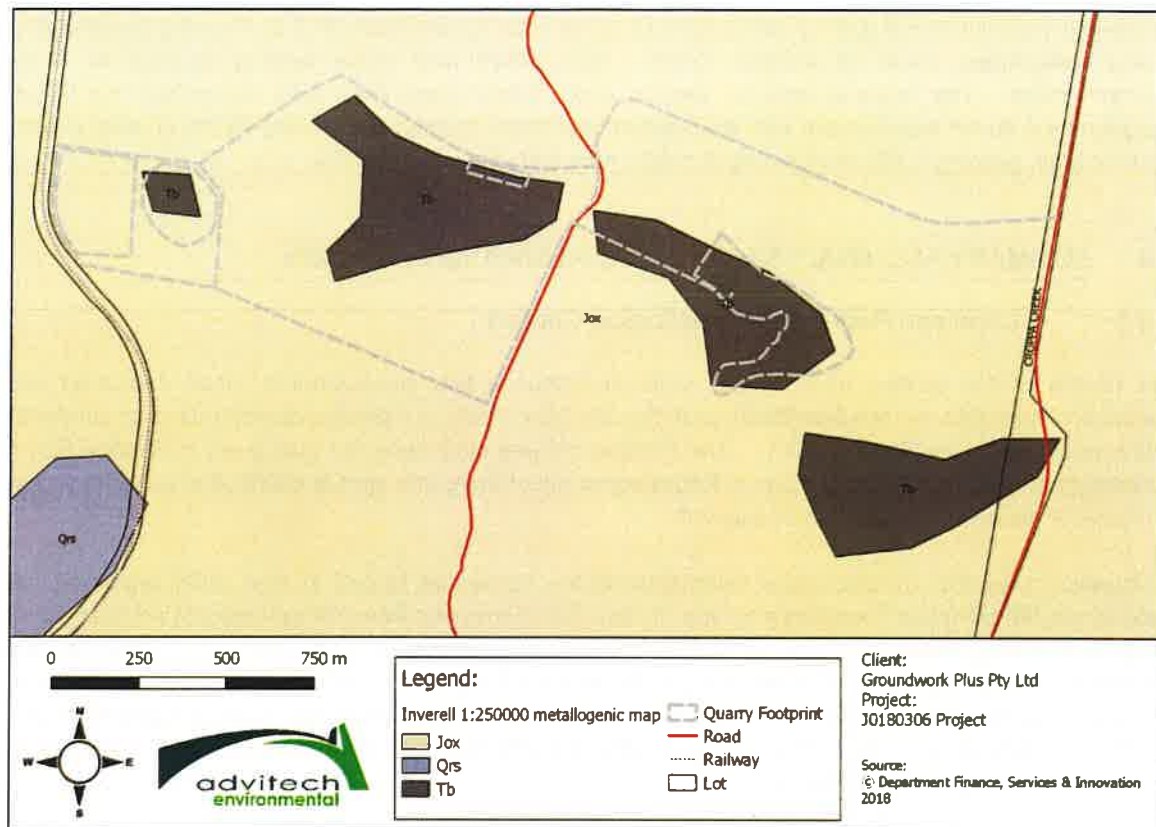


Figure 4: Geological map of the study area with original quarry footprint

3.6 Landscape history, uses and disturbances

The history of the landscape and its past and present uses and disturbances, are important to the interpretation of archaeological evidence and what may remain. Occupation of Australia by Aboriginal people is currently thought to have commenced at least 20,000 to 60,000 years prior to arrival of the European settlers. The environments of five broad time periods can be reconstructed within which the archaeological resources of the eastern coast of Australia can be evaluated:

- The Late Pleistocene is thought to overlap with the time Aboriginal people first settled in the Hunter Valley;
- The Last Glacial Maximum (LCM) (peaked around 20,000 years ago) during which people adapted to significant climactic and environmental change;
- The Holocene (the last 12,000 years) that saw sea levels and positions stabilise at their current positions;
- The landscape in c.1790 as it was immediately before European settlers arrived; and
- The last 200 years when the landscape was dramatically altered by European settlement and land use practices.

There are very few direct lines of evidence (archaeological, ecological, and geomorphic) that document what the landscape at the Pearlman quarry was like prior to European settlement. The regional history connects to pastoralism with cattle, sheep and wheat the main industries recorded (HO and DUAP 1996, pp. 78-87). In North Star (the closest village) employment in the 2016 census (ABS 2018) is still mainly

based in agriculture with grain growing the main occupation reported with 34.5 %. Farming of cattle/grain and sheep/grain made up another 12.6%. Specialised beef cattle farming equated to 11.5% employment. The regional data for Gwydir Local Government Area also recognised the largely agricultural driven employment with specialised beef cattle farming comprising 16.2% of employment, other grain growing 5.8% and farming of cattle/grain and sheep/grain 4.7%.

4. SUMMARY AND ANALYSIS OF BACKGROUND INFORMATION

4.1 Local and Regional Archaeological Context

A review of the context of local and regional archaeological assessments, when combined with environmental factors (see **Section 5**), provides the broad basis of a predictive archaeological model for the study area (see **Section 8.3.1**). The broader cultural landscape (as discussed in **Section 5.6**) is highlighted when expected site types, frequency of occurrence and spatial distribution patterns across the wider area are modelled and analysed.

However, previous archaeological investigations are somewhat limited in their utility regarding site locations, lithic artefact quantities and type. These limitations arise from the variable way archaeologists have previously identified, classified and recorded Aboriginal objects, particularly lithic materials, and Aboriginal sites. Owing to these variations in the amount of data that is included in reports and the terms different archaeologists use to describe artefact types, a comparison of objects and tool types from each site is not considered to be representative or reliable for the purposes of predictive modelling other than on a broad and generalised basis.

Overall, there is a lack of substantial archaeological data for the local and regional area. The type of archaeological data available in the Narrabri region is heavily influenced by coal mining with examples below:

4.1.1 AECOM Australia Pty Ltd 2010, Maules Creek Coal Project Environmental Assessment prepared for Hansen Bailey.

Aboriginal heritage values that were located within the project area include stone artefacts, tool assemblages, grinding grooves and scar trees. 103 identified archaeological sites are within the study area, though 28 were reported as being directly impacted, 18 were potentially in danger of indirect impact. Other Gamilaroi practices noted through observation were from George Clarke, an escaped convict who lived with the Gamilaroi and undertook ritual scarification. George Clarke when he was recaptured by authorities shared his knowledge of Aboriginal culture and Australian landscape. This sparked interest from explorers about the landscape and rivers in the area especially the Kindur (likely the Gwydir River in flood) (AECOM 2010, p. 25).

4.1.2 Archaeological Surveys and Reports Pty Ltd 2004, Proposed Werris Creek Coal Mine Aboriginal Heritage Assessment. Report to R.W. Corkery and Co Pty Limited on behalf of Werris Creek Coal Pty Limited.

The proposed mine 4 km south of Werris Creek was assessed in consultation with Nungaroo Local Aboriginal Land Council. The location of grinding grooves and community consultation determined that the site had significance for the local community and was to be preserved in situ with a 100 m buffer for mining activities.

4.1.3 Archaeological Surveys and Reports Pty Ltd 2007, The Salvage and Removal of the "Narrawolga" Axe-grinding Groove Site, Werris Creek Coal Mine, Werris Creek, Northern NSW.

The report details the salvage and removal of the "Narrawolga" axe-grinding grooves. The site contained 43 grooves. The grooves were to be relocated during the mining operations and replaced at the site with mining ceased. 10 blocks were removed to the temporary storage area.

4.1.4 Archaeological Surveys and Reports Pty Ltd 2009, Narrabri Coal Mine Stage 2 longwall Project Aboriginal Heritage Assessment. Report to R.W. Corkery and Co Pty Limited on behalf of Narrabri Coal Operations.

The assessment investigated an area within the mine site, Brine storage area and water pipeline corridor to the mine site. Consultation was conducted with Narrabri Local Aboriginal Land Council and Gomeroi Narrabri Aboriginal Corporation. The results included 43 sites in panels 1-7 and 69 sites in panels 8-26 in the mine site. The Brine storage area included 9 sites and no sites were recorded in the pipeline corridor.

4.1.5 Area Environmental Consultants and Communication 2018, Narrabri South Solar Farm Cultural Heritage Assessment. Report to Canadian Solar (Australia) Pty Ltd

The solar farm is 7.5 km south east of Narrabri. The proposed site is 206 hectares. During the survey 10 scar trees were recorded. Recommendations for Aboriginal heritage includes further consultation including a Cultural Heritage Management Plan, and techniques for accidental impact.

4.1.6 Central Queensland Cultural Heritage Management Pty Ltd 2016, Aboriginal Cultural Heritage Assessment Report for the Narrabri Gas Project. Report for Santos.

The Narrabri gas project area is approximately 25 km south west of Narrabri and covers 95000 hectares. Due to the size of the project area a selective survey method was used. The Dewhurst-Bibblewindi area had 29km of transects surveyed during October 2013. The second study area was the Leeward area. The fieldwork was conducted in April and length of transects cover were 14.5km. During the survey 4 Aboriginal artefacts were located, 2 isolated stone artefacts and 2 scar trees. At the time of the report, 90 sites are known to exist in the project area. Recommendations included pre-clearance surveys before ground disturbance and use of precautionary and avoidance principles.

4.1.7 Insite Heritage 2010, Aboriginal Cultural Heritage Impact Assessment Report for the Continuation of Boggabri Coal Mine. Report to Hansen Bailey Pty Ltd.

Boggabri Mine engaged Insite Heritage to undertake an Aboriginal archaeological assessment as part of a planned continuation of open cut mining at the site. The assessment located 77 heritage items including artefact scatters, isolated finds and scar trees in the study area. Further recommendations were made for an existing 27 sites. Insite cite previous ARAS (2005 and 2007) reports as having conducted assessments and salvages. Insite reference the Leard State Forest and Baan Baa Ranges as having potential and known sites that contribute to the local and regional Aboriginal heritage context.

4.1.8 On Site Cultural Management Pty Ltd 2017, Due Diligence Investigation for the Protection of Aboriginal Objects - Proposed Construction of Conservation Fencing and Associated Infrastructure, Pilliga State Forest. Report to Australian Wildlife Conservancy on behalf of NSW Office of Environment and Heritage.

The project proposed to create 32.1 km of feral predator-proof fence. This would enclose a 5822 hectares area of the Pilliga state conservation area. The survey covered 39.6 km for the proposed fence and operations area. 3 Aboriginal artefacts/sites were located including a grindstone fragment and 2 scar trees. The due diligence recommended an ACHA and potential AHIP.

4.1.9 Umwelt 2017, Australian Rail Track Corporation Inland Rail Narrabri to North Star EIS Aboriginal Cultural Heritage and Archaeological Assessment, Newcastle, Australia.

The Inland Rail project (Umwelt 2017, pp. 77-81) found 19 new sites consisting of 12 isolated artefacts and 7 artefact scatters. Also mentioned in the ARTC North Star to Narrabri study area is suitable stone for resources. The report specifies a location between North Star and Milguy in the vicinity of Tikitere (Pearlman Quarry site) contains raw silcrete. This is occurring as cobbles in the Tackinbri Creek and Croppa Creek, and a mapped outcrop slightly to the east of the assessment area (Umwelt 2017, p. 43). Silcrete, porcellanite, basalt and dolerite are raw material that if sufficient quality may be used for manufacturing stone artefacts.

4.1.10 University of Queensland Culture & Heritage Unit 2017, Aboriginal Heritage Conservation Strategy: Maules Creek Coal Mine, Tarrawonga Coal project, Boggabri Coal Mine, and Related Offset Areas. Prepared for Whitehaven Coal Limited and Idemitsu Australia Resources.

The Boggabri Mine has had a large number of Aboriginal cultural heritage sites located, according to UQCHU (2017, p19-20) with 152 sites recorded, some of which were approved for salvage in 2007 and 2013. Another nearby mine Tarrawonga located 133 sites that included 50 artefact scatters, 59 isolated finds and 24 scar trees; Maules Creek Mine located 67 sites with a mix of artefact scatters (43) and isolated finds (24) (UQCHU 2017, p.19).

4.1.11 Whincop, M. 2018, Aboriginal Cultural Heritage Assessment for the Vickery Extension Project in the Gunnedah and Narrabri Shires, New South Wales. Report for Whitehaven Coal Limited.

The project is located approximately 25 km north of Gunnedah. The assessment is assisting in winning approval for an extension to an approved open cut mining operation. The area has had intensive disturbance over the last 150 years, including historical mining and agriculture. 21 new sites were identified in the project area. An additional 3 sites in the project area were already registered on AHIMS.

4.2 The Landscape and Cultural Heritage

The way that perceptions, beliefs, stories, experiences and practices give shape, form and meaning to a landscape is termed a cultural landscape. An Aboriginal cultural landscape is 'a place or area valued by an Aboriginal group (or groups) because of their long and complex relationship with that land. It expresses their unity with the natural and spiritual environment and embodies their traditional knowledge of spirits, places, land uses, and ecology'. Material remains of the association may be prominent, but will often be minimal or absent (DECCW, 2010). The physical evidence of Aboriginal use of the landscape (such as campsites and art sites), stories and mythology, cultural resources and the landscape itself provide strong cultural links with the past for the present day Aboriginal community (OEH, 2015).

The landscape scale of cultural heritage is similar to the concept of 'whole-of-landscape' in ecosystem conservation - just as there is connectivity between all parts of natural ecosystems (plants, animals, soils and water), there is connectivity between cultural objects and places through past human behaviour patterns. The cultural landscape concept emphasises the landscape scale of history and the connectivity between people, places and heritage items. It recognises that the present landscape is the product of long term and complex relationships between people and the environment. Aboriginal cultural landscapes are comprised of:

- Significant biodiversity and a diverse range of ecological systems and associations, all of which contributed to the continuing existence of Aboriginal peoples in the region over many thousands of years, and which are valued in different ways by Aboriginal communities today;
- Material remains of this continuing occupation in the form of a diverse array of Aboriginal sites and places known to the Aboriginal communities, some of which will be recorded on the Aboriginal Heritage Information Management System;
- Extensive historical records from 1788 through to today which record observations of Aboriginal people and lifestyles, wars, massacres, social and cultural events, population census, social interactions, language, and which influence Aboriginal community values today; and
- An Aboriginal population made up of people who have traditional association and knowledge of the region, as well as others who live, work and play within the region, all of whom may attribute various values with the area, derived from the distant and recent past, through to the present day.

For Aboriginal people, the significance of individual landscape features is derived from their inter-relatedness within the cultural landscape. This means features cannot be assessed in isolation and any assessment must consider the feature and its associations in a holistic manner. This may require a range of assessment methods and will always require the close involvement and participation of Aboriginal people. By consulting with Aboriginal people and using the concept of cultural landscapes, the story behind the features can be told that demonstrates the associations that may exist between Aboriginal objects and other features within the landscape (DECCW, 2010).

Landscapes have social and symbolic dimensions for people, and some locations with unusually high or low artefact densities may represent the influence of non-environmental (social and or symbolic) factors (White and McDonald 2010). Aboriginal people have cultural associations with the landscape of Australia deriving from a long pre-contact history, historical interactions during settlement and contemporary attachments.

Consultation was undertaken with Aboriginal Stakeholders in the area and in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010*. The contemporary submissions regarding the cultural landscape and previous use of the site are limited and discussed in **Sections 5.6 and 6.1**.

4.2.1 Local and Regional Character of Aboriginal Land Use and its Material Traces

The environment of the study area (topography, geology, landforms, climate, geomorphology, hydrology, soils and vegetation) has been described in detail in **Section 5** of this assessment. Environmental factors strongly influence the suitability of a place for human occupation as well as the duration of that use. The known nature and distribution of cultural materials and resources derived from

historical studies and existing known sites, combined with the environmental factors and contemporary cultural accounts, assist in forming a local and regional character of Aboriginal use.

Academic investigation and research has expounded a variety of theories regarding the immigration route and timing of Aboriginal people's arrival in Australia (Bowdler, 1977; Horton, 1981, Smith, 1987). Archaeological investigation in the wider region has provided evidence of occupation at Burrill Lake 20,000 years BP, in the southern Tablelands, 10,000 years BP, in Birragai, 21,000 years BP and in the lower Blue Mountains, 17,000 years BP (Rich, 1988). Bowdler (1981) and Koettig (1985) submit that sites south of Sydney increased around 2,500 years ago and that this was indicative of changes in stone tool technology.

About 19,000 years ago, after the Last Glacial Maximum, global temperatures began to warm. Approximately 10,000 years ago the climate is likely to have become broadly similar to that of today. While the fluctuations in the climate during the last 10,000 years is likely to have been complex, the sea reached its present level around 7,000 years ago and environmental changes after that time are likely to have been relatively minor when they are compared with those during the preceding Aboriginal occupation of the region. It is likely that, during this time, Aboriginal populations were small and use of the local area was transient, especially during the severe winter conditions that would have prevailed. Populations may have preferred to live near the coast, where the year-round climate would possibly have been more temperate, although occupation in the interior landscapes is not discounted and was also probable at different times and in different places over this long geomorphic time period.

Archaeologists, historians and ethnographers have regularly considered why Aboriginal people chose specific locations for camps. Predominantly and generally it is considered that camp sites were chosen for:

- Their proximity to fresh water;
- Availability of food supply or other required resource;
- A vantage ground in case of attack from an enemy;
- For spiritual reasons and to be close to areas of ceremony and tribal gatherings; and
- Movement between resource zones, as well as territory and rights of access by and to such resources.

Other uses of the local landscape by Aboriginal people may have included ceremonial sites, corroboree sites, rock shelters (which may have been used for habitation, ceremony, signage and teaching); rock and ochre extraction quarries, fish traps within streams and rivers, trade routes, walking lines and burials.

A general model of forager settlement patterning in the archaeological record has been established by Foley (1981). Foley's model distinguishes the 'home base' site with peripheral 'activity locations'. Home base sites generally occur in areas with good access to a wide range of resources (reliable water, raw materials, and so on). The degree of environmental reliability of these resources may influence the rate of return and length of occupation of sites. Further, Foley (1981) suggests that home base sites generally show a greater diversity of artefacts and raw material types reflecting that they are representative of a greater array of activities performed at both the site and immediate area.

Activity locations occur within the foraging radius (approximately 10 km) of a home base camp and served as a focus of a specific activity (Renfrew and Bahn, 1991). Activity locations will show a low diversity in artefacts and are not likely to contain features reflecting a base camp (such as hearths). However, the location of certain activities cannot be predicted or identified.

Kuskie and Kamminga (2000) established a general model of occupation strategies based primarily upon ethnographic research (see **Table 2**). The model distinguishes between short-term or extended long-term occupation and makes some predictions about the likely location of different foraging and settlement activities. For example, the presence of features that required a considerable amount of labour investment, such as stone-lined ovens, heat-treatment pits or grinding grooves, are likely to occur at places where occupation occurred for extended periods of time. Where band mobility was high and campsites frequently shifted throughout the landscape, artefact assemblages are not expected to contain elements such as grindstones, heat-treatment pits, ovens and the diversity of implements frequently discarded at places of extended residential occupation. **Table 2** has been adapted from Kuskie and Kamminga (2000).

Table 2: Site Descriptions (adapted from Kuskie & Kamminga 2000)

Occupation Pattern	Activity Location	Proximity to water	Proximity to food	Archaeological expectations
Transitory movement	All landscape zones	Not important	Not important	<ul style="list-style-type: none"> Assemblages of low density & diversity Evidence of tool maintenance & repair Evidence for stone knapping
Hunting &/or gathering without camping	All landscape zones	Not important	Near food resources	<ul style="list-style-type: none"> Assemblages of low density & diversity Evidence of tool maintenance & repair Evidence for stone knapping High frequency of used tools
Camping by small groups	Associated with permanent & temporary water	Near (within 100m)	Near food resources	<ul style="list-style-type: none"> Assemblages of moderate density & diversity Evidence of tool maintenance & repair Evidence for stone knapping & hearths
Nuclear family base camp	Level or gently undulating ground	Near reliable source (within 50m)	Near food resources	<ul style="list-style-type: none"> Assemblages of high density & diversity Evidence of tool maintenance & repair & casual knapping Evidence for stone knapping Heat treatment pits, stone lined ovens grindstones

Occupation Pattern	Activity Location	Proximity to water	Proximity to food	Archaeological expectations
Community base camp	Level or gently undulating ground	Near reliable source (within 50m)	Near food resources	<ul style="list-style-type: none"> Assemblages of high density & diversity Evidence of tool maintenance & repair & casual knapping Evidence for stone knapping Heat treatment pits, stone lined ovens Grindstones & ochre Large area >100sqm with isolated camp sites

Hunting would have comprised the major economic role of the men (Kohen 1986). Along the rivers, traps and snares would have been set for bandicoots and wallabies, while decoys for snaring birds were also a commonly employed technique, 'these are formed of underwood and reeds, long and narrow, shaped like a mound raised over a grave, with a small aperture at one end for the admission of the prey' (Tench 1793). Hunting methods included smoking out the animal by lighting a fire in the base of a hollow tree, burning large tracts of land and gathering the stranded animals, as well as cutting toe-holds in trees (Tench 1793).

The wider local vegetation is likely to have provided Aboriginal people in the area with raw materials such as bark and wood for shelters, canoes, containers, and fires, as well as a limited variety of medicinal and food sources. This vegetation would also have supported the habitation of a variety of small land mammals, reptiles and birds which may have been eaten by Aboriginal people.

A sense of the potential range of plants and animals utilised by Aboriginal people can be gleaned by comparing lists of species known to occur in the area with those known regionally to have been utilised by Aboriginal people. Only remnants of the original native vegetation and their associated resources currently exist within the study area today (see **Section 4.3.1**). With the loss of this habitat only a few of the faunal species likely to have been utilised by Aboriginal people remain within the study area. The availability of fresh water in the study area would have been tentative and reliant upon rainfall. However, the nearby Mungle, Tackinbri and Yallaroi Creeks would have provided a more reliable and accessible source of fresh water.

There was no real local or district outlook from the study area due to the landscape and surrounding tree canopy. No evidence of significant cultural or spiritual aspects of the study area was found.

Overall, based on the environmental and archaeological context and using Kuskie and Kaminga's model it is considered that the study area would have been most likely suitable for transitory hunting and foraging as opposed to any lengthy occupation. Preferable areas for occupation contain richer resources, such as Mungle, Tackinbri and Yallaroi Creeks. Using this predictive model with a regional model such as UCHQU (2017, pp. 33-35) and Umwelt (2017, pp. 53-55) which details that sites are more likely to occur within:

- 200m of a named watercourse;
- 100m of a mapped drainage line;
- 50m of a known Aboriginal cultural heritage site;

- On landforms with a slope no greater than 30 degrees, except where sandstone bedrock or limestone outcrops are present; and
- Archaeological deposits may be at depth due to terrace locations that are subject to flooding.

4.2.2 Aboriginal History

Some discussion of Aboriginal history and associated land use within the region and local area is made in **Section 5.4.1** above. The use of ethno-historical records is often useful in attempting to reconstruct Aboriginal life at the time of the colonisation of Australia. However, these historical observations are from non-Aboriginal people incorporating their own bias and perspectives possibly leading to misinterpretation. Usual ethnographic information recorded about Aboriginal people at the time of European arrival include observations about Aboriginal material culture, such as clothing, adornments, body painting and piercings, weapons and tools. Hunting practices, foods consumed, ceremonial gatherings and associated practices, such as funerary beliefs and rites of passage, are also noted throughout the historical and anthropological record.

The records show that the Gamilaroi people and the European Settlers engaged in conflict a number of times. Early accounts from European exploration show that Mitchell (1838, pp. 98, 178, 278) engaged in conflict on his expedition. This at times is related by detailed descriptions of traditions and practices that Mitchell (1838 pp. 33, 55, 160) and his expedition experienced, and also cordial experiences where trade occurred or directions were asked.

Other Aboriginal history recorded was by Mathews (1895 and 1917) who detailed Bora Ground ceremonies and initiation ceremonies of the Gamilaroi, in which Mathews as an anthropologist observed and recorded the events for posterity and a greater understanding of the Gamilaroi and pre-colonial practices. However, during colonisation and the frontier wars events such as the massacres at Myall Creek near Bingara and Terry Hie Hie occurred. This was preceded by an incident at Waterloo Creek south of the study area (Umwelt 2017, p. 47).

Despite this, Gamilaroi people still reside in their traditional lands to the present day. There does not appear to be any oral or documentary evidence of any specific culturally significant areas within or immediately adjacent to the study area, however, an existing AHIMS site does exist within 1km of the study area.

4.2.3 Contemporary Cultural Accounts

The physical evidence of Aboriginal use of the landscape (such as campsites and art sites), stories and mythology, cultural resources and the landscape itself provide strong cultural links with the past for the present day Aboriginal community (OEH, 2015). Gamilaroi and many other Aboriginal people have long cultural associations with the landscape of the region deriving from an extensive pre-contact history, historical interactions during settlement and contemporary attachments. Local Aboriginal people are currently researching and reclaiming their cultural practices of the past (pers. comm. Glenda Chalker [Site Officer for Cubbitch Bartha] 9 June, 2016). Aboriginal people still reside in the area and continue to appreciate, care for and conserve their cultural practices. The presence of numerous rock art sites, a scar tree in the 'Myall Hollow Creek' area, grinding grooves and the bora ground at Terry Hie Hie indicates that the general area was occupied and used by Aboriginal people on subsequent occasions over many years. The Terry Hie Hie Aboriginal area was created in 2005 (NPWS 2018).

Many of the local Aboriginal people identify as being part of the Gamilaroi nation. The Moree Gamilaroi Local Aboriginal Land Council members are the Aboriginal custodians of the study area. It must also be considered that Aboriginal cultures were not static and that clan and tribal boundaries, language

groups and dialects most likely changed over many thousands of years. The native title claim is registered under the name of Gomeroi People with the National Native Title Tribunal. This claim was registered in 2012.

For the purposes of this archaeological assessment, and in accordance with current cultural practices, we will refer to the local Aboriginal people as the Gamilaroi Aboriginal people. Advitech Environmental means no offence to any Aboriginal person in this regard and believes that identification of Aboriginal peoples, their traditional lands and their families are a cultural matter for Aboriginal people and separate from this archaeological assessment.

4.2.4 Cultural significance

The Burra Charter (2013) defines 'cultural significance' very broadly to include 'aesthetic, historical, scientific, social or spiritual value for past, present or future generations'. This definition captures places of cultural significance to Indigenous cultures. It also includes places that provide a physical location that is integral to the existence, observation and practice of intangible heritage. The Burra Charter definition of cultural significance encompasses all forms of spirituality, regardless of the culture from which it emanates. Similarly, aesthetic value is not limited to a 'western' perception of aesthetics (taken from ICOMOS Practice Note: The Burra Charter and Indigenous Cultural Heritage Management).

No items or places of cultural significance were noted or considered to exist within the study area addressed in this report.

4.3 OEH Aboriginal Heritage Information Management System (AHIMS)

A search of the OEH AHIMS register has shown that Aboriginal sites or objects are currently recorded within the search area (approximately 3km radius). The basic details of the known registered sites within 5km are itemised below in **Table 3**.

Table 3: Summary results of AHIMS Extensive search and new additions

Site ID	Site Name	Aboriginal site/object	Status
11-1-0043	NNS IA10	Artefact	Valid
11-1-0048	GWP/IRP/TIK/6	PAD	Updated to "Not a site"
11-1-0049	GWP/IRP/TIK/5	PAD	Updated to "Not a site"
11-1-0050	GWP/IRP/TIK/4	Artefact	Updated to "Not a site"
11-1-0051	GWP/IRP/TIK/3	Artefact	Updated to "Not a site"
11-1-0052	GWP/IRP/TIK/2	Artefact	Updated to "Not a site"
11-1-0053	GWP/IRP/TIK/1	Artefact	Updated to "Not a site"
11-1-0054	GWP/IRP/Pearl/1	Scar Tree	Valid

The full AHIMS results, details of their specific locations and mapping, are provided in **Appendix 1**. These detailed results have been separated in order to enable easy detachment of the Appendix and prevent unnecessary public disclosure of these details.

Reliance on the locations provided by the AHIMS searches is tentative. There are many variables that must be considered when using the Aboriginal Heritage Information System (AHIMS). More particularly, site coordinates, and descriptions are not always correct due to the following:

- Errors resulting from the evolution of subsequent computer systems used by OEH that have failed to account for or correctly translate old coordinate systems, such as topographic map references, to new systems;
- Errors resulting from human error or incorrect descriptions of locality on the site cards submitted to AHIMS;
- Errors resulting from data input. Most commonly the naming of the correct mapping system used; and
- Few sites have been updated on the AHIMS register to record if they have been subject to a s87 or s90 permit and, as such, what sites remain in the local area and what sites have been destroyed is unknown.

Variation in the classificatory definitions employed by archaeologists will significantly influence the range of artefact types identified in an assessment. Due to differences in recording techniques it is difficult to determine how many of each artefact type is represented across the region. Artefact types noted include flakes (broken, retouched, debitage, waste, chips), cores (multi-platform, single and bipolar), geometric microliths, backed blades, bondi points, scrapers, eloueras, burins, blades, hatchets, choppers (unifacial and bifacial), pebble tools, edge-ground axes, anvils and hammer stones. Due to variations in both the amount of data that is included in reports, and the terms different archaeologists used to describe artefact types, it is not practicable to provide a count of the different artefact types. It is therefore not productive to attempt to quantify the proportionate representation of artefact types identified in previous studies. An analysis of sites according to the number of artefacts present, the distance from water and the landform type may allow for the identification of a number of trends. However, there are various factors influencing these results, including, not limited to:

- A lack of substantial archaeological investigation of privately owned properties surrounding the study area. As the study area and the surrounding locations are part of the earliest properties to be developed and the active protection of Aboriginal heritage has only occurred within the last thirty years, insufficient investigative results are present to make an informed analysis of trends;
- The fact that the landform on which a site area is observed may not necessarily be its origin, for example, artefacts from a crest may be relocated by erosion such that they are recorded further down a slope;
- Effects of biased sampling of landforms due to decisions made by archaeologists and as a result of development area boundaries, levels of exposure on different landforms and variable recording by archaeologists. For example, the large percentage of sites found along creek lines may be (at least partially), a result of the biased focus of many cultural heritage surveys towards this landform. In addition, it was not possible to obtain sufficient information from a large number of site cards and reports; and
- Artefact counts can be skewed due to factors such as the differing fragmentation levels of discrete stone types and levels of ground surface visibility. Typically, a very large number of sites/artefacts are located on exposures and yet very few artefacts are visible away from these exposures.

In the case of this assessment and the study area, little reliance should be placed on the archaeological context due to the lack of information available by way of comparable studies in the locality and on the same landforms. However, some modelling of past Aboriginal use can be derived from the surrounding registered Aboriginal sites.

5. ABORIGINAL DUE DILIGENCE ASSESSMENT RESULTS

5.1 Archaeological assessment, survey and data collection

5.1.1 Methodology

The study area was surveyed via pedestrian survey of with the transect path recorded via GPS (see **Figure 5**). The survey was undertaken by Jake Brown (archaeologist) on the 8 January 2019. Ground visibility was considered average to good with limited vegetation cover obscuring visibility.

Areas with the greatest exposure of ground surface and with landforms suitable for occupation across the study area were targeted in the field survey. **Figure 5** below denotes the walking transects taken during the survey.



Figure 5: Transects and driven tracks taken during survey 8 January, 2019 illustrated on GPS layer

5.1.2 Survey Units

Landscape forms were divided into survey units (see **Figure 6**). Survey units within the study area are defined in **Table 4**.

Table 4: Survey Units

Survey Unit No.	Definition	Landforms	Disturbance
1	Relatively undisturbed with some regrowth and mature trees. Elevated position on ridgeline. Some agriculture practices.	Ridge (Eastern)	Existing ground disturbance, access track to area and previously cleared areas. Agriculture practices.
2	Limited disturbance with regrowth in some places and some mature vegetation. Agriculture practices.	Ridge (Western)	Previously cleared areas, heavily disturbed existing quarry area. Agriculture practices.
3	Heavily disturbed area with agricultural use and quarry use.	Flat (Stockpile)	Agricultural use, crop growth, tracks and existing quarry.

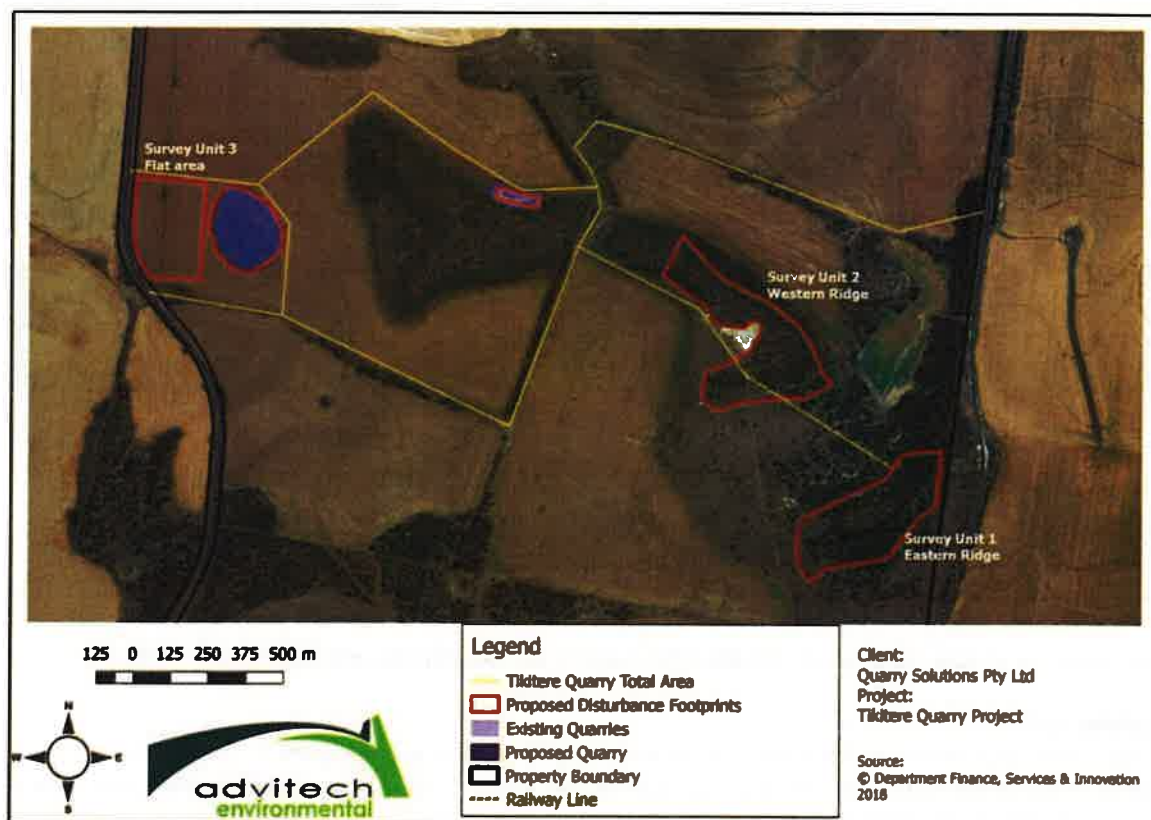


Figure 6: Survey units from due diligence assessment.

5.1.3 Effective survey coverage

The detection of Aboriginal objects is dependent on a number of environmental factors including:

- surface visibility (which is determined by the nature and extent of ground cover including grass and leaf litter and so on);
- the survival of the original land surface and associated cultural materials; and

- the exposure of the original landscape and associated cultural materials (by water, sheet and gully erosion, ploughing, grazing, vehicle tracks and so on),

Combined, these processes and activities are used in determining the likelihood of both surface and subsurface cultural materials surviving and being detected. Effective coverage is known as an estimate of the amount of ground that could be observed during the survey taking into account local constraints on site discovery such as development, vegetation and soil cover. There are two components used to determine the percentage of the survey's effective coverage: visibility and exposure.

The first component in establishing effective coverage is to calculate the amount of ground exposure. Exposure is an estimate of the area with a likelihood of revealing subsurface cultural materials rather than just an observation of the amount of bare ground. Exposure is the percentage of land for which erosion and exposure is sufficient to reveal cultural materials on the surface (OEH 2010).

The second component is visibility. This is the amount of bare ground visible on exposures which may reveal artefacts or other cultural materials. Visibility is hampered by vegetation, plant or leaf litter, loose sand, stony ground or introduced materials (such as rubbish). On its own, visibility is not a reliable factor in determining the detectability of subsurface cultural materials (OEH 2010).

The effective coverage for the study area, on a survey unit basis, was determined for both visibility and exposure and **Table 5** details the calculations used. As indicated in **Table 5**, the effective coverage for the study area illustrates the overall effectiveness of the survey.

Table 5: Effective coverage

SU	Landform	Area (ha)	Vis. %	Exp. %	Effective coverage area (ha)	Effective coverage (%)	% of landform effectively surveyed
1	Ridge (East)	12.5	80%	80%	2.9	23.2	44.7
2	Ridge (West)	14.3	80%	80%	9.1	63.6	44.7
3	Flat (Stockpile)	8.3	80%	75%	3.8	45.7	45.7
Total effective coverage					15.8	45.01	78.5%

A discussion of each survey unit, effective coverage and disturbances, past and present follows:

Survey Unit 1

This survey unit relates to the eastern ridge of the study area (refer to **Figure 7**). This survey unit has some disturbance from agricultural production on the lower portion of the ridge to the south. Some access tracks have been cut through vegetation. Vegetation can be relatively dense in sections particularly along the north side of the ridge. Not much vegetation clearance has occurred besides where agriculture or exploratory expeditions have occurred for quarrying

Survey Unit 2

This survey unit relates to the western ridge of the study (see **Figure 8**). This survey unit has some disturbance from agricultural production on the lower portion of the ridge to the south. Access tracks have been cut through vegetation. Vegetation can be relatively dense in sections particularly along the north side of the ridge. Not much vegetation clearance has occurred besides where agriculture or exploratory expeditions have occurred for quarrying. An existing quarry area is next to this survey unit.

Survey Unit 3

This survey unit relates to the flat area on the western side of the project area, on which a stockpile will be created. This area has existing agricultural/pastoral disturbance and abuts the railway line along its western edge. To the eastern edge is an existing quarry (see **Figure 9**). Other disturbances include fencing and access tracks. The limiting factors to visibility were vegetation relating to agriculture.



Figure 7: Photograph on Ridge (SU1)



Figure 8: Edge of Cleared and Regrowth Areas (SU2)



Figure 9: Proposed Stockpile Location Facing East Away from Rail Line Toward Existing Quarry

5.2 Results

Overall, 45% of the land for extraction/stockpile areas was effectively surveyed with additional surveying outside of proposed extraction and stockpile areas. Current disturbances on the property include commercial (farming), ancillary, fencing, alteration of land surfaces by grading/ploughing, fill or excavation and historical and modern clearance of vegetation on the property.

Effective coverage was considered acceptable in all survey units. Effective coverage was achieved either due to the number of passes within a transect, good visibility during survey, additional areas assessed where possible and additional paths over the same area traversed to better understand the landscape. It is considered that there is high potential for the presence of Aboriginal objects in survey units 2 and 3, with a lower potential in survey unit 1.

In the instance of the Pearlman Quarry study area, only the surface integrity can be investigated, through assessment of past and present land uses and their impacts. Due to the land use impacts (such as clearing, agricultural/pastoral activities, road works, and infrastructure) as well as natural impacts (erosion, bioturbation, flora/fauna activity) within the investigation area, it can be confidently assumed that the integrity of the area is lost. Sites GWP/IRP/TIK/1-6 are included in this disturbance, and as such it is unlikely that any of these sites were identified in situ, and the potential to find additional in situ sites in subsequent assessments of the investigation area is low to nil.

5.2.1 Cumulative Impacts

The cumulative impact to Aboriginal heritage in the study area is moderate, given that:

- The high density deposits identified during due diligence assessments occur within the development footprint and will be directly impacted;
- The placement of the development footprint is located over areas that traditionally have higher potential for Aboriginal archaeological material (simple slopes and near creeks/waterways);
- A comparable suite of landforms (creeks and creeks/waterways) that are expected to, and do contain a similar archaeological resource occur in multiple contexts both within the local area and throughout the Hunter Valley; and
- The presence of a previously registered AHIMS site in close proximity to the study area, which suggests that this area holds potential for additional Aboriginal archaeological material to be identified in the landscape.

6. ABORIGINAL CULTURAL HERITAGE ASSESSMENT

6.1 Further Investigation

Further Investigation was recommended as part of the due diligence assessment due to existing registered AHIMS sites and located potential Aboriginal items found near or in the with the search area. As part of the further investigation, community consultation was conducted following the *NSW Aboriginal Cultural Heritage Consultation requirements for proponents* 2010.

6.2 Survey Methodology

The survey methodology focused on a refined version of the due diligence methodology including a refined predictive model, proposed assessment survey and recording procedure.

6.2.1 Refined predictive model

Based on the predictive modelling from the due diligence assessment and following an inspection of the study area, a final predictive model for the study area and its archaeological potential, reveals that there is a medium likelihood of Aboriginal object(s) being present within the developed and disturbed portions of the study area. More particularly:

- There is a high likelihood that Aboriginal object(s) will be present within the areas to be impacted, particularly stone artefacts, either isolated or as part of a scatter. This conclusion is based on:
 - The identification of six potential Aboriginal sites within or in extremely close proximity to the disturbance footprint, two of which were stone artefact scatters with multiple individual artefacts noted;
 - The landscape and landforms of the area proposed for impact. The results of contextual archaeological studies indicate a preference for sites within 50 metres of reliable water sources or a confluence of water sources, on ridge lines, spurs and on crests. There is a crest within the study area, located approximately 2 kilometres from the most reliable source of water in the area;
 - The lack of archaeological reports published or available for the area give an inaccurate indication of the potential for Aboriginal sites to be found. While one existing registered AHIMS site that is currently located in close proximity to the disturbance footprint, there is potential for other previously recorded but not registered sites to exist in the area;
 - The lack of archaeological research in the immediate area means there is a high likelihood that extant Aboriginal archaeological sites exist in the landscape and have not previously been identified or recorded; and
 - The presence of a nearby registered Aboriginal site. This site is located within 50m of the western side of the proposed stockpile footprint.

In summary, the study area provides suitable resources and landscape features (elevated positions, distance to semi-permanent water) to allow for temporary or transient occupation of the site. While it is unlikely that the area hosted long term community base camps, it is reasonable to infer that smaller camping or nuclear family base camps may have been established in the area. The observation of potential Aboriginal sites in the proposed footprint is in alignment with what is to be expected of an area with these environmental features: the sites identified during due diligence were either isolated stone artefacts or were low to medium density scatters. There were no indications of sites existing in the study area that suggest extended stays or base camps.

As a result of the survey conducted over the area, the predictive model of site location can be reassessed for the investigation area:

- The potential for bora/ceremonial areas, culturally modified trees (carved/scarred), rock art shelters/engravings and stone arrangements to occur within the investigation area remains low or negligible;
- No evidence was observed to support the likelihood of burial sites in the area; and
- Due to the presence of both scatters and isolated stone artefacts, it can be assumed that there remains a moderate potential for additional isolated sites and scatters to be identified in the broader area.

6.2.2 Proposed assessment survey

The proposed survey was to further assess the development area with the assistance of the local Aboriginal community. This survey aimed to cover additional area to that covered within the due diligence survey and consisted of community participation in the field and data gathering about the potential cultural significance of the area. Any data gathered prior to the field survey will be used to assist in targeting specific areas of investigation. The central ridge assessed in the due diligence was decided by the proponent.

The proposed method of field assessment was a pedestrian survey. The pedestrian survey was conducted by four people, comprising two archaeologists from Advitech and two Aboriginal community members. Transects were planned with a proposed spacing for each individual to cover 5m - 10m depending on vegetation density. This method was decided upon based on the previous assessment by Advitech of the proposed Pearlman quarry in January 2019 that determined the central ridge has steep sections with dense vegetation.

The survey was conducted using a judgement sampling strategy to cover areas that were not investigated in the due diligence survey, and areas with a higher likelihood of containing heritage values. The judgement sampling strategy (Burke and Smith 2004, p. 65-69) was chosen to allow for the data from previous surveys to be used and plan a systematic survey. The proposed survey route was recorded in **Figure 9** and **Table 8**. **Figure 9** shows the centre lines for transects aiming for four people covering 10m each (5m either side of a person). Limitations when surveying the extraction area included dense vegetation on the northern side of the central ridge and disturbance over the site. The extraction area was surveyed firstly in an east/west direction, with the stockpile area surveyed in a north/south direction. Spot checks and vehicle survey followed the planned and existing haul routes. These were recorded with a GPS. The total length of the 13 transects is 5326m (5.3km).

Table 6: Pedestrian transect details

Transect ID	Length (m)	Start / End Point	Latitude	Longitude
1	310	1	-29.014462	150.334798
		2	-29.011364	150.334985
2	308	3	-29.011289	150.334378
		4	-29.014364	150.33427
3	310	5	-29.014355	150.333723
		6	-29.011242	150.333831
4	324	7	-29.014448	150.333214
		8	-29.011209	150.333345
5	287	9	-29.011153	150.332812
		10	-29.014018	150.332868
6	637	11	-29.016806	150.356462
		12	-29.013062	150.35129
7	637	13	-29.013494	150.350947
		14	-29.017238	150.356096
8	634	15	-29.017653	150.355746

Transect ID	Length (m)	Start / End Point	Latitude	Longitude
9	633	16	-29.013919	150.350616
		17	-29.014346	150.350276
		18	29.018071	150.355396
10	390	19	-29.018468	150.355056
		20	-29.016204	150.351881
11	287	21	-29.016605	150.351517
		22	-29.018267	150.353861
12	237	23	-29.018631	150.353468
		24	-29.017268	150.351508
13	242	25	-29.01766	150.351125
		26	-29.019042	150.353114
Total length of Transects = 5236m				

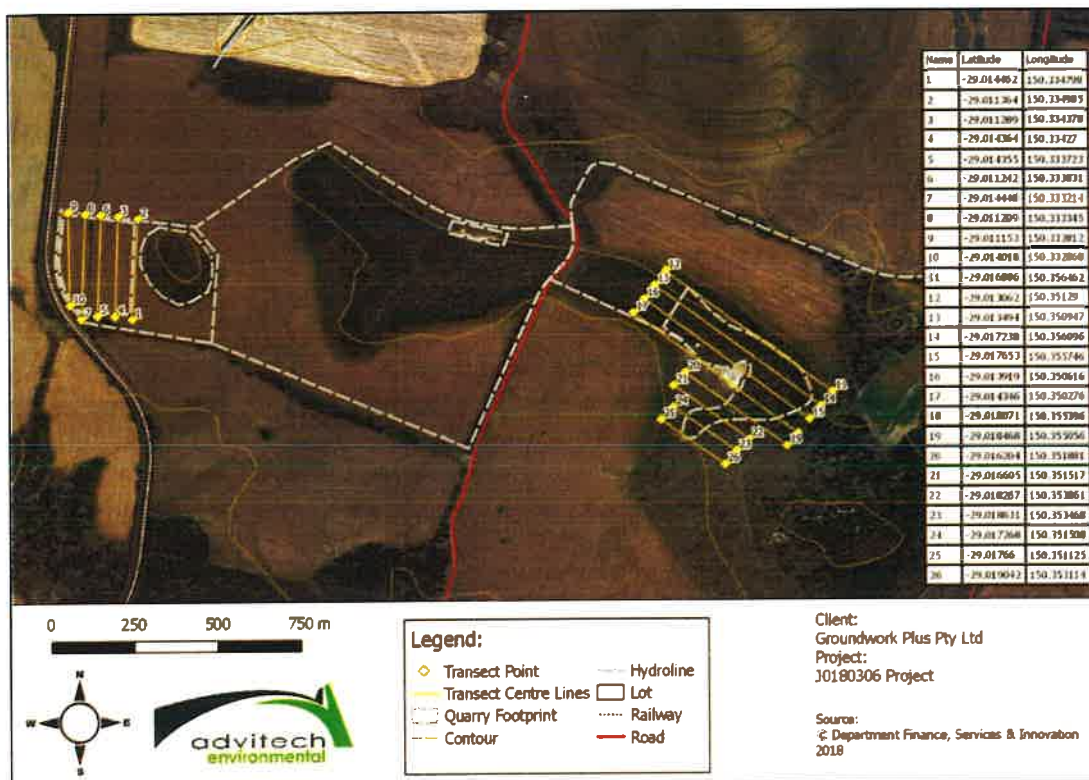


Figure 10: Pedestrian transects plan map with start/end points (original quarry footprint)

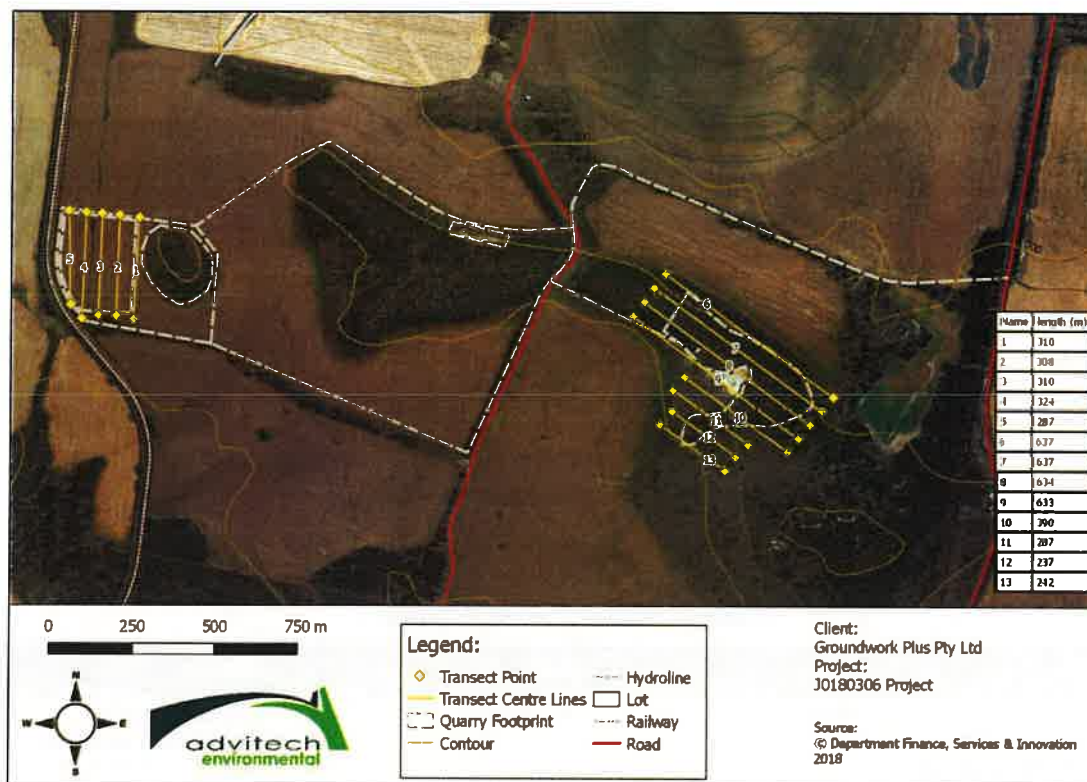


Figure 11: Pedestrian transects IDs and length (original quarry footprint)

Recording was conducted in the following methods adapted from Burke and Smith (2004):

Table 7: Examples of recording

Item	Recording Action
Isolated Artefact/s (up to 5 within 1m ²)	<ul style="list-style-type: none"> Photos of multiple sides with scale card (e.g. flake ventral and dorsal) GPS location Field notes including measurements, material and artefact type
Open scatter (5+artefacts within 1m ²)	<ul style="list-style-type: none"> Photos of individual artefacts, extent of scatter GPS location Field notes including measurements, number of artefacts, material and artefacts type
Scar tree	<ul style="list-style-type: none"> Photos of scar and tree GPS location Field notes including measurements, species, direction and condition of scar/s
Stone arrangement	<ul style="list-style-type: none"> Photos of individual stones and pattern GPS location Sketch of pattern Field notes including type and size of stone

Records including photos of landscape and a GPS trail were kept for the survey as well as field notes which included details of any finds.

6.3 Community Consultation

During the due diligence assessment phase Advitech contacted by phone and email the Toomelah Local Aboriginal Land Council to determine if they would be interested in participating in the due diligence field survey. No reply was received as to the intended participation of the LALC or individual representative of the local Aboriginal community prior to the survey. Moree LALC was also contacted and limited contact was made. No registration was forthcoming.

The following tables (Tables 6, 7 and 8) detail the events of community consultation for the proposed Pearlman quarry. Table 6 details the initial contact of parties listed in the *NSW Aboriginal Cultural Heritage Consultation requirements for proponents* 2010 and responses. Table 7 describes the registered parties for the project with party, contact person and date of registration. Table 8 lists responses from the review of the draft ACHA, with party, date of response and a summary of their response. Further consultation details can be found in Appendix II.

6.3.1 Stage 1: Notification of project proposal & registration of interest

Table 8: Initial Consultation letters

Contacted party	Method	Date	Response
North West Environmental Protection and Regulation Group Regional Office	Post	9 April 2019	Reply on 18/4/2019, letters to recommended parties sent 29/4/2019
Moree Local Aboriginal Land Council (LALC)	Post and Email	9 April 2019	No reply
Toomelah Local Aboriginal Land Council	Post and Email	9 April 2019	No reply
Office of the Registrar, Aboriginal Land Rights Act 1983 (NSW)	Email	9 April 2019	Reply 17/4/2019 - contact Moree LALC
Gomerioi Tribal Nation	Post	9 April 2019	Four responses through NTSCORP
Native Title Services Corporation Limited (NTSCORP)	Email	9 April 2019	16, 17, 30 April and 1 May 2019. Replies indicating Gomerioi native title applicants wish to be involved
Moree Plains Shire Council	Email	9 April 2019	No reply
National Native Title Tribunal (NNTT)	Email	9 April 2019	12 April 2019 - NNTT replied Pearlman quarry is freehold and this extinguished native title and they are not able to search Freehold land.

Table 9: Registered Parties

Registered Party	Contact person	Date Registered
Raymond Weatherall (Native Title Applicant)	Raymond Weatherall	16/4/2019

Registered Party	Contact person	Date Registered
Dennis Griffen (Native Title Applicant)	Dennis Griffen	30/4/2019
Maria (Polly) Cutmore (Native Title Applicant)	Maria (Polly) Cutmore	30/4/2019
Donald Craigie (Native Title Applicant)	Donald Craigie	30/4/2019
Stephen Talbott (Native Title Applicant)	Stephen Talbott	1/05/2019
Cutmore Family Group	Karen Craigie	15/05/2019
Gomerioi Dreaming Pty Ltd	Alfred Priestley	15/05/2019
AT Gomilaroi Cultural Consultancy	Aaron Talbott	17/05/2019

6.3.2 Stage 2: Presentation of Information about the proposed project

Information was sent to registered parties once receipt of interest was received and the registration period has concluded. The presentation consisted of a summary of background information, details about the purpose and objectives of the project, as well as the proposed methodology for feedback from the registered parties.

6.3.3 Stage 3: Gathering information about cultural significance

No cultural information was garnered from the consultation phase. Participants in the field survey made a potential connection to a Women's site, due to the presence of Kurrajongs, no evidence of stone tools and a scar tree being located near the Kurrajong.

6.3.4 Stage 4: Review of draft cultural heritage assessment report

During the review period from the 22 July to 21 August two RAPs contact Advitech regarding the Pearlman quarry project. Details can be seen in **Table 10** below and **Appendix II**.

Table 10: Summary of comments and replies from review of draft report

Registered Party/ Contact Person	Date	Summary of reply and/or comment
Gomerioi Dreaming Pty Ltd - Alfred Priestly	22 July, 2019	Acknowledged receipt of report
Stephen Talbott	22 July, 2019	Contacted Jake Brown to discuss report and methodology of fieldwork. Asked for copy of report to be sent to NTSCORP representative. Report was forward on 22 July, 2019. Full details in Appendix II .

6.4 Survey Results

The survey conducted on Tuesday 25 June 2019 involved the participation of Advitech archaeologists Jake Brown and Jessica Blackman and registered Aboriginal parties Aaron Talbott and Raymond Weatherall. Quarry Solutions representative John Sherburd was present during the survey. **Figure 12** details the GPS tracks recorded from the ACHA survey.

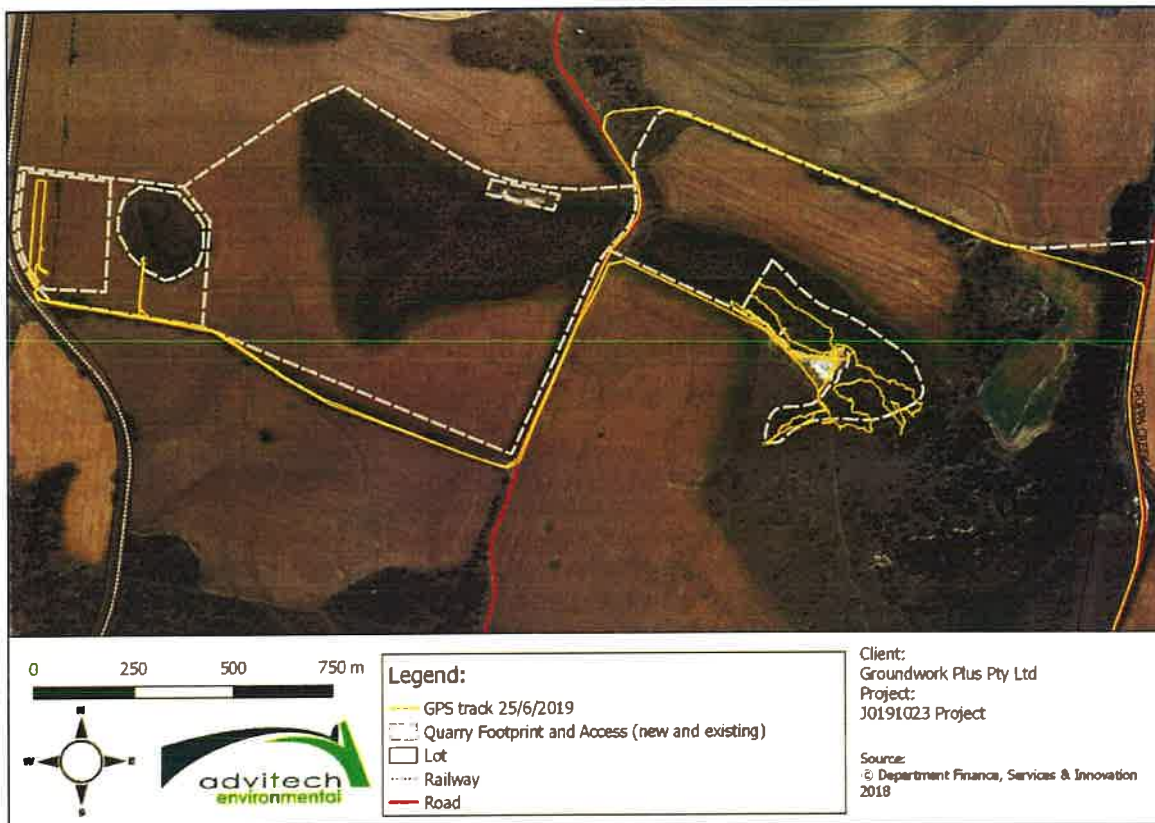


Figure 12: GPS tracks 25 June 2019 ACHA survey (original quarry footprint)

6.4.1 Survey Units

Landscape forms were divided into survey units (see **Figure 13**). Survey units within the study area are defined in **Table 11**.

Table 11: Survey Units

Survey Unit No.	Definition	Landforms	Disturbance
1	Limited disturbance with regrowth in some places and some mature vegetation. Agriculture practices.	Ridge	Previously cleared areas, heavily disturbed existing quarry area. Agriculture practices.
2	Heavily disturbed area with agricultural use and quarry use.	Flat (Stockpile)	Agricultural use, crop growth, tracks and existing quarry.

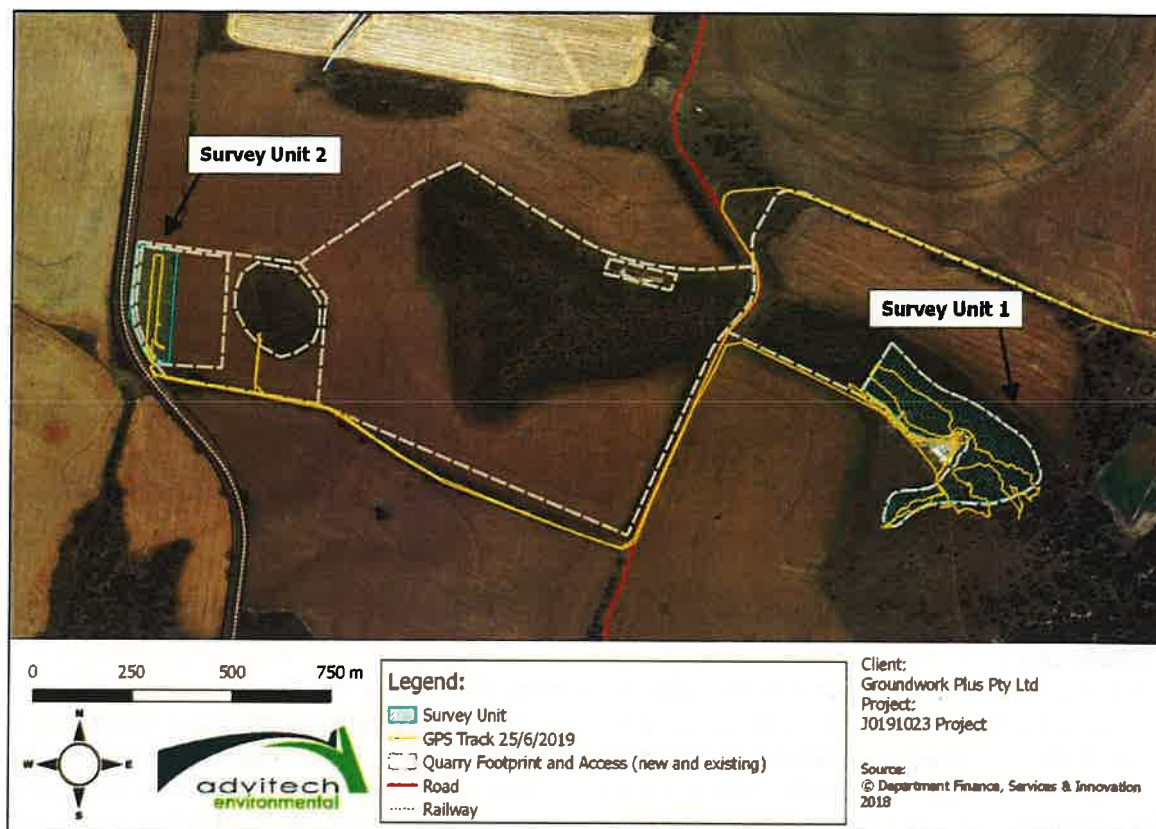


Figure 13: Survey units for ACHA survey (original quarry footprint)

6.4.2 Effective survey coverage

The detection of Aboriginal objects is dependent on a number of environmental factors including:

- surface visibility (which is determined by the nature and extent of ground cover including grass and leaf litter and so on);
- the survival of the original land surface and associated cultural materials; and
- the exposure of the original landscape and associated cultural materials (by water, sheet and gully erosion, ploughing, grazing, vehicle tracks and so on),

Combined, these processes and activities are used in determining the likelihood of both surface and subsurface cultural materials surviving and being detected. Effective coverage is known as an estimate of the amount of ground that could be observed during the survey, taking into account local constraints on site discovery such as development, vegetation and soil cover. There are two components used to determine the percentage of the survey's effective coverage: visibility and exposure.

The first component in establishing effective coverage is to calculate the amount of ground exposure. Exposure is an estimate of the area with a likelihood of revealing subsurface cultural materials rather than just an observation of the amount of bare ground. Exposure is the percentage of land for which erosion and exposure is sufficient to reveal cultural materials on the surface (OEH 2010).

The second component is visibility. This is the amount of bare ground visible on exposures which may reveal artefacts or other cultural materials. Visibility is hampered by vegetation, plant or leaf litter, loose

sand, stony ground or introduced materials (such as rubbish). On its own, visibility is not a reliable factor in determining the detectability of subsurface cultural materials (OEH 2010).

The effective coverage for the study area, on a survey unit basis, was determined for both visibility and exposure and **Table 12** details the results of effective coverage.

Table 12: Effective coverage

SU	Landform	Area (m ²)	Vis. %	Exp. %	Effective coverage area (m ²)	Effective coverage (%)
1	Ridge	92500	50%	70%	32375	35
2	Flat (Stockpile)	29760	60%	85%	15177	51
Total effective coverage					47552	86

A discussion of each survey unit, effective coverage and disturbances, past and present follows:

Survey Unit 1

This survey unit relates to the Eastern ridge of the study (see **Figure 13**). This survey unit has some disturbance from agricultural production on the lower portion of the ridge to the south. Access tracks have been cut through vegetation. Vegetation can be relatively dense in sections particularly along the north side of the ridge. Little vegetation clearance has occurred besides where agriculture or exploratory expeditions have occurred for quarrying. An existing quarry area is located adjacent to this survey unit.

Survey Unit 2

This survey unit relates to the flat area on the western side of the project area, on which a stockpile will be created. This area has existing agricultural/pastoral disturbance and abuts the railway easement along its western edge. To the eastern edge is an existing quarry (see **Figure 13**). Other disturbances include fencing and access tracks. The limiting factors to visibility were vegetation relating to agriculture.

6.4.3 Stockpile area

The stockpile area was surveyed on Tuesday morning after site inductions were completed. The approximate 40m width was covered per recorded transect line (**Figure 12** and **Figure 15**). The area on the methodology map (**Figure 11**) overlapped with the existing approved DA for the Tikitere quarry. As a result, the survey area was reduced to a thin margin of land situated between the railway easement and an existing fence line, which can be seen as a thin line of vegetation running north-south in **Figure 15**.

Demarcation pegs existed at the stockpile area and John Sherburd also provided information about the boundaries and possible operational techniques. The survey area was heavily disturbed through agricultural practices. Raw material was evident in the southern part of the proposed stockpile area. This was also noted in the due diligence assessment in January 2019. The transects shown in **Figure 12** and **Figure 15** represent the GPS track with three participants to the right of the line with approximately 10m spacing; the line closest to the fence line was assessed first and line closest to the railway second. The Registered Aboriginal Parties were satisfied with the results of the field survey and no heritage values were identified in the stockpile area (refer to **Appendix II** for transect proforma).

6.4.4 Quarry area

The quarry area was surveyed on Tuesday morning through to early afternoon. The site had previously contained a few points of possible concern which were noted in the due diligence assessment in January. These related to a silcrete outcrop and possible raw material manuport (chert).

During the ACHA survey the silcrete outcrop which is mostly outside the impact area was not deemed a concern by the Registered Aboriginal Parties. The eastern side of the site that borders the larger portion of the silcrete outcrop has exfoliated material that has shattered into natural flakes. From examination of the site this may have occurred through a mixture of natural exfoliation, human disturbance such as road creation, borrow pits and agriculture as well as by animals, with cattle and pigs noted on the property.

Finds during the survey comprised a fallen tree with a scar. The tree is located approximately 30m west from the most eastern boundary of the original quarry footprint (**Figure 16 and Figure 17**) and was thought to be of Aboriginal origin. The tree was located near a Kurrajong tree, which the registered parties connect to a potential Women's site. It was recommended that for any future works, female Aboriginal representatives should attend as is culturally appropriate. No cultural information about the site/location was forthcoming in the methodology review period. The tree had evidence of regrowth on the scarred section of the trunk. A ring mark was also evident, however given its location with respect to other mature trees in the vicinity, the reasoning for the ring mark was difficult to accurately determine. Potentially the ring mark could be attributed to animal activity or the tree being historically used as part of fence. The tree was moderately preserved and did not appear to have insect or vegetation damage.

The scar tree was recorded as a Box Gum with the following scar dimensions:

Length	Width	Girth	Orientation
790mm	85mm	1070mm	West (when standing)

No other items of heritage value were discovered in the quarry footprint.



Figure 14: Scar tree in quarry impact area

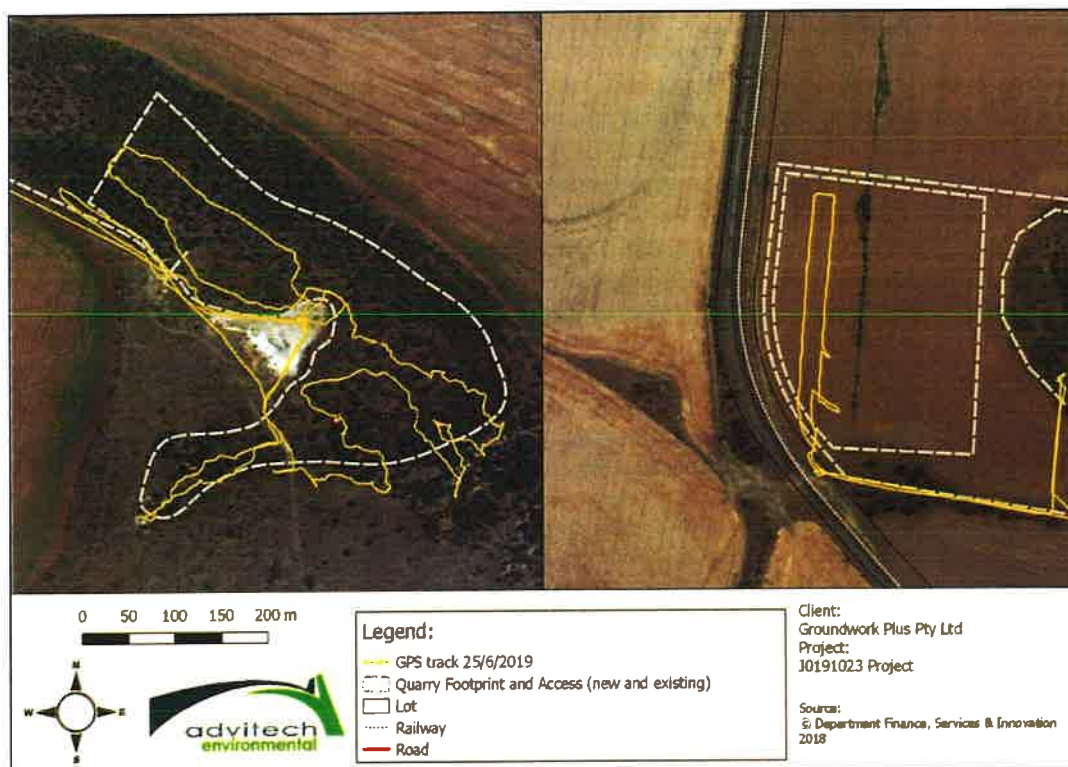


Figure 15: Survey map close-up of GPS records of pedestrian transects (original quarry footprint)

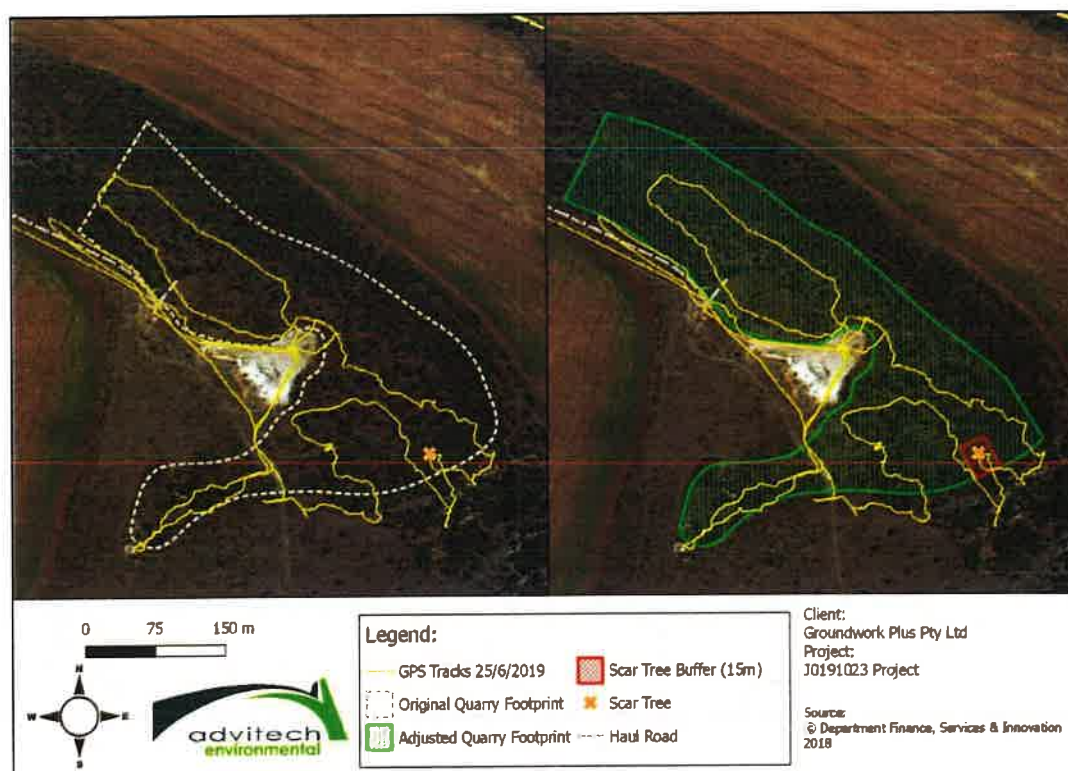


Figure 16: Quarry footprint comparison with June GPS tracks

7. RECOMMENDATIONS

Recommendations for this project consist of the options below:

a) Redesign of footprint to exclude registered site

The scar tree is located approximately 30m within the footprint. The client (Quarry Solutions) wishes to use the redesign option and as such have provided details of the adjust site footprint as seen in **Figure 17** and **Figure 18**. **Figure 16** shows that the majority of the footprint was inspected during the ACHA survey and **Figure 5** shows the area was also inspected during the due diligence survey. No finds were recorded in the western area of the footprint. The redesign does not seek to expand the total area of the footprint.



Figure 17: Map of proposed buffer area and footprint adjustment put forward by Quarry Solutions



Figure 18: Close up of adjusted quarry footprint with 15m buffer

Or

b) Aboriginal Heritage Impact Permit (AHIP)

Applying for an AHIP with the completed ACHA report to disturb the heritage item/s. This process may take several months to complete; the timeframe OEH provides for this is at least 60 days excluding any additional delays as a result of feedback or amendments being requested by OEH. Options for mitigation/relocation of the heritage item/s would need to be confirmed with the registered Aboriginal parties and OEH with a care and control agreement or approved keeping place. Options that might be available includes taking the items from the property to an agreed location or relocation on site to a safe location (site office, secluded area).

Quarry solutions also referenced the Quarry Institute Australia's cultural heritage induction guide which this report would recommend is continued to be used for education of site personnel about heritage items. An unexpected finds procedure is also recommended for use throughout the life of the project (for example, **Figure 19**).

Six objects were recorded and registered with AHIMS prior to the ACHA fieldwork commencing. Following the results of this assessment, and the lack of cultural significance determined through the survey and from feedback from the Aboriginal community, these sites have been submitted to AHIMS to be amended to "Not a Site" on the AHIMS database. These areas are predominantly outside the impact

area and should not be affected by quarry activities. The scarred tree recorded during the ACHA fieldwork will be registered with AHIMS prior to any management measures being implemented following the registered Aboriginal Parties review of the document.

8. CONCLUSIONS

The Aboriginal Cultural Heritage Assessment of the proposed Pearlman quarry resulted in a single cultural item being located. Quarry Solutions were made aware of this after the survey in June and will seek to implement the exclusion buffer around the scar tree (**FIGURE 17 and Figure 18**). It is advised to consider the recommendation options going forward (as Quarry Solutions has done with the footprint redesign) and the registered Aboriginal parties' opinions and recommendations when progressing the Pearlman quarry.

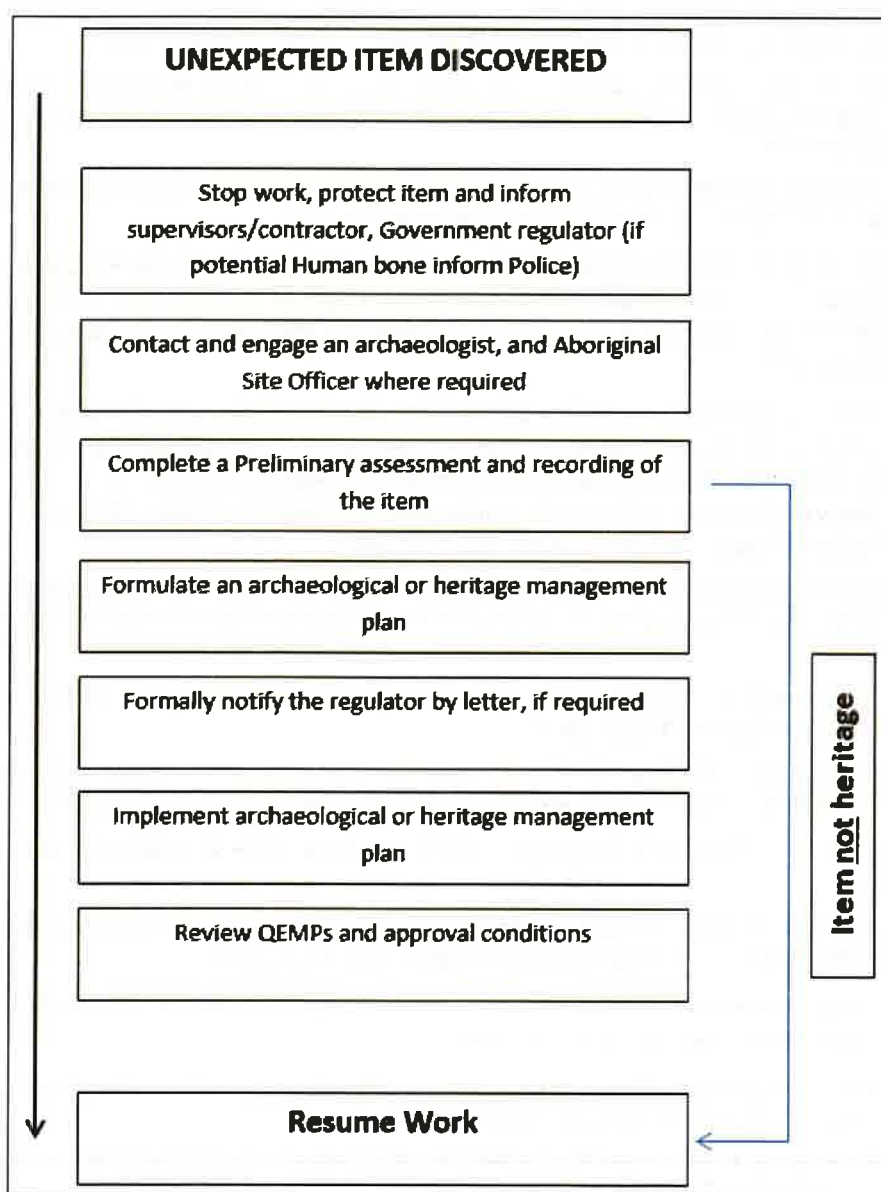


Figure 19: Unexpected finds procedure flow chart

9. REFERENCES

The following information was used in the preparation of this report:

- Australian Bureau of Statistics (ABS) 2018, *2016 Census Quickstats - North Star*, viewed 27/6/2019 < https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC13008>.
- AECOM Australia Pty Ltd 2010, Maules Creek Coal Project Environmental Assessment prepared for Hansen Bailey. Viewed 4/1/2019 <<http://www.whitehavencoal.com.au/environment/docs/appendix-j-indigenous-heritage-report.pdf>>.
- Archaeological Surveys and Reports Pty Ltd 2004, Proposed Werris Creek Coal Mine Aboriginal Heritage Assessment. Report to R.W. Corkery and Co Pty Limited on behalf of Werris Creek Coal Pty Limited.
- Archaeological Surveys and Reports Pty Ltd 2007, The Salvage and Removal of the "Narrawolga" Axe-grinding Groove Site, Werris Creek Coal Mine, Werris Creek, Northern NSW.
- Archaeological Surveys and Reports Pty Ltd 2009, Narrabri Coal Mine Stage 2 longwall Project Aboriginal Heritage Assessment. Report to R.W. Corkery and Co Pty Limited on behalf of Narrabri Coal Operations.
- Area Environmental Consultants and Communication 2018, Narrabri South Solar Farm Cultural Heritage Assessment. Report to Canadian Solar (Australia) Pty Ltd
- Australia ICOMOS 2013, *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 1999, with associated Guidelines and Code on the Ethics of co-existence*. Viewed 19/12/2018 <<http://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf>>.
- Bastin G and the ACRIS Management Committee 2008, *Brigalow Belt South bioregion, Rangelands 2008 – Taking the Pulse*, published on behalf of the ACRIS Management Committee by the National Land & Water Resources Audit, Canberra. Viewed 10/12/2018 < <https://www.environment.gov.au/system/files/resources/a8015c25-4aa2-4833-ad9c-e98d09e2ab52/files/bioregion-brigalow-belt-south.pdf>>
- Bowdler, S. 1977, *The Coastal Colonisation of Australia*. In Allen, J. Golson, J. and Jones, R (eds) Sunda and Sahul: Prehistoric studies in Southeast Asia, Melanesia and Australia, Academic Press, London.
- Bowdler, S. 1981, Hunters in the highlands: Aboriginal adaptations in the eastern Australian uplands. *Archaeology in Oceania* 16 (2): 99-111
- Bureau of Meteorology (BOM) 2019, Climate Statistics for Australian locations (Moree). Viewed 10/4/2019 < http://www.bom.gov.au/climate/averages/tables/cw_053115.shtml>.
- Burke, H. & Smith, C. 2004. *The Archaeologist's Field Handbook*. Allen & Unwin, Crows Nest, Sydney, Australia.
- Central Queensland Cultural Heritage Management Pty Ltd 2016, Aboriginal Cultural Heritage Assessment Report for the Narrabri Gas Project. Report for Santos.
- Department of the Environment and Energy (DEE) 2018, EPBC Act Protected Matters Search Tool. <<http://www.environment.gov.au/epbc/pmst/>>
- Department of the Environment, Water, Heritage and the Arts (DEWHA) 2013, Significant Impact Guidelines 1.1. Matters of National Significance < <http://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance>>

- Department of Industry 2018, Lands, Reserves and Cemeteries. < <https://www.industry.nsw.gov.au/lands>>
- Department of Planning and Environment - Resources and Energy (DPE) 2018a, MinView. <<https://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/geoscience-information/services/online-services/minview>>
- Department of Planning and Environment - Resources and Energy (DPE) 2018b, NSWGeologyPlus Interactive Geological Maps of NSW. < <https://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/geoscience-information/products-and-data/maps/geological-maps>>
- Department of Urban Affairs and Planning (DUAP) 1996, Extractive Industries - Quarries EIS Guideline. <<http://www.planning.nsw.gov.au/~media/Files/DPE/Guidelines/extractive-industries-quarries-eis-guideline-1996-10.ashx>>
- Foley, R. 1981, A Model of Regional Archaeological Structure. In *Proceedings of the Prehistoric Society*. 47:1-17.
- Green D., Ali A., Petrovic J., Burrell M., Moss P. 2012, Water resource and management overview: Border Rivers Catchment, NSW Department of Primary Industries, Sydney
- Heritage Council of NSW, 2006, Historical Archaeology Code of Practice.
- Heritage Office 2001, Assessing Heritage Significance. NSW Heritage Office. Sydney.
- Heritage Office (HO) and Department of Urban Affairs and Planning (DUAP) 1996, Regional Histories: Regional Histories of New South Wales. Sydney.
- Heritage Office 2006, Photographic Recording of Heritage Items Using Film or Digital Capture
- Horton, D. R. 1981, *Water and woodland: the peopling of Australia*. Australian Institute of Aboriginal Studies Newsletter 16.
- Insite Heritage 2010, Aboriginal Cultural Heritage Impact Assessment Report for the Continuation of Boggabri Coal Mine. Report to Hansen Bailey Pty Ltd.
- Koettig, M.K. 1985, *Archaeological investigation of three sites on Upper Mill Creek, near Lucas Heights, Sydney*. Unpublished report to MWDA. Report held NSW NPWS.
- Kohen, J.L. 1986, *Prehistoric Settlement in the Western Cumberland Plain: Resources, Environment and Technology*. Unpublished PhD Thesis. Macquarie University.
- Kuskie, P. J. and J. Kamminga. 2000, Salvage of Aboriginal Archaeological Sites in relation to the F3 Freeway near Lenaghans Drive, Black Hill, New South Wales. Vol. A: Report. Unpublished report by South East Archaeology to Roads and Traffic Authority, New South Wales (Major Projects, Northern Region, Newcastle).
- Mathews, R.H. 1895, The Bora, or Initiation ceremonies of the Kamilaroi Tribe. *Journal of the Anthropological Institute*, Vol. XXIV, pp.318-339. Viewed 27/6/2019 < <https://downloads.newcastle.edu.au/library/cultural%20collections/pdf/mathews1895-96.pdf>>.
- Mathews, R.H. 1917, Two Bora Grounds of the Kamilaroi Tribe. *Journal and proceedings of the Royal Society of New South Wales*, Vol. 51, pp. 423-430.
- Mitchell, T.L., 1838, Three Expeditions in the Interior of Eastern Australia, with descriptions of the recently explored region of Australia Felix and of the present colony of New South Wales. Viewed 4/1/2019 <<http://adc.library.usyd.edu.au/data-2/mitthre.pdf>>.
- Murray-Darling Basin Authority n.d., Gwydir. Viewed 27/6/2019 < <https://www.mdba.gov.au/discover-basin/catchments/gwydir>>.

National Parks and Wildlife Service (NPWS) 2018, Terry Hie Hie Aboriginal Area. Viewed 14/6/2019 <<https://www.nationalparks.nsw.gov.au/visit-a-park/parks/terry-hie-hie-aboriginal-area>>.

NSW Heritage Office 1998, Skeletal Remains - Guidelines for the Management of Human Skeletal Remains under the Heritage Act 1977.

NSW National Parks and Wildlife Service 2003, 'The Bioregions of New South Wales: their biodiversity, conservation and history', NSW National Parks and Wildlife Service Hurstville.

NSW Government 2018, Sharing and Enabling Environmental Data (SEED).
<<https://datasets.seed.nsw.gov.au/>>

Office of Environment and Heritage (OEH) 2018f, Search for NSW heritage.
<<http://www.environment.nsw.gov.au/heritageapp/heritagesearch.aspx>>

Office of Environment and Heritage, 2017, Great Soil Group (GSG) Soil Type map of NSW, NSW Office of Environment and Heritage, Sydney. Viewed 1/6/2019 <<https://data.gov.au/dataset/ds-nsw-bb1f895b-ceaa-45eb-a056-3423fd7588d9/details?q=>>>.

1. Office of Environment and Heritage

- Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010.
- Aboriginal Cultural Heritage. Protecting local heritage places: a guide for communities, Australian Heritage Commission, Canberra, ACT 1998.
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales 2010.
- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW 2010.
- Environmental Planning and Assessment Act 1979 (NSW)
- Espade, NSW Soil and Land Information. Downloaded 27 June, 2019 from <http://www.environment.nsw.gov.au/eSpadeWebapp/>.
- *Heritage Act, 1977.*
- NSW Heritage Manual (1996 - 2001) particularly:
 - Archaeological Assessments;
 - Historical Archaeological Sites;
 - Guidelines for Photographic Recording;
 - Heritage Assessment Guidelines;
 - Assessing Heritage Significance;
- Great Soil Groups (GSG) Soil Type map of NSW
- Draft Plan of Management, Terry Hie Hie Aboriginal Area 2017; and
- *What is an Aboriginal Cultural Landscape?* Fact Sheet 2 2010

On Site Cultural Management Pty Ltd (2017), Due Diligence Investigation for the Protection of Aboriginal Objects - Proposed Construction of Conservation Fencing and Associated Infrastructure, Pilliga State Forest. Report to Australian Wildlife Conservancy on behalf of NSW Office of Environment and Heritage.

Renfrew, C. and Bahn, P. 1991, *Archaeology: Theories, Methods and Practice*. Thames & Hudson.

Smith, M.A. 1987, Pleistocene occupation in Arid Central Australia. *Nature*, Vol. 328 (20 August).

- Tench, W. 1793, Complete Account of the Settlement at Port Jackson. G. Nicol and J. Sewell, London. Viewed 11/1/2019 <<http://setis.library.usyd.edu.au/ozlit/pdf/p00044.pdf>>.
- Umwelt 2017, Australian Rail Track Corporation Inland Rail Narrabri to North Star EIS Non-Aboriginal Heritage Impact Statement, Newcastle, Australia.
- University of Queensland Culture & Heritage Unit 2017, Aboriginal Heritage Conservation Strategy: Maules Creek Coal Mine, Tarrawonga Coal project, Boggabri Coal Mine, and Related Offset Areas. Prepared for Whitehaven Coal Limited and Idemitsu Australia Resources.
- Whincop, M. 2018, Aboriginal Cultural Heritage Assessment for the Vickery Extension Project in the Gunnedah and Narrabri Shires, New South Wales. Report for Whitehaven Coal Limited.
- White, B. and McDonald, J. 2010, Lithic Artefact Distribution in Rouse Hill Development Area, Cumberland Plain, New South Wales. Australian Archaeology, No. 70, June.



APPENDIX I: AHIMS Extensive Search

NOT FOR PUBLIC DISCLOSURE



AHIMS Web Services (AWS) Extensive search - Site list report

Your Ref/PO Number : Tikitere
Client Service ID : 375034

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	SiteStatus	SiteFeatures	SiteTypes	Reports
11-1-0043	NNS IA10	GDA	56	240255	6787420	Open site	Valid	Artefact :-		
Contact		Recorders		Umwelt (Australia) Pty Limited, Miss. Nicola Roche				Permits		

Report generated by AHIMS Web Service on 16/10/2018 for Rod Bennison for the following area at Lot : 5, DP-DP755984 with a Buffer of 200 meters. Additional Info : IN DD and ACHA.
Number of Aboriginal sites and Aboriginal objects found is 1

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

APPENDIX II: Aboriginal Consultation Log

1. Consultation log
2. Advertisement from consultation
3. Transect sheets
4. Methodology and report replies

Pearlman Quarry- JO180306 (F15821)

Date	Communication Type	Sent/Received	Advitec Personnel Making/Taking Comms	Internal/External Comms	Name of Sending/Receiving Stakeholder	Content of Comms	Actions/Notes
3/01/2019	Phone	Sent By	Jake Brown	External	Tomelah LALC	No answer 11:39am	
3/01/2019	Email	Sent By	Jake Brown	External	Tomelah LALC	Sent 11:59am	
1/02/2019	Phone	Sent By	Jessica Blackman	External	Moree Champion	1:59pm spoke to Jess Singh. Follow up meail requested to obtain quote for 2 x notices in the Moree Champion newspaper	Follow up email
1/02/2019	Email	Sent By	Jessica Blackman	External	Moree Champion	Email to request a quote for 2 x notices. Included tentative wording and example of past notices to get an accurate quote. Sent 2:20pm	
4/02/2019	Email	Received By	Jessica Blackman	External	Moree Champion	1:30pm received email from Glenda with quote for advertisements. Also recommended the Border news as another newspaper to get a quote from.	

9/04/2019	Email	Sent By	Jake Brown	External	Moree Council, Moree LALC, NNTT, NTSCORP, Registrar, Toomelah LALC	ACHA consultation to recommended parties in Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010	
9/04/2019	Letter	Sent By	Jake Brown	External	OEH EPRG north west office Dubbo, Moree LALC, Toomelah LALC	ACHA consultation to recommended parties in Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010	
10/04/2019	Email	Received By	Jake Brown	External	NNTT	Reply to request for potential interested parties for ACHA. NNTT asked for geospatial form to be filled out and returned. Form sent and receipt received.	Geospatial search form filled out and sent to required email address. Receipt received.
12/04/2019	Email	Received By	Jake Brown	External	NNTT	NNTT can't search Tikitere as the land is freehold and indicates native title has been extinguished.	

17/04/2019	Email	Received By	Jake Brown	External	Raymond Weatherall	Native Title Applicant (Gomerari) registered interest.	Response sent to email saying site visit should be done ASAP to coincide with other inland rail assessments. Reply sent to say consultation is underway and the methodology will be sent when the registration period is finished.
17/04/2019	Email	Received By	Jake Brown	External	Dylan Orsborn	Solicitor for NTSCORP	Confirmed that Raymond was the native title applicant and that NTSCORP will be in contact with other native title applicant.
17/04/2019	Email	Received By	Jake Brown	External	Raymond Weatherall	Sent email confirming native title applicant and requesting methodology.	Reply was sent to say methodology was still under construction and will be sent to all registered parties about the 15th May.
18/04/2019	Email	Received By	Jake Brown	External	Elizabeth Loane (Office of the Registrar)	No registered parties in project area. Suggested contacting Moree LALC as possible source of identifying stakeholders.	

18/04/2019	Email	Sent By	Jake Brown	External	Brad Dwyer	Placement of ad in Border News for the week of the 29th April.
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29/04/2019	Letter	Sent By	Jake Brown	External	OEH list of potentially listed parties	seeking interested parties
------------	--------	---------	------------	----------	--	----------------------------

						Provided names for registration from Gomeroi native title applicants
						Raymond Weatherall

30/04/2019	Email	Received By	Jake Brown	External	Dylan Orsborn (NTSCORP)	Dennis Griffen
						Maria (Polly) Cutmore
						Donald Craigie

1/05/2019	Letter	Sent By	Jake Brown	External	Dylan Orsborn (NTSCORP)	Another applicant registered through NTSCORP Stephen Talbott
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9/05/2019	Letter	Received By	Jake Brown	External		Michelle Saunc letter return to sender
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15/05/2019	Email	Received By	Jake Brown	External	Karen Craigie	Terry Hie Hie Aboriginal CO-OP not operational at present. Please register Cutmore Family Group with Karen as representative.
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15/05/2019	Email	Received By	Jake Brown	External	Alfred Priestley Gomeroi Dreaming Pty Ltd	Registered interest
------------	-------	-------------	------------	----------	--	---------------------

17/05/2019	Email	Received By	Jake Brown	External	Aaron Talbott	Aaron called to register interest
17/05/2019	Email	Sent By	Jake Brown	External	Aaron Talbott, Karen Craigie, Raymond Weatherall and Alfred Priestly	Methodolgy sent by email
17/05/2019	Letter	Sent By	Jake Brown	External	Dennis Griffen, Maria Cutmore, Donald Craigie, Stephen Talbott	Methodolgy sent by post
17/05/2019	Letter	Sent By	Jake Brown	External	Dylan Orsborn (NTSCORP)	Methodolgy sent to Dylan and conformation that methodology has been sent to applicants by post and email where applicable.
20/05/2019	Email	Received By	Jake Brown	External	Karen Craigie	Email received confirming receipt of methodology
23/05/2019	Letter	Received By	Jake Brown	External	Ray Tighe and Brian Draper	Consultation letters returned to sender
29/05/2019	Email	Sent By	Jake Brown	External	Helen Knight OEH	Consultation email about registered parties as per NSW legislation
29/05/2019	Email	Sent By	Jake Brown	External	Moree LALC	Consultation email about registered parties as per NSW legislation moreelalc@bigpond.com.au

30/05/2019	Email	Received By	Jake Brown	External	Moree LALC	Steve McIntosh CEO emailed and called to discuss registered parties list sent to Moree LALC. Moree LALC has not made contact despite repeated attempts at contact since 2018.	Called Steve on 31/5/2019
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31/05/2019	Phone	Sent By	Jake Brown	External	Moree LALC	Called Steve McIntosh CEO on phone number attached to email. No answer	Follow up email sent
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31/05/2019	Email	Sent By	Jake Brown	External	Raymond Weatherall	Sent email to inquire about potential for survey
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	Letter	Sent By	Jake Brown	External	Aaron Talbott	Sent email to inquire about potential for survey
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11/06/2019	Phone	Sent By	Jake Brown	External	Raymond Weatherall	Phone call to discuss potential for survey	Voicemail left
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	Phone	Received By	Jake Brown	External	Raymond Weatherall	Phone called received, confirmation that Raymond can attend. Sent email which was not received and will send email again.	Email received with insurances
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12/06/2019

Needs to send insurance before confirmation of work, Aaron said that he will send through by Monday 17th.

12/06/2019	Phone	Received By Jake Brown	External	Aaron Talbott		
25/06/2019	Email	Sent By	Jake Brown	External	Aaron Talbott and Raymond Weatherall	Email sent to Aaron and Raymond thanking them for fieldwork, confirming invoices should be addressed to Groundwork Plus and 7:30am - 2:30pm day, plus personal vehicle travel to and from Moree.
27/06/2019	Email	Sent By	Jake Brown	External	Raymond Weatherall	request to adjust name of invoice to Quarry solutions and adjust date of payment from date of issue Phone call from Raymond discussing changes
27/06/2019	Email	Sent By	Jake Brown	External	Aaron Talbott	request to adjust name of invoice to Quarry solutions
27/06/2019	Email	Received By Jake Brown	External	Raymond Weatherall	Adjusted invoice received and forwarded to client	Invoice forward and email sent to Raymond confirming this
5/07/2019	Phone	Received By Jake Brown	External	Aaron Talbott	Missed call from Aaron about addressing invoice	sent message addressing question.

5/07/2019	Email	Received By Jake Brown	External	Aaron Talbott	Received screen shot of invoice.	Replied 8/7/2019 asking for pdf copy of invocie to forward to client. Received later 8/7/2019
9/07/2019	Email	Received By Jake Brown	External	Raymond Weatherall	Received email inquiring about invoice payment.	Reply sent after contacting client, Quarry Solution pays 30 days after the end of the month.
9/07/2019	Email	Sent By Jake Brown	External	Aaron Talbott	Emailed about Quarry Solutions payment schedule.	
22.7.2019	Email	Sent By Jake Brown	External	Stephen Talbott, Aaron Talbott, Raymond Weatherall, Karen Craigie, Alfred Priestly	Draft ACHA report sent	
22.7.2019	Letter	Sent By Jake Brown	External	Donald Craigie, Dennis Griffen and Maria Polly Cutmore	Draft ACHA report sent	
22.7.2019	Email	Received By Jake Brown	External	Alfred Priestley, Gomerio Dreaming Pty Ltd	Confirmation of receiving report	

22.7.2019	Phone	Received By Jake Brown	External	Stephen Talbott	Phone call from Stephen following up report. Stephen said he had spoken to Raymond Weatherall and he had concerns with the people present knowing what they were looking for. Raymond also mentioned to Stephen only 1 day assessment and asked if anymore field was to take place. I replied it was not likely and this would depend on comments from the report. Regarding the methodology of a days fieldwork and any other issues, no one replied to the methodology, where it concerns could have been addressed. Asked report to be forwarded on to representative at NTSCORP.
22.7.2019	Email	Sent By Jake Brown	External	Dylan Orsborn (NTSCORP)	Following Stephen's request, report was forward to Dylan at NTSCORP.
23.7.2019	Email	Received By Jake Brown	External	Dylan Orsborn (NTSCORP)	Response from previous email acknowledging receipt of report.
15.8.2019	Email	Received By Jake Brown	External	Mungindi LALC	Initial consultation for ACHA returned to sender

Cultural Heritage Assessment

Registration of Interest for Aboriginal people who hold cultural knowledge

PROJECT: Aboriginal Cultural Heritage Assessment at Tikitere Quarry

The purpose of community consultation with Aboriginal people is to assist the proposed applicant in the preparation of an application for an AHIP, if required, and to assist the Director General of the Office of Environment and Heritage (OEH) in his or her consideration and determination of the application.

This is an invitation for Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the area of the proposed project to register an interest in a process of community consultation with the proposed applicant regarding the proposed activity. As per the Aboriginal Cultural Heritage Requirements for Proponents (2010), interested parties are advised of the following;

- Unless otherwise specified, if you register your interest your details will be provided to OEH and the Local Aboriginal Land Council (LALC);
- The LALC's who hold cultural knowledge relevant to the proposed project area that is relevant to determining the significance of Aboriginal objects and/or places within the proposed project are who wish to register, do so as an Aboriginal organisation not an individual; and
- Where an Aboriginal organisation representing Aboriginal people who hold cultural knowledge relevant to the proposed project area and that is relevant to determining the significance of Aboriginal objects and/or places within the proposed project area who wish to register, must nominate a contact person and provide written confirmation and contact details of this person or persons

PROPONENT: T. Woods, Quarry Solutions Pty Ltd PO Box 903 Oxenford Qld 4210

Registration from Aboriginal people and/or Aboriginal groups wishing to be consulted must be received by phone, email or in writing no later than: **Friday 17th May 2019.**

To register your interest, please contact: **Jake Brown, Archaeologist**
Advitech Environmental, PO Box 207, Mayfield NSW 2304,
Email: jake.brown@advitech.com.au or Ph: 02 4924 5400



TRANSECT RECORDING FORM



Project ID: <i>Peckman Quarry</i>		Job No:	Folder No:
Recorder: <i>[Signature]</i>		Date: <i>28/6/19</i>	
Transect ID: <i>6-13</i>		GPS Readings: Start:	End:
Tr. Length:	Tr. Width: <i>5-10 m depending on veg.</i>	Bearing/Direction:	
Photo No:			
Plan/Drawing No:			
Overall Visibility (%): <i>50%</i>		Exposure (%): <i>70%</i>	
Vegetation: <i>dense to light East to west.</i>		Land Use/Disturbance: <i>existing quarry/corrapill. and clearing, regrowth.</i>	
Landform(s): <i>Hill, crest</i>			
Soil:			
Site(s) Recorded: <ul style="list-style-type: none"> • Scat on fallen tree next to Kalyang. • potential resource for silcrete. • 360° view NTH/STH, east/west 			

Sketch:

Ref. to map

Figure 12 and Figure 13

Comments:

- * Rather women participate in future surveys potential woman's site.

TRANSECT RECORDING FORM



Project ID: <i>pearlman Quarry</i>		Job No:	Folder No:
Recorder: <i>Jack + CSS B / RAN / HJ</i>		Date: <i>25/8/11</i>	
Transect ID: <i>4 + 5</i>		GPS Readings: Start:	End:
Tr. Length:	Tr. Width: <i>40 m</i>		
Photo No:		Bearing/Direction:	
Plan/Drawing No:			
Overall Visibility (%): <i>60 %</i>		Exposure (%): <i>85 %</i>	
Vegetation: <i>Young Crops - wheat</i>		Land Use/Disturbance: <i>Ploughed paddocks</i>	
Landform(s): <i>Plain</i>			
Soil:			
Site(s) Recorded:			

Sketch:

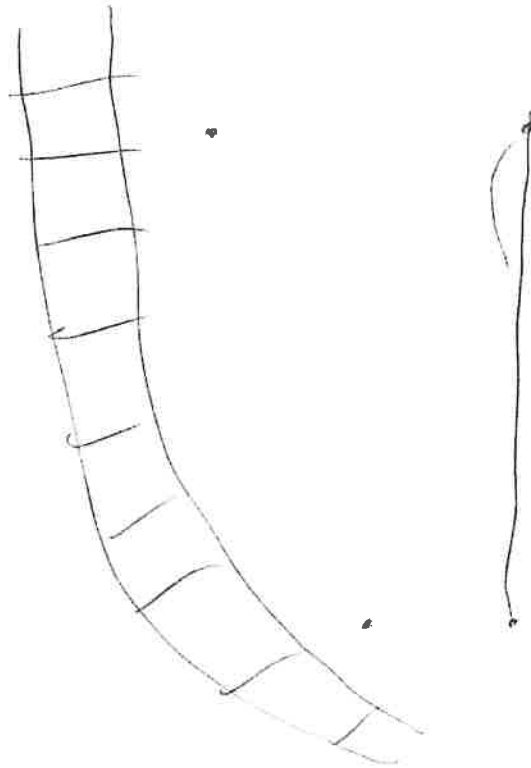


Figure 12 and Figure 13

Comments:

Heavily ploughed area between fence line
and Railway tracks. Natural material
on surface, machine work.

Jake Brown

From: Karen Craigie <kcraigie61@gmail.com>
Sent: Sunday, 19 May 2019 11:42 AM
To: Jake Brown
Subject: Re: Pearlman Quarry
Attachments: image001.jpg

Received, thank you.

On Fri., 17 May 2019, 12:36 pm Jake Brown, <Jake.Brown@advitech.com.au> wrote:

Hello Karen,

Please find attached the methodology for the assessment of the Pearlman Quarry for your review. The name change reflects that this is a second quarry going on the Tikitere site and that the other quarry is already approved. If you have any questions please don't hesitate to contact me. The End of the review period is set for 14 June 2019.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au



7 Riverside Drive | Mayfield West | NSW | 2304 | PO Box 207 | Mayfield | NSW | 2304 | P 02 4924 5400

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If you have received this email in error, please delete it and notify us immediately.

Jake Brown

From: Alfred Priestley <gomeroidreaming@gmail.com>
Sent: Monday, 22 July 2019 12:59 PM
To: Jake Brown
Subject: Re: Pearlman quarry report review

Categories: Filed

Thanks Jake

On 22 Jul 2019 12:56, "Jake Brown" <jake.brown@advitech.com.au> wrote:

Dear Registered Party,

Thank you for your contribution to the Pearlman quarry project. There has been a delay in sending the draft ACHA report for review due to an alteration to the quarry footprint to protect a scarred tree located during the survey. This has not expanded the size of the footprint. If you have any comments or questions about the project or report please let me know. The end of the review period for the draft report at noon the **20 August, 2019**.

Regards,

Jake

Jake Brown Archaeologist

jake.brown@advitech.com.au



www.advitech.com.au

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APPENDIX III: Information Presentation for Community Members

INFORMATION PRESENTATION FOR COMMUNITY MEMBERS

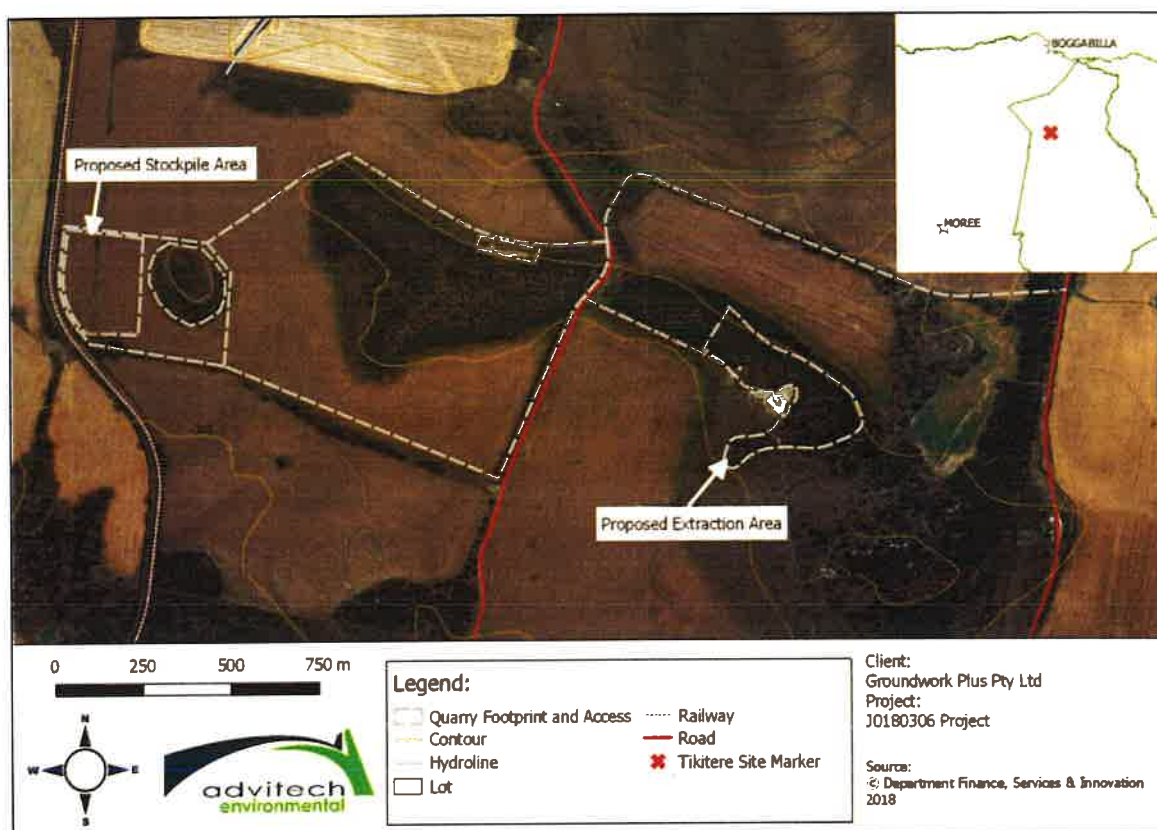
PROPOSED PEARLMAN QUARRY

Advitech Environmental (Advitech Pty Limited) has been contracted to conduct an Aboriginal Cultural Heritage Impact Assessment. The assessment may also result in an application for an Aboriginal Heritage Impact Permit (AHIP) under Part 6 of the *National Parks and Wildlife Act 1974* should any Aboriginal Objects or Places be located within the possible impact area. The Pearlman Quarry is approximately 69 km north east of Moree and 45 km south of Boggabilla. North Star (village) is approximately 10km north. The approximate area of the site is 1695.43 hectares, with 9.25 hectares comprising the proposed extraction areas. The proposed quarry is located on the property consisting of Lot 5 DP 755984 and Lot 17 DP 755984, with the railway line running through the property north to south.

The quarry will produce a number of products suitable for the needs of the Inland Rail Project. Upon completion of supply of material to the project, the area of operation of the quarry would be rehabilitated to a suitable landform for continuing rural activities.

A due diligence assessment under the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* was conducted on 8 January 2019. The resulting survey discovered potential stone artefacts.

Further to this discovery, an Aboriginal Cultural Heritage Assessment was recommended and accepted as part of the ongoing Environmental Impact Statement for the quarry expansion. The proposed area is shown in the map below.



Timeline

Stages	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11
Stage 1: Consultation	X	X	X	X	X	X	X	X	X	X	X
Stage 2: Survey							X				
Stage 3: Reporting					X	X	X	X			
Stage 4: Finalisation											X

Survey Methodology

The survey methodology which will be conducted at the quarry on **25 June, 2019** will include a predictive model, proposed assessment survey and recording procedure.

Refined predictive model

Based on the predictive modelling from the due diligence assessment and following an inspection of the study area, a final predictive model for the study area and its archaeological potential, reveals that there is a medium to high likelihood of Aboriginal object(s) being present within the developed and disturbed portions of the study area. More particularly, there is a high likelihood that Aboriginal object(s) will be present within the areas to be impacted, particularly stone artefacts, either isolated or as part of a scatter. This conclusion is based on:

- The identification of two potential sites and observation of four Aboriginal sites within or in extremely close proximity to the disturbance footprint, two of which were stone artefact scatters with multiple individual artefacts noted;
- The landscape and landforms of the area proposed for impact. The results of contextual archaeological studies indicate a preference for sites within 50 metres of reliable water sources or a confluence of water sources, on ridge lines, spurs and on crests. There is a crest within the study area, located approximately 2 kilometres from the most reliable source of water in the area;
- The lack of archaeological reports published or available for the area give an inaccurate indication of the potential for Aboriginal sites to be found. While one existing registered AHIMS site that is currently located in close proximity to the disturbance footprint, there is potential for other previously recorded but not registered sites to exist in the area;
- The lack of archaeological research in the immediate area means there is a high likelihood that extant Aboriginal archaeological sites exist in the landscape and have not previously been identified or recorded; and
- The presence of a nearby registered Aboriginal site. This site is located within 50m of the western side of the proposed stockpile footprint.

In summary, the study area provides suitable resources and landscape features (elevated positions, distance to semi-permanent water) to allow for temporary or transient occupation of the site. While it is unlikely that the area hosted long term community base camps, it is reasonable to infer that smaller camping or nuclear family base camps may have been established in the area. The observation of

Aboriginal sites in the proposed footprint is in alignment with what is to be expected of an area with these environmental features: the sites identified during due diligence were either isolated stone artefacts or were low to medium density scatters. There were no indications of sites existing in the study area that suggest extended stays or base camps.

As a result of the survey conducted over the area, the predictive model of site location can be reassessed for the investigation area:

- The potential for bora/ceremonial areas, culturally modified trees (carved/scarred), rock art shelters/engravings and stone arrangements to occur within the investigation area remains low or negligible;
- No evidence was observed to support the likelihood of burial sites in the area; and
- Due to the presence of both scatters and isolated stone artefacts, it can be assumed that there remains a moderate potential for additional isolated sites and scatters to be identified in the broader area.

Survey

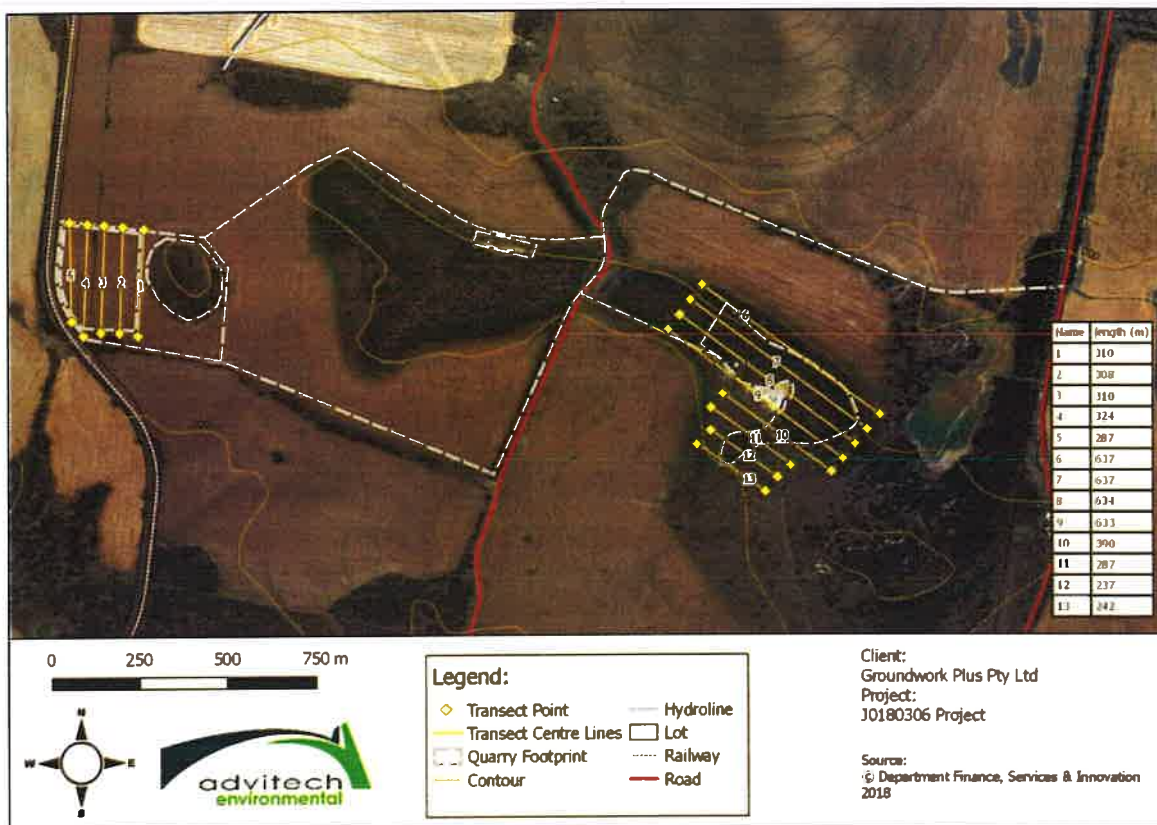
The proposed survey is to further assess the development area with the assistance of the local Aboriginal community. This survey aims to cover additional area to that covered within the due diligence survey and will consist of community participation in the field and data gathering about the potential cultural significance of the area. Any data gathered prior to the field survey will be used to assist in targeting specific areas of investigation. The eastern ridge assessed in the due diligence was decided by the proponent

The proposed method of field assessment is a pedestrian survey with vehicle survey and spot checks along haul roads. The pedestrian survey will be conducted by four people, comprising two archaeologists from Advitech and two community members. Transects will be planned with a proposed spacing for each individual to cover 5m - 10m depending on vegetation density. This method was decided upon based on the previous assessment by Advitech of the proposed Pearlman quarry in January 2019 that determined the central ridge has steep sections with dense vegetation. The study area consists of land 300m to 320m above sea level. The extraction area is 320m above sea level (see **Table 4** for survey units).

The survey will be conducted using a judgement sampling strategy to cover areas that were not investigated in the due diligence survey, and areas with a higher likelihood of containing heritage values. The judgement sampling strategy (Burke and Smith 2004, p. 65-69) was chosen to allow for the data from previous surveys to be used and plan a systematic survey. The proposed survey route is recorded in **Figure 9** and **Table 8**. **Figure 9** shows the centre lines for transects aiming for four people covering 10m each (5m either side of a person). Limitations when surveying the extraction area may include dense vegetation on the northern side of the central ridge and disturbance over the site. The extraction area will be surveyed firstly in a north/south direction; the stockpile area will also be surveyed in a north/south direction. Spot checks and vehicle survey will follow planned and existing haul routes. These will be recorded with a GPS. There is a planned 20m spacing between the transects, which are 40m in width (based off a field team of 4 people). The total length of the 13 transects is 5326m (5.3km).

Table 13: Pedestrian transect details

Transect ID	Length (m)	Start / End Point	Latitude	Longitude
1	310	1	-29.014462	150.334798
		2	-29.011364	150.334985
2	308	3	-29.011289	150.334378
		4	-29.014364	150.33427
3	310	5	-29.014355	150.333723
		6	-29.011242	150.333831
4	324	7	-29.014448	150.333214
		8	-29.011209	150.333345
5	287	9	-29.011153	150.332812
		10	-29.014018	150.332868
6	637	11	-29.016806	150.356462
		12	-29.013062	150.35129
7	637	13	-29.013494	150.350947
		14	-29.017238	150.356096
8	634	15	-29.017653	150.355746
		16	-29.013919	150.350616
9	633	17	-29.014346	150.350276
		18	-29.018071	150.355396
10	390	19	-29.018468	150.355056
		20	-29.016204	150.351881
11	287	21	-29.016605	150.351517
		22	-29.018267	150.353861
12	237	23	-29.018631	150.353468
		24	-29.017268	150.351508
13	242	25	-29.01766	150.351125
		26	-29.019042	150.353114
Total length of Transects = 5236m				



Recording will be conducted in the following methods adapted from Burke and Smith (2004):

Table 14: Examples of recording

Item	Recording Action
Isolated Artefact/s (up to 5 within 1m ²)	<ul style="list-style-type: none"> Photos of multiple sides with scale card (e.g. flake ventral and dorsal) GPS location Field notes including measurements, material and artefact type
Open scatter (5+artefacts within 1m ²)	<ul style="list-style-type: none"> Photos of individual artefacts, extent of scatter GPS location Field notes including measurements, number of artefacts, material and artefacts type
Scar tree	<ul style="list-style-type: none"> Photos of scar and tree GPS location Field notes including measurements, species, direction and condition of scar/s
Stone arrangement	<ul style="list-style-type: none"> Photos of individual stones and pattern GPS location Sketch of pattern Field notes including type and size of stone

Records including photos of landscape and a GPS trail will be kept for the survey as well as field notes which may include details of any finds.

Consultation

- Consultation with registered Aboriginal parties involves obtaining the views of, and information from, Aboriginal parties and reporting on these. It should not be confused with other field assessment processes involved in preparing a proposal and an application.
- Consultation does not include the employment of Aboriginal people to assist in field assessment and/or site monitoring;
- The proponent is not obliged to employ those Aboriginal people registered for consultation. Consultation as per these requirements will continue irrespective of potential or actual employment opportunities (i.e. pay disputes) for Aboriginal people; and
- A daily fee for service will be provided to registered Aboriginal participants of the survey

Forms

You will find a number of forms attached for your convenience. However, you are most welcome to provide the information required in any form that you would like. Please ensure that answers to all the questions are returned to Advitech Environmental no later than **14 June, 2019**.

Forms attached:

- Register of cultural knowledge holder;
- Cultural significance; and
- Comments on proposed methodology.

Advitech would welcome community feedback and any additional cultural information that could help inform the assessment process including the survey methodology and potential AHIPS application.

Thank you for your cooperation in this process,

Please contact Jake Brown either via email or phone (details below) no later than **14 June, 2019**.
Regards,

Jake Brown

Email - jake.brown@advitech.com.au
Phone - 02 4924 5400

FORMS

Advitech Environmental Pty. Ltd. would like to clearly state that, should you wish to provide feedback in another form, you are encouraged to do so. You are under no obligation to complete the attached forms which are as follows:-

- Registration of Cultural Knowledge Holders
- Cultural Significance
- Comments on proposed methodology

However, should you wish to use this forms, please complete, sign and return to Advitech by 26 April (at the very latest);

Postal address:

Jake Brown
Advitech
P O Box 207
Mayfield NSW 2304

Email: jake.brown@advitech.com.au

Fax: 02 4967 3772

REGISTRATION OF CULTURAL KNOWLEDGE HOLDER

Advitech and the proponent would like to facilitate a process whereby all registered Aboriginal parties are provided the opportunity to contribute to culturally appropriate information gathering, provide information that will enable the cultural significance of Aboriginal sites/places on the project area to be determined, and have input into the development of any cultural heritage management options. To enable this to occur, it is necessary to consult with the cultural knowledge holder(s).

To this end, as per the OEH Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010), you are required to provide details of the individual(s) who hold cultural knowledge (according to traditional lore) relevant to the project area. If your group has no knowledge holders, this is important information too.

Please fill in the following information for cultural knowledge holder(s). If there are more than three in your organisation please feel free to attach another sheet. If there are no knowledge holders in your group please send back blank.

Name: _____

Address: _____

Phone: _____ Mobile: _____

Fax: _____ E-mail: _____

Name: _____

Address: _____

Phone: _____ Mobile: _____

Fax: _____ E-mail: _____

Name: _____

Address: _____

Phone: _____ Mobile: _____

Fax: _____ E-mail: _____

CULTURAL SIGNIFICANCE

As per the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010), the proponent seeks information on the following:

- 1) Are there Aboriginal objects of cultural value in the proposed project area?

- 2) Are there Aboriginal places of cultural value to the Aboriginal people in the area of the proposed project? This may include places of social, spiritual and cultural value, historic places with cultural significance, and potential places/areas of historic, social, spiritual and/or cultural significance that may be either pre-contact, post contact or contemporary in age.

- 3) Is there any other cultural information relevant to the proposed project area?

- 4) Advitech and the proponent would like to develop and implement appropriate protocols for sourcing and holding cultural information. Please provide your preferred method of providing detailed information on the above (e.g. written, verbal, this form) and any restrictions you would like to place on your information.

COMMENTS ON PROPOSED METHODOLOGY

I, _____ (please insert your name) of _____ (please insert the name of your group), **agrees to the methodology** outlined by Advitech in relation to the proposed assessment at Pearlman Quarry.

Additional comments:

Signed: _____ Date: _____

Position within organisation: _____

I, _____ (please insert your name) of _____ (please insert the name of your group), **does not agree to the methodology** outlined by Advitech in relation to the proposed Project at Pearlman Quarry for the following reasons (please explain your reasons for disagreeing):

I would like to suggest the following (please provide your reasoning):

Signed: _____ Date: _____

Position within organisation: _____



APPENDIX IV: Site Photographs 25 June, 2019

Stockpile area





Quarry Area











Archaeological Report

Historic Heritage Assessment

Pearlman Quarry

Quarry Solutions Pty Ltd

17 July, 2019

Rev 2 (Final Issue)

Report Details

Historic Heritage Assessment - Pearlman Quarry

Job #: J0191023, Folder #: F20107, Revision: 2 (Final Issue), Date: 17 July, 2019

Filename: 20107 Pearlman Quarry Historic Heritage Assessment Rev2.docx

Prepared For

Quarry Solutions Pty Ltd

c/. Jim Lawler, Project Director, Groundwork Plus Pty Ltd

Email: jlawler@groundwork.com.au, Telephone: 07 38710411

6 Mayneview Street Milton Queensland 4064

PO Box 1779 Milton Queensland 4064

Prepared By

Advitech Pty Limited t/a Advitech Environmental

ABN: 29 003 433 458

Jake Brown, Archaeologist

Email: jake.brown@advitech.com.au, Telephone: 02 4924 5400, Mobile: 0421555894




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History

Date	Revision	Comments
11 March, 2019	0	Draft Issue for Client Review
16 July, 2019	1	Draft Issue for Client Review
17 July, 2019	2	Final Issue

Endorsements

Function	Signature	Name and Title	Date
Prepared by		Jake Brown Archaeologist	17 July, 2019
Checked by		Jessica Blackman Archaeologist	17 July, 2019
Authorised for Release by		Dr Rod Bennison Lead Environmental Scientist	17 July, 2019

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1. INTRODUCTION

Advitech Pty Limited (trading as Advitech Environmental) was engaged by Groundwork Plus Pty Ltd (Groundwork Plus) on behalf of Quarry Solutions Pty Ltd to undertake a Heritage Assessment on the proposed hard rock quarry site located south of North Star on the land identified as Lot 5 on Deposited Plan 755984 and Lot 17 on Deposited Plan 755984. Quarry Solutions propose to operate the quarry for the land owners (the Pearlman's). This Heritage Impact Assessment has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs). This report aims to provide an assessment of historic heritage of the proposed hard rock quarry against the criteria set out in the SEARS.

It should be noted that this report was prepared by Advitech Pty Limited for Groundwork Plus ('the customer') in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

2. QUALIFICATIONS OF THE INVESTIGATOR

Jake Brown, Archaeologist, has 2 years of experience in Aboriginal archaeological assessments, research, reporting, analysis and consultation. This experience has included cataloguing stone artefacts from the Hunter region, conducting field surveys and monitoring of potential find sites during surface/subsurface disturbance across central and northern Queensland. Jake's educational qualifications include a Bachelor of Social Science (Hons) in Sociology and Anthropology, University of Newcastle 2015, and a Graduate Certificate of Archaeology from Flinders University 2017. Jake is a member of the Australian Archaeological Association.

Jessica Blackman, Archaeologist, has 6 years of experience in Aboriginal archaeological assessment, cultural heritage management, reporting, analysis, and community consultation. Jessica's training in the mining and minerals industry has allowed her to gain extensive experience in field heritage survey and assessment, artefact and cultural site identification and cataloguing, and land access facilitation through meeting internal and regulatory compliance obligations. Jessica has worked in Queensland, New South Wales and the Northern Territory. Jessica holds a Bachelor of Arts with an extended major in archaeology and anthropology (University of Queensland 2011) and a Native Title Masterclass Certificate (James Cook University 2015). Jessica is a member of the Australian Archaeological Association (AAA), the Australian Society for Historical Archaeology (ASHA), the Lithics Studies Society and the World Archaeological Congress.

3. BACKGROUND AND OBJECTIVES OF THE ASSESSMENT

3.1 The Proposed Pearlman Quarry

The Pearlman Quarry is approximately 69 km north east of Moree and 45 km south of Boggabilla. North Star (village) is approximately 10km north. The approximate area of the site is 1695.43 hectares, with 9.25 hectares comprising the proposed extraction areas (see **Figure 1**). The land is zoned RU1 Primary Production within the Gwydir Shire Council district. The proposed quarry is located on the property consisting of Lot 5 DP 755984 and Lot 17 DP 755984, with the railway line running west of the site, north to south.

The preliminary investigation by Groundwork Plus indicates basalt calculated at a volume of 1,029,000m³ in the Pearlman East site, which includes the two proposed sites and one of the approved areas. The quarry will produce a number of products suitable for the needs of the Inland Rail Project. Upon completion of supply of material to the project, the area of operation of the quarry would be rehabilitated to a suitable landform for continuing rural activities.

3.2 Purpose of this Assessment Report

The purpose of this report is to assess potential non-Aboriginal or historic heritage issues from the operation and construction of the proposed quarry and, where required, identify feasible and reasonable mitigation measures. The proposal is designated development under Part 4 of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) and, as such, this statement has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs).

3.3 Secretary's Environmental Assessment Requirements

This report will be appended to an Environmental Impact Statement (EIS) which must comply with the requirements of Clause 6 and 7 of the Environmental Planning and Assessment Regulation 2000, and which addresses environmental considerations identified in the Secretary's Environmental Assessment Requirements (SEARs) (EAR1331) relevant to heritage. The SEARs state that the heritage assessment should be undertaken with a view to the:

- identification of Historic heritage in the vicinity of the development and an assessment of the likelihood and significance of impacts on heritage items, having regard to the relevant policies and guidelines listed in Attachment 1.

Those relevant policies and guidelines listed in Attachment 1 are:

- The Burra Charter (The Australia ICOMOS charter for places of cultural significance);
- NSW Heritage Manual (OEH); and
- Statements of Heritage Impact (OEH).

Further, in regard to historic heritage, the Office of Environment and Heritage provided recommendations to inform the SEARs:

- *The EIS must provide a heritage assessment including but not limited to an assessment of impacts to State and local heritage including conservation areas, natural heritage areas, places of Aboriginal heritage value, buildings, works, relics, gardens, landscapes, views, and trees. Where impacts to State or locally significant heritage items are identified, the assessment shall:*
 - *outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the NSW Heritage Manual (1996).*
 - *be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).*
 - *include a statement of heritage impact for all heritage items (including significance assessment).*

- *consider impacts including, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment (as relevant).*
- *where potential archaeological impacts have been identified, develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations (terrestrial and maritime as relevant) and include the results of these test excavations.*

3.4 Planning Context

3.4.1 New South Wales Legislation

3.4.1.1 Environmental Planning and Assessment Act 1979

Development in NSW is subject to the requirements of the Environmental Planning and Assessment Act 1979 (EP&A Act) and its associated regulations and planning instruments. Developments requiring consent, such as the Pearlman Quarry proposal, are assessed under Part 4 of the EP&A Act. As the proposed quarry is designated development, the application for development must be accompanied by an environmental impact assessment in the form prescribed by the accompanying regulations, and as stipulated in the SEARs detailed above. Where extractive industries, including quarries, generate more than 30,000 cubic metres per year and or disturb greater than 2.0 ha of land, consent under Schedule 3 (Part 19) of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) is also required.

3.4.1.2 National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 (the NPW Act) aims to conserve and manage natural resources and Aboriginal heritage. This is through conservation and protection of wildlife including threatened species and their habitat as well as identification, conservation and protection of Aboriginal objects and places. The Act allows for conservation agreements, conservations areas, prevention of harm including research and monitoring of heritage and environmental values. Further values able to be protected include buildings, places and objects of non-Aboriginal cultural values on land referred to under this Act.

3.4.1.3 Heritage Act 1977

The Heritage Act 1977 (the Heritage Act) aims to conserve and manage the State's heritage, whether they are places, buildings, works, relics, moveable objects or precincts of local or State heritage significance. A property is a heritage item if it is listed in the heritage schedule of the Local Council's Local Environmental Plan or on the State Heritage Register, a register of places and items of particular importance to the people of NSW. If an item of heritage value was identified, then consultation would be undertaken with Moree Plains Shire Council and an assessment undertaken in accordance with OEH guidelines for Assessing Heritage Significance (Heritage Office, 2001). The heritage statement is the basis for policies and management structures that will affect an item's future.

3.4.1.4 Local Planning Instruments

Development at the site is regulated under the Gwydir Shire Council Local Environmental Plan (GLEP) 2013. These policies determine which development is permissible, prohibited, exempt or complying. As the proposed quarry is on land zoned RU1 Primary Production, an extractive industry located at the proposal site would be permissible with development consent. Further, Schedule 5 lists all items of environmental heritage. No heritage item is listed within proximity to the proposal site.

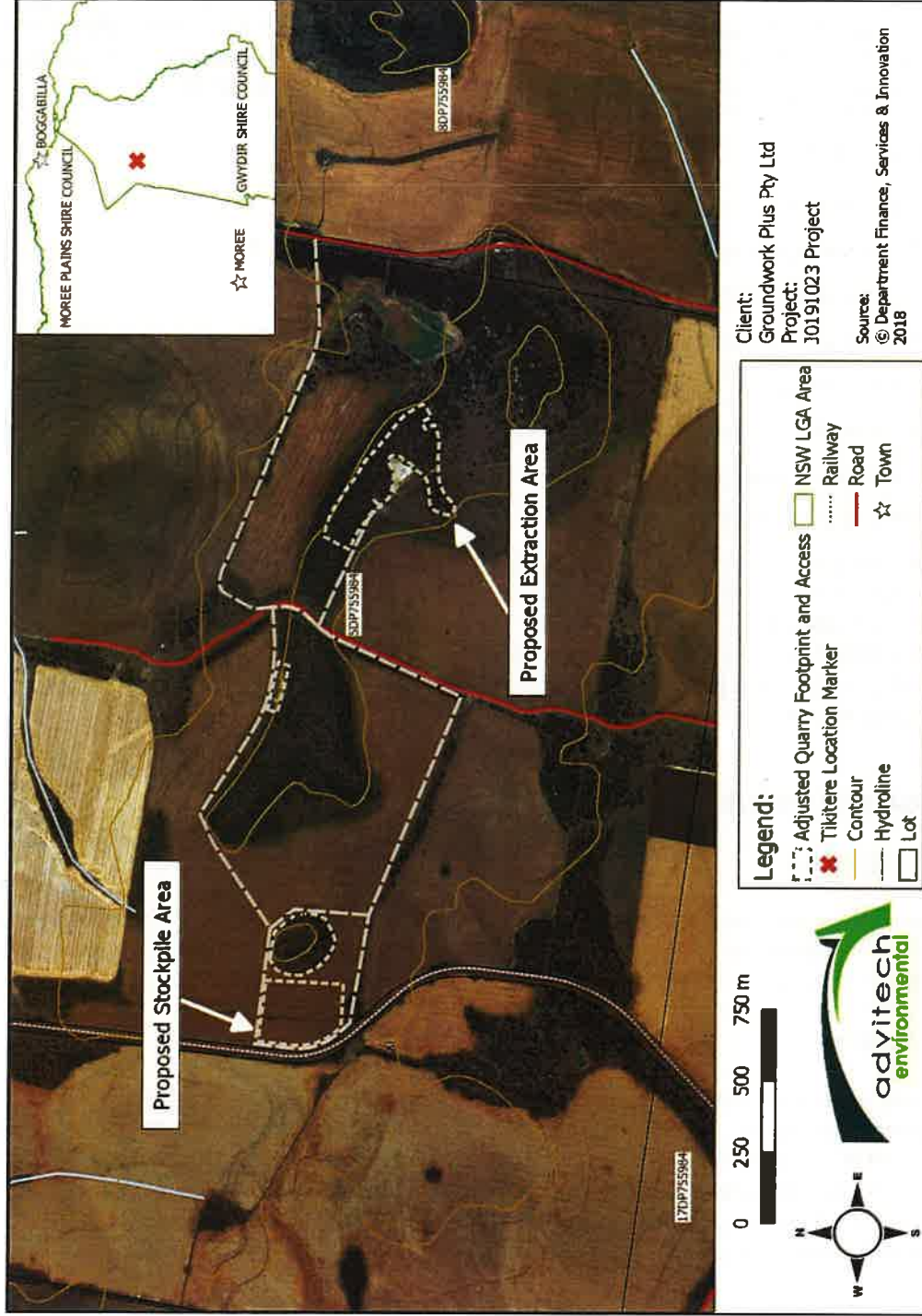


Figure 1: Site Location Map

3.4.2 Commonwealth Legislation

Under the Federal Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), referral is required to the Australian Government for proposed actions that have the potential to significantly impact on Matters of National Environmental Significance (MNES) or the environment of Commonwealth land. The assessment of the proposal's impact on MNES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant MNES or on Commonwealth land. Accordingly, the proposal does not need to be referred to the Australian Government Department of the Environment and Energy (DoEE) under the EPBC Act.

3.4.3 The Project

The historic heritage assessment has been prepared in accordance with:

- *Environmental Planning and Assessment Act 1979* (NSW) (EPA Act);
- *Heritage Act 1977* (NSW) (Heritage Act);
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *National Parks and Wildlife Act 1974* (NPW Act);
- Gwydir Shire Council Local Environment Plan 2013 (GLEP);
- The Burra Charter (The Australia ICOMOS charter for places of cultural significance);
- NSW Heritage Manual; and
- All relevant Local and State policies and guidelines, including the Environmental Planning and Assessment Regulation 2000, State Environmental Planning Policy 55 - Remediation of Land, State Environmental Planning Policy 44 - Koala Habitat, State Environmental Planning Policy (State and Regional Development) 2011, State Environmental Planning Policy (Infrastructure) 2007, and State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.

4. PHYSICAL CONTEXT

4.1 Topography

The topography of the area slopes away from the proposed extraction area. The extraction area is situated on a hill at approximately 340 metres above sea level and the entrance to the access track is approximately 280 metres above sea level (see **Figure 1**).

4.2 Hydrology

The development site is situated at the northern end of the Brigalow Belt South Bioregion within the Northern Outwash sub region. The closest perennial river is the Croppa River which is approximately 12 km south west of the study area. To the north of the Pearlman quarry site is Mungie Creek which is non-perennial and has offshoots that enter the northern side of lot/plan 5 DP 755984. To the south is Tackinbri Creek which defines the boundary of lot 17 DP 755984. The area is a part of the Border Rivers catchment which covers 49,500 km² of which 24,500 km² is in NSW (Green et al 2012) (see **Figure 1**).

4.3 Geology/Soils/Geomorphology

The Great Soil Group map of NSW (OEH 2017) indicates Black earths, Chocolate soils and Grey, Brown and Red Clays with good surface condition across the lot/plan and quarry footprint (see **Figure 2**). The Northern Outwash subregion is characterised by Red loams and heavy brown clays (NPWS 2003, pp. 136).

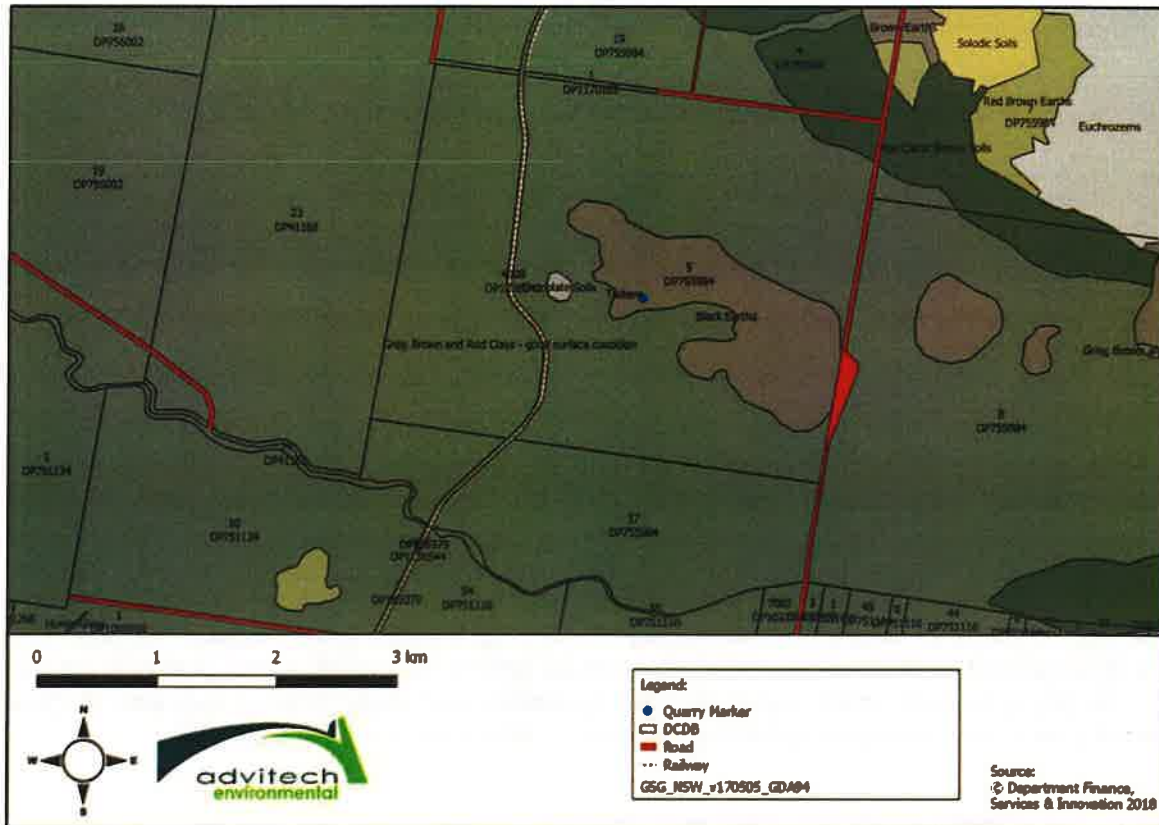


Figure 2: Soil Map with DCDB (Lithosols [yellow], Black earths [dark grey], Grey Brown and Red Clays [light grey])

The Brigalow Belt South Bioregion contains large volcanic attributes such as the Liverpool Range and Warrumbungles (NPWS 2003, pp. 132). The subregion is the Northern Outwash with geologically contain tertiary and Quaternary alluvial fans and stream terraces (NPWS 2003, pp. 136). Characteristic landforms of the Northern Outwash include sloping plains with alluvial fans which are steeper and coarser than the Gwydir Fans downstream (NPWS 2003, pp. 136). The Gwydir River runs from west of Armidale for 480km to the Barwon River near Collarenebri (Murray-Darling Basin Authority n.d.). The Gwydir is approximately 55km south of the study area.

4.3.1 Flora and Fauna

The majority of the landscape in the study has been cleared for agricultural purposes. The Subregion of Northern Outwash in the Brigalow Belt South Bioregion is classified as having flora including:

Poplar box with white cypress pine, wilga and budda on red soils, belah and brigalow on brown clays. (NSW NPWS 2003 136).

The fauna include both native and introduced species. Introduced species such as pigs, goats, foxes, rabbits, wild dogs, feral cats and carp have been noted in the bioregion (Bastin 2008, pp. 4-5).

4.4 Landscape History, Uses and Disturbances

The history of the landscape and its past and present uses and disturbances are important to the interpretation of archaeological evidence and what may remain. Occupation of Australia by Aboriginal people is currently thought to have commenced at least 20,000 to 60,000 years prior to arrival of the European settlers. The environments of five broad time periods can be reconstructed within which the archaeological resources of the eastern coast of Australia can be evaluated:

- The Late Pleistocene (>40,000 years ago) is thought to overlap with the time Aboriginal people first settled in the Hunter Valley;
- The Last Glacial Maximum (LCM) (peaked around 20,000 years ago) during which people adapted to significant climatic and environmental change;
- The Holocene (the last 10,000 years) that saw sea levels and positions stabilise at their current positions;
- The landscape in c.1790 as it was immediately before European settlers arrived; and
- The last 200 years when the landscape was dramatically altered by European settlement and land use practices.

There are very few direct lines of evidence (archaeological, ecological, and geomorphic) that document what the landscape at the Pearlman quarry site was like prior to European settlement. The regional history connects to pastoralism with cattle, sheep and wheat the main industries recorded (HO and DUAP 1996, pp. 78-87). In North Star (the closest village) employment in the 2016 census (ABS 2018) is still mainly based in agriculture with grain growing the main occupation reported with 34.5 %. Farming of cattle/grain and sheep/grain made up another 12.6%. Specialised beef cattle farming equated to 11.5% employment. The regional data for Gwydir Shire Council also recognised the largely agricultural driven employment with specialised beef cattle farming comprising 16.2% of employment, other grain growing 5.8% and farming of cattle/grain and sheep/grain 4.7%.

5. HISTORIC HERITAGE ASSESSMENT

Heritage places and landscapes can include natural resources, objects, customs and traditions that individuals and communities have inherited and wish to conserve for future generations. Cultural heritage comprises places and items that may have historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance at a local, State, National or International level.

Under Sections 139 and 140 of the NSW Heritage Act 1977, a person may not disturb or excavate land to discover, expose or move a relic without first obtaining the permission of the Heritage Council.

The Heritage Act defines a relic as being any deposit, object or material evidence:

- a) which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement; and
- b) which is fifty or more years old.

The historical archaeological context refers to any remaining physical evidence of the past. This can include below ground evidence such as building foundations, occupation deposits, features and artefacts and above ground evidence including buildings that are intact or ruined, or landform features

such as retaining walls or drainage lines. Once an item is considered to be a relic, its significance is then assessed (see **Section 5.6**).

This historical research is based upon the use, occupation and development of the study area and its surrounds. Research has concentrated upon facets relevant to heritage and archaeological study and has been compiled from primary source material and secondary source literature.

5.1 Methodology

The methodology undertaken for this heritage assessment included:

- Undertaking primary and secondary research on the study area in order to provide a referenced historic summary (see Sections 5.3 and 5.4);
- Conducting statutory and non-statutory heritage database searches;
- Searches including the NSW State Heritage Register (SHR), NSW State Heritage Inventory (SHI), Local Environmental Plans (LEP), Relevant Section 170 Registers (S170), the Commonwealth Heritage List and National Trust Heritage List (NT);
- Conducting a site inspection of the study area;
- Undertaking heritage assessments of any potential heritage items, if any, identified through the research and site inspection; and
- Providing a statement of significance for each heritage item assessed, if any.

5.2 Heritage Registers and Inventories

Heritage registers and inventories are lists of identified heritage items that record known archaeological resources at local, State and National levels. The registers may provide information on comparative sites which can be used to assist in the interpretation of archaeological evidence and also in the evaluation of the relative significance of historical/archaeological heritage material.

Statutory and non-statutory heritage database searches included the NSW State Heritage Register (SHR), NSW State Heritage Inventory (SHI), Narrabri and Moree Plains Local Environmental Plan 2011 (LEP), Relevant Section 170 Registers (S170), Commonwealth Heritage List and National Trust Heritage List (NT). These searches revealed that there are no items of heritage at local, State or National level within 1 kilometre of the study area. However, the following heritage sites as noted below are recorded as being in the wider local vicinity:

Table 1: Statutory Desktop Searches

Statutory Authority	Are there any Aboriginal objects or places within the project area	Comment
NPW Act - Schedule 14	No	Nil
NSW State Heritage Register	No	Nil
S.170 Heritage and Conservation register	No	Nil
Commonwealth Heritage List	No	Nil
National Heritage List	No	Nil
World Heritage List	No	Nil
Register of the National Estate	No	Croppa Creek (Aboriginal)
EPBC Act Protected Matters Report	No	Nil
Local Environmental Plan (Council)	No	Nil

5.3 Regional Historical Context

The regional history connects to pastoralism with cattle, sheep and wheat being the main industries recorded (HO and DUAP 1996, pp. 78-87). Moree and Narrabri were important towns that developed in the late 19th century. Moree was a link to the Great Artesian Basin with the water used in the wool-scouring industry until the trade declined, while Narrabri was also an important water point and connection to the railway (HO and DUAP 1996, p. 84). Wialda was also an important early town in the region with a population of 45 in 1851, while it also had a courthouse and lock up in 1847 (HO and DUAP 1996, p.81)

The area was explored by Sir Thomas Mitchell and John Oxley in the 19th Century in their role as surveyor-general. Oxley explored the Liverpool Plains in 1818 (Dunlop 1967). Mitchell explored the area as part on the exploration/mapping of the Darling River in 1831, 1835, 1836 and 1845 (Baker 1967). Captain James Sturt explored the region in 1828 including the Castlereagh, Macquarie marshes, Darling River and Bogan River (Gibney 1967). The Darling Downs was also explored by botanist Allan Cunningham in 1827 (Perry 1966) and naturalist Charles Coxen in 1834-1835 and around the Darling Downs before the 1850's (Chisholm 1969).

Squatting on Crown lands was also prominent in early 19th century as the known boundaries of the colony were changing due to exploration and desirable pastoral land being sought. The expansion often followed colonial explorers after reports of the suitability of the land (Royal Historical Australian Society n.d.). Acts such as the 1833 "An act for protecting the Crown Lands of the Colony from Encroachment, Intrusion and Trespass" were aimed to solidify the government's position in affirming their rights (Royal Historical Australian Society n.d.; Australasian Legal Information Institute 1833). The term squatting according to the Royal Historical Australian Society (n.d.) originated in the United States of America where it was a negative term, however, in Australia was less negative as squatting was seen as a lucrative occupation. Pickard (2008, p.76) says the term persisted after legislation changed to grant licences to occupy the land.

The Australian Agricultural Company was formed under an Act of British parliament in 1824. The company received one million acres at Port Stephens and later sold some of this land when it was realised that the area was not suitable for Merino sheep farming (State Library NSW 2018). The land was replaced by grants in 1833 on the Liverpool Plains on the Peel River near Tamworth (Goonoo Goonoo Estate) and near Murrurundi (Warrah Estate). The company still exists holding seven million hectares across Queensland and the Northern Territory for Cattle farming (State Library NSW 2018).

North Star, the closest village to the Pearlman quarry lies approximately 10km to the north. The village started from a mail exchange on a property called Cleveland in 1916, with the name North Star as the official exchange name (de Greenlaw 2005, pp. 13-14). The area was settled earlier by five brothers (name of Sutton) that settled various stations in approximately 1888 and helped to develop the area.

5.4 Local Historical Context

The study area exists within the County of Staplyton and Parish of Booraba (see **Figure 3**). The map featured in **Figure 4** was made in 1884 with alterations until 1900. The study area was indicated as block 695; it was gazetted on 24 February 1900 and put up for sale in Wialda 30 March 1900. No bid was recorded (for IB.01.1291). Tenure configuration has lots 5 DP 755984 and 17 DP 755984 joined.

The next parish map was drawn up 1901 (see **Figure 5**). It indicates that the land was taken up by William Clemesha in 8/10/1908 as a settlement lease with an end date of 7/10/1948. However, the

land went into forfeiture on the 28/5/1913 and was provisionally reversed on the 18/6/13 and was absolutely reversed 20/8/1913. The annual rent was £17.11.10.

The land transferred to H.E.K. Nicholson in 2/10/1929 as a conditional lease (shown as an edit to the 1915 parish map see **Figure 6**), this lot comprised 3128 acres. The smaller lot to the south is referred to as having Nicholson as the owner under a conditional purchase (comprised 1046 acres). The map also indicates to the tenure division as two lots and the railway line running through both lots. The 1936 parish map displayed in **Figure 7** shows that Nicholson still held the proposed quarry site, however the smaller lot (1046 acres) bordering the Tackinbri Creek had since passed to the National Bank of Australasia Ltd. The National Bank of Australasia Ltd was established in 1858 and merged with the Commercial Banking Company of Sydney in 1982 to become the National Australia Bank (CBC 2010). The 1936 parish map was cancelled 2/10/1969.

The next parish map of Booraba references being placed into office use on the 4/7/1969 (see **Figure 8**). This map indicates the land passed to Hyman and A.T. Pearlman as part of an Additional Conditional Purchase. The lot bordering Tackinbri Creek was still in the possession of the National Bank of Australasia Ltd, with a note on this lot referring to Tikitere (Pearlman quarry site) as approximately located next to the railway line.

Tikitere (the Pearlman quarry site) was a part of the Boggabilla line which started at Camurra. It is recorded that the station opened in 1934 and closed in 1975 (NSWrail.net n.d.). The Public Works Act 1912, which superseded the 1923 Camurra to Boggabilla Railway Act, funded the construction of the Moree-Mungindi line of which the Boggabilla line branched off at Camurra (Australasian Legal Information Institute 1923; Gunn 1989, pp.267).

The ARTC (Umwelt 2017, p.91) commissioned report indicated one surveyor's tree to the south of the proposed quarry site in a neighbouring lot 54 DP 751116. While this is outside the intended operational areas some consideration such as suggested in the ARTC (Umwelt 2017, p.123-124) could be taken to avoid impact these local historical items.

No items of historical significance were found within the study area and there is no historical evidence to suggest the presence of a potential archaeological deposit from previous historical use of the property.



Figure 3: 1942 Staplyton County NSW Land Map



Figure 4: 1884 Map of Booraba Parish



Figure 5: 1901 Map of Booraba Parish

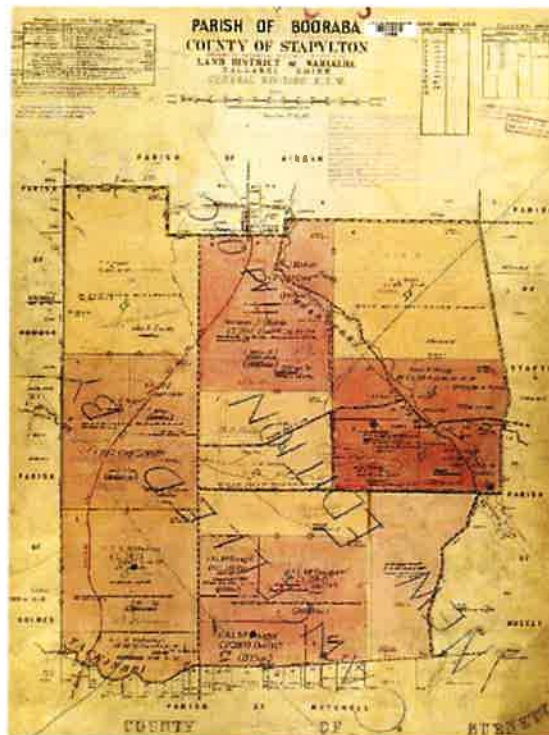


Figure 6: 1915 Map of Booraba Parish



Figure 7: 1936 Map of Booraba Parish

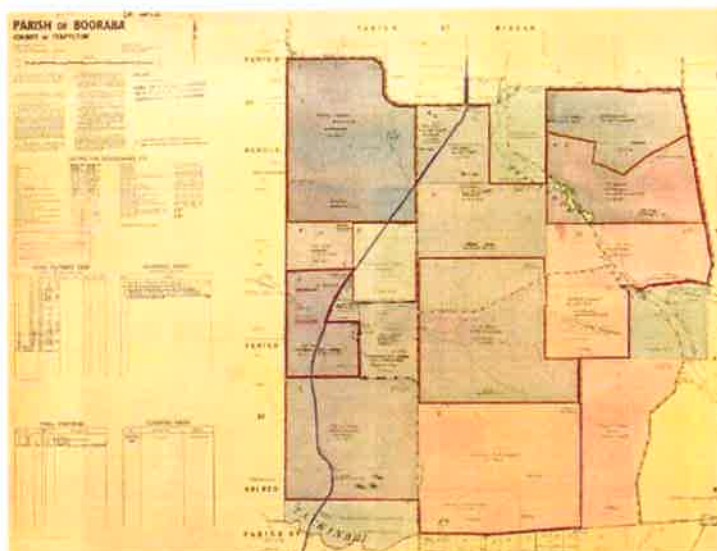


Figure 8: 1969 Map of Booraba Parish

5.5 NSW Heritage Office Assessment Criteria

The NSW heritage assessment criterion encompasses the four values in the Australia ICOMOS Burra Charter and these four broad values are used to assess the heritage significance of an item. It is important for items to be assessed against these values to ensure consistency across the State. While all four values should be referred to during an assessment, in most cases items will be significant under only one or two values. The four values are:

- Historic significance;
- Aesthetic significance;
- Scientific significance; and
- Social significance.

In order to apply a standardised approach to the assessment of these four values, the NSW Heritage Office (2001) has defined a series of seven criteria that will be used by the Heritage Council of NSW as an assessment format within NSW. To be assessed as having heritage significance, an item must meet at least one of the seven criteria detailed below:

- **Criterion (a)** the importance of an item in the course or pattern of the cultural or natural history of NSW or a local area [historical].
- **Criterion (b)** the existence of a strong or special association between an item and the life or works of a person or group of persons important in NSW or local cultural or natural history [historical].
- **Criterion (c)** the importance of an item in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW or a local area [aesthetic].
- **Criterion (d)** the existence of a strong or special association between an item and the social, cultural or spiritual essence of a particular community or cultural group within NSW or a local area [social].

- **Criterion (e)** the potential of an item to provide information that will contribute to an understanding of the cultural or natural history of NSW or a local area [scientific].
- **Criterion (f)** the quality of an item to possess uncommon, rare or endangered aspects of the cultural or natural history of NSW or a local area [rare degree of significance].
- **Criterion (g)** the demonstration by an item of the principal characteristics of a class of cultural or natural place or cultural or natural environment within NSW or a local area [representative degree of significance].

The assessment of an item's significance depends upon its identifiable cultural, community, historical or geographical context:

- Local level identifies the item as being significant within an identifiable local and/or regional cultural and/or community group and/or historical/geographical heritage context;
- State level identifies the item as being significant within an identifiable State-wide cultural and/or community group and/or historical/geographical heritage context;
- National level identifies the item as being significant within an identifiable national cultural and/or community group and/or historical/geographical heritage context; and
- International level identifies the item as having implications of significance for an identifiable cultural and/or community group both nationally and abroad and/or a world-wide historical/geographical heritage context.

5.6 Assessment of Heritage Items in the Study Area

This Section provides a discussion and explanation of the significance of the study area in relation to the criteria specified by the NSW Heritage Council as detailed above.

Criteria (a) and (b) relate to the study area and its historical beginnings. The study area has not been identified as being associated with any important item or persons important to local or State history. The study area is not considered to be significant at a local, State, National or International level.

Criterion (c) relates to aesthetic significance and is not demonstrated within the study area; the current improvements are of modern construction and the vistas and views afforded from the location as limited due to its lower lying position in the surrounding landscape. In the context of the overall study area, aesthetic significance is not demonstrated.

Criterion (d) relates to the social significance of the study area. This criterion is not met as there is no known association with an identifiable social group nor is the study area known to contribute to any community sense of place.

Criterion (e) relates to the scientific potential of the study area. The study area is considered to have no remaining evidence of historical development and has been modified. The study site is considered to have no significant archaeological or research potential.

Criterion (f) relates to rarity and is not relevant to the study area. The surrounding lots to the study area are also representative of rural subdivisions.

Criterion (g) relates to the study area and its position in a cultural rural landscape. The Burra Charter (1999) defines place as "site, area, land, landscape, building or other work, groups of buildings or other

works, and may include components, contents, spaces and views". A setting is defined as "the area around a place, which may include the visual catchment" and may contribute to its significance. Cultural landscapes can include homesteads and farmlands, remnant vegetation, Aboriginal sites and places, wetlands, early settlements, parklands, disused cemeteries, defunct industrial complexes and so on. There are three categories of cultural landscape to consider:

- Designed - clearly designed and created intentionally by people. Embraces garden and parkland landscapes constructed for aesthetic reasons which are often (but not always) associated with religious or other monumental buildings and ensembles;
- Evolved - a result of the connection and/or interaction between an intentional design and the landscape in which it sits, its present form developed by association with and in response to its natural environment; and
- Associative - identifiable connection between religious, artistic or cultural associations and the natural landscape rather than material cultural evidence. As urban expansion occurs, and with the pressures to develop and redevelop, cities and towns are losing open spaces, cultural landscapes, green corridors and amenity. The NSW Heritage Office has identified the depletion of cultural landscapes as an important issue threatening the cultural values and lifestyles of our cities.

The study area is an evolved landscape resulting from housing, farming structures, vegetation clearing, the construction of dams and drainage lines, pastoralism, market gardening, fencing and flooding. The landscape is not considered to be significant, rare or representativeness at local, State or National level.

5.7 Physical and Heritage Impact

As no items of historic heritage were located within the study area there will be no impacts to historic heritage as a result of the proposed development.

As part of the Inland Rail project, the proposed Pearlman quarry would have minimal to no impact on historic heritage items; this has been based on desktop research of the quarry site and the surrounding area and a field assessment of the quarry site. ARTC (Umwelt 2017) has had a historical report commissioned and if concerns arise precautions from this report for surrounding historical items could be implemented. The field assessment did not locate any items which would require conservation. Care should still be taken in case unknown historic heritage items are discovered during operations.

6. RESULTS

A desktop assessment of the study area has determined that the impact to historical heritage would have minimal to no impact on historic heritage as no heritage items have been previously recorded on the site. A field assessment (see **Figure 9**) for Aboriginal and non-Aboriginal heritage did not recognise any particular vulnerabilities for heritage items. Direct and indirect impacts should be considered during planning and be kept to a minimum. Direct impacts can be defined as:

As a result of the proposed project be carried out at the defined project area e.g. at quarry site, and as a result of the defined project for example removing ground material for construction purposes which may cause physical damage to an item with heritage value.

Indirect impact can be defined as:

An indirect impact from a secondary consequence, for example a truck damaging a building 5km away while transporting of goods to or from site. This could be through an accident or vibration further weakening a building.

Thematic themes suggested by the Heritage Council of NSW that align with evidence from the research include:

- 3. Developing local, regional and national economies - agriculture (rural landscape), pastoralism, exploration,
- 4. Building settlements, towns and cities - land tenure (subdivision pattern, land title document)

Local evidence of settlement in the area from 1888 and the village of North Star (starting as a mail exchange) nearby display the trend of settlement. In addition to the local evidence, regional exploration and settlement connected to early Australian colonial history and links to key colonial figures that were prominent in naming and shaping aspects of Australian life today are evident. This has local, State, National and international significance as the past colonial British activities such as settlement, exploration and organisation methods still have a strong resonance today; an example can be seen in the agriculture activities that were imported to Australia and which are still practiced in a similar fashion. The railway is another example which helped to organise and establish the current layout of Australia. This was demonstrated through ability to transport goods, and in its influence over the development and location of towns and localities through occupation and job availability.

7. CONCLUSION AND RECOMMENDATIONS

7.1 Statement of Heritage Impact

No Statement of Heritage Impact is required due to the absence of any historic heritage in the study area that will be impacted by the proposed development.

It is recommended that care is taken when undertaking the proposed project in case unexpected heritage values are located on site. In the unlikely event that unexpected archaeological remains or potential heritage items not identified as part of this report are discovered during construction of the proposed project, all works in the immediate area should cease, the find/s and potential impacts should be assessed by a qualified archaeologist or heritage consultant and, if necessary, the OEH Heritage Division notified in accordance with Section 146 of the Heritage Act 1977 (NSW) (refer to **Figure 11** unexpected finds procedure).

If an archaeological relic is located as part of the proposal a S146 Discovery of a Relic notification form must be completed and submitted to the OEH Heritage Division.

In the unlikely event that a potential burial site or potential human skeletal material is exposed within the proposal site, the following procedure should be followed in accordance with the Policy Directive - Exhumation of Human Remains (NSW Department of Health 2008), Skeletal Remains - Guidelines for the Management of Human Skeletal Remains under the *Heritage Act 1977* (NSW Heritage Office 1998) and the Aboriginal Cultural Heritage Standards and Guidelines Kit (NPWS 1997):

- As soon as remains are exposed, work is to halt immediately to allow assessment and management;
- Contact local police, OEH Heritage Division;

- A physical or forensic anthropologist should inspect the remains in situ, and make a determination of ancestry (Aboriginal or non-Aboriginal) and antiquity (pre-contact, historic or forensic);
- If the remains are identified as forensic the area is deemed as crime scene;
- If the remains are identified as Aboriginal, the site is to be secured and the Heritage Division is to be contacted; and
- If the remains are non-Aboriginal (historical) remains, the site is to be secured and the Heritage Division is to be contacted.

The above process functions only to appropriately identify the remains and secure the site. From this time, the management of the remains is to be determined through liaison with the appropriate stakeholders (NSW Police Force, forensic anthropologist, OEH Heritage Division, registered Aboriginal parties and so on) and in accordance with the *Public Health Act 1991*.

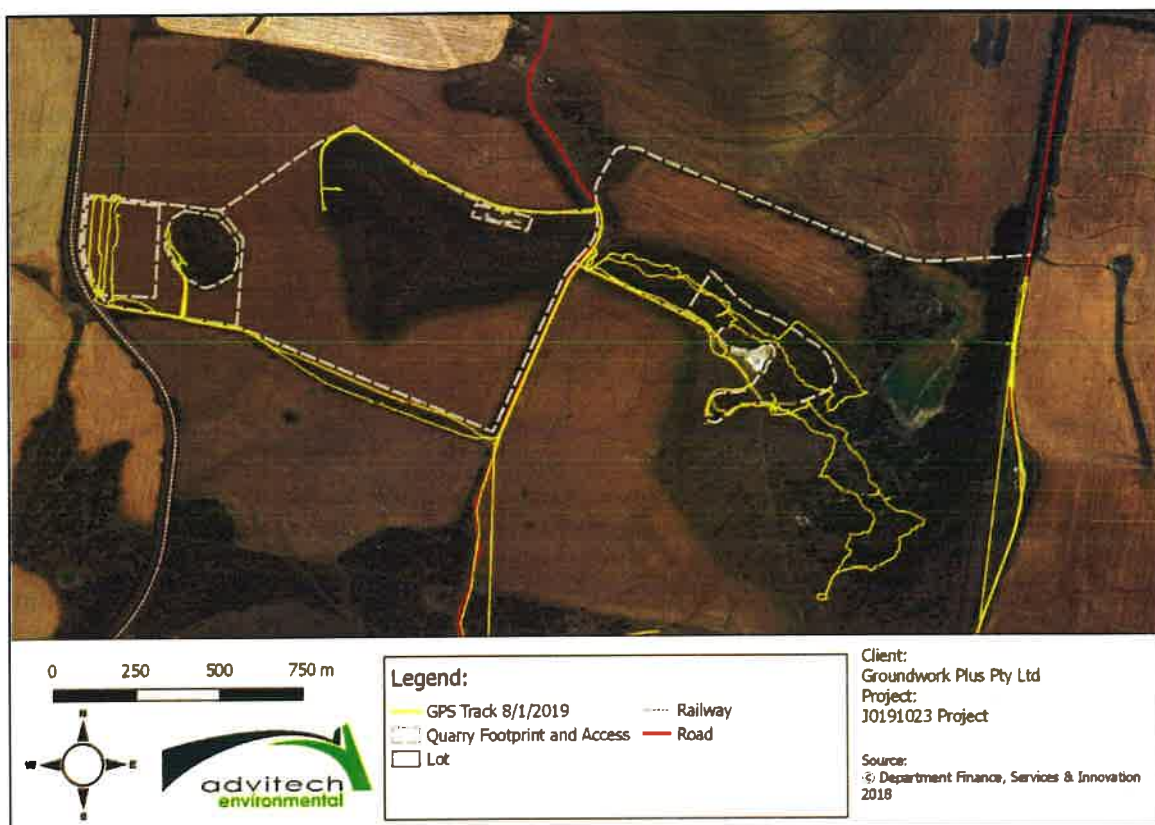


Figure 9: Pearlman Quarry Field Assessment 8 January, 2019 Map (original quarry footprint)

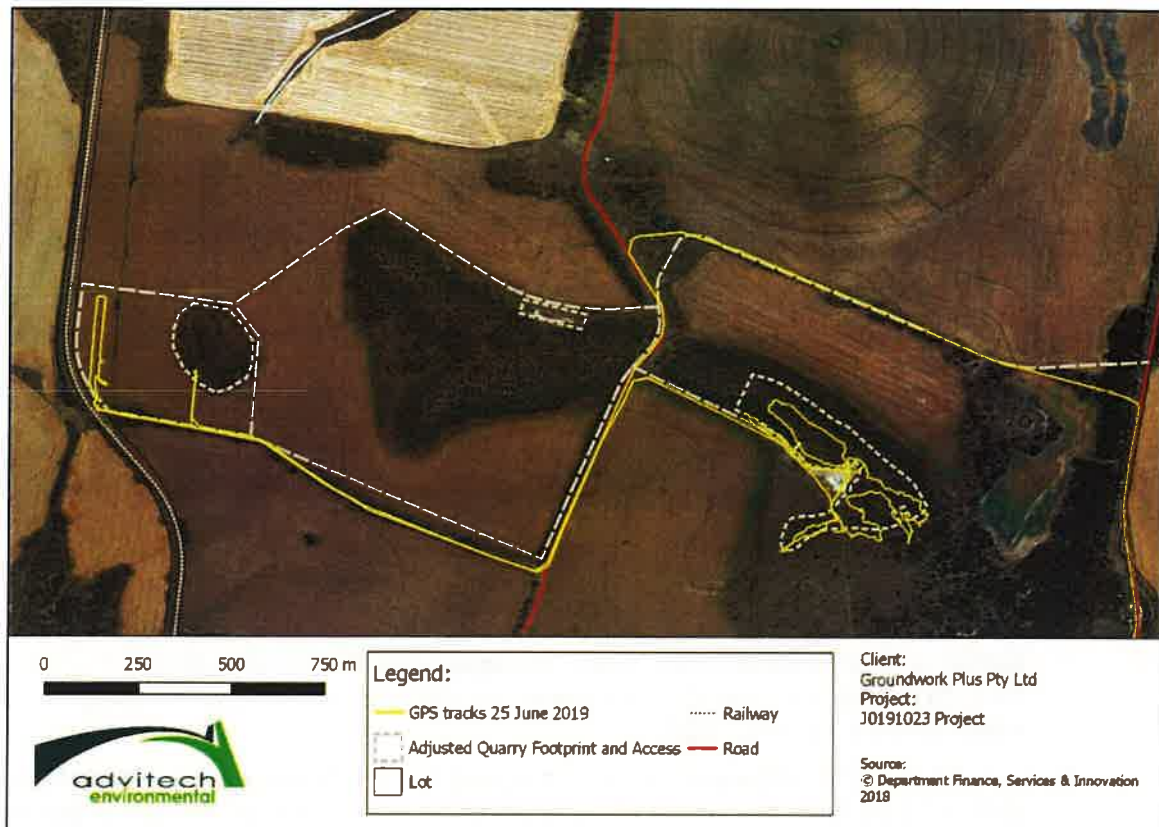


Figure 10: Pearlman Quarry Field Assessment 25 June, 2019 Map (adjusted quarry footprint)

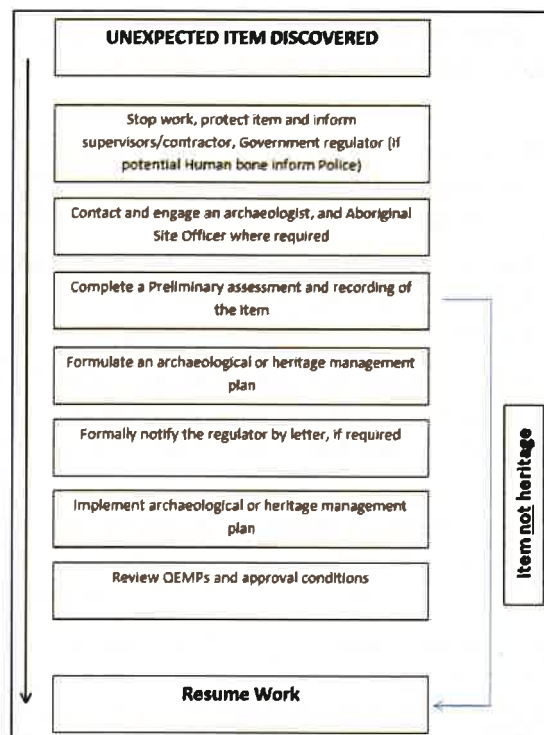


Figure 11: Unexpected Finds Flowchart

8. REFERENCES

The following information was used in the preparation of this report:

- Australasian Legal Information Institute 1833, An act for protecting the Crown Lands of the Colony from Encroachment, Intrusion and Trespass, viewed 20/12/2018 <http://classic.austlii.edu.au/au/legis/nsw/num_act/clea1833n11268.pdf>.
- Australasian Legal Information Institute 1923, *Camura to Boggabilla Railway Act*, viewed 20/12/2018 <http://classic.austlii.edu.au/au/legis/nsw/num_act/ctbra1923n49289.pdf>.
- Australian Bureau of Statistics (ABS), 2018, *2016 Census Quickstats - Gwydir*, viewed 19/12/2018
<http://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/LGA13660?opendocument>.
- Australian Bureau of Statistics (ABS), 2018, *2016 Census Quickstats - North Star*, viewed 19/12/2018
<http://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC13008>.
- Baker, D. W. A. 1967, 'Mitchell, Sir Thomas Livingstone (1792-1855)', Australian Dictionary of Biography, National Centre of Biography, Australian National University, viewed 14/12/2018 <<http://adb.anu.edu.au/biography/mitchell-sir-thomas-livingstone-2463>>, published first in hardcopy 1967.
- Bastin G and the ACRIS Management Committee, Brigalow Belt South bioregion, Rangelands 2008 – Taking the Pulse, published on behalf of the ACRIS Management Committee by the National Land & Water Resources Audit, Canberra. Viewed 19/12/2018 <<https://www.environment.gov.au/system/files/resources/a8015c25-4aa2-4833-ad9c-e98d09e2ab52/files/bioregion-brigalow-belt-south.pdf>>
- CBC Officers Club Inc. 2010, Some Important Dates, viewed 20/12/2018
<<http://www.cbcbank.com.au/images/Matters%20of%20Interest/History/Some%20dates.htm>>.
- Chisholm, A. H. 1969, 'Coxen, Charles (1809-1876)', Australian Dictionary of Biography, National Centre of Biography, Australian National University, viewed 20/12/2018 <<http://adb.anu.edu.au/biography/coxen-charles-3281>>., published first in hardcopy 1969.
- de Greenlaw, J. 2005, Gwydir Shire North Star Shines Program Draft Community Strategic Plan 2005, viewed 20/12/2018 <<http://gwydirshire.com/wp-content/uploads/2009/05/NORTHSTARStrategicPlandraft2005.pdf>>.
- Dunlop, E. W. 1967, 'Oxley, John Joseph (1784-1828)', Australian Dictionary of Biography, National Centre of Biography, Australian National University, viewed 14/12/2018
<<http://adb.anu.edu.au/biography/oxley-john-joseph-2530>>. Published first in hardcopy 1967.
- Gibbney, H. J. 1967, 'Sturt, Charles (1795-1869)', Australian Dictionary of Biography, National Centre of Biography, Australian National University, viewed 20/12/2018 <<http://adb.anu.edu.au/biography/sturt-charles-2712>>, published first in hardcopy 1967.
- Green D., Ali, A., Petrovic J., Burrell M., Moss P. 2012. *Water resources and management overview: Border Rivers catchment*, NSW Office of Water, Sydney
- Gunn, J. 1989. *Along Parallel Lines: A History of the Railways of New South Wales*, Melbourne University Press, Carlton, Victoria, Australia.

Heritage Office (HO) and Department of Urban Affairs and Planning (DUAP) 1996. Regional Histories: Regional Histories of New South Wales. Sydney.

Murray-Darling Basin Authority n.d., Gwydir, viewed 19/12/2018 < <https://www.mdba.gov.au/discover-basin/catchments/gwydir>>.

NSW National Parks and Wildlife Service 2003, 'The Bioregions of New South Wales: their biodiversity, conservation and history', NSW National Parks and Wildlife Service Hurstville.

NSWrail n.d., Boggabilla Branch, viewed 20/12/2018 < <https://www.nswrail.net/lines/show.php?name=NSW:boggabilla>>.

Perry, T. M. 1966, 'Cunningham, Allan (1791-1839)', Australian Dictionary of Biography, National Centre of Biography, Australian National University, viewed 20/12/2018 < <http://adb.anu.edu.au/biography/cunningham-allan-1941>>., published first in hardcopy 1966.

Pickard, J. 2008, 'Shepherding in Colonial Australia', Rural History, vol. 19, no. 1, pp. 55-80, DOI: 10.1017/S0956793307002300.

Royal Historical Australian Society n.d., 'Squatting' on Crown Lands in New South Wales, viewed 20/12/2018 < https://www.rahs.org.au/wp-content/uploads/2015/05/Book-1_Section-1-Exploration-and-Early-Squatting.pdf>.

State Library New South Wales 2018, Australian agricultural and rural life - Australian Agricultural Company, viewed 21/12/2018 <<https://www.sl.nsw.gov.au/stories/australian-agricultural-and-rural-life/australian-agricultural-company>>.

Umwelt (2017) Australian Rail Track Corporation Inland Rail Narrabri to North Start EIS Non-Aboriginal Heritage Impact Statement, Newcastle, Australia.

