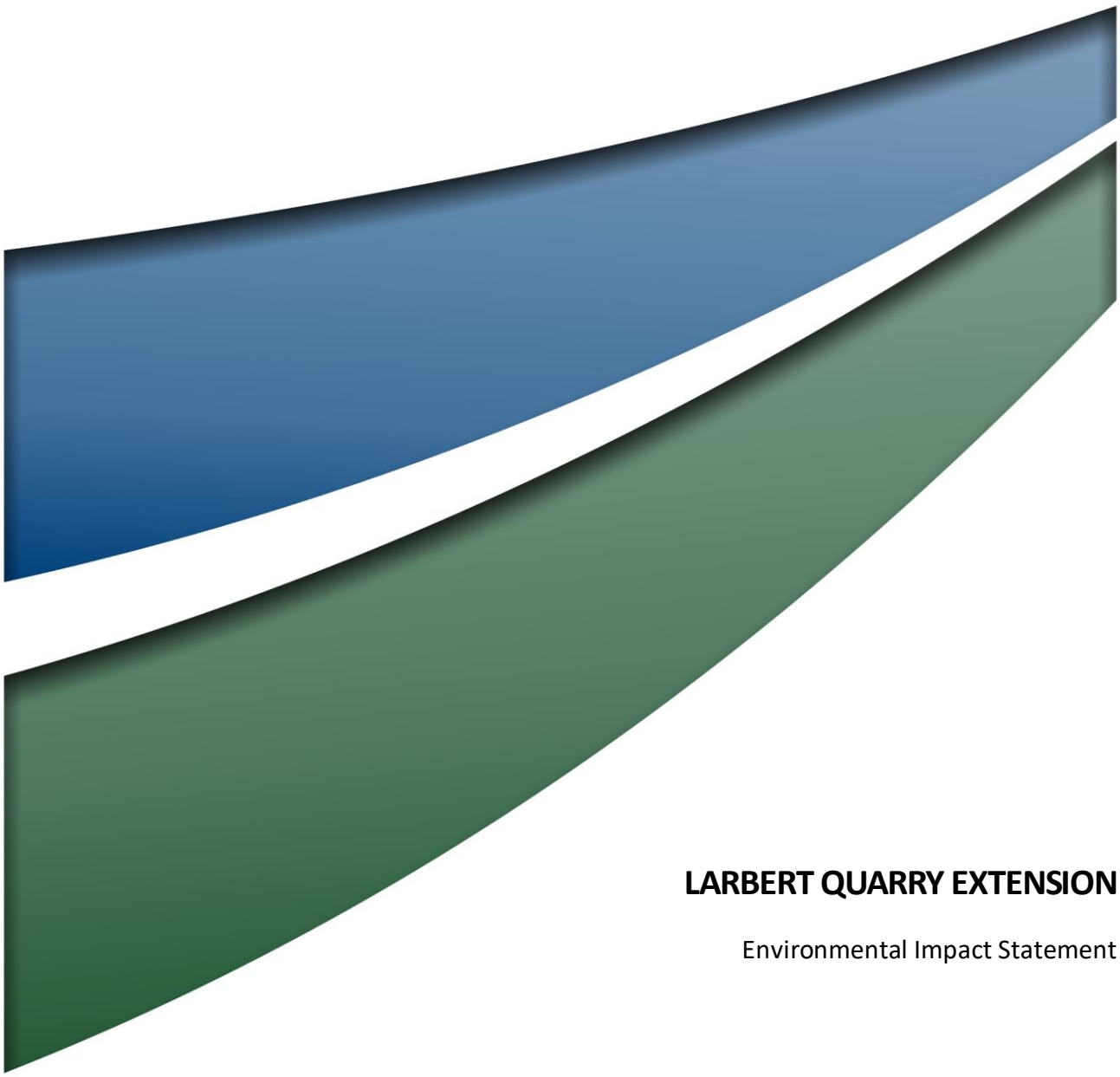
umwelt
Environmental & Social Consultants



# LARBERT QUARRY EXTENSION

Environmental Impact Statement

**FINAL**

**October 2023**

# LARBERT QUARRY EXTENSION

Environmental Impact Statement

## FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Canberra Sand and Gravel

| | |
|---|---|
| Project Director: | Paul Douglass |
| Project Manager: | Paul Douglass |
| Report No. | 22128/R01 |
| Date: | October 2023 |


75 York Street
Teralba NSW 2284

T| 1300 793 267 E|
info@umwelt.com.au
www.umwelt.com.au


This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

***Acknowledgement of Country***

*Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.*



**Document Status**

| Rev No. | Reviewer | | Approved for Issue | |
|---|---|---|---|---|
| | Name | Date | Name | Date |
| V1.1 | Jai Roby | 29 June 2023 | Paul Douglass | 29 June 2023 |
| V2.0 | Jai Roby | 18 July 2023 | Paul Douglass | 18 July 2023 |
| V3.0 | Jai Roby | 11 October 2023 | Paul Douglass | 11 October 2023 |

# Executive Summary

This Environmental Impact Statement (EIS) has been prepared by Umwelt on behalf of Canberra Sand & Gravel Pty Limited (the Proponent) to assess the environmental and social impacts of the proposed project and to support a development application to Queanbeyan Palerang Regional Council (QPRC) to increase the production rate for Larbert Quarry (the Quarry). The Quarry is located on Lot 24 in Deposited Plan (DP) 755915, approximately 15 km north of Braidwood and 85 km east of Canberra and is wholly within the QPRC Local Government Area (LGA).

Access to the Quarry is via the Site Access Road on Lot 330 DP 755915 east of the Quarry and a portion of Lot 24 DP 755915.

Larbert Quarry is a sand and gravel quarry and is currently approved as non-designated development under DA 2014.148 and MOD.2019.024 for sand and gravel extraction and wet screening of these materials. The washing plant has been constructed and is currently operational.

The Quarry is approved for an annual extraction rate up to 20,000 $m^3$ of sand and gravel with a disturbance area of approximately 2 hectares (ha). CSG are seeking to extend operations at the Quarry by expanding the extraction area over Lots 24, 25, 27, and 330 in DP 755915 and increasing production (progressively) to a maximum of 200,000 tonnes per annum (tpa) to meet significant local and regional demands.

The Proponent is making an application for a new designated development and is seeking the following for the Larbert Quarry Expansion (the Project):

- Extraction of alluvial sand and gravel (increasing progressively up to a maximum of 200,000 tonnes per annum (tpa)) with an average extraction of 400 tonnes per day (tpd) up to a maximum of 1,000 tpd. The total available resource is 5,000,000 t.
- Increasing the approved area from 2 ha to 29.21 ha, with extraction across Lots 24, 25, 27 and 330 of DP 755915.
- Quarry production to extend to 2052.
- Wet screening plant to meet demand for washed/screened products. The current screening plant will continue to be used while sufficient. When production output increases a larger screening plant is likely to be purchased.
- Ancillary activities including stockpiling areas and surface water controls. Stockpile areas would hold up to 8000 t of product.
- Infrastructure including a demountable office/amenities building, pump-out septic system, bunded fuel and stores containers, weighbridge, and secure site entrance from Larbert Road.
- Transportation of processed product to customers using the existing private Larbert Quarry Access Road (compacted and gravelled), and the public Larbert Road (sealed).

The Project has been designed through a detailed social, economic and environmental risk-based approach that aims to maximise production efficiency and combine the synergies provided through the use of existing infrastructure, whilst seeking to minimise impacts on the environment and surrounding community.

The Project will provide ongoing employment opportunities and other economic benefits at a local, regional and State level including:

- Ongoing employment opportunities for the existing Larbert Quarry workforce.
- Ongoing contribution to the local, regional and State economies.

This EIS includes a detailed assessment of the potential environmental, social and economic outcomes of the Project and identifies the management and mitigation measures that will be implemented. A summary of the key findings of the assessment following implementation of all reasonable and feasible mitigation and management measures is provided in **Table ES.1**.

**Table ES.1 Key Findings of Environmental Assessments**

| Aspect | Summary |
|---|---|
| **Air Quality, Greenhouse Gas and Energy** | The results of the dispersion modelling indicate the following:<br>• The predicted annual average $PM_{10}$ and $PM_{2.5}$ and dust deposition at the nearest sensitive receivers are all predicted to comply with the NSW EPA air quality criteria.<br>• The cumulative 24-hour assessment showed that there were no sensitive receivers predicted to experience maximum 24-hour cumulative $PM_{10}$ and $PM_{2.5}$ concentrations above the NSW EPA air quality criteria.<br>• In summary, there were no impacts to surrounding sensitive receivers predicted as a result of the proposed Project were modelled.<br>Diesel combustion is anticipated to be the only significant greenhouse gas emission source, comprising 135 tpa $CO_{2\text{-}e}$ as Scope 1. There will no mains electricity supply to the Site and thus no Scope 2 emissions are anticipated for the proposed Project. |
| **Noise and Vibration** | The Noise Impact Assessment demonstrated that the project would comply with the relevant criteria for both operational and traffic noise to be generated across all assessment periods. Construction activities are anticipated to exceed the NMLs at receiver R01 during quarry haul road upgrade works. However, where noise management strategies are implemented, it is anticipated to noise emissions will be reduced by up to 10 dB, and construction noise would remain below the relevant NMLs at all receiver locations. |
| **Traffic and Transport** | The proposed expansion is expected to generate 9 vehicle trips in the AM and PM peak hours to and from the Quarry. While an increase in overall truck movements is proposed, comparing traffic simulation results between the with and without development scenarios shows that the traffic generated from the development will have negligible effect on performance of key intersections, and no changes in the level of services have been identified. It is concluded that the Project will have no tangible effect on local traffic function. |

| Aspect | Summary |
|---|---|
| **Surface Water** | The Project is anticipated to have limited impacts to surface water environmental values. The Project will have an adequate and reliable water source and is considered that the estimated loss of catchment (0.009%) to the Shoalhaven River will have negligible impact on flow regimes and water availability to downstream water users. The Site is likely to be affected by out of bank flooding from Shoalhaven River in high flow events. The impacts of the proposed bunding on local flood regimes will be considered. However, it is expected that any impacts on flood regimes would be localised to Shoalhaven River adjacent to the Project Site. |
| **Groundwater** | The maximum potential extend of drawdown impacts would be limited to the depth of the proposed excavations below the water table and equates to less than 2 m of drawdown below the pre-development water table elevation. Potential risks to water quality can be managed by implementing appropriate procedures for storage and use of chemicals, refuelling and maintenance of plant and machinery and implementing appropriate spill response plans.<br>Potential impacts associated with the proposed development would not exceed the "minimum impact considerations" outlined in the NSW Aquifer Interference Policy (NSW DPI, 2012). Therefore, groundwater impacts associated with the project are acceptable. |
| **Biodiversity** | The Biodiversity Impact Assessment identified one plant community type (PCT) impacted by the proposed Project, PCT3347 Southern Tableland Creekflat Ribbon Gum Forest. This PCT is not associated with a threatened ecological community (TEC) listed under the NSW *Biodiversity Conservation Act 2016* or the EPBC Act. The proposed Project will directly impact 23.03 ha of PCT3347 in poor condition, and 0.1 ha of PCT3347 in good condition. Most areas of remnant vegetation will be avoided with 0.1 ha of treed areas needed to be removed.<br>No threatened species were recorded during field assessment; however, two threatened species are presumed to inhabit the subject land:<br>• Squirrel Glider (*Petaurus norfolcensis*) – 0.1 ha to be impacted.<br>• Brush-tailed Phascogale (*Phascogale tapoatafa*) – 0.1 ha to be impacted.<br>It is concluded the mitigation measures planned to be implemented with the proposed Project will mitigate any other residual impacts not offset by the biodiversity offset credits. |
| **Aboriginal Cultural Heritage** | The ACHAR recorded stone artefacts in the Project Area. The proposed Project has been redesigned to avoid these areas; however, areas designated AS02 and AS03 will be impacted by the proposed Project. The impacted sites will require an Aboriginal Heritage Impact Permit (AHIP) and it is proposed that the artefacts collected during the test excavation and during the surface collection as part of the proposed AHIP be reburied on site in a location agreed to with the RAPs. Mitigation measures identified in this report is planned to be implemented to reduce any further impacts from the proposed Project. |
| **Historic Heritage** | No listed heritage sites are recorded within or adjoining the Project site. Given the distance to closest item of known heritage significance, and no blasting techniques are to be used in the proposed Project, the Project is considered unlikely to impact on any items of heritage significance directly or indirectly. |
| **Waste** | The existing waste management practices will continue to be implemented on site and are appropriate for the project. |
| **Visual** | The proposed expansion of the quarry operations is not expected to create a visual impact out of keeping with the existing use of the land as a sand quarry. |

| Aspect | Summary |
|---|---|
| **Social / Economic** | The potential for impact on the local socio-economic climate is limited, based on the scale of the Project and the fact that the quarry is currently operating and minor reliance of the proposed operations on local services and infrastructure. The proposed Project will continue to provide ongoing benefits for the local and wider communities through ongoing employment, flow- on benefits through use of local services, and through local and regional expenditure. |
| **Hazard and Risk** | The proposed expansion of the quarry is not expected to increase the bushfire risk of the Site. Mitigation measures identified in this assessment are planned to be implemented to reduce any bushfire risks of the proposed Project. A Bushfire Management Plan shall be prepared following approval of the proposed Project. |

The Project has been assessed against the principles of ecologically sustainable development, and the objects and relevant clauses of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This assessment has indicated that the Project, as an existing sand and gravel quarry, is considered suitable for the scale of production increase proposed and on balance it is assessed that the proposed Project could be undertaken in a manner that would satisfy all relevant statutory goals and criteria, environmental objectives and reasonable community expectations. The assessment therefore concludes that the Project is consistent with the principles of ecologically sustainable development.

# Declaration

| EIS Prepared By: | |
|---|---|
| **Name:** | Mr Paul Douglass<br>Manager Planning and Sustainability |
| **Qualifications:** | Master of Environmental Studies, University of Newcastle<br>Bachelor of Town Planning, University of New South Wales |
| **Address:** | Umwelt (Australia) Pty Limited<br>75 York Street<br>TERALBA NSW 2284 |
| **In respect of:** | Larbert Quarry Expansion as described in the accompanying Environmental Impact Statement. |
| **Applicant Name:** | Canberra Sand & Gravel Pty Limited |
| **Applicant Address:** | P.O Box 110 Fyshwick ACT 2609 |
| **Land to be developed:** | 552 Larbert Road, Larbert NSW |
| **Proposed Development:** | Larbert Quarry Expansion |
| **Environmental Impact Statement:** | An Environmental Impact Statement is attached. |
| **Certification:** | I declare that:<br>the statement has been prepared in accordance with the requirements of Schedule 2 of the Environmental Planning and Assessment Regulation 2000, the statement contains all available information that is relevant to the environmental assessment of the development to which the statement relates; and the information contained in the statement is neither false nor misleading. |
| **Signature:** |  |
| **Date:** | 13 October 2023 |

# Table of Contents

# Figures



# Tables

# Appendices

# 1.0 Introduction

## 1.1 Project Overview

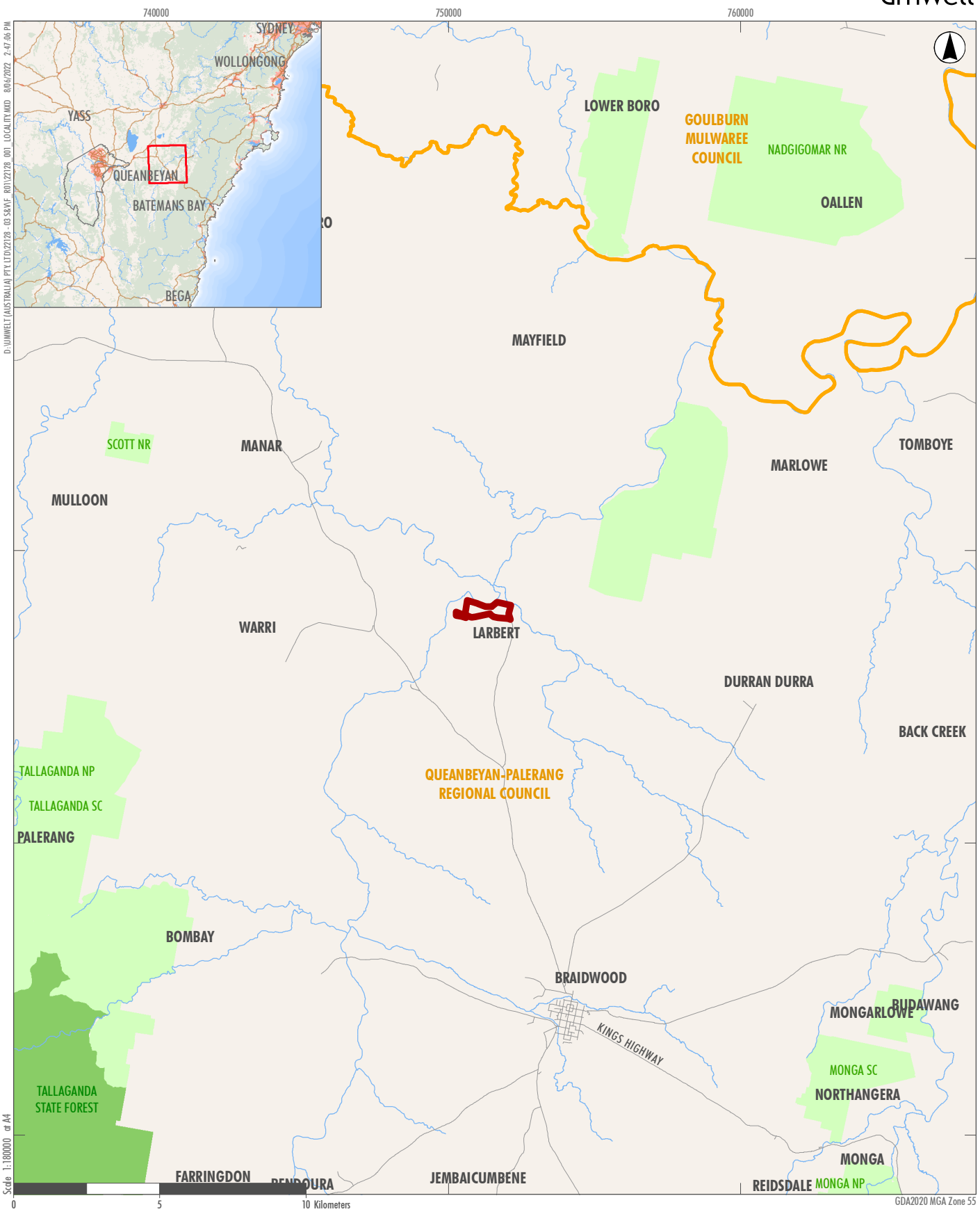
Larbert Quarry (the Quarry) is a sand and gravel quarry operated by Canberra Sand & Gravel Pty Limited (CSG) on Lot 24 in Deposited Plan (DP) 755915 (552 Larbert Rd, Larbert NSW), approximately 15 km north of Braidwood and 85 km east of Canberra (refer to **Figure 1.1** and **Figure 1.2**). The Quarry is located in Queanbeyan Palerang Regional Council (QPRC) Local Government Area (LGA) and is currently approved as non-designated development by QPRC under DA 2014.148 (refer to **Appendix A**) and MOD.2019.024 (refer to **Appendix B**) for sand and gravel extraction, and wet screening (washing) of these materials. DA 2014.148 limits operations to an extraction rate of less than 20,000 $m^3$ (~30,000 t) per year and disturbance area of 2 hectares (ha).

This Environmental Impact Statement (EIS) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of CSG (the Proponent) to accompany the development application to QPRC for an expansion to Larbert Quarry (the Project).

The Proponent is seeking development consent to expand quarrying operations as follows.

- Extraction of alluvial sand and gravel (increasing progressively up to a maximum of 200,000 tonnes per annum (tpa)) with an average extraction of 400 tonnes per day (tpd) up to a maximum of 1,000 tpd. The total available resource is 2,500,000 t.
- Increasing the approved area from 2 ha to 29.21 ha, with extraction and progressive restoration across Lots 24, 25, 27 and 330 of DP 755915.
- Quarry operations to extend to 2052.
- Wet screening plant to meet demand for washed/screened products. The current screening plant will continue to be used while sufficient. When production output increases a larger screening plant is likely to be bought for the Project Site.
- Ancillary activities including stockpiling areas and surface water controls. Stockpile areas would hold up to 8000 t of product.
- Infrastructure including a demountable office/amenities building, pump-out septic system, bunded fuel and stores containers, weighbridge, and secure site entrance from Larbert Road.
- Transportation of processed product to customers using the existing private Larbert Quarry Access Road (compacted and gravelled), and the public Larbert Road (sealed).

Notably, the land over which the majority of the additional disturbance area is to be undertaken has been cleared previously and pasture improved for agricultural purposes, and so does not retain significant area of native vegetation. The Project does not require any modifications to the Larbert Quarry Access Road or public Larbert Road, noting that the production rate and therefore number of vehicles on these roads would be increased.




Legend

- Study Area
- Local Government Area
- NPWS Estate
- State Forest
- Roads
- Railway
- Watercourses

FIGURE 1.1

Locality Plan

Data source: NSW DSFI (2022)

750500 751000 751500 752000

6008809

SHOALHAVEN RIVER

DURAN DURRA CREEK

LARBERT

LARBERT ROAD

6007500

Scale 1:5000 at A3

0 250 500 Metres

GDA2020 MGA Zone 55

Legend

- Study Area
- Proposed Disturbance Area
- Current Disturbance Area
- Property Boundary
- Access Road
- Watercourses

FIGURE 1.2

Study Area

Image source: Google Earth (2022) Data source: NSW DSFI (2020)

## 1.2 The Proponent

CSG is a family-owned landscaping and construction supply company, established in 1960. CSG operate two sand and gravel quarries, one at Larbert (this Quarry) and a second at Bungendore Sands Quarry, under DA 2020-1146. These quarries supply material to customers in the local and sub-region markets.

**Table 1.1 Proponent Details**

| Registered Name | Canberra Sand & Gravel Pty Limited |
|---|---|
| **ABN** | 37 008 417 883 |
| **Address** | P.O Box 110 Fyshwick ACT 2609 |

## 1.3 Existing Approved Operations

### 1.3.1 Project History

As noted in **Section 1.1**, the Quarry currently operates under development consent DA 2014.148 and MOD 2019.024, issued by QPRC, which limits extraction to a disturbance footprint of 2 ha and production to 20,000 $m^3$ per annum. CSG previously extracted sand and gravel from an open pit on Lot 330 of DP 755915 which exhausted the available resource, and the site has since been successfully rehabilitated. The current pit is located on Lot 24 of DP 755915. The proposed extraction area subject to this application covers Lots 24, 25, 27 and 330 of DP 755915.

An application for Secretary's Environmental Assessment Requirements (SEARs) was submitted in June 2022 to commence the process for this development application. SEARs were provided by the delegate for the Planning Secretary on 30 September 2022 (refer to **Appendix C**).

CSG continues to operate the Quarry in accordance with DA 2014.148 and MOD 2019.024 while this application is assessed and determined.

### 1.3.2 Approved Operations

The Quarry is currently approved as non-designated development by QPRC under DA 2014.148 (refer to **Appendix A**) and MOD.2019.024 (refer to **Appendix B**) for sand and gravel extraction, and wet screening (washing) of these materials of Lot 24 in DP 755915. DA 2014.148 limits operations to an extraction rate of less than 20,000 $m^3$ (~30,000 t) per year and disturbance area of 2 hectares (ha). DA 2014.148 will be surrendered following commencement of a new development consent.

## 1.4 Project Objectives

The objectives of the Larbert Quarry Expansion Project (the Project) are to:

- Provide a reliable source of screened/washed sand and gravels to meet the increasing local and regional demand for landscaping and construction products. Product is anticipated to be supplied approximately as follows:
    - 60% screened/washed sand for concrete, asphalt and landscaping
    - 25% screened sand for civil sectors including bricklayer's sand, sports ground soils and bioretention ponds
    - 15% screened/washed coarse aggregates for landscaping and civil sectors.
- minimise, to the greatest extent practicable, the impact on the local environment, community, and other stakeholders
- provide for a final landform which is amenable to future use for agriculture or other agreed purposes
- ensure the expanded Quarry can operate in a safe, reliable, and cost-effective manner, contributing to the local economy of the QPRC LGA.

## 1.5 Project Justification

The Quarry produces a high-quality sand and gravel product with demand increasing beyond the current approved limits of development consent. The Project will allow CSG to increase supply of these products to construction and landscaping businesses in the region, supporting the growth of the local economy.

## 1.6 EIS Structure

This EIS has been prepared in accordance with the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), the Environmental Planning and Assessment Regulation 2021 (EP&A Reg) and the SEARs (refer to **Appendix C**). The EIS comprises a main text component and supporting studies, which are included as appendices. An overview of the layout and contents of the main text is presented in **Table 1.2** below.

**Table 1.2 Format of the EIS**

| Section | Description |
|---|---|
| **Executive Summary** | Provides a concise overview of the proposed Project expansion, approach to the assessment and assessment of impacts following the implementation of the various management and mitigation measures nominated throughout the EIS. |
| **Declaration** | Provides a statement of authorship and declaration as to the accuracy of the EIS in accordance with the requirements of Schedule 2 of the Environmental Planning and Assessment Regulation 2021. |

| Section | Description |
|---|---|
| **Section 1.0** | Introduces the proposed Project, the Proponent and the Project Site, provides information on the structure of the document and describes the management of investigations. |
| **Section 2.0** | Provides a description of the site and its surrounding context, including areas outside of the site that may be impacted by the Project. |
| **Section 3.0** | Provides a detailed description of the Project including proposed staging of activities, operational parameters, waste and water management, hours of operation, infrastructure and services and rehabilitation activities. **Section 3.0** also identifies and describes other feasible alternatives considered and rejected by the Proponent through the design phase of the Project. |
| **Section 4.0** | Summarises the approach taken to identifying and prioritizing issues for assessment in the EIS. This includes a description of stakeholder engagement, planning document review and analysis of environmental performance. |
| **Section 5.0** | Assesses the environmental impacts of the proposed Project by describing how the matters identified in the SEARs have been assessed, and how any potential impacts have been avoided, minimised or offset. |
| **Section 6.0** | Provides a summary of the mitigation measures to be implemented by the Proponent in the execution of the proposed Project and outlines the evaluation and draws conclusions, including discussion of how the Project balances impacts, strategic need and benefits. |
| **Section 7.0** | References. |

The information presented in this document covers all aspects of the planning, development, operation, rehabilitation and proposed environmental management of the Project at a level of detail reflecting the environmental risk posed by each issue.

The main text of the EIS is supported by a set of appendices as follows.

- A copy of existing DA 2014.148 approval held at Larbert Quarry.
- A copy of existing MOD.2019.024 approval held at Larbert Quarry.
- A copy of the Secretary's Environmental Assessment Requirements (SEARs) and matters identified for consideration in the correspondence submitted to NSW Department of Planning and Environment (DPE) by other State government agencies.
- A copy of the Deed of Licence CSG has with the Landowner to extract sand and gravel.
- An Air Quality Impact Assessment prepared by Zephyr Environmental Pty Ltd.
- A Noise Impact Assessment prepared by Muller Acoustic Consultants Pty Ltd.
- A Traffic Impact Assessment prepared by Indesco Pty Ltd.
- A Surface Water Impact Assessment prepared by Umwelt (Australia) Pty Ltd.

- A Groundwater Impact Assessment prepared by Ground Doctor Pty Ltd.
- A Biodiversity Development Assessment Report prepared by AREA Environmental and Heritage Consultants Pty Ltd.
- An Aboriginal Heritage Assessment prepared by AREA Environmental and Heritage Consultants Pty Ltd.
- A Bushfire Risk and Hazard Assessment prepared by Umwelt (Australia) Pty Ltd.
- An Aerial Elevation Survey prepared by Elevated Surveys.

## 1.7 Management of Investigations

This EIS has been prepared by Umwelt: Paul Douglass, Manager Planning and Sustainability, and Lucinda Burchfield, Principal Environmental Consultant, with assistance from Caroline Gazi, Nadia Aurisch and Jai Roby, Environmental Consultants.

The following personnel are of the Proponent who provided specific information in respect to existing and approved activities and reviewed and approved this document for release.

- Mr Trevor Allen – General Manager of Canberra Sand & Gravel.
- Mr Wayne Gregory – Director of Canberra Sand & Gravel.

# 2.0 Project Context

## 2.1 Site Description

The Quarry is located approximately 15 km north of Braidwood and 85 km east of Canberra, in the QPRC Local Government Area (LGA). The Project Site is located across Lots 24, 25, 27 and 330 of DP 755915, which are all zoned RU1 Primary Production, as are all adjacent lots. In accordance with Palerang Local Environment Plan (2014) Land Use Table, RU1 zoning permits extractive industries with consent.

The land which is the subject to the proposed development application is owned by Jason Paul Griggs (Landowner) with CSG (Licensee) holding a deed of licence to extract sand and gravel from the Quarry. A copy of this deed is provided in **Appendix D**.

## 2.2 Local and Regional (Strategic) Context

### 2.2.1 Southeast and Tableland Regional Plan 2036

The Southeast and Tablelands Regional Plan 2036 (Regional Plan) is the NSW Government's strategic long-term plan for guiding planning and land use decisions for the Southeast and Tableland region until 2036. The Southeast and Tableland region is one of Australia's most geographically diverse natural environments (DPE, 2017). The Regional Plan provides an overarching framework for guiding more detailed land use plans, development proposals, and infrastructure funding to coincide with the future population and economic changes in the region.

The Regional Plan sets out four regionally focused goals for the region:

1. A connected and prosperous economy.
2. A diverse environment interconnected by biodiversity corridors.
3. Healthy and connected communities.
4. Environmentally sustainable housing choices.

The Regional Plan aims to strengthen the region's economic diversity and continue to build on its existing capacity to foster greater market and industry diversification while conserving aboriginal cultural, built heritage and environmental values.

The Project aligns with several 'directions' in the Regional Plan, namely:

- The Project will help enhance strategic transport links to support economic growth for the region by providing more affordable sand and gravel resources for the region's activities.
- The Project will contribute to improving transport connections for the region by providing high-quality sand and gravel construction materials.
- The Project will also contribute to delivering greater housing supply and choice for the region by providing additional sand and gravel construction materials at an affordable price.

### 2.2.2 QPRC Local Strategic Planning Statement 2020

The QPRC Local Strategic Planning Statement 2020 (LSPS) outlines the 20-year vision for land use planning in the QPRC LGA (QPRC, 2020). The LSPS is aligned with the Southeast and Tablelands Regional Plan 2036 by setting out how directions and actions of the plan will be implemented at a local level. It does this through land use planning priorities and short, medium and long-term actions, along with the means for monitoring and reporting on the delivery of the actions.

DRC has identified 14 planning priorities to guide the future strategic planning work in the region. The most relevant Planning Theme and Priority for the Project is set out under the Planning Priority 8 which aims to 'Ensure future planning for the region is well coordinated and provides for its sustainable management'.

The Project will assist in the delivery of Planning Priority 8 by providing a local and cost-effective supply of sand and gravel for infrastructure projects within the QPRC LGA. This will support significant growth of the QPRC region and surrounding areas.

### 2.2.3 Palerang Development Control Plan 2015

The Palerang Development Control Plan 2015 (DCP) applies to the Project. The purpose of the DCP is to support the broad objectives of the QPRC Regional Local Environmental Plan by providing clear and concise development guidelines for various forms of development. Section C25 of the DCP identifies industrial development controls which apply specifically to RU1 Primary Production zones.

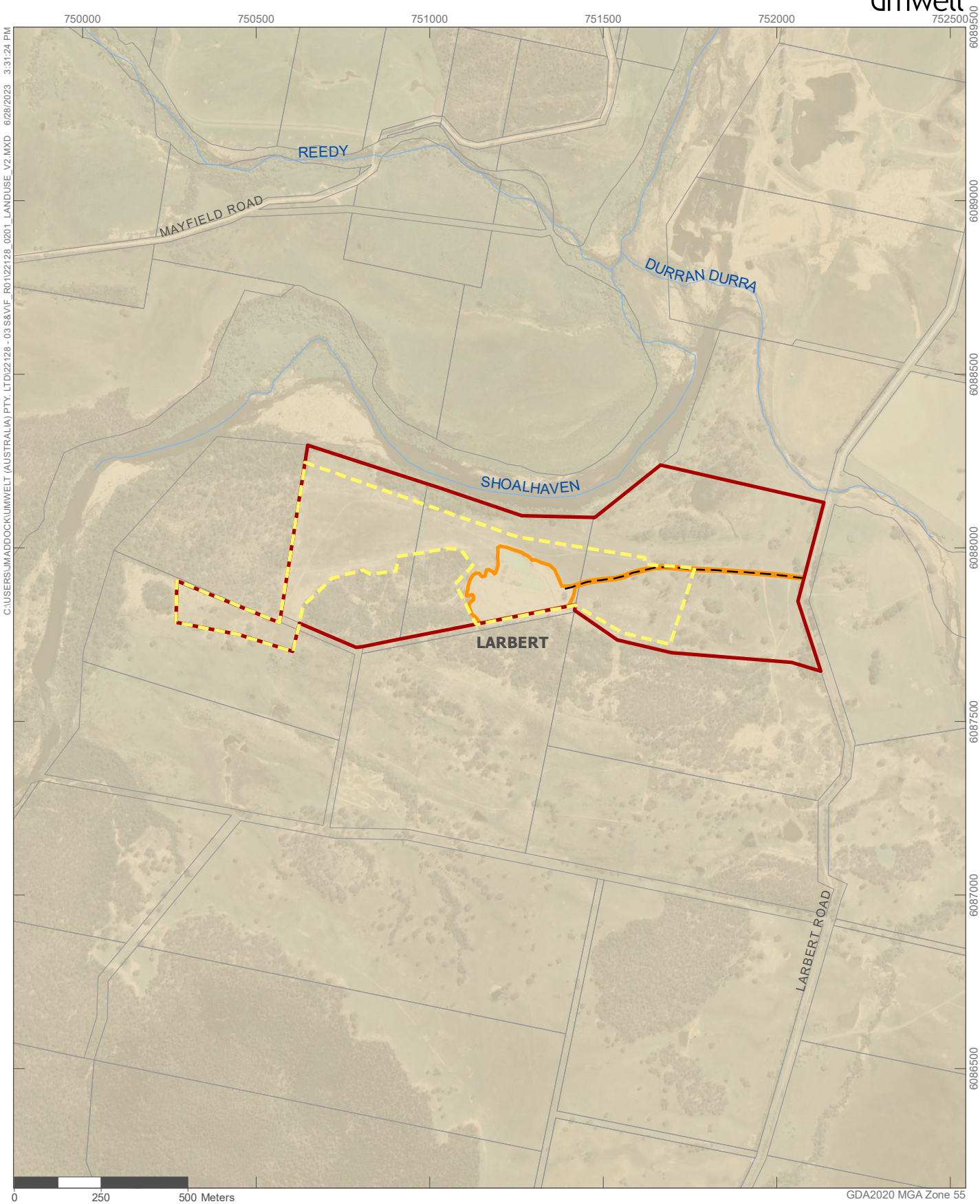
An assessment of the Project against Section C25 development controls is provided in **Section 4.1.3**.

## 2.3 Land Zoning and Use

The Quarry is located across Lots 24, 25, 27 and 330 of DP 755915, which are all zoned RU1 Primary Production, as are adjacent lots to the Project site (see **Figure 2.1**). In accordance with QPRC Local Environment Plan (2022) Land Use Table, RU1 zoning permits extractive industries with consent. Land ownership and lot boundaries of the Project Site and within the surrounding area are shown in **Figure 2.2**.

The land which is the subject to the proposed development application is owned by Jason Paul Griggs (Landowner) with CSG (Licensee) holding a deed of licence to extract sand and gravel from the Quarry. A copy of this deed is provided in **Appendix D**.

An easement exists extending from Larbert Road to Lot 26, DP 755915 (shown in **Figure 2.3**) which is Crown Land. It is understood this easement is an extension of the Larbert Road easement and as such QPRC is the relevant authority for this road. An enclosure permit has been authorised and issued by the QPRC to CSG to allow the easement to be fenced in Lots 24, 25, 27 and 330 of DP 755915.




**Legend**

- Study Area
- Proposed Disturbance Area
- Current Disturbance Area
- Property Boundary
- Access Road
- Watercourses

**Zone**

- RU1 Primary Production

**FIGURE 2.1**

Land Use

**Image source:** Google Earth (2022) **Data source:** NSW DSFI (2020)

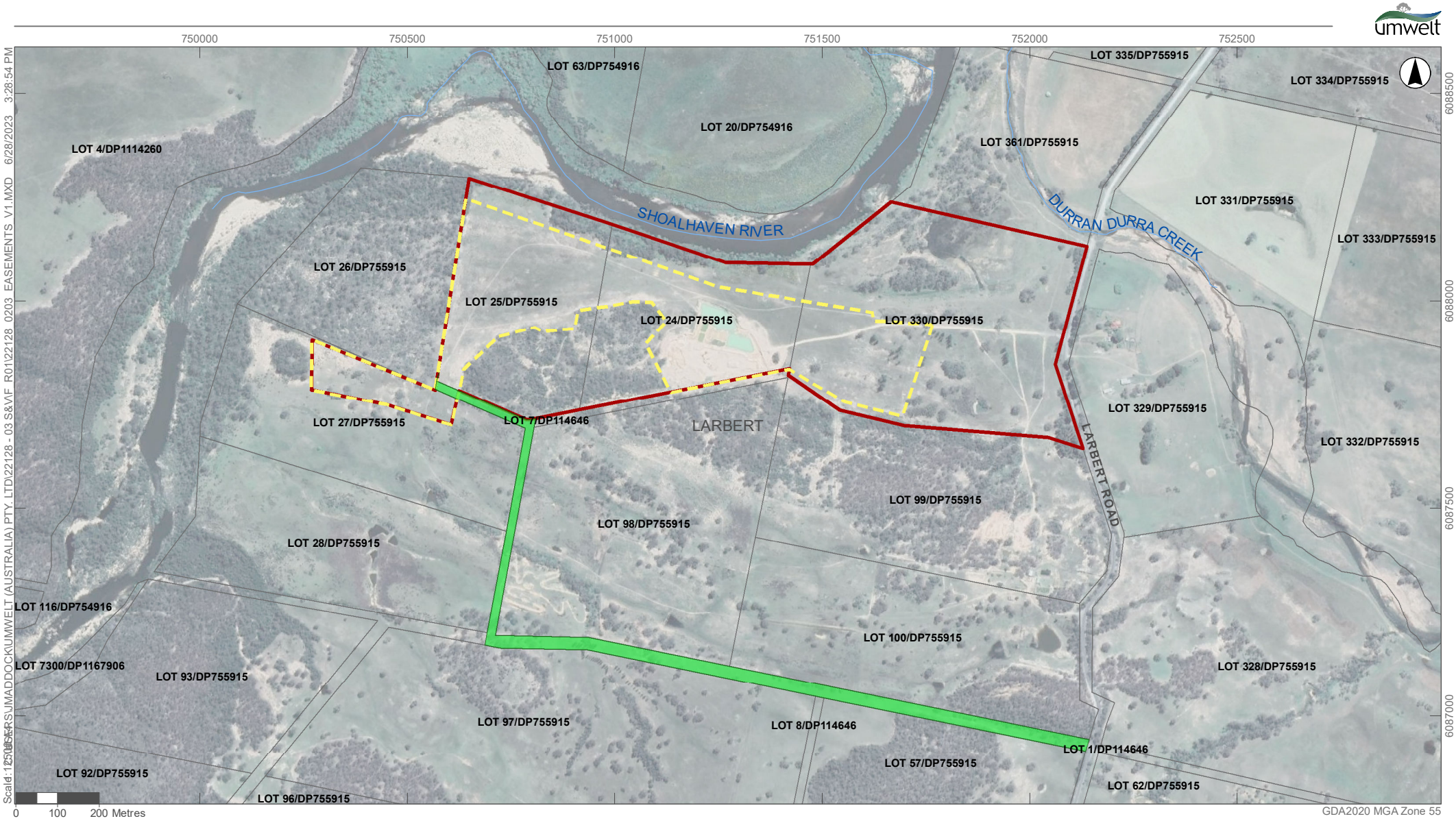

**Legend**

- Study Area
- Property Boundaries
- Watercourses

**FIGURE 2.2**

Land Ownership

**Image source:** Google Earth (2022) **Data source:** NSW DSFI (2020)




## Legend

- Study Area
- Proposed Disturbance Area
- Easements
- Property Boundaries
- Watercourses

**FIGURE 2.3**

Larbert Road Extension Easement

**Image source:** Google Earth (2022) **Data source:** NSW DSFI (2020)

## 2.4 Environmental Setting

### 2.4.1 Climate

Climate statistics relevant to the Project are presented in **Table 2.1** and have been sourced from the following Bureau of Meteorology (BoM) weather stations:

- Temperature and Rainfall – Braidwood Racecourse AWS (Automatic Weather Station) (Station Number 069132) located approximately 14 km south of the Quarry.
- Evaporation – Braidwood (Wallace Street) (Station Number 069010) located approximately 16.7 km south of the Quarry.

**Table 2.1 Climate Statistics**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Temperature (°C) (1985 to 2022)** | | | | | | | | | | | | | |
| Mean Max | 27.0 | 25.2 | 22.7 | 19.5 | 15.9 | 12.6 | 12.1 | 13.5 | 16.6 | 19.3 | 22.0 | 24.7 | **19.3** |
| Mean Min | 12.4 | 12.3 | 10.1 | 6.1 | 2.8 | 1.0 | 0.1 | 0.6 | 3.2 | 5.8 | 8.5 | 10.6 | **6.1** |
| **Monthly Rainfall (mm) (1985 to 2022)** | | | | | | | | | | | | | |
| Mean | 63.5 | 68.4 | 64.1 | 41.2 | 43.5 | 58.1 | 33.9 | 54.0 | 49.5 | 56.6 | 79.1 | 64.1 | **658.8** |
| Lowest | 4.8 | 2.2 | 0.8 | 0.6 | 1.8 | 1.2 | 3.2 | 0.8 | 2.6 | 3.0 | 9.8 | 0.6 | **416.4** |
| 10$^{th}$ Percentile | 15.6 | 22.4 | 18.8 | 5.3 | 6.8 | 5.5 | 5.9 | 10.1 | 17.5 | 13.8 | 24.2 | 15.8 | **459.7** |
| Median | 51.6 | 50.0 | 44.9 | 27.9 | 22.2 | 31.8 | 20.2 | 33.9 | 45.3 | 54.3 | 72.6 | 65.6 | **645.9** |
| 90$^{th}$ Percentile | 122.8 | 138.6 | 130.8 | 90.9 | 119.7 | 167.3 | 73.1 | 142.9 | 89.2 | 102.7 | 137.6 | 123.5 | **859.9** |
| Highest | 161.0 | 198.6 | 240.6 | 254.8 | 172.8 | 219.2 | 108.2 | 212.4 | 125.4 | 153.6 | 241.4 | 146.4 | **1255.2** |
| **Evaporation (mm) (1900 to 2022)** | | | | | | | | | | | | | |
| Mean Monthly | 6.0 | 5.1 | 4.1 | 2.8 | 1.8 | 1.5 | 1.5 | 2.1 | 3.0 | 3.9 | 5.0 | 5.8 | **3.6** |

#### 2.4.1.1 Temperature

January is typically the warmest month of the year with both the warmest mean daily maximum temperature of 27.0 °C and warmest mean daily minimum temperature of 12.4 °C. The coolest month of the year is typically July with the lowest mean daily maximum temperature of 12.1 °C and lowest mean minimum temperature of 0.1 °C.

#### 2.4.1.2 Rainfall and Evaporation

On average, 658.8 mm of rain is recorded each year, with that rainfall spread fairly evenly throughout the year. Rainfall is typically highest between November to March (mean range: 63.5 mm to 79.1 mm) and drier throughout the remainder of the year. Rainfall can, however, be highly variable from year to year with annual rainfall varying from 416.4 mm to 1255.2 mm, and monthly variations from 0.6 mm to 244.8 mm.

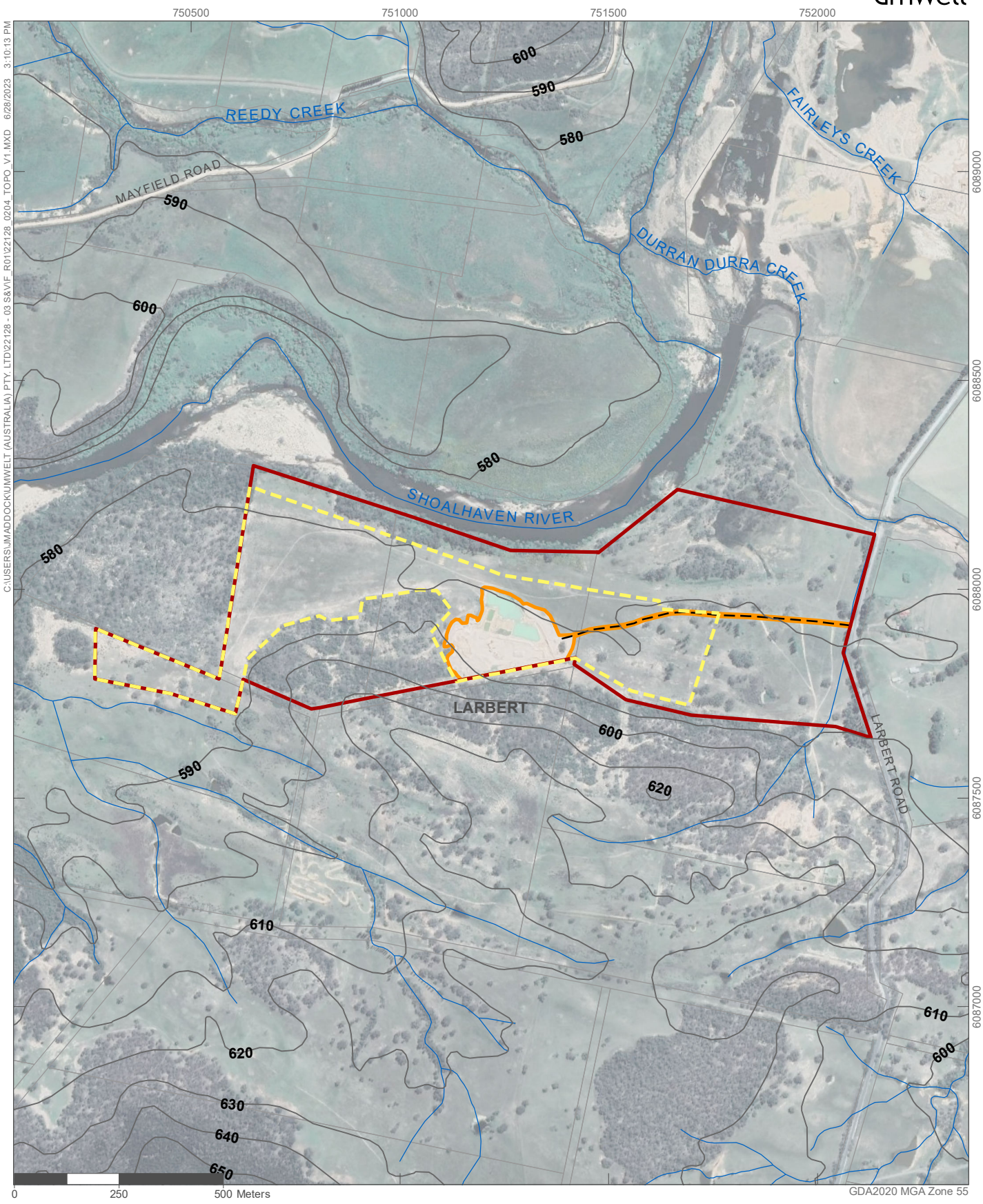
On average, 3.6 mm of evaporation is recorded each year, with evaporation spread fairly evenly throughout the year. Evaporation is typically highest between November to February (mean range: 5.0 mm to 6.0 mm) and less throughout the remainder of the year reaching its lowest during June and July (mean range: 1.5 mm).

### 2.4.2 Topography and Hydrology

#### 2.4.2.1 Topography

The Project Site occurs within a largely cleared landscape which gently descends toward the Shoalhaven River in the north and northwest (refer to **Figure 2.4**). The geology is representative of an unconsolidated Neogene and Quaternary alluvial flood terrace with some basaltic sediment overlying broader Devonian granodioritic intrusion as part of the Braidwood Granodiorite Suite (NSW Government, 2023).

The granodioritic intrusion presents topographically as an east-west ridge to the south of the Quarry, lying outside the proposed extraction area. Elevation decreases steeply approaching the extraction area although no outcrops were observed. The topography then remains near flat with a gentle slope across the extraction area toward the Shoalhaven River in the north and west. The Quarry-side Shoalhaven Riverbank features a sharp drop of approximately 5 m.




**Legend**

- Study Area
- Proposed Disturbance Area
- Current Disturbance Area
- Property Boundary
- Access Road
- Watercourses
- 10m Contour

**FIGURE 2.4**

Topography and Drainage

**Image source:** Google Earth (2022) **Data source:** NSW DSFI (2020)

#### 2.4.2.2 Hydrology

The site lies adjacent to the Shoalhaven River and the currently approved Quarry is located approximately 100 m from the river at its nearest point. Durran Durra creek is a minor watercourse feeding into the Shoalhaven River and is located 800 m northwest of the site. The proposed disturbance footprint will remain at least 50 m from the Shoalhaven River. Given the planned Quarry expansion is not within 40 m of the riverbank, *Controlled Activity Approval* is not anticipated to be required.

**Surface Water**

The Project Site is covered under the Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011 (NSW Consolidated Regulations, 2018).

During heavy rain or storm events, surface water may enter the extraction area where it is diverted to a low point and is able to infiltrate through the extraction area base due to the permeable nature of the sandy soil. Water that infiltrates in this manner is anticipated to intersect groundwater, which has been previously described as being greater than 5 m below ground level (Robson Environmental, 2019).

CSG has committed to manage water in and around the extraction area as follows:

- Bunding placed around the extraction area to divert surface water and minimise the volume that may enter the extraction area during heavy rain events.
- Excavation works are conducted in dry weather to avoid the deterioration of vehicular tracks on the site.
- Potential contaminants on site are kept to a minimum. A spill kit is kept on site to help contain any potential minor spills from machinery or vehicles.

Water used for screening/washing is sourced from the extraction area and no new dams (external to the extraction area) are proposed. CSG proposes to continue to access groundwater through targeted excavations of internal sumps (which will also collect any rainfall/runoff from the extraction area).

**Flooding**

The site is approximately 5 m above the flow level of the Shoalhaven River on a gentle slope on an outer bend (high side) of the river. The landowner advises that the proposed Project site has not flooded in living memory. Despite this anecdotal evidence provided, a flood risk assessment has been commissioned for the Project.

**Groundwater**

The Project Site is located within the Goulburn Fractured Rock Groundwater Source covered by the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011 (NSW legislation, 2023).

Groundwater depth has been identified at depths ranging from 1.9 m to 5.0 m below ground level (bgl). Select areas of the current extraction area are developed below 5 m to intercept groundwater for use in the wash screening plant. Further information can be found in **Section 5.5**.

## 2.4.3 Soils

Typical soils of the region are sandy clay with an absence of organic matter within the topsoil zone. The characteristics of the sandy soil are rapid infiltration of surface water (permeable), and low erosion potential.

The NSW Soil and Land Information database eSPADE, managed by DPE, identifies the Project Site as Land and Soil Capability (LSC) Class 5 (refer to **Figure 2.5**), which suggests the land is severely limited in ability to sustain high impact land uses.

The Project Site does not occur on land classified as Biophysical Strategic Agricultural Land (BSAL), which is determined by a combination of soil fertility, LSC class and access to reliable water (DPE, 2023).

A search of the NSW EPA list of sites notified under Section 60 of the *Contaminated Land Management Act 1997* was conducted by Ground Doctor as part of the Groundwater Impact Assessment (refer to **Section 5.5**). The search indicated no sites were listed within a 5 km radius of the Project site.

Acid sulphate soil risk mapping presented on the NSW DPE eSpade website (www.environment.nsw.gov.au/eSpade) indicates that the site is not located within an acid sulphate soil risk zone.

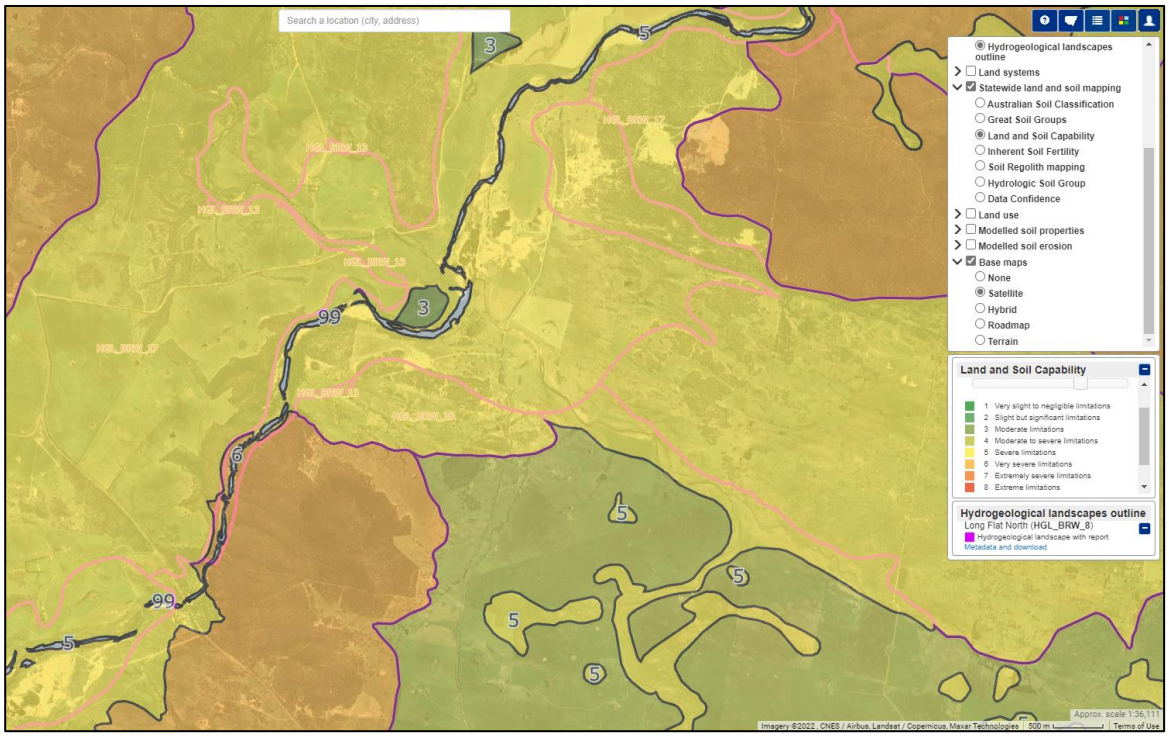



**Figure 2.5 Project Site Land and Soil Capability Map**

### 2.4.4 Biodiversity

The Project area largely comprises areas that have previously been significantly disturbed and/or cleared associated with the historical agricultural land use. The development site has been designed to impact the disturbed portion of the Project landscape, largely devoid of remnant vegetation, trees, or suitable habitat for threatened species. Higher quality remnant native vegetation within the subject land has been specifically avoided by the proposal.

Vegetation in the area commonly includes *Eucalyptus viminalis* and/or *Eucalyptus pauciflora*, occasionally with *Eucalyptus stellulata*. A sparse small tree layer is sometimes present. Smaller shrubs are also sparse and commonly include scattered *Acacia dealbata*, or rarely *Cassinia longifolia*. The ground layer is generally dense and grassy. The ground layer also includes a suite of soft-leaved forbs, small vines, and occasional clumps of the large riparian sedge *Carex appressa*.

One plant community type (PCT) exists in the Project area, PCT3347 Southern Tableland Creekflat Ribbon Gum Forest. This PCT is a tall to very tall grassy sclerophyll open forest to woodland of creek flats and gentle footslopes in undulating tablelands of higher eastern parts of the South Eastern Highlands bioregion. This PCT is widely distributed. Soils are often relatively deep, including alluvium or colluvium, derived from a wide range of sedimentary and granitic rocks.

Further detail regarding the flora and fauna present within the Project Area is provided in Section 5.6 and **Appendix K**.

### 2.4.5 Cultural Heritage

#### 2.4.5.1 Aboriginal Cultural Heritage

The approved Quarry is in a highly disturbed area subject to previous tree clearing and disturbance to soil through primarily agricultural activities (grazing). There is a known Aboriginal site approximately 250 m northeast of the proposed disturbance area. Archaeological surveys were undertaken on the Site by AREA Environmental and Heritage Consultants Pty Ltd (AREA) during September and November 2022 and identified three artefact scatters across the Site (AS01, AS02 and AS03). The proposal has been redesigned to avoid AS01, however AS02 and AS03 will be impacted by the proposal and thus an Aboriginal Heritage Impact Permit (AHIP) will be acquired by the Proponent prior to impacting the two Aboriginal sites.

Further detail regarding Aboriginal cultural heritage within the Project Area is provided in **Section 5.7** and **Appendix K.**

#### 2.4.5.2 Non-Aboriginal Cultural Heritage

A desktop study conducted by Umwelt did not identify any listed heritage sites recorded within or adjoining the Project Area. The Project is considered unlikely to impact on any items of heritage significance directly or indirectly. Further detail regarding non-Aboriginal cultural heritage is provided in **Section 5.8**.

# 3.0 Project Context

## 3.1 Summary

As discussed in **Section 1.0**, CSG proposes to extend the extraction area, production rate, quarry life and disturbance footprint of Larbert Quarry. The existing extraction area is located on Lot 24 of DP 755915 and the expanded extraction area will be located on Lots 24, 25, 27 and 330 of DP 755915. The Quarry extension is to provide for additional screened/washed sand and gravel products up to a maximum of 200,000 tpa and a maximum of 1,000 tpd with an anticipated average production rate of 400 tpd. In order to achieve these production targets, a number of associated changes to activities and infrastructure on the Project Site would be required including additional screening equipment, truck movements and water usage.

The layout of the Project Area is shown in **Figure 1.2** which identifies the Study Area, current disturbance area and proposed disturbance area. No modifications to the private Larbert Quarry Access Road are proposed for the purpose of the Project. **Table 3.1** provides a comparative analysis of the Project against the existing development approved under DA 2014.148 and MOD 2019.024.

**Table 3.1 Project Parameters**

| Parameter | Approved Development (DA 2014.148 and MOD 2019.024) | Larbert Quarry Expansion Project |
|---|---|---|
| **Site description** | Lot 24, DP 755915 | Lots 24, 25, 27 and 330, DP 755915 |
| **Products** | Screened/washed alluvial sand and gravel | No change |
| **Production rate** | Up to 20,000 tonnes per annum | Up to 200,000 tonnes per annum |
| **Quarry life** | Up to 20 years | Up to 2052 |
| **Disturbance footprint** | Up to 2 ha | Up to 29.21 ha |
| **Extraction area** | Up to 1.8 ha | 24.8 ha, and depth of 576 mAHD |
| **Extraction methods** | Excavation of unconsolidated alluvium using 25 t excavator | No change. |
| **Extraction equipment** | 1x 25 t excavator<br>1x Front end loader | 1x 25 t excavator<br>1x Front end loader<br>1x Haul truck |
| **Processing and stockpiling area** | Screened material adjacent (west) to the washing plant.<br>Two stockpiles of raw material east of the washing plant. | No change |

| Parameter | Approved Development (DA 2014.148 and MOD 2019.024) | Larbert Quarry Expansion Project |
|---|---|---|
| **Processing operations** | • Stripping up to 0.3 m topsoil – for rehabilitation use or sale.<br>• Extract raw material by excavator.<br>• To raw feed (stockpiling).<br>• Haul to wash/processing plant via loader. Loader to feed plant.<br>• Material screened, washed and stockpiled. | • Stripping up to 0.3 m topsoil – for rehabilitation use or sale.<br>• Extract raw material by excavator.<br>• To raw feed (stockpiling).<br>• Haul to wash/processing plant initially via loader, then haul truck when excavation is further from plant. Loader to feed plant.<br>• Material screened, washed and stockpiled.<br>Existing washing/screening plant to be used as long as it remains suitable. Larger plant to be purchased when required. |
| **Transport routes** | Haul trucks to travel via Larbert Quarry Access Road to Larbert Road and the Kings Highway | No change |
| **Vehicle movements** | A maximum of ten haulage movements per week (approximately two haulage movement per day) | Product truck capacity assumptions:<br>• 80% 38.5 t capacity<br>• 20% 32 t capacity.<br>Product truck daily movements:<br>• average: 22<br>• maximum: 54. |
| | | Supply truck x1: diesel mechanic/service truck<br>• Once weekly (2 movements). |
| | | Light vehicles x2:<br>• maximum 6 movements per day. |
| **Water usage** | Dust suppression and operation of screening plant | No change |
| **Water source** | Surface harvesting supplemented by groundwater extracted from pit on Lot 24 DP 755915 | No change |
| **Infrastructure and services** | No mains power, water or sewage services to site. Power by diesel generator. | No mains power, water or sewage services to site. Diesel generator will continue as the power source with the addition of rooftop solar power.<br>The following additional infrastructure will be required:<br>• weighbridge<br>• demountable office/amenities<br>• rainwater tank for additional potable water supply<br>• self-bunded fuel and stores containers<br>• light vehicle parking<br>• pump-out septic system. |

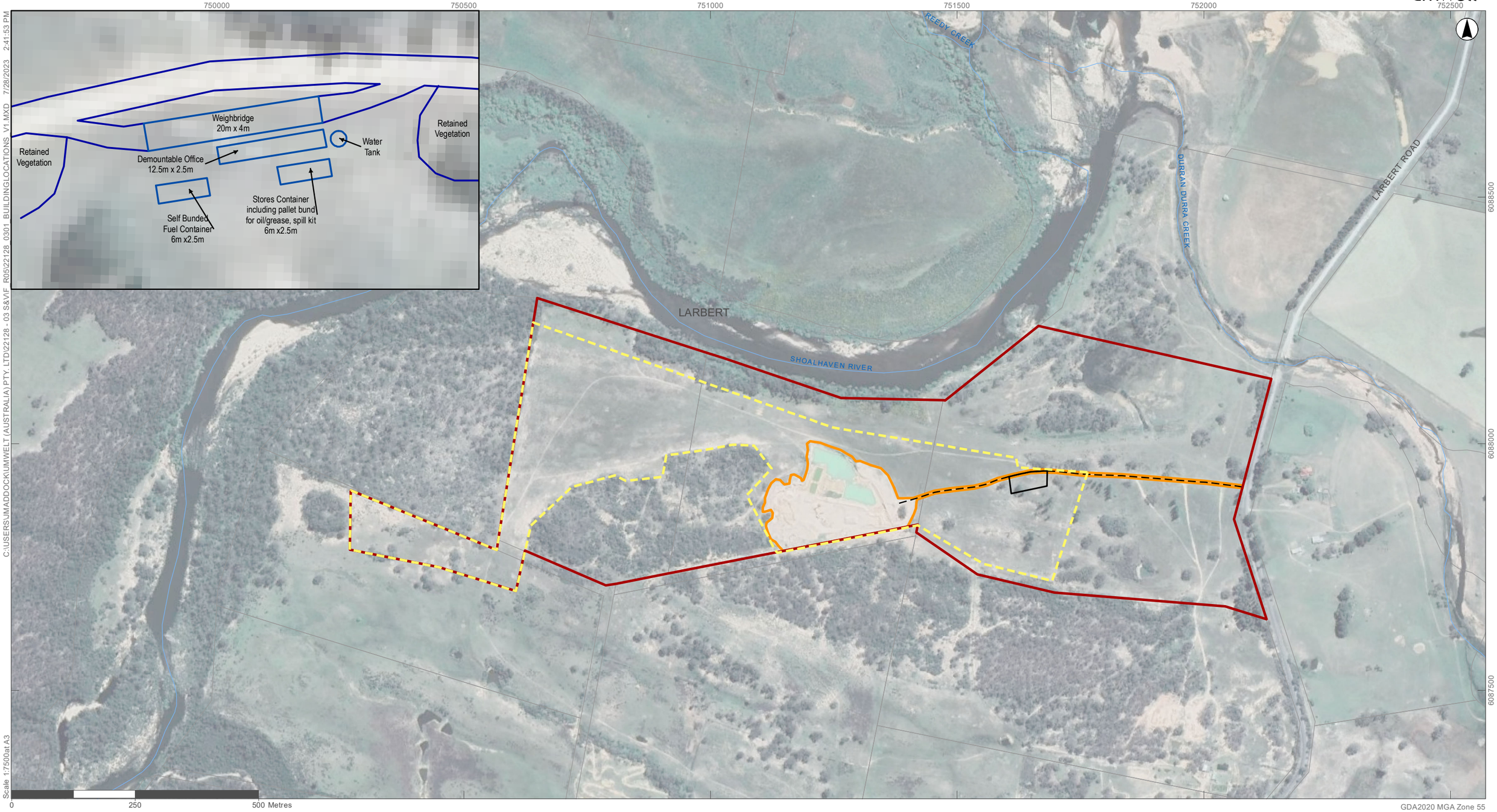
| Parameter | Approved Development (DA 2014.148 and MOD 2019.024) | Larbert Quarry Expansion Project |
|---|---|---|
| **Hours of operation** | • Monday to Friday: 6:00 am–6:00 pm.<br>• Saturdays: 7:00 am–2:00 pm.<br>• Sundays: non-operational.<br>• Public holidays: non-operational. | No change |
| **Employment** | 2 full-time equivalent employees | 3–4 full-time equivalent employees |
| **Rehabilitation** | Final landform:<br>• Safe and stable final landform, battered to suit surrounding land.<br>Final land use:<br>• returned to open grazing for cattle as per current land use. | No change |

## 3.2 Construction

The additional infrastructure and services proposed to be present onsite are listed in **Table 3.2** with proposed dimensions. Proposed infrastructure and services are planned to be installed onsite following approval of the proposed Project. The additional infrastructure will be located within the approved disturbance area adjacent to the access road as depicted in **Figure 3.1**.

**Table 3.2 Dimensions of Additional Infrastructure**

| Proposed buildings | Proposed dimensions (approx.) |
|---|---|
| **Weighbridge** | 20 m x 4 m |
| **Demountable Office** | 12.5 m x 2.5 m |
| **Fuel Container** | 6 m x 2.5 m |
| **Stores Container** | 6 m x 2.5 m |
| **Water Tank** | 10,000 L |
| **Light vehicle Parking** | Minimum 5 parking spaces |
| **Pump out septic system** | To be confirmed following approval. |




**Legend**

- Study Area
- Proposed Disturbance Area
- Current Disturbance Area
- Property Boundary
- Access Road
- Watercourses
- Proposed Buildings Inset Location

**FIGURE 3.1**

Proposed Building Locations

**Image source:** Google Earth (2022) **Data source:** NSW DSFI (2020)

## 3.3 Operations

### 3.3.1 Production Rate

CSG proposes to increase production at the Quarry to a maximum of 200,000 tpa. At this maximum production rate, it is expected that all the screened material will be supplied to the civil construction, commercial landscaping and pre-mixed concrete sectors in the QPRC LGA, the South Coast and ACT. This maximum production rate is expected to coincide with the demand increase for high-quality sand and gravel, whereby CSG will progressively increase production to a maximum of 200,00 tpa.

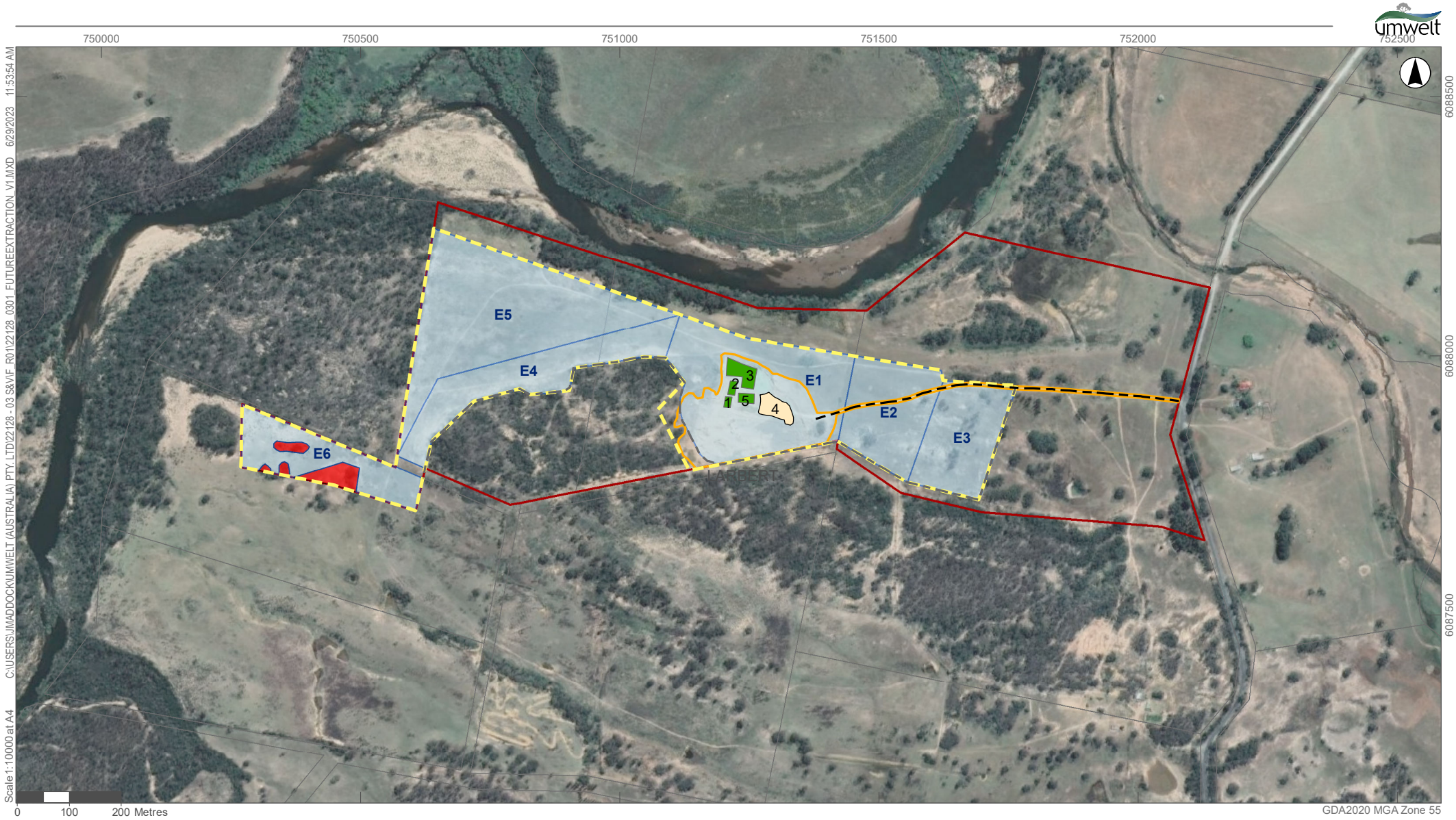
Sand and gravel production rates for the proposed Project will vary on a daily basis to reflect demand and is proposed to have an average rate of 400 tpd, up to a maximum 1,000 tpd.

### 3.3.2 Extractions

Extraction would expand from the current extraction area, as a series of defined extraction cells with each cell developed as follows:

- A layer of topsoil (up to 0.3 m) will be stripped by excavator and stockpiled for later rehabilitation.
- The sand and gravel will then be extracted by excavator to a depth of approximately 5 m. No drill and blast techniques will be used for the extraction of sand and gravel.
- The extracted material would be transferred either by front-end loader or haul truck (dependant on distance from the plant) to stockpile adjacent to the wet screening operations.

Select areas of the extraction area would be excavated greater than 5 m to intercept local groundwater. This groundwater will be used as the primary source of water for washing the silt and finer materials from the sand and gravel (refer to **Section 3.4**). Figure 3.2 below displays the future extraction area sequencing for the proposed Project across the life of the mine.




## Legend

- Study Area
- Current Disturbance Area
- Proposed Disturbance Area
- Property Boundaries
- Access Road
- Internal Access Road
- Avoidance Areas
- Extraction Blocks

**Water Management Ponds**

- Existing
- Future

**FIGURE 3.2**

Future Extraction Map

**Image source:** Google Earth (2022) **Data source:** NSW DSFI (2020)

### 3.3.3 Overburden

Additional overburden produced by the Project expansion will be used for bund construction and within any site rehabilitation works. Sufficient capacity exists within the Site to accommodate the additional overburden produced as part of the Project.

### 3.3.4 Drill and Blast Operations

Drill and blast operations will not take place within the Project. The proposed Project will continue the currently approved process of extracting sand and gravel by excavator.

## 3.4 Processing Operations

The Project proposes little change to the existing process of sand and gravel extraction. The changes being an increase in the quantity of sand and gravel extracted from the Quarry to meet current demands, and later changes in the utilities used for the process of sand and gravel.

Located within the existing extraction area, CSG maintains a wet screening/sand washing plant to separate silt and finer materials from the sand and gravel.

From the extraction area of the Quarry, raw sand and gravel is collected by a 25-tonne excavator and is transferred by a front-end loader to be stockpiled near the washing plant. From stockpile, the raw material is fed to a hopper with a screen to remove any sticks or larger rocks. The screened sand is transferred to a wash tank where water is added to remove the finer particles from coarser sand and gravel. Through gravity, the heavier sands and gravel are separated and stockpiled in preparation for sale.

As is current practice, the silt containing water is pumped from the top of the wash tank to a sediment pond where the sediment and silt is allowed to settle. The water is then recycled by pumping back to the wet screening plant. The silt is then dried and mixed with topsoil for use in either rehabilitation works or cell bunding.

No modifications to the existing washing plant are proposed; however, additions and modifications may be made over time to accommodate increased production and customer specifications for sand and gravel products. Furthermore, as the extraction area moves further from the wet screening operations, a haul truck will be introduced to transfer the raw sand and gravel from the extraction cell to stockpile.

To accommodate the increase in production of screened and washed sand and gravel, the existing washing plant will be upgraded to a larger washing plant when required.

## 3.5 Water Management System

The proposed Water Management System (WMS) for the Project has been designed to exclude run-on from areas external to the pit, contain rainfall runoff within the Project WMS and consists of the following key components:

- A clean water diversion drain will be located on the southern boundary of the Quarry will direct upslope surface runoff to the east and west, where it will flow towards the Shoalhaven River.
- The Silt Pond which receives surplus water from the sand/gravel washing plant and direct rainfall. In the event that inflows exceed the Silt Pond capacity, the Silt Pond will spill to the Clean Water Pond.

- The existing Clean Water Pond (with a floor level in the groundwater table) which receives seepage inflows from the Silt Pond, groundwater, direct rainfall and surface facilities runoff. The sand/gravel washing plant is supplied with water from the Clean Water Pond and also loses water via seepage to the groundwater table.
- The Pit (with a floor level above the groundwater table) which receives inflows from rainfall runoff will typically be allowed to infiltrate into the highly permeable sand/gravel alluvium. Runoff captured in the Pit will be used to supplement operational demands if required.

All rainfall runoff on disturbed areas of the operating Quarry will be contained within the WMS. A Water Management System Plan can be viewed in *Figure 3.1* of **Appendix H**. No surplus water will require off-site controlled discharges due to the highly permeable nature of the site soils. It is understood that for the existing operation (that does not presently direct runoff from undisturbed catchments) there has never been an uncontrolled discharge from the existing Quarry WMS, including for a period of two consecutive years with rainfall exceeding the 90th percentile in 2021 (1128 mm) and 2022 (1067 mm).

### 3.5.1 Water Requirements

The proposed Project is anticipated to require a maximum Clean Water Pond groundwater extraction of 18.8 ML/year, with an average extraction rate of 8.9 ML/year. This groundwater extraction is to be used for sand and gravel extraction operations within the Project involving screening (washing) of these materials and dust suppression across the Site. Water requirements for the proposed Project are listed in the Water Balance Model of the Surface Water Impact Assessment (refer to *Section 4.0* of **Appendix H** for further information).

### 3.5.2 Water Sources

Water sources to be utilised within the Project area involve direct rainfall on water storages and WMS catchment runoff, and groundwater seepage into the Clean Water Pond.

### 3.5.3 Erosion and Sediment Control

During all phases of the Project erosion and sediment controls will be established in general accordance with *Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom, 2004) and Volume 2E: Mines and quarries* (Department of Environment and Climate Change, 2008). Should the Project be approved, a detailed soil and water management plan (SWMP) will be prepared by a suitably qualified person to facilitate implementation of best practice erosion and sediment controls during all phases of the project.

CSG has committed to manage water in and around the extraction area as follows:

- Bunding placed around the extraction area to divert surface water and minimise the volume that may enter the extraction area during heavy rain events.
- Excavation works are conducted in dry weather to avoid the deterioration of vehicular tracks on the site.

### 3.5.4 Groundwater Management

A groundwater impact assessment was completed by Ground Doctor in January 2023 (Ground Doctor, 2023). It determined that the proposed development would intersect water within an alluvial aquifer and therefore would be an aquifer interference activity. Potential impacts associated with the proposed development would not exceed the "minimum impact considerations" outlined in the NSW Aquifer Interference Policy (NSW DPI, 2012) and therefore groundwater impacts associated with the project are acceptable.

Potential risks to water quality can be managed by implementing appropriate procedures for storage and use of chemicals, refuelling and maintenance of plant and machinery, and implementing appropriate spill response plans, all of which CSG has committed to undertaking. CSG has also committed to water management techniques outlined in **Section 3.5.4**. Further information regarding groundwater impacts from the Project can be found in **Section 5.5**.

## 3.6 Waste Management System

Limited waste will be generated from the Project. Overburden material produced due to the expansion of the Quarry footprint will be used for bund construction and within the site rehabilitation works. Sufficient capacity exists within the site to accommodate the additional overburden produced as part of the Project.

Waste material from screening including small volumes of clay, sticks and organic matter will be incorporated into overburden stockpiles for later use in rehabilitation works and cell bunding. Silt from the settlement pond will also be incorporated into the overburden stockpiles.

## 3.7 Site Access and Transportation

No change to site access is proposed and will remain via the Site Access Road on Lot 330 and 24 of DP 755915 (refer to **Figure 1.2**). Light vehicles and general deliveries will follow the Access Road and travel to the Site carpark and offices located on the east side of the currently approved extraction area.

Heavy vehicles accepting washed sand and gravel will leave the extraction area following the Site Access Road until they reach the intersection of Larbert Road / Access Road. A right turn will be made on Larbert Road and heavy vehicles will travel along this road until they reach the intersection of Kings Highway / Larbert Road. Heavy vehicles will travel on Kings Highway to reach their destination.

## 3.8 Utilities and Services

The Project would utilise a demountable office/amenity building. The demountable building is planned to be powered by a small diesel genset and/or solar panels, and to be installed after the approval of the proposed Project. A rainwater tank for additional potable water supply and a pump-out septic system are planned to be installed onsite. A parking area for light vehicles will also be utilised and will be designed adjacent to the demountable office.

## 3.9 Hours of Operation

The operational hours of the Project are not proposed to change from what is currently approved for Larbert Quarry and is shown in **Table 3.3**.

**Table 3.3 Proposed Hours of Operation**

| Activity | Permissible Hours |
|---|---|
| **All activities** | • Monday to Friday: 6:00 am–6:00 pm.<br>• Saturdays: 7:00 am–2:00 pm.<br>• Sundays: non-operational.<br>• Public holidays: non-operational. |

## 3.10 Employment and Economic Contribution

### 3.10.1 Employment

The Proponent anticipates that three–four employees will be employed full-time at the Quarry. This is an increase to the current approved operations of one – two full time equivalent employees.

### 3.10.2 Economic Contribution

The economic benefits of the Project will be substantially increased, due to extended employment and increased production. An initial investment of up to $500,000 will be made into mobile equipment and approximately $400,000 will be invested into infrastructure and facilities onsite. Total wages are expected to be approximately $270,000 per year. Parts, equipment, maintenance and servicing is intended to be sourced from nearest service centres of Braidwood and Queanbeyan where available.

In addition, the Project would contribute to local, regional, and State economies by providing:

- competitively priced sand and gravel products to local and regional development
- high quality source of sand and gravel products for commercial and retail customers throughout the QPRC LGA, the ACT and the South Coast of NSW.

The Project would also create economic flow on effects through business and employee expenditure on goods and services in the local community.

## 3.11 Rehabilitation

### 3.11.1 Final Land Use Objectives

The Project Site is currently zoned as RU1 – Primary Production under the Palerang Local Environment Plan (2014). RU1 zoning permits extractive industries with consent. The life of the Project is subject to ongoing market demand for sand and gravel. If the Project Site is no longer required for operational purposes, the final land use in the disturbance area would be decommissioned to be consistent with current land use according to the Palerang LEP (2014) – open pasture suitable for grazing (cattle).

### 3.11.2 Final Landform

If retained for future agricultural (extractive) land use, no further modifications to the landform would be made, with any extractive works subject to the requirements of the subsequent user.

During excavation, topsoil (approximately 0.3 m) will be stripped by excavator and stockpiled on site for later use in rehabilitation. As detailed further in **Section 5.4.3.2**, stockpile management will include for seeding as a control for erosion, which will also provide stability of stockpiled materials, whether topsoil or overburden. Progressive rehabilitation techniques (i.e., reshaping, topsoil, vegetation) is planned to be undertaken as soon as practicable after excavation of a terminal face is complete.

The final landform remains to be defined and will be dependent on confirmation of the final extraction area. The objectives for the final landform are to be:

- Safe.
- Geotechnically stable and non-polluting.
- Battered to be consistent with the surrounding topography, with a natural rill angle +10 % for slope stability (likely 1 in 3 for rehabilitation).

### 3.11.3 Rehabilitation Procedures

In the event that future use of the land for extractive purpose is not considered suitable, the Project Site would be returned to an agricultural land use. Rehabilitation would therefore involve the following:

**Profiling and Shaping Activities**

Extraction area of the Project Site would be dozed with overburden material used as a fill material to create a gentle, southerly sloping landform.

Terminal extraction faces will be shaped and battered at a 3:1 ratio to allow for seeding/planting. A front-end loader and/or excavator would be used to shape this material such that water drains towards the extraction area batter. Drainage swales will also be constructed to mitigate erosion on the final landform of the Site.

**Soil Replacement**

Once the landform is shaped and profiled, previously stockpiled soil would be spread to a depth of approximately 0.3 m.

The front-end loader would be used to transfer the topsoil and roughly spread the soil to the required depth. Once spread, an attempt would be made to minimise vehicular traffic over this area.

**Revegetation**

Once the soil has been spread, these areas would be seeded with a native pasture mix. Fertiliser and water would be applied over the reseeded areas as necessary, and a weed control program would be undertaken in conjunction with other property activities.

## 3.12 Need for the Project

The Project will provide a source of essential high-quality sand and gravel to meet the strong local, regional and national demand associated with public infrastructure, construction projects and commercial landscaping.

The Project will provide significant economic benefits to the local area and region by providing:

- competitively priced sand and gravel products to local and regional developments
- a high-quality source of sand and gravel products for commercial and retail customers throughout the QPRC LGA, the ACT and the South Coast of NSW.

The Project would also create economic flow on effects through business and employee expenditure on goods and services in the local community.

## 3.13 Alternatives Considered

In assessing the feasibility of the proposed Project, CSG considered alternatives to the proposed development. These included:

- Do nothing.

The alternative of not proceeding with the proposed Project was considered; however, this option is not considered appropriate as it is considered that the environmental and social impacts of the proposed Project can be effectively managed and minimised through appropriate environmental controls. The local and regional demand for sand and gravel would also continue to be high if this 'do nothing' approach were undertaken.

# 4.0 Issue Identification and Prioritisation

## 4.1 Issue Identification

### 4.1.1 Approach

In order to undertake a comprehensive assessment of the environmental impacts arising from the proposed modification, appropriate emphasis needs to be placed on those issues likely to be of greatest significance to the local environment, neighbouring landowners and residents, and the local and broader community. To ensure this has occurred, the following has been undertaken to identify relevant environmental issues for assessment:

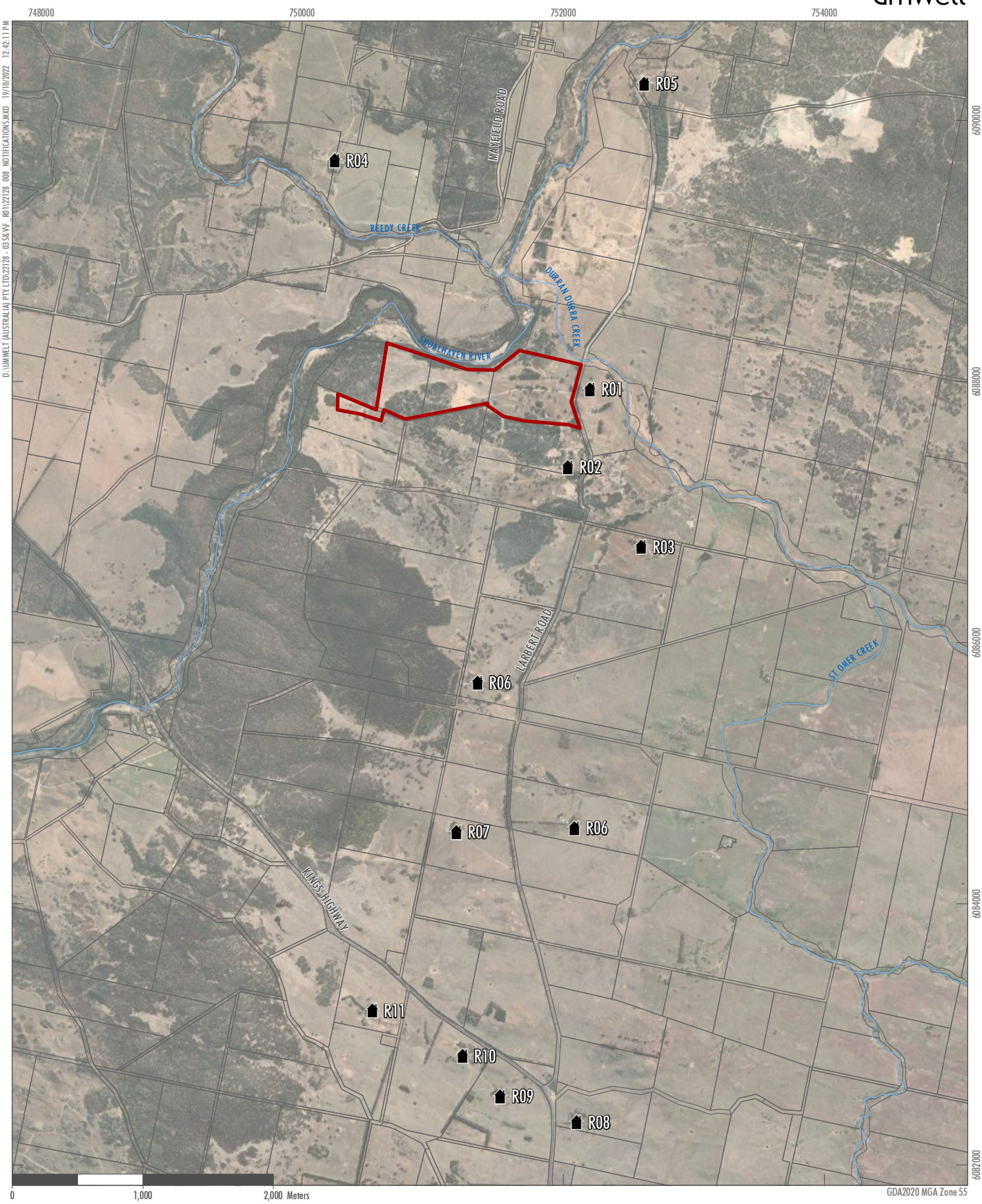
- a program of community and government agency consultation
- a review of environmental planning documentation
- a review of environmental performance.

### 4.1.2 Stakeholder Engagement

CSG engaged with relevant community members that may be affected by the Proposed Project in the form of a Community Information Sheet. Residences engaged by CSG are displayed in Figure 4.1. Responses from the contacted local residences to the proposed Project are listed below in **Table 4.1**.

**Table 4.1 Community Information Sheet Responses**

| Local Residence | Response to proposed Project |
|---|---|
| **R1** | Approval of Project |
| **R2** | Approval of Project |
| **R3** | No response |
| **R4** | No response |
| **R5** | No response |
| **R6 (west of Larbert Rd)** | No response |
| **R6 (east of Larbert Rd)** | Approval of Project |
| **R7** | Approval of Project |
| **R8** | No response |
| **R9** | No response |
| **R10** | No response |
| **R11** | No response |




Legend

- Study Area
- Lot Boundaries
- Watercourses
- Dwelling Location

## Community Notification Locations

Image source: ESRI Basemap (2022) Data source: NSW DSFI (2020)

### 4.1.3 Strategic and Statutory Context

This section details the statutory context for the Project and discusses the application of these planning provisions to the Project.

#### 4.1.3.1 Commonwealth Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) prescribes the Commonwealth's role in the environmental assessment of impact, management, and protection of areas of national significance and biodiversity conservation. The EPBC Act is administered by Department of Climate Change, Energy, the Environment and Water.

Under the EPBC Act, the approval of the Commonwealth Minister for the Environment is required for any action that may have a significant impact on matters of prescribed national environmental significance (MNES). The MNES are identified as:

- World Heritage properties.
- National heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Threatened species and communities listed under the EPBC Act.
- Migratory species listed under the EPBC Act.
- Nuclear actions.
- Marine areas or reserves.
- A water resource, in relation to coal seam gas development and large coal mining development.

The Project does not currently operate under a Commonwealth EPBC Act approval and no aspect of the existing operations have been referred.

There are no proposed changes to operations of the Project which would result in a significant impact on MNES. As such, it is considered that the Project does not require referral to the Minister under the EPBC Act.

#### 4.1.3.2 NSW Legislation and Policies

**Environmental Planning and Assessment Act 1979 (EP&A Act)**

The EP&A Act is the primary legislation governing environmental planning and assessment for NSW. The objectives of the EP&A Act relevant to the Proposed Modification encourage:

- the proper management, development and conservation of natural and artificial resources
- the promotion and co-ordination of the orderly and economic use and development of land
- the protection of the environment
- ecologically sustainable development.

DA 2014.148 was originally approved by the former Palerang Council (now the QPRC) under Section 81(1)(a) of the EP&A Act on 23 December 2014 and is classified as non-designated development. To obtain approval for the extraction area extension, CSG has chosen to apply for a new designated development consent under Section 4.15 of the EP&A Act.

In determining a development application, the consent authority must take into consideration the matters referred to in section 4.15(1). These matters for consideration and the sections where they are addressed in this EIS are provided in **Table 4.2**.

**Table 4.2 Section 4.15(1) Matters for Consideration**

| Matters for Consideration | Relevant EIS Section |
|---|---|
| (a) the provisions of—<br>(i) any environmental planning instrument | **Section 4.1.3** |
| (ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and | **N/R** |
| (iii) any development control plan | **Section 4.1.3.4** |
| (iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4 | **Not Applicable** |
| (iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph) | **Not Applicable** |
| (v) repealed | **Not Applicable** |
| (b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality | **Section 5.0** |
| (c) the suitability of the site for the development | **Section 2.0** and **Section 6.2** |
| (d) any submissions made in accordance with this Act or the regulations | **Not Applicable** |
| (e) the public interest | **Section 6.2** |

The objectives of the EP&A Act relevant to the Project are as follows:

- Facilitate ecologically sustainable development (ESD).
- Consideration of the principles of ecologically sustainable development has been addressed in **Section 6.5**.
- Promote and co-ordinate the orderly and economic use and development of land.
- The Project provides for the continuation and improved efficiency of a local industry supplying sand and gravel products. The Project provides an important product for local development of all kinds.
- Protect the environment including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.

- As discussed in **Section 5.6**, the Project is unlikely to result in any additional impacts to native flora and fauna, ecological communities or habitats.
- To provide public involvement and participation in the planning and assessment process.
- The local community has been consulted regarding the Project and has been given the opportunity to provide input to the EIS process. The broader public will be provided the opportunity to make a submission during the exhibition process. Further details of the consultation process are provided in **Section 4.1.2**.

On the basis of the above, it is considered that the Project meets the relevant objectives of the EP&A Act.

**Protection of the Environment Operations Act 1997**

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the EPA and provides licences relating to air, water, and noise pollution, and waste management. An Environmental Protection Licence (EPL) will be required for the operation of the Project, given that it will now exceed the threshold for a sand extraction activity.

Prior to determination of the development application, General Terms of Approval to be issued by the EPA are required which will nominate the conditional requirements under which an EPL may be granted following the issue of development consent.

**Water Management Act 2000**

The *Water Management Act 2000* (WM Act) regulates the taking, interception, storage and use of surface water and groundwater within areas subject to Water Sharing Plans (WSPs).

Part 2 of the WM Act applies to the requirement to obtain a licence for the 'taking of water' from a water source. An access licence entitles its holder to specified shares in the available water within a specified water management area or from a specified water source. It enables the licence holder to take water from the environment in accordance with specified rates and conditions under the terms of the licence. The licensing provisions apply to areas of NSW that have a water sharing plan (WSP).

The Quarry will require a Water Access Licence (WAL) to use groundwater. The Proponent will commence the process to obtain a WAL and groundwater allocation.

**Other NSW Legislation**

A summary of the other State environmental and planning legislation potentially relevant to the Project is provided in **Table 4.3** below.

**Table 4.3 Summary of Other NSW Legislation**

| Legislation | Applicability to the Project |
|---|---|
| ***Biodiversity Conservation Act 2016* (BC Act)** | The general purpose of the BC Act is to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development (ESD).<br>Impacts on biodiversity were considered in this EIS in accordance with the *Biodiversity Assessment Methodology (BAM)* and can be found in **Section 5.6**. No further disturbance to biodiversity is proposed and as such no further impacts on biodiversity require assessment. |

| Legislation | Applicability to the Project |
|---|---|
| ***Crown Land Management Act 2016* (CLM Act)** | The CLM Act provides for a consistent approach to management, facilitation of community involvement and future use of Crown land, with consideration of the environmental, social, cultural heritage and economic factors and the spiritual, social and cultural importance of Crown land to Aboriginal people.<br>The Project does not require access to any Crown lands and therefore no further assessment is required. |
| ***Roads Act 1993* (Roads Act)** | The Roads Act sets out the rights of the public, adjoining landowners, opening and closing, classification and the distribution of function in relation to public roads.<br>No changes are proposed to be made to the existing public road network as part of the Project, and as such, no further approval under the Roads Act is required. |
| ***Environmentally Hazardous Chemicals Act* 1985** | Under the *Environmentally Hazardous Chemicals Act 1985* a licence is required for any storage, transport or use of prescribed chemicals. Should such a licence be required under this Act during the life of the Project, CSG or the relevant contractor will obtain a licence prior to the storage, transport or use of prescribed chemicals. |
| ***National Parks and Wildlife Act 1974* (NPW Act)** | The object of the NPW Act relate to conserving their State's natural and cultural heritage; fostering public appreciation, understanding and enjoyment of their State's natural and cultural heritage; and managing any lands reserved for the purposes of conserving and fostering public appreciation and enjoyment of the State's natural and/or cultural heritage.<br>Under section 86 of the NPW Act, it is an offence to harm an Aboriginal object, except where authorised by an Aboriginal heritage impact permit issues under section 90 of the Act.<br>Impacts on Aboriginal cultural heritage was assessed for this EIS and an Aboriginal Heritage Impact Permit will be obtained to enable the salvage and relocation of any artefacts identified within the Project Area (See **Section 5.7** for the Aboriginal Cultural Heritage Assessment).<br>No further disturbance outside the proposed Project Area is proposed and therefore no further impact on Aboriginal cultural heritage is anticipated. |
| ***Heritage Act 1977* (Heritage Act)** | The Heritage Act provides for the identification, registration and protection of items of State heritage significance.<br>Under Part 4 of the Heritage Act, approval is required to undertake a range of activities relating to items listed on the State Heritage Register. Under Part 6, an excavation permit is required for any activity that is likely to disturb a relic of State or local heritage significance.<br>Impacts on non-Aboriginal cultural heritage were assessed for this EIS and can be found in **Section 5.8**. |
| ***Fisheries Management Act 1994*** | The Project will not impact fish habitat and no approvals will be required under this Act. |

#### 4.1.3.3 State Environmental Planning Instruments

State Environmental Planning Policies (SEPPs) are environmental planning instruments created by the NSW government. The SEPPs that are potentially relevant to the Project are discussed below.

**State Environmental Planning Policy (Transport and Infrastructure) 2021**

Since 1 March 2022, the State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP) regulates the permissibility and assessment requirements for key infrastructure and service facilities across the State. The T&I SEPP provides specific development controls for specific infrastructure or infrastructure supporting development or facilities to ensure a consistent and sustainable approach to infrastructure and service facilities across NSW.

While no specific development controls are nominated for extractive industries under Part 2.3 of the T&I SEPP, Schedule 3 requires a consent authority to inform and take into consideration any issues raised by Transport for New South Wales (TfNSW) for any developments listed in Schedule 3 of the SEPP. The consent authority is also required to consider any accessibility, road safety, parking and transport efficiency issues caused by the development.

Under Schedule 3 of the T&I SEPP, industrial development greater than 20,000 $m^2$ in area with access to any road requires referral to Roads and Maritime. Schedule 3 also requires industrial development greater than 5,000 $m^2$ with access to a classified road or to a road that connects to a classified road (if access is within 90 m of the connection, measured along alignment of connecting road) to be referred to the Roads and Maritime.

The Quarry is Located on a site >20,000 $m^2$ with access to the site from a classified road, and as such, it is expected the Proposed Modification will be referred to TfNSW in accordance with the T&I SEPP.

**State Environmental Planning Policy (Planning Systems) 2021**

Since 1 March 2022, State Environmental Planning Policy (Planning Systems) 2021 (Planning SEPP) replaced SEPP (State and Regional Development) 2011, SEPP (Aboriginal Land) 2019, and SEPP (Concurrences and Consents) 2018. 'Chapter 2 – State and regional development' contains planning provisions from the State and Regional Development SEPP and identifies state or regionally significant development, state-significant infrastructure, and critical state-significant infrastructure.

As a designated development for the purpose of extractive industry, the development would be categorised as Regional Development. As Regional Development, the Proposed Modification will be determined by a Regional Planning Panel of the Planning Panels Secretariat of the DPE, in this case, the Southern Regional Planning Panel.

**State Environmental Planning Policy (Resilience and Hazards) 2021**

Chapter 3 of the State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP) replaces the former State Environmental Planning Policy No. 33 (SEPP 33) and provides for the identification, effective control and assessment of hazardous and offensive industry.

Hazardous and offensive industries, and potentially hazardous and offensive industries, relate to industries that, without the implementation of appropriate impact minimization measures, would (or potentially would) pose a significant risk in relation to the locality, to human health, life or property, or to the biophysical environment.

In accordance with the R&H SEPP, the hazardous materials to be held or used at the Quarry are required to be identified and classified in accordance with the risk screening method contained within the *Appendix 4* of *Applying SEPP 33 January 2011* (DoP, 2011). Hazardous materials are defined within that document as substances falling within the classification of the Australian Code for the Transportation of Dangerous Goods by Road and Rail (Dangerous Goods Code) (Department of Infrastructure, Transport, Regional Development and Local Government, 2009).

The Proposed Modification would not result in any modifications to the types, volumes, storage or use of hazardous or dangerous goods within the Quarry Site. These operations have been determined to not be a hazardous or offensive development. No further consideration of Chapter 3 of the R&H SEPP is required.

Chapter 4 of the R&H SEPP replaces the former State Environmental Planning Policy No. 55 (SEPP 55) and requires the consent authority to consider whether the land on which the proposed development will be undertaken is contaminated and if it is suitable for the proposed use. A search of the EPA contaminated land record was undertaken for the Quarry Site and surrounding areas. No records of land contamination were identified within or in proximity to the Quarry. No potentially contaminating historical land uses are known to have been undertaken on the site and no noticeable evidence of contamination is present. The site is therefore considered suitable for the continued use as a Quarry.

**State Environmental Planning Policy (Biodiversity and Conservation) 2021**

Commencing on 1 March 2022, the State Environmental Planning Policy (Biodiversity and Conservation) 2021 (B&C SEPP), Chapter 2 aims:

- to protect the biodiversity values of trees and other vegetation in non-rural areas of the State
- to preserve the amenity of non-rural areas of the State through the preservation of trees and other vegetation.

The development site of the Project has been designed to impact the disturbed portion of the immediate landscape, largely devoid of remnant vegetation, trees or suitable habitat for threatened species. Despite the low occurrence of native vegetation, the Proponent has sought to further minimise impacts to biodiversity values. Most areas of remnant vegetation will be avoided with only 0.1 hectares of treed areas removed. An impact assessment of the Project on Biodiversity values can be found in **Section 5.6** and **Appendix J**.

**State Environmental Planning Policy (Resources and Energy) 2021**

The Resources and Energy SEPP regulates the permissibility and assessment requirements for mining, petroleum production and extractive industries and related development. The SEPP outlines where various activities are permissible both with and without development consent. The SEPP also defines mining, petroleum production and extractive industries developments that are prohibited, exempt or complying developments.

**Table 4.2** presents a summary of the matters that the Minister or their delegate needs to consider when assessing a new or modified Proposed Modification (Part 2.3 – Clauses 2.16 to 2.23).

**Table 4.4 Application of the Extractive Industries SEPP**

| Clause | Description |
|---|---|
| **2.16 non-discretionary development standards for mining** | The object of this clause is to identify development standards on particular matters relating to mining that, if complied with, prevents the consent authority from requiring more onerous standards for those matters (but that does not prevent the consent authority granting consent even though any such standard is not complied with). |
| | The matters set out in this clause are identified as non-discretionary development standards for the purposes of Section 4.15 (2) and (3) of the Act in relation to the carrying out of development for the purposes of mining.<br>Note: The development standards do not prevent a consent authority from imposing conditions to regulate project-related noise, air quality, blasting or ground vibration impacts that are not the subject of the development standards. |
| | *Cumulative noise level.*<br>The development does not result in a cumulative amenity noise level greater than the acceptable noise levels, as determined in accordance with *Table 2.2* of the Noise Policy for Industry, for residences that are private dwellings. |
| | *Cumulative air quality level.*<br>The development does not result in a cumulative annual average level greater than 25 µg/$m^3$ of $PM_{10}$ or 8 µg/$m^3$ of $PM_{2.5}$ for private dwellings. |
| | *Airblast overpressure.*<br>Airblast overpressure caused by the development does not exceed:<br>• 120 dB (Lin Peak) at any time, and<br>• 115 dB (Lin Peak) for more than 5% of the total number of blasts over any period of 12 months,<br>measured at any private dwelling or sensitive receiver.<br>Drill and blast operations are not being undertaken in the proposed Project. |
| | *Ground vibration.*<br>Ground vibration caused by the development does not exceed:<br>• 10 mm/sec (peak particle velocity) at any time, and<br>• 5 mm/sec (peak particle velocity) for more than 5% of the total number of blasts over any period of 12 months,<br>measured at any private dwelling or sensitive receiver.<br>Drill and blast operations are not being undertaken in the proposed Project. |

| Clause | Description |
|---|---|
| | *Aquifer interference.*<br>Any interference with an aquifer caused by the development does not exceed the respective water table, water pressure and water quality requirements specified for item 1 in columns 2, 3 and 4 of *Table 1* of the Aquifer Interference Policy for each relevant water source listed in column 1 of that Table.<br>Note: The taking of water from all water sources must be authorised by way of licences or exemptions under the relevant water legislation. |
| **2.17 Compatibility with other land uses** | Consider:<br>• the existing uses and approved uses of land in the vicinity of the development<br>• the potential impact on the preferred land uses (as considered by the consent authority) in the vicinity of the development<br>• any ways in which the development may be incompatible with any of those existing, approved or preferred land uses.<br>Evaluate and compare the respective public benefits of the development and the above land uses.<br>Evaluate any measures proposed by the applicant to avoid or minimise any incompatibility. |
| **2.18 Consideration of voluntary land acquisition and mitigation policy** | Consideration is given to any applicable provisions of the voluntary land acquisition and mitigation policy and, in particular:<br>• any applicable provisions of the policy for the mitigation or avoidance of noise or particulate matter impacts outside the land on which the development is to be carried out, and<br>any applicable provisions of the policy relating to the developer making an offer to acquire land affected by those impacts. |
| **2.19 Compatibility with mining, petroleum production or extractive industry** | Consideration is given to whether the development is likely to have a significant impact on current or future mining, petroleum production or extractive industry and ways in which the development may be incompatible.<br>Measures taken by CSG to avoid or minimise any incompatibility are considered.<br>The public benefits of the development and any existing or approved mining, petroleum production or extractive industry must be evaluated and compared. |

| Clause | Description |
|---|---|
| **2.20 Natural resource and environmental management** | Consideration is given to ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure:<br>• impacts on significant water resources, including surface and groundwater resources, are avoided or minimised<br>• impacts on threatened species and biodiversity are avoided or minimised<br>• greenhouse gas emissions are minimised and an assessment of the greenhouse gas emissions (including downstream emissions) of the development is provided. |
| **2.21 Resource recovery** | The efficiency of resource recovery, including the reuse or recycling of material and minimisation of the creation of waste, is considered. |
| **2.22 Transport** | The following transport related issued are considered.<br>• the transport of some or all of the materials from the site by means other than public road<br>• limitation of the number of truck movements that occur on roads within residential areas or roads near to schools<br>• the preparation of a code of conduct for the transport of materials on public roads. |
| **2.23 Rehabilitation** | The rehabilitation of the land affected by the development is considered including:<br>• the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated<br>• the appropriate management of development generated waste<br>• remediation of any soil contaminated by the development<br>• the steps to be taken to ensure that the state of the land does not jeopardize public safety, while being rehabilitated or at the completion of rehabilitation. |

### 4.1.3.4 Local Environmental Plans

#### QPRC Local Environmental Plan 2022

The Project is located on land zoned as RU1 – Primary Production under the QPRC Local Environmental Plan 2022 (LEP 2022). Extractive industries are permitted with development consent on land zones RU1 – Primary Production.

The Project is consistent with the zoned land and is considered permissible development under the QPRC LEP 2022.

#### Palerang Development Control Plan 2013

The Palerang DCP applies to the Project. The purpose of the DCP is to support the broad objectives of the QPRC LEP 2022 by providing clear and concise development guidelines for various forms of development. Section C25 of the DCP identifies Rural industry development controls which apply specifically to RU1 Primary Production zones. An assessment of the Project against the best practice controls nominated in *Section C25* of the DCP is provided in **Table 4.5**.

**Table 4.5 DCP 2015 – Best Practice Controls for RU1 Primary Production zones**

| Performance Criteria for RU1 – Primary Production zones | Proposed Development Satisfies Control or Justification for non-compliance |
|---|---|
| **Element 1: Building Design** | |
| Buildings are to be designed and sited so as to not to have a significant impact on the rural landscape, amenity and agricultural productivity of rural areas. | Compliant – the Quarry does not front a local road. |
| Building colours are to be neutral or earth tones of non-reflective material. | Compliant – buildings are set-back to meet requirements. |
| Outdoor storage yards are to be screened from roadways and neighbouring dwellings. | Compliant – buildings are set-back to meet requirements. |
| **Element 2: Setbacks** | |
| Rural industry buildings and storage areas require a minimum:<br>• 50 m setback from primary road frontage<br>• 25 m side and rear setback<br>• 100 m setback from any watercourse<br>• 100 m setback from National Park. | Compliant – buildings façades are neutral in colour and relate to the function of the building. No specific architectural design features are proposed given the Quarry does not front a local road. |

## 4.1.4 Environmental Performance

CSG has not received any complaints with respect to operations of the Quarry, transport of quarrying materials or rehabilitation works on site since commencement of operations. There have been no reported discharges of water from the Quarry. Should the Project be approved, a detailed Operations Environmental Management Plan (OEMP) will be prepared by a suitably qualified person to facilitate implementation of best practise for operational activities during all phases of the Project.

## 4.2 Issue Prioritisation

For each of the environmental issues identified (refer to **Section 4.1**), a preliminary environmental evaluation was undertaken for the Proposed Project to identify, from a technical perspective, the key environmental and community issues of relevance and the level of assessment required as part of the environmental assessment process. This analysis was undertaken in conjunction with a review of the currently approved operations to determine whether the Proposed Project would result in any material change to the impacts assessed originally (and therefore warrant further assessment).

The method used for the environmental risk analysis encompassed the following key steps:

- Identify each element of the Proposed Project.
- Identify the environmental and community aspects and potential impacts associated with each element of the Proposed Project in the context of the existing approved operations (that is, whether or not there is likely to be a change to the impacts approved as part of the existing consent for the Quarry).
- Assess the potential scale of the modified impact to determine the key issues requiring further assessment and the level of assessment required.
- The outcomes of the preliminary environmental risk analysis are detailed in **Table 4.6**.

**Table 4.6 Potential Environmental Impact Analysis**

| Environmental Issue | Potential Effect | Priority/Coverage | Mitigation |
|---|---|---|---|
| **Air Emissions / Odour / Greenhouse Gas and Energy** | The Proposed Modification has the potential to result in changes to air emissions due to additional processing activities (sand and gravel extraction).<br>The increase in extractive operations could result in an increase particulate matter levels and greenhouse gas emissions. | High Priority.<br>An Air Quality Impact Assessment has been undertaken by Zephyr Environmental to assess the predicted air emissions against relevant criteria (refer to **Section 5.1** and **Appendix E**). | Management measures outlined in **Section 5.1.5** will mitigate any adverse environmental impacts relating to air emissions. |
| **Noise** | This Project will not undertake blasting activities so vibration levels will not be impacted.<br>Noise is expected to be predominantly impacted by the increase in vehicular traffic and machinery involved with the expansion and increased extraction rate. | High Priority.<br>A Noise Impact Assessment has been undertaken by MAC to assess the predicted noise emissions against relevant criteria (refer to **Section 5.2** and **Appendix F**). | Management measures outlined in **Section 5.2.5** will mitigate any adverse environmental impacts. |
| **Traffic and Transport** | Increase transport associated with the Project has the potential to impact local traffic and a traffic impact assessment is required. | High Priority.<br>A Traffic Impact Assessment has been completed by Indesco (refer to **Section 5.1** and **Appendix G**). | Management measures for Traffic and Transport impacts outlined in **Section 5.3.5** will mitigate any adverse environmental impacts. |
| **Water Resources** | Effective management of water is a key consideration for the proposed Project. The Project will increase the production rate and therefore an assessment of the water requirements and potential surface water impacts has been undertaken. | Medium Priority.<br>A Surface Water Impact Assessment and a Groundwater Impact Assessment has been completed by Umwelt and Ground Doctor respectively (refer to **Section 5.4, Section 5.5, Appendix H** and **Appendix I**). | Any adverse Surface and Groundwater impacts will be mitigated by management measures outlined in **Section 5.4.3** and **Section 5.5**. |

| Environmental Issue | Potential Effect | Priority/Coverage | Mitigation |
|---|---|---|---|
| **Biodiversity** | Although areas which may contain notable native vegetation are avoided for the proposed expansion, and the disturbance footprint is predominantly limited to areas of exotic pasture, an assessment of the ecological values of the extension area is still required to determine the extent of offsetting required (if any) under the *Biodiversity Conservation Act 2016*. | Medium Priority.<br>A Biodiversity Assessment Report has been complete by AREA (refer to **Section 5.6** and **Appendix J**). | Management measure outlined in **Section 5.6.5** will mitigate any adverse environmental impacts. |
| **Aboriginal Cultural Heritage** | As the Project will involve expanding the extraction area and disturbance footprint, impacts to Aboriginal Cultural Heritage will need to be assessed to determine the extent of assessment required. | Medium Priority.<br>An Aboriginal Cultural Heritage Assessment Report has been completed by AREA (refer to **Section 5.7** and **Appendix K**). | Mitigation measures outlined in **Section 5.7.5** will mitigate any adverse environmental or social impacts. |
| **Historical Cultural Heritage** | No historical cultural heritage items have been identified within or adjoining the Project area. | Further assessment not required. | N/A |
| **Waste Management** | Additional overburden produced due to the expansion of the quarry footprint will be used for bund construction and within the site rehabilitation works. Sufficient capacity exists within the site to accommodate the additional overburden produced as part of the Project. | Further assessment not required. | N/A |
| **Land Resources** | The overall approach to rehabilitation and final landform of the Quarry will remain unchanged as described in **Section 3.11**. | Further assessment not required. | N/A |
| **Visual Amenity** | The Proposed Modification does not involve any changes which would alter the visibility of the Quarry (as approved). | Further assessment not required. | N/A |
| **Contaminated land** | A search of the NSW EPA contaminated land database identified that there are no registered contaminated sites in proximity to the Quarry. | Further assessment not required. | N/A |

| Environmental Issue | Potential Effect | Priority/Coverage | Mitigation |
|---|---|---|---|
| **Hazard and risk** | As the Project will require additional infrastructure and an increase in the disturbance area, bushfire risk and hazards will need to be assessed to determine the risk of bushfire to the proposed Project. | Medium Priority.<br>A Bushfire Risk and Hazard Assessment has been completed by Umwelt (refer to **Section 5.11** and **Appendix L**). | Mitigation measures outlined in **Section 5.11.3** will mitigate any bushfire risk or hazard. |
| **Public Infrastructure** | The Project would not result in any changes to public infrastructure, although potential impacts to the identified easement may occur (see **Figure 2.3**). | Further advice from QPRC will be taken with respect to assessment and management of the road easement which may be affected. | N/A |
| **Socio-economic** | The economic benefits of the Project will be substantially increased, due to increased employment and production. | Medium Priority.<br>The relative costs (impacts) and benefits (contributions) of the Proposed Modification are reviewed and assessed (refer to **Section 5.10**). | Management measures outlined in **Section 5.10** will mitigate any adverse social impacts. |

# 5.0 Assessment of Impacts

The order and content of the following sections is based on the issue identification and prioritisation completed for the project and described in **Section 4.2**.

## 5.1 Air Quality and Greenhouse Gas

### 5.1.1 Introduction

An assessment of the air quality and greenhouse gas impacts of the Project has been prepared by Zephyr Environmental Pty Limited (Zephyr) in general accordance with the NSW EPA A*pproved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (EPA, 2016).

### 5.1.2 Existing Environment

#### 5.1.2.1 Meteorological

Meteorological conditions are important for determining the direction and rate at which emissions from a source will disperse. The key meteorological requirements of air dispersion models are, typically, hourly records of wind speed, wind direction, temperature, and atmospheric stability.

Although there is no on-site meteorological station at the Project Site, the Bureau of Meteorology (BoM) operates an automatic weather station located at Braidwood Racecourse, approximately 10 km to the south southeast of the Project.

Annual meteorological data collected at the station from 2016 to 2021 was analysed, with 2021 used as a representative year. A summary of these results is show in **Table 5.1**.

**Table 5.1 2021 Meteorological Statistics (Representative Year 2021)**

| Statistic | 2021 |
|---|---|
| **Annual average wind speed (m/s)** | 2.3 |
| **Highest average hourly wind speed (m/s)** | 13.6 |
| **Percentage of calms (%)** | 22 % |
| **Predominant winds** | West and east |

#### 5.1.2.2 Background Air Quality

Emissions to air will occur from a variety of activities including material extraction, material handling, material transport, processing, and wind erosion of stored materials and exposed surfaces. These emissions would mainly comprise of particulate matter in the form of total suspended particulates (TSP), particulate matter with equivalent aerodynamic diameter of 10 microns or less ($PM_{10}$), particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$) and deposited dust (those particles which deposit on surfaces). There would also be relatively minor emissions from machinery exhausts such as carbon monoxide (CO), oxides of nitrogen ($NO_x$) and particulate matter.

Although there is no air quality monitoring undertaken at or directly around the Project, there a number of regional monitors operated by the DPE. Details of these monitoring locations are provided in **Table 5.2**.

**Table 5.2 Regional (Comparative) Air Quality Monitoring Stations**

| Station Location | Operated by | Purpose | Type | Pollutant(s) monitored |
|---|---|---|---|---|
| **Narrabri** | DPE | Regional air quality monitoring station | | $PM_{10}$, $PM_{2.5}$ |
| **Tamworth** | DPE | Regional air quality monitoring station | | $PM_{10}$, $PM_{2.5}$ |
| **Albury** | DPE | Regional air quality monitoring station | | $PM_{10}$, $PM_{2.5}$ |
| **Bathurst** | DPE | Regional air quality monitoring station | TEOM/BAM | $PM_{10}$, $PM_{2.5}$ |
| **Orange** | DPE | Regional air quality monitoring station | TEOM/BAM | $PM_{10}$, $PM_{2.5}$ |

*Note 1: TOEM = Tapered element oscillating microbalance, and BAM = Beta attenuation monitor.*

The results at each of the five monitors is summarised in **Table 5.3**.

**Table 5.3 $PM_{10}$ and $PM_{2.5}$ Results**

| Year | DPE Narrabri | DPE Tamworth | DPE Albury | DPE Bathurst | DPE Orange |
|---|---|---|---|---|---|
| **$PM_{10}$** | | | | | |
| 2016 | - | 15.3 | 15.1 | 13.3 | - |
| 2017 | - | 15.3 | 15.8 | 14.1 | - |
| 2018 | 14.8 | 20.1 | 19.8 | 18.8 | - |
| 2019 | 23.2 | 33.7 | 23.4 | 27.4 | 28.3 |
| 2020 | 12.4 | 16.8 | 20.1 | 17.0 | 17.9 |
| 2021 | 7.0 | 12.7 | 14.3 | 11.3 | 11.4 |
| **$PM_{2.5}$** | | | | | |
| 2016 | - | 7.8 | 7.3 | 6.1 | - |
| 2017 | 4.9 | 8.3 | 7.3 | 7 | - |
| 2018 | 7.7 | 14.4 | 10.1 | 11.3 | 15.8 |
| 2019 | 5.5 | 6.8 | 11.1 | 7.6 | 9.1 |
| 2020 | 3.2 | 5.1 | 7.3 | 5.1 | 6.6 |
| 2021 | - | 7.8 | 7.3 | 6.1 | - |

*Note: 2019 and 2020 concentrations are not considered representative due to extreme weather conditions across NSW (extreme drought and bushfire).*

A more detailed review of available monitoring data and establishment of background levels is provided by Zephyr (2022) (refer to **Appendix E**).

There is no monitoring data available for dust deposition so a conservative background assumption of 2 $g/m^2$/month has been adopted for the cumulative assessment.

## 5.1.3 Assessment Criteria

The EPA has developed assessment criteria for:

- TSP, to protect against nuisance amenity impacts.
- $PM_{10}$ and $PM_{2.5}$ to protect against health impacts.
- Deposited dust, to protect against nuisance amenity impacts.

Most of the EPA criteria are drawn from national standards for air quality set by the *National Environmental Protection Council of Australia* (NEPC) as part of the *National Environment Protection Measures* (NEPM). These criteria are outlined in **Table 5.4** and apply to existing and potential sensitive receptors such as such as residences, schools and hospitals.

**Table 5.4 NSW EPA Impact Assessment Criteria for Key Emissions**

| Pollutant | Averaging Period | Criteria | Source |
|---|---|---|---|
| **PM10** | 24-hour | 50 µg/m$^3$ | EPA (2016)/DoE (2016) |
| | Annual | 25 µg/m$^3$ | |
| **PM2.5** | 24-hour | 25 µg/m$^3$ | EPA (2016)/DoE (2016) |
| | Annual | 8 µg/m$^3$ | |
| **TSP** | Annual | 90 µg/m$^3$ | EPA (2016)/NHMRC (1996) |
| **Deposited Dust (insoluble solids)** | Annual (maximum increase) | 2 g/m$^2$/month | EPA (2016)/NERDDC (1998) |
| | Annual (maximum total) | 4 g/m$^2$/month | |

The relative change in emissions is also be considered when considering the impact of the Project on local air quality (where background levels are equal to or exceed criteria). Zephyr (2022) has adopted background concentrations of $PM_{10}$ (11.5 µg/m$^3$) and $PM_{2.5}$ (5.5 µg/m$^3$) based on a regional average for 2021 of the locations identified in **Table 5.3**. These adopted levels below the criteria shown in **Table 5.4**.

## 5.1.4 Assessment Methodology

### 5.1.4.1 Overview

The AQIA has been prepared in consideration of the NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Approved Methods) (EPA, 2016) with an emphasis on emissions of particulate matter, the key pollutant typically associated with quarrying operations. The approach included three key elements as follows:

- Identification of two representative operating scenarios (annual average production and maximum daily production) for the proposed Quarry and development of an emissions inventories for this.
- Development and running of a dispersion model based on the local terrain, meteorological conditions and proposed locations of key emission sources of the Proposed Project.
- Assessment of the predicted emission and deposition levels at sensitive receivers generated by the proposed Quarry operations (including traffic movements on the Access Road) and prediction of cumulative impacts when background air quality is accounted for.

A summary of these key components of the methodology is provided below, with a full description included in **Appendix E**.

### 5.1.4.2 Emissions Inventories

An emissions inventory has been developed for the proposed Quarry, with emission factors developed within NSW, and by the United States Environmental Protection Agency (US EPA, 1985), having been applied to estimate the amount of dust produced by each proposed activity.

**Table 5.5** presents the estimated annual TSP, $PM_{10}$ and $PM_{2.5}$ emissions (in kg/y) for the assessment scenarios.

**Table 5.5 Estimated Emissions to Air**

| Activity | Estimated annual emissions (kg/y) (annual average production | | | Estimated annual emissions (kg/y) (maximum daily production) | | |
|---|---|---|---|---|---|---|
| | TSP | $PM_{10}$ | $PM_{2.5}$ | TSP | $PM_{10}$ | $PM_{2.5}$ |
| **Stripping topsoil** | 290 | 73 | 7 | 290 | 73 | 7 |
| **Emplacing topsoil at stockpiles** | 15 | 7 | 1 | 15 | 7 | 1 |
| **Excavators on raw material** | 301 | 142 | 22 | 456 | 216 | 33 |
| **Loading material to stockpiles** | 301 | 142 | 22 | 456 | 216 | 33 |
| **Loading stockpiled material to hopper** | 301 | 142 | 22 | 456 | 216 | 33 |
| **Dry screening** | 2,500 | 860 | 57 | 3,788 | 1,303 | 86 |
| **Loading screened material to stockpiles** | 301 | 142 | 22 | 456 | 216 | 33 |
| **Loading product to trucks** | 301 | 142 | 22 | 456 | 216 | 33 |
| **Hauling product off site** | 4,603 | 1,132 | 113 | 6,974 | 1,715 | 172 |
| **Wind erosion - stockpile area** | 2,628 | 1,314 | 197 | 2,628 | 1,314 | 197 |
| **Wind erosion - exposed areas** | 13,140 | 6,570 | 986 | 13,140 | 6,570 | 986 |
| **Total** | **24,682** | **10,668** | **1,469** | **29,115** | **12,061** | **1,612** |

*Source: Adapted from Zephyr's Table 7-1 and 7-2.*

### 5.1.4.3 Dispersion Modelling

The US EPA's dispersion model AERMOD was used to predict ground-level concentrations and deposition levels due to the identified emission sources at surrounding receivers and is considered to be the most suitable model for the source types, proximity of the sensitive receivers and local topography. AERMOD is accepted by the NSW EPA and used widely in Australia.

The AERMOD system includes AERMET, used for the preparation of meteorological input files and AERMAP, used for the preparation of terrain data. As such, the dispersion modelling accounts for the local meteorology and terrain information and used PM emission estimates to predict the air quality impacts for annual average and maximum daily operations.

#### 5.1.4.4 Greenhouse Gas Assessment

Quantification of greenhouse gas (GHG) emissions has been completed in accordance with the GHG Protocol (WRI and WBCSD, 2004), Intergovernmental Panel for Climate Change (IPCC) and Australian Government GHG accounting/classification systems.

This GHG assessment is also guided by the emission estimation methodologies endorsed under the National Greenhouse and Energy Reporting Regulations 2008 (the NGER Regulations) (as amended in 2019).

The NGER Guidelines are reporting year specific, and outline calculation methods and criteria for determining GHG emissions, energy production, energy consumption and potential GHG emissions embodied in combusted fuels. This includes an assessment of *Scope 1 emissions* (on site generated emissions – fuel consumption) and *Scope 2 emissions* (off site generated emissions – purchase of electricity generated offsite).

A detailed review of the methodology used for the Greenhouse Gas Assessment can be found in Section 9 of the AQIA (refer to **Appendix E**).

### 5.1.5 Air Quality Management Measures

Given the limited dust impacts modelled, the following mitigation measures are recommended.

- Operation of water cart on the unsealed access road during conditions that enhance dust lift off.
- Dust suppression of stockpiles when required.

### 5.1.6 Impact Assessment

The cumulative concentrations of airborne particulate matter and deposited dust were predicted by Zephyr (2022) at 7 receivers surrounding the Project Site (refer to **Appendix E**). The following provides a summary of the modelling predictions and assessment of impacts.

#### 5.1.6.1 $PM_{10}$

**Table 5.6** presents the predicted annual average and 24-hour concentration of $PM_{10}$ at the 6 surrounding receivers.

**Table 5.6 Predicted $PM_{10}$ Concentrations**

| Receiver | Annual Average (µg/m³) | | | | Maximum 24-hour average (µg/m³) | | | |
|---|---|---|---|---|---|---|---|---|
| | Background | Project | Total | Criterion | Background | Project | Total | Criterion |
| R1 | 11.5 | 0.3 | 11.8 | 25 | 27.3 | 6.3 | 33.9 | 50 |
| R2 | 11.5 | 0.4 | 11.9 | | 27.3 | 5.2 | 32.5 | |
| R3 | 11.5 | 0.2 | 11.7 | | 27.3 | 1.6 | 28.9 | |
| R4 | 11.5 | 0.1 | 11.6 | | 27.3 | 1.0 | 28.3 | |
| R5 | 11.5 | 0.1 | 11.6 | | 27.3 | 1.1 | 28.4 | |
| R6 | 11.5 | < 0.1 | 11.5 | | 27.3 | 0.2 | 27.5 | |

As shown in **Table 5.6**, both annual average and 24-hour average $PM_{10}$ concentrations were predicted to remain below the EPA's adopted criterion.

### 5.1.6.2 $PM_{2.5}$

**Table 5.7** presents the predicted annual average and 24-hour concentration of $PM_{2.5}$ at the 6 receivers.

**Table 5.7 Predicted $PM_{2.5}$ Concentrations**

| Receiver | Annual Average (µg/m³) | | | | Maximum 24-hour average (µg/m³) | | | |
|---|---|---|---|---|---|---|---|---|
| | Background | Project | Total | Criterion | Background | Project | Total | Criterion |
| R1 | < 0.1 | 5.5 | 5.5 | 8 | 14.8 | 0.8 | 15.6 | 25 |
| R2 | 0.1 | 5.5 | 5.6 | | 14.8 | 0.9 | 15.7 | |
| R3 | < 0.1 | 5.5 | 5.5 | | 14.8 | 0.3 | 15.1 | |
| R4 | < 0.1 | 5.5 | 5.5 | | 14.8 | 0.2 | 15.0 | |
| R5 | < 0.1 | 5.5 | 5.5 | | 14.8 | 0.2 | 15.0 | |
| R6 | < 0.1 | 5.5 | 5.5 | | 14.8 | < 0.1 | 14.8 | |

As shown in **Table 5.7**, both annual average and 24-hour average $PM_{2.5}$ concentrations were predicted to remain below the EPA's adopted criterion. Zephyr (2022) notes that there were a number of instances in 2021 (the representative year) when daily $PM_{2.5}$ concentrations exceeded 25 µg/m³ at the DPE monitoring sites. However, the results (as shown in **Table 5.7**) predict very minor contributions from the Project, not resulting in any additional exceedances.

### 5.1.6.3 Deposited Dust

**Table 5.8** presents the predicted annual average concentration of deposited dust at the 7 receivers.

**Table 5.8 Predicted Annual Average Deposited Dust**

| Receiver | Annual Average (g/m²/month)) | | | |
|---|---|---|---|---|
| | Background | Project | Total | Criterion (g/m²/month) |
| **R1** | 2 | 0.4 | 2.4 | 4.0 |
| **R2** | 2 | 1.6 | 3.6 | |
| **R3** | 2 | 0.5 | 2.5 | |
| **R4** | 2 | 0.1 | 2.1 | |
| **R5** | 2 | 0.1 | 2.1 | |
| **R6** | 2 | < 0.1 | 2.0 | |

As shown in **Table 5.8**, the results show that there are no sensitive receivers predicted to exceed the adopted annual average dust deposition criterion, either incremental (2 g/m²/month) or cumulative (4 g/m²/month).

#### 5.1.6.4 Greenhouse Gas

**Scope 1 Emissions – Fuel Consumption**

Scope 1 fuel consumption emissions have been calculated using the energy content and emission factors from *Table 3* of the National Greenhouse Accounts Factors 2021 and are presented in **Table 5.9**.

**Table 5.9 Diesel GHG Emissions – Scope 1**

| Fuel Type | Energy content (GJ/KL) | Emission factor (kg $CO_{2\text{-}e}$/GJ) | | |
|---|---|---|---|---|
| | | $CO_2$ | $CH_4$ | $N_2O$ |
| **Diesel Oil** | 38.6 | 69.9 | 0.1 | 0.2 |

*Source: Modified after Zephyr (2022) – Table 9-1.*

The annual estimated diesel usage is 50 kL/y and the Scope 1 Emissions is 135 t $CO_{2\text{-}e}$.

**Scope 2 Emissions – Electricity Consumption**

As the Project will not be connected to mains electricity supply, Scope 2 emissions are not proposed to be generated by the Project, with a diesel generator and solar power (aiming to meet ~20 % of requirements) to supply electricity on site. Therefore, no Scope 2 emissions will be generated by the Project.

#### 5.1.6.5 Odour

The Project does not feature significant odour generating emissions sources, with it considered unlikely to generate odorous emissions.

### 5.1.7 Conclusion

Zephyr (2022) predicts that, based on dispersion modelling carried out in accordance with regulatory guidelines, the Project will not result in unacceptable changes to local or regional air quality. The annual average $PM_{10}$ and $PM_{2.5}$ concentrations will remain below the adopted criteria and no additional exceedance of 24-hour maximum $PM_{10}$ and $PM_{2.5}$ concentrations are predicted at residences surrounding the Quarry.

The potential for elevated dust emissions will be managed through the implementation of best-practice controls consistent with the EPA's *Approved Methods*.

Further, diesel combustion will be the only significant greenhouse gas emission source, with no Scope 2 emissions to be generated by the Project.

## 5.2 Noise and Vibration

### 5.2.1 Introduction

A Noise and Vibration Impact Assessment (NVIA) for the Project was undertaken by Muller Acoustic Consultants (MAC 2022) with reference to the following guideline documents:

- NSW Department of Environment and Climate Change (DECCW), *NSW Interim Construction Noise Guideline (ICNG),* July 2009.

- NSW Environment Protection Authority (EPA), *Noise Policy for Industry* (NPI) 2017.
- NSW Department of Environment, Climate Change and Water (DECCW) – *NSW Road Noise Policy* (RNP), March 2011.
- Australian Standard AS 1055:2018 – Acoustics – Description and measurement of environmental noise – General Procedures.
- International Organisation for Standardisation (ISO) 9613-1:1993 (ISO9613:1) – Acoustics – Attenuation of Sound During Propagation Outdoors – Part 1: Calculation of the Absorption of Sound by the Atmosphere.
- International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) – Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation.
- International Organisation for Standardisation (ISO) TR 17534-3 – Acoustics — Software for the calculation of sound outdoors — Part 3: Recommendations for quality assured implementation of ISO 9613-2 in software according to ISO 17534-1.
- Roads and Maritime Services (Roads and Maritime), *Construction Noise and Vibration Guideline* (CNVG), 2016.

A complete version of MAC (2022) is provided as **Appendix F**, with the following sub-sections providing:

- a description of the local noise environment and sensitive receivers (**Section 5.3.2**)
- an overview of the applicable noise criteria (**Section 5.3.3**)
- a description of the assessment methodology (**Section 5.3.4**)
- a summary of proposed noise mitigation and monitoring (**Section 5.3.5**)
- an assessment of residual impacts following the implementation of those controls (**Section 5.3.6**).

## 5.2.2 Existing Environment

### 5.2.2.1 Noise Sources

The noise climate in the area surrounding the Quarry reflects the variety of land uses and noise generating activities of the local setting. Noises which may be audible at surrounding residences include the following:

- Traffic on Larbert Road.
- Existing operations at Larbert Quarry.
- Operations at the nearby Schmidt's Quarry.
- Earthworks associated with the quarry and nearby developments.
- Agricultural and rural noises such as farm machinery, stock, birds and insects.
- Domestic noises such as lawn mowers, pumps, dogs, etc.
- Wind generated noises such as wind in trees.

#### 5.2.2.2 Background Noise Levels

Background noise monitoring has not been completed for the Project Site. The NPI provides a process for establishing noise criteria for consents and licences, enabling the EPA to regulate noise emissions scheduled premises under the *Protection of the Environment Operations Act 1997* (POEO Act). In low noise environments, such as rural environments, minimum assumed *Rating Background Levels* (RBLs) apply within the NPI and can be adopted in lieu of completing background noise measurements.

The minimum assumed RBLs and background noise levels for the Project are:

- Day (7.00 am to 6.00 pm) = 35 dB(A).
- Evening (6.00 pm to 10.00 pm) = 30 dB(A).
- Night (10.00 pm to 7.00 am) = 30 dB(A).

This is considered the most conservative method for establishing noise criteria for the Project.

#### 5.2.2.3 Sensitive Receivers

MAC (2022) identified 5 potentially sensitive receivers in proximity to the Project Area (refer to *Figure 1* of **Appendix F**). The sensitive receivers are categorised as rural residential and are classified as part of RU1 primary production land zoning.

### 5.2.3 Assessment Criteria

#### 5.2.3.1 Project Noise Trigger Levels

*Project Noise Trigger Levels* (PNTLs) are derived in accordance with the EPA's NPI which provides a benchmark or objective for assessing a site. The PNTL is not intended for use as a mandatory requirement but is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response.

**Project Intrusiveness Noise Level**

The Project Intrusiveness Noise Level (PINL) is defined as the rating background noise level (RBL) RBL + 5 dB. The RBL is determined by measurement of the long-term background noise level $LA_{90}$. The PINLs for the Project were above the minimum assumed RBLs as outlined in **Table 5.10**.

**Table 5.10 Project Intrusiveness Noise Level – Residential Receiver**

| Time Period | Minimum RBL – dB $LA_{90}$ | PINL – dB ($LA_{eq}$) |
|---|---|---|
| **Day period** | 35 | 40 |
| **Evening period** | 30 | 35 |
| **Morning Shoulder (6.00 am to 7.00 am Monday–Saturday)** | 30 | 35 |

*Source: Modified after MAC (2022) – Table 6.*

### Project Amenity Noise Levels

The Project Amenity Noise Level (PANL) is determined by comparing the existing ambient noise levels with the recommended acceptable ambient noise levels (*Table 2.2* of the NPI) for the respective noise amenity areas. The PANL at a receiver depends on the type of receiver and the noise amenity area of each receiver. The relevant PANLs are shown in **Table 5.11**.

**Table 5.11 Project Amenity Noise Levels – Rural Residential Receiver**

| Time of Day | Recommended ANL dB LAeq(period) | PANL dB LAeq(period)[1] | PANL dB LAeq(15min)[2] |
|---|---|---|---|
| **Day period** | 50 | 45 | 48 |
| **Evening period** | 45 | 40 | 43 |
| **Morning Shoulder (6.00 am–7.00 am Monday–Saturday)** | 40 | 35 | 38 |

*Note 1: Includes a -5 dB adjustment to the amenity level to account for existing industrial noise as per Section 2.4 of the NPI.*

*Note 2: Includes a +3 dB adjustment to the amenity period level to convert to a 15-minute assessment period as per Section 2.2 of the NPI.*

*Notes: The recommended amenity noise levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.*

*Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7 of the NPI.*

*Day – the period from 7:00 am–6:00 pm Monday to Saturday or 8:00 am–6:00 pm on Sundays and public holidays; Evening - the period from 6:00 pm–10:00 pm; Night – the remaining periods.*

*Source: Modified after MAC (2022) – Table 6 and 7.*

### Project Noise Trigger Levels (PNTL)

PNTLs are derived in accordance with the NPI to provide a benchmark for assessing a site. If the PNTL is exceeded, it indicates a potential noise impact on the community, and thus triggers a management response. They are the lower of either the PINL or the PANL. **Table 5.12** presents the derivation of the PNTL in accordance with the methodologies outlined in the NPI, with the receiver type being residential.

**Table 5.12 Project Noise Trigger Levels dB $L_{Aeq(15min)}$ – Rural Residential Receiver**

| Time of Day | RBL | PINL | PANL | PNTL |
|---|---|---|---|---|
| **Day period** | 35 | 40 | 48 | 40 |
| **Evening period** | 30 | 35 | 43 | 35 |
| **Morning Shoulder (6.00 am–7.00 am Monday – Saturday)** | 30 | 35 | 38 | 35 |

*Source: Modified after MAC (2022) – Table 8.*

#### 5.2.3.2 Maximum Noise Level Assessment

The potential for sleep disturbance from maximum noise level events from a project during the night-time period (in this instance the morning shoulder period) needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed the following criteria, a detailed maximum noise level event assessment should be undertaken.

- $L_{Aeq\ (15\ minute)}$ 40 dB or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- $L_{Amax}$ 52 dB or the prevailing RBL plus 15 dB, whichever is the greater.

Based on the Projects RBL's, the screening noise level at residential receivers are:

- $L_{Aeq\ (15\ minute)}$ 35 dB, and
- $L_{Amax}$ 45 dB.

As per *Section 2.5* of the NPI, the highest of the two criteria are adapted as the trigger level. Therefore, the trigger level for the Project is $L_{Aeq\ (15\ minute)}$ 40 dB and $L_{Amax}$ 52 dB.

#### 5.2.3.3 Road Traffic Noise Criteria

The RNP sets out noise criteria that provide for a degree of amenity appropriate for the land use and land category. This assessment has adopted the 'Freeway/arterial/sub-arterial road' category for the designated inbound and outbound transport routes, consistent with the classification of the haulage route as a 'principal haulage route'. **Table 5.13** reproduces the road traffic noise assessment criteria for residential land uses relevant for this road type.

**Table 5.13 Road Traffic Noise Criteria**

| Road category | Type of project/land use | Assessment Criteria – dB(A) | |
|---|---|---|---|
| | | Day (7.00 am–10.00 pm) | Night (10.00 pm–7.00 am) |
| **Freeway/arterial/ sub-arterial roads** | Existing residences affected by additional traffic on existing freeways/arterial/ sub-arterial roads generated by land use developments | $L_{Aeq(15\ hour)}$ 60 dBA (external) | $L_{Aeq(15\ hour)}$ 55 dBA (external) |

*Source: Modified after MAC (2022) – Table 10.*

*Note: For road noise assessments, the day period is from 7:00 am–10:00 pm (i.e. there is no evening assessment period as there is with operational noise). Night is from 10:00 pm–7:00 am.*

For other sensitive land uses, the following road traffic noise assessment criteria apply as per *Table 4* of the RNP:

- School classrooms – 40 dB $L_{Aeq(1hour)}$ internal – when in use.
- Open space (active use) – 60 dB $L_{Aeq(15hour)}$ external – when in use.

Receivers experiencing increases in traffic noise levels above those presented in **Table 5.14** due to the addition of vehicles along the haulage route should be considered for mitigation.

**Table 5.14 Relative Increase Criteria for Residential Land Uses**

| Road Category | Type of Project/Development | Total Traffic Noise Level Increase, dB(A) | |
|---|---|---|---|
| | | Day (7.00 am–10.00 pm) | Night (10.00 pm–7.00 am) |
| **Freeway/arterial/ sub-arterial roads** | New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road. | Existing traffic LAeq(15hr) +12 dB (external | Existing traffic LAeq(9hr) +12 dB (external) |

*Source: Modified after MAC (2022) – Table 11.*

*Note: For road noise assessments, the day period is from 7:00 am–10:00 pm (i.e. there is no evening assessment period as there is with operational noise). Night is from 10:00 pm–7:00 am.*

The RNP also states that, where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB, which has been accepted as the threshold of perceptibility to a change in noise level.

### 5.2.3.4 Construction Noise Management

The construction noise target levels are the Noise Management Levels (NML) provided in the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) as shown in **Table 5.15**.

**Table 5.15 Project Noise Trigger Levels dB $L_{Aeq(15min)}$ – Rural Residential Receiver**

| Time of Day | Noise Management Level LAeq(15 minute) | All receivers |
|---|---|---|
| **Recommended Standard Hours: Monday to Friday 7.00 am–6.00 pm Saturday 8.00 am–1.00 pm No work on Sundays and Public Holidays** | 35 + 10 dB(A) | 45 |
| **Outside recommended standard hours (Night 10.00 pm–7.00 am)** | Noise affected RBL + 5 dB(A) | 35 |

### 5.2.3.5 Construction Vibration

A qualitative vibration assessment was conducted, with vibration levels assessed against the Department of Environment and Conservation (DEC) 2006, *Assessing Vibration: A Technical Guideline* (the 'Guideline'). Due to the nature of the works proposed and distances to potential vibration sensitive receivers, vibration impacts from the project were assessed as negligible.

As any vibration generating activities (e.g. use of vibrator roller in road construction) are greater than 100 m for the nearest sensitive receiver, under *The Construction Noise and Vibration Strategy* (V4.1 Transport for NSW, 2019) human exposure to vibration is anticipated to be minimal.

As the quarry will be excavation, load and haul only, no blasting assessment was required to be completed.

## 5.2.4 Assessment Methodology

### 5.2.4.1 On site Operational Noise

Assessment of operational noise was conducted using the iNoise (Version 2022) noise modelling software, using sound power level spectra for each of the Quarry noise sources derived from on-site measurement or from MAC's database of measured quarry noise sources. To predict noise levels at the potential noise receivers, the model incorporated a 3-dimension digital terrain map, relevant noise source data, ground type, shielding such as barriers and/or adjacent buildings, and atmospheric information All noise sources were assumed to be operating for the full 15-minute assessment period simultaneously.

A worst-case modelling scenario was assessed to represent typical operational noise emissions from the Project and assumed the following activities:

- Quarrying of sand and gravel material by excavator. The excavator was conservatively assessed above the bench, at natural ground level.
- Quarried sand and gravel loaded by excavator from the quarry to haul trucks for delivery to the processing and stockpiling area.
- Screened sand and gravel loaded by front end loader to the screening hopper.
- Further mineral processing through a wash tank.
- Processed aggregate will be loaded into road trucks for transportation offsite via the access road east to Larbert Road.

The modelling was undertaken under meteorological conditions considered to be features of the local setting (in accordance with the NPI classification for meteorological features) for each scenario as follows:

- Morning shoulder: Light stable winds (2 m/s in all directions) and inversion condition – Stability Class F.
- Day: light winds (up to 3 m/s) and inversion conditions – Stability Class D.

### 5.2.4.2 Road Traffic Noise

MAC (2022) applied the US Environment Protection Agency's road traffic calculation method to predict the $L_{Aeq}$ noise levels from site trucks travelling past sensitive receivers along Larbert Road. This method is an internationally accepted theoretical traffic noise prediction model and is ideal for calculating road traffic noise where relatively small traffic flows are encountered.

For the purpose of $L_{Aeq}$ noise level prediction, MAC (2022) considered a worst-case scenario on Larbert Road as follows:

- Average of 22 vehicle movements per day (vpd).
- Maximum of 54 vpd.
- One supply truck is expected per week and two light vehicles operate daily (6 maximum vpd).

#### 5.2.4.3 Construction Noise

The construction scenario adopted a generic construction fleet representative of plant used in the construction / improvements to the site access road (Scenario 2) and clearing and grubbing of the operational area (Scenario 2) (refer to **Table 5.16** below).

**Table 5.16 Construction Noise Scenarios**

| Item | Sound Power Level (dB(A)) |
|---|---|
| **Scenario 1 – Access Road Improvement Works** | |
| Grader | 108 |
| Smooth Drum Roller | 108 |
| Water Cart | 101 |
| **Total** | **111** |
| **Scenario 2 – Clearing and Grubbing of Operational Area** | |
| Bulldozer | 110 |
| Grader | 108 |
| Water Cart | 101 |
| **Total** | **112** |

*Source: Modified from MAC (2022) – Table 16.*

### 5.2.5 Noise Management Measures

#### 5.2.5.1 Construction and Operational Noise

The following operational safeguards, controls and management measures would be implemented at the Quarry.

- Toolbox and induction of personnel prior to shift to discuss noise control measures that may be implemented to reduce noise emissions to surrounding receivers.
- Training of employees to conduct quieter work practices.
- Equipment which is used intermittently is to be shut down when not in use.
- Where possible, machinery will be located/orientated to direct noise away from the closest sensitive receivers.
- Undertake regular maintenance of machinery to minimise noise emissions. Maintenance will be confined to standard daytime construction hours and where possible, away from noise sensitive receivers.
- The quietest suitable machinery reasonably available will be selected for each work activity.
- Queuing of vehicles adjacent to any receivers will be avoided.

- Where practicable, ensure noisy plant/machinery are not working simultaneously in close proximity to receivers.
- Where possible, all plant is to utilise a broad band reverse alarm in lieu of the traditional hi-frequency type reverse alarm and minimise the need for reversing or movement alarms.

It is to be noted that the Access Road has already been constructed, with only maintenance activities required. These 'standard' mitigation measures should be considered to manage exceedances during the construction phase.

#### 5.2.5.2 Traffic Noise

While the movement of heavy vehicles is already a feature of local roads, the Proponent will implement the following safeguards and controls to minimise the potential for any increase in overall noise levels.

- Transport operations will adhere to the approved hours of operation. Truck despatch will occur from 6.00 am, however, no quarrying (and loading and haulage of materials) will occur before 7.00 am.
- The Proponent will refuse entry to poorly maintained vehicles, or those reported to generate excessive noise levels.
- The Proponent requires all truck drivers comply with a Drivers Code of Conduct outlining procedures for reducing noise impacts during transportation within the Project Site and off site.
- The Proponent requires all drivers to obey all traffic signs, speed zones and operate in a safe and courteous manner at all times.

#### 5.2.5.3 Noise Monitoring

The NMP will include a provision for attended noise monitoring within the community in response to received complaints, if any. The operator attended noise measurements and recordings will be conducted to quantify noise emissions from the Quarry as well as the overall level of ambient noise.

When required, the operator will quantify and characterise the energy equivalent (LAeq) intrusive noise level from the project over a 15-minute measurement period. In addition, the operator will quantify and characterise the overall levels of ambient noise over the 15-minute measurement interval. Instrumentation used during the monitoring will be equivalent to a Type 1 meter with 1/3 octave band analysis and have audio recording functionality for post processing source identification. 1/3 octave band analysis will be required to establish whether modification factors in accordance with the NPI are to be applied.

All acoustic instrumentation used as part of the attended monitoring program will be designed to comply with the requirements of AS IEC 61672.1-2019, Electroacoustics – Sound level meters – Specifications and will have current calibration certificates. All instrumentation will be programmed to record statistical noise level indices in 15-minute intervals including $L_{Amax}$, $L_{Amin}$ and $L_{Aeq}$.

Instrument calibration will be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA. The measurement position(s) will be selected considering:

- weather conditions such as rain and wind, insect noise
- the location and direction of any noise source/s

- the most sensitive position at the affected receiver
- the need to avoid reflecting surfaces (where possible).

## 5.2.6 Impact Assessment

### 5.2.6.1 Operational Noise

As presented in **Table 5.17**, the predicted noise levels at the residential receivers surrounding the Quarry site during calm and prevailing meteorological conditions. Contours maps which present interpolated images of noise levels surrounding the Quarry are provided in MAC (2022) (refer to **Appendix F**).

**Table 5.17 Predicted Operational Noise Levels**

| Receiver | Predicted Noise Level (dB) ($L_{Aeq(15min)}$) | |
|---|---|---|
| | Morning Shoulder[1] | Day[1] |
| **PNTL** | **35** | **40** |
| R01 | 35 | 40 |
| R02 | 32 | 36 |
| R03 | <30 | <30 |
| R04 | <30 | <30 |
| R05 | 30 | 33 |

*Source: Modified after MAC (2022) – Table 17.*

*Notes: Modelled under noise enhancing meteorological conditions.*

The results of the predictive modelling show that noise emissions from the Quarry satisfy the PNTL at all non-project related residential receivers, for the operational scenario.

### 5.2.6.2 Maximum Noise Level

Considering the maximum noise levels from transient events, MAC (2022) predicts the maximum noise level screening criteria will be easily satisfied with the highest predicted $L_{Amax}$ noise level of 40 dB(A) identified a R01, which is well below the screening criteria of 52 dB(A).

Predictions are below the EPA screening criteria; therefore, no further assessment or detailed analysis is required.

### 5.2.6.3 Construction Noise

Two construction scenarios were modelled by MAC (2022), access road upgrades (Scenario 1), and clearing and grubbing of the operational area (Scenario 2). Predicted noise levels for the construction scenarios are compliant with the noise management levels (45 dB(A)) with the exception of receiver R01 for Scenario 1 (54 dB(A)), which was modelled on 'worst case'' conditions. As the site access road has only been recently upgraded it is unlikely extensive works beyond general maintenance will be conducted.

The application of the standard mitigation measures discussed in **Section 5.2.5.1** should be implemented, with the application of these mitigation measures likely to result in up to a 10 dB(A) reduction in noise at R01, with the construction noise levels remaining below the relevant NML at R01 (and all other receivers).

### 5.2.6.4 Road Traffic Noise

Based on the maximum daily traffic movements nominated in **Section 5.2.4.2**, **Table 5.18** presents predicted existing traffic noise, additional traffic noise and combined traffic noise along with the proposed increase.

**Table 5.18 Road Traffic Noise – Residential Receivers**

| Offset Distance (m) | Period | Criteria | Traffic Noise (dB(A)) (Proposed Traffic) |
|---|---|---|---|
| **Larbert Road** | | | |
| 100 m | Day | 60 | 29.2 |
| | Night | 55 | 21.0 |

*Source: Modified after MAC (2022) – Table 23.*

The traffic noise contribution from the Quarry is predicted to remain well below the relevant day and night assessment criteria for the nearest residential receivers on Larbert Road.

### 5.2.6.5 Cumulative Noise Assessment

As shown in *Figure 4* in **Appendix F**, the cumulative noise level assessment identified the proposed Lento Earthworks Sand Quarry to the immediate east of the Quarry (600 m), and Riverdale Quarry 1.5 km to the north of the Quarry.

The predicted cumulative noise levels identify that the cumulative noise levels at the most affected residential receiver (R01) will not exceed the adopted criteria during the day and night time periods and are compliant with the recommended amenity levels.

## 5.2.7 Conclusion

MAC (2022) have concluded that results of the NVIA demonstrate that operational noise levels comply with the relevant NPI criteria for all assessment periods at the most affected sensitive receiver locations. Furthermore, sleep disturbance is not anticipated, and maximum noise events are predicted to satisfy the EPA trigger level for sleep disturbance.

Noise levels associated with construction activities are anticipated to exceed the NMLs at receiver R01 during quarry haul road upgrade works. MAC (2022) noted that it is unlikely extensive work will be completed to the access road as it has been recently upgraded. MAC also identified the owner of the property at R01 is also the owner of the land on which the quarry is situated on. Noise management strategies identified in **Section 5.2.5** were recommended to be implemented and if so, is anticipated to reduce noise emissions up to 10 dB, and construction noise levels would therefore remain below the relevant NMLs at all receiver locations. Additionally, the NA demonstrates that the road noise criteria as specified in the RNP will be satisfied at the nearest potentially affected receivers for worst case operational road traffic.

Based on these results, there are no noise related issues which would prevent the approval of the extension of the quarry.

## 5.3 Traffic and Transport

### 5.3.1 Introduction

An assessment of the traffic, transport and local road infrastructure associated with the Project has been undertaken by Indesco Pty Limited (Indesco). The Traffic Impact Assessment (TIA) has been prepared to address the relevant SEARs detailed in **Appendix C** and in general accordance with the guidelines and policies specified by the Guide to Traffic Generating Development (RTA), Road Design Guide (RMS), relevant Austroads Standards, and the agency requirements of Transport for NSW (TfNSW) (see **Appendix G**).

The following sub-section draws on information presented in the TIA (**Appendix G**) and describes the existing traffic environment, predicted changes to the traffic environment as a result of the Project, the proposed management and mitigation measures and an assessment of traffic related impacts.

### 5.3.2 Existing Environment

In summary, laden truck would exit the Project Area via the Internal Access Road, turn right onto Larbert Road at the Access Road / Larbert Road intersection. Vehicles would then travel south until they reached the Kings Highway / Larbert Road intersection, before turning left or right onto the Kings Highway.
The condition of these roads (**Section 5.3.2.1**), intersections details (**Section 5.3.2.2**), and traffic volumes (**Section 5.3.2.3**) are discussed below.

The route as detailed above is shown in **Figure 5.1**.

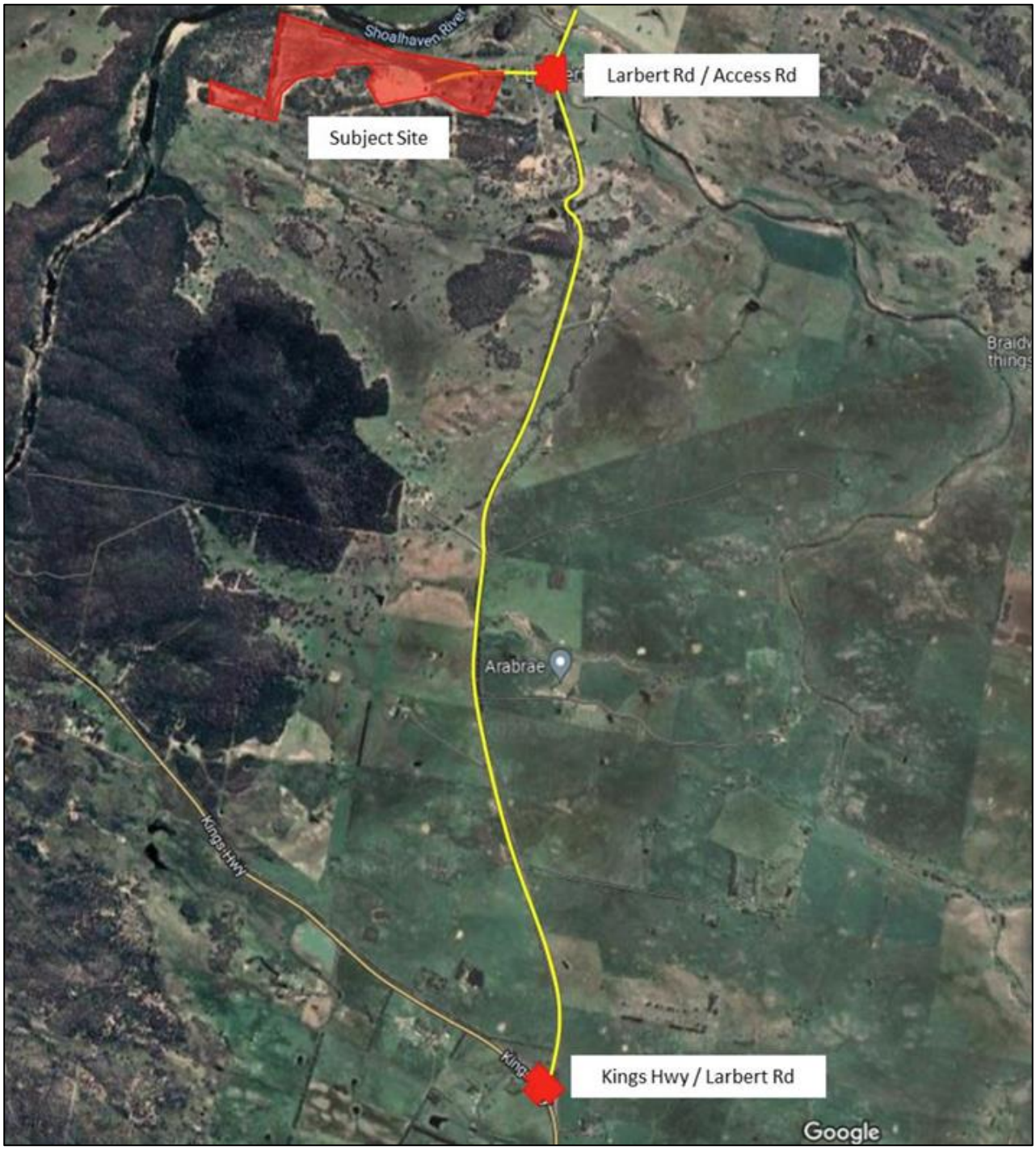



**Figure 5.1 Transport Route**

#### 5.3.2.1 Road Condition

The key road network relevant to the Project presented in **Figure 5.1** are described below.

**Kings Highway**

The Kings Highway (State Road B52) is under care and maintenance of TfNSW, linking the Australian Capital Territory (ACT) to the South Coast, passing through the major centres of Bungendore and Braidwood.

In the vicinity of the proposed project, the Kings Highway is a two lane, two-way, undivided carriageway with an 8 m carriageway and 1.2 m shoulder on either side.

The road is generally described as being sealed in good condition and has a posted speed limit of 100 km.

**Larbert Road**

Larbert Road is a local road under care and maintenance of the local council, QPRC. Larbert Road meets the Kings Highway at a give-way intersection with channelised right-turn (CHR) and auxiliary left-turn (AUL) movements.

Larbert Road is a two lane, two-way undivided carriageway with an 8 m carriageway without a verge on either side.

**Access Road**

The Access Road is a local road under care and maintenance of CSG. The Access Road meets Larbert Road at a give-way intersection with basic right-turn (BAR) and basic left-turn (BAL) movement.

Access Road is a two lane, two-way undivided carriageway with a 6 m carriageway without a verge on either side. The road is unsealed.

#### 5.3.2.2 Intersections

**Larbert Road / Access Road**

The Larbert Road / Access Road intersection is a give-way intersection with basic right-turn (BAR) and basic left-turn (BAL) from the single lane Access Road and two lane Larbert Road.

Given the low traffic volumes at this intersection, Indesco has confirmed that Larbert Road is classified as a minor road and therefore does not require capacity analysis to be conducted.

**Kings Highway / Larbert Road**

The Kings Highway / Larbert Road Intersection is a give-way intersection with channelised right-turn (CHR) and auxiliary left-turn (AUL) movements.

Using the SIDRA Intersection Analysis software package, Indesco has confirmed this intersection performs at an acceptable level of service (LOS A) without any congestion or queuing.

**Intersection Geometry**

Providing a road network that is in alignment with the holistic approach to achieving the Safe System vision as well as intersection forms that are aligned with the safe roads and roadsides description should result in reduced likelihood of crashes.

According to the required geometry requirements and existing geometry conditions, the existing geometries of the Kings Highway / Larbert Road and the Larbert Road / Access Road intersections are considered to be appropriate. In addition, the lengths of deceleration lanes approaching the Kings Highway / Larbert Road intersection comply with the design criteria of Austroads Guide to Road Design Part 4A which specifies 70.0 m for AUL and 63.0 m for CHR.

According to the Section 3 of Guide to Road Design Part 4A: Unsignalised and Signalised Intersections, for the Kings Highway / Larbert Road intersection the approach sight distance (ASD) is 64 m and the safe intersection sight distance (SISD) is 234 m. For Larbert Road / Access Road intersection, the ASD is 64 m and the SISD is 114 m. The existing condition is considered to be adequate in terms of sight distance achieved.

The current geometric configuration of the Larbert Road / Access Road intersection and Kings Highway / Larbert Road intersection satisfies the B-double truck movements.

As the existing access to/from Larbert Quarry is not proposed to be altered and caters for the largest vehicle that utilise the facility, the geometry of the access appears to be consistent with the AUSTROADS preferred rural property access with indent. Therefore, a swept path analysis of the existing property access has not been carried out.

#### 5.3.2.3 Existing Traffic Volumes

Contemporary traffic survey volume data was collected for the project, with the traffic survey conducted by Trans Traffic Survey (2022) on Thursday 18 August 2022 during the AM period (7:30 am–9:30 am) and the PM period (4:30 pm–6:30 pm).

Daily traffic volumes were counted as follows:

- Access Road: 41 vehicles/day.
- Larbert Road: 184 vehicles/day.
- Kings Highway: 4,313 vehicles/day.

Traffic generation of the existing haulage activity has been calculated based on the following parameters:

- Maximum production of the existing quarry: 30,000 tpa.
- Working weeks per year (haulage activity): 50 weeks.
- Average mass of material per vehicle: 37.2 tonnes per vehicle.
- Peak hour factor: 3.

The peak hour factor is the ratio of the absolute peak operating conditions to the average operating conditions of a peak production year, as modelled for existing quarry and the quarry (with the reduced operational hours). This represents what is considered to be the 'worst-case' peak operational scenario and accounts for all aspects of variations expected throughout each day and the year.

Given the above parameters, existing traffic generation is as follows:

- Existing working hours per week (haulage activity): 67 hours.
- Existing peak hourly traffic volume (IN): 1 vehicle per hour (1 vph).
- Existing peak hourly traffic volume (OUT): 1 vph (assumed same as inbound traffic volumes).

#### 5.3.2.4 Road Safety

A review of crash data from 2016 to 2020 (most recent data set) identified the following:

- No reported crashes at the Larbert Road / Access Road intersection.
- Five reported crashes on the Kings Highway within proximity to the Kings Highway / Larbert Road intersection:
    - One serious injury was recorded.

It was found that these crashes occurred at a distance sufficiently far from the Kings Highway / Larbert Road intersection to conclude that there is no systematic safety issue at these two key intersections that would reasonably require further consideration.

### 5.3.3 Assessment Methodology

A full description of the assessment methodology implemented by Indesco (2022) is provided in that report (refer to **Appendix G**). In summary, the assessment methodology included the following.

- Existing traffic and parking conditions surrounding the site.
- Suitability of the proposed access arrangements for the site.
- Suitability of parking provision.
- Traffic generation of the development and its impact on the surrounding road network, including:
    - intersection analysis using SIDRA INTERSECTION 9.0
    - turn warrant criteria based on the relevant Austroads Guide to Road Design guideline, and
    - mid-block assessment based on the criteria within both the TfNSW Guide and *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis*.
- Peak Hour assessment, the scenarios assessed for the peak hour assessment are based on the following:
    - 2022 design year (current)
    - 2032 design year (with and without development)
    - the future year assessments include consideration of regional traffic growth along with the arterial road network (being Kings Highway).
- Sight distances.
- Intersection geometry.
- Safety assessment.

## 5.3.4 Predicted Changes to Traffic Environment

### 5.3.4.1 Traffic Volumes

Given the proposed expansion in quarry operations will increase the number of staff from 1–2 employees to 3–4 full-time equivalent employees; the light vehicle traffic generation caused by the proposed expansion will be negligible and has not been considered further as part of this assessment.

Indesco has been advised that the mass of material per vehicle (tonnes per vehicle) is 38.5 t (80%) and 32 t (20%) truck and dogs. On this basis, average mass of material per vehicle is 37.2 tonnes per vehicle (0.8*38.5+0.2*32 = 37.2).

The proposed increase in quarry operations will not require the additional facilities and there will not be a construction phase to enable the increase in operations. For this reason, a construction traffic impact assessment is not necessary for the Larbert Quarry expansion.

The additional number of trucks likely to be generated by the quarry expansion has been estimated by adopting the following project operational parameters:

- Maximum increase: 170,000 tpa.
- Working weeks per year (haulage activity): 50 weeks.
- Average mass of material per vehicle: 37.2 tonnes per vehicle.
- Peak hour factor: 3.

According to the above parameters, the traffic generation of quarry after the proposed expansion has been calculated as follows:

- Working hours per week (haulage activity): 67 hours.
- Peak hourly traffic volume (IN): 5 vph.
- Peak hourly traffic volume (OUT): 5 vph (assumed same as IN traffic volumes).

The additional number of trucks likely to be generated by the other quarry within the study area has been estimated to be an additional peak hourly traffic volume both in bound and out bound to be 1 vph.

### 5.3.4.2 Roads and Intersections

**Traffic Distribution**

The distribution of additional trips to/from the expanded quarry has been determined using the existing and likely future exportation catchment for the development. According to the available data, the quarried material would likely be distributed as follows:

Current Haul Routes:

- ACT – approx. 50%.
- Bungendore/Queanbeyan and surrounds – approx. 10%.
- South Coast/Braidwood area – approx. 40%.

Future Haul Routes (estimates):

- South Coast/Braidwood area – 60%
- ACT – 25%
- Bungendore/Queanbeyan and surrounds – 15%.

**Peak Hour Traffic Volume Analysis**

SIDRA traffic modelling has been undertaken for the future (2032) traffic volumes scenario. The details of the SIDRA model outputs for each intersection in the 2032 without development scenario is provided in **Appendix G**.

The simulation results show the Kings Highway / Larbert Road intersection will continue to perform at an acceptable level of service (LOS A) without congestion or queuing.

Comparing traffic simulation results between the with and without development scenarios shows that the traffic generated from the development will have negligible effect on performance of the key intersections, and no changes to the level of service have been identified.

## 5.3.5 Management Measures

The following safety improvements are recommended to improve the safety of haul routes:

- The QPRC install an advisory intersection sign on the Larbert Road (north) side road to pre-warn drivers of the upcoming intersection with the quarry access road.
- The QPRC implement advisory speed limit signage on Larbert Road.
- The Proponent updates the quarry Traffic Management to include the proposed changes in accordance with guidance provided by Safe Works Australia.
- It is recommended to provide five (5) car park spaces for light vehicles for employees, visitors and operational purposes.
- The parking design criteria must comply with AS2890.1 (Off-street car parking).

## 5.3.6 Impact Assessment

### 5.3.6.1 Traffic Impact Assessment

Based on the traffic impact assessment conducted, the proposed expansion is expected to generate 9 vehicle trips in the AM and PM peak hours. Comparing traffic simulation results between the with and without development scenarios shows that the traffic generated from the development will have negligible effect on performance of key intersections, and no changes in the level of services have been identified.

#### 5.3.6.2 Car Parking Assessment

The NSW Guide to Traffic Generating Developments (Issue 2.2, October 2002) provides car parking requirements for developments. According to the guideline, no parking requirement rate has been advised for Quarries. However, it is recommended to provide adequate number of parking for staff and operational purposes. On this basis and given the number of three - four full time employees, it is recommended to provide five (5) car park spaces for light vehicles for employees, visitors, and operational purposes. The design criteria must comply with AS2890.1 (Off-street car parking).

#### 5.3.6.3 Road Safety

An assessment of the safety of the key intersections has also been conducted and has considered the appropriate geometries and locations of these intersections. This includes consideration of the following features:

- Turning lane warrants.
- Sight distances.
- Crash data.
- Swept path analysis.
- Any other relevant safety features.

The assessment identified that the existing geometry of the Kings Highway / Larbert Road and Larbert Road / Access Road intersections are considered to be appropriate, and the existing condition of both intersections is considered to be adequate in terms of sight distance achieved.

It is reasonable to conclude that there is no systematic safety issue at these two key intersections that would reasonably require further consideration.

While noting that the volume of traffic on the local road network will increase as a result of the Project, the roads and intersections will remain well within capacity and therefore not result in any increased road hazard.

### 5.3.7 Conclusion

It is concluded that the proposed project is to result in negligible impacts to local traffic conditions. While an increase in overall truck movements is proposed, comparing traffic simulation results between the with and without development scenarios shows that the traffic generated from the development will have negligible effect on performance of key intersections, and no changes in the level of services have been identified. The identified impacts will be mitigated considering:

- No history of road accidents on Larbert Road and the intersection of the Kings Highway and Larbert Road.
- The surrounding road network would remain well below capacity, with intersection performance remaining good (LOS A and DoS 0.165).

To improve the safety of haul routes Indesco recommended the following safety improvements:

- The QPRC install an advisory intersection sign on the Larbert Road (north) side road to pre-warn drivers of the upcoming intersection with the quarry access road.
- The QPRC implement advisory speed limit signage on Larbert Road.
- The Proponent updates the quarry Traffic Management to include the proposed changes in accordance with guidance provided by Safe Works Australia.

# 5.4 Surface Water

## 5.4.1 Introduction

The following sub-sections have been prepared by Umwelt to address the SEARs and key requirements of the EPA as relevant to potential impacts on surface water. This section provides:

- A review of local setting (**Section 5.4.2**).
- A review of water management measures (**Section 5.4.3**).
- A conceptual Water Balance Model (**Section 5.4.4**).
- An assessment of the Sites impacts to Surface Water (**Section 5.4.5**).
- A conclusion of the work Umwelt had undertaken for the Surface Water Assessment (**Section 5.4.6**).

## 5.4.2 Local Setting

### 5.4.2.1 Hydrology and Topography

Umwelt identified the Project lies within the floodplain flats of the Shoalhaven River catchment area, flowing past the Quarry immediately north of the Project Area, which has a total catchment area of approx. 7,300 km$^2$ (BoM, 2016). The Shoalhaven River catchment is part of the Sydney drinking water catchment, which supplies drinking water to a population of around 5 million (BoM, 2016). To the east, an unnamed 2nd order (as per the Strahler stream ordering system) watercourse is located along the boundary of the Project Area and discharges to the north-east into the 4th order Durran Durra Creek, and then into the Shoalhaven River approximately 700 m downstream of the Project boundary. To the north-west region of the Project Area, an unnamed 1st order watercourse flows west into an unnamed 3rd order watercourse, which drains to the Shoalhaven River.

Topography of the Project Area ranges from approximately 610 mAHD along the southern Project boundary to 580 mAHD in the north-western region of the Project Area. The majority of the Project Area is relatively flat with an average slope of 3%, with a maximum slope of approximately 15% in the south-west corner of the Project Area, to the west of the existing quarry operations. The local site catchment gradient falls in a predominantly northerly direction, draining from a ridge line located south of the Project Area, towards the Shoalhaven River.

### 5.4.2.2 Soil Landscapes

Three soil landscapes are present within the Project Area, including Larbert, Larbert Variant b and Oorong (DPE, 2020). Modelled soil properties can be found in the SWIA in **Appendix H**.

The Larbert and Larbert Variant b Soil Landscapes are described as "flat to gently undulating alluvial floodplains and valley flats of the Braidwood Rises and Oallen Relict Rises" (DEP, 2020). The Larbert Soil Landscape has a very high erosion hazard, seasonal waterlogging, localised non-cohesive soils, and low fertility with strongly acidic topsoil (DPE, 2020). The Larbert Soil Landscape is comprised of gravel, sand, silt and clay, and the Larbert Variant b is comprised of loose sand and some gravel (DPE, 2020).

The Oorong Soil Landscape is located in the southern regions of the Project Area, within the steeper terrain and is described as "undulating aeolian sand dunes covering granitic terrain", with "swampy hollows between dunes common" (DPE, 2020). The Oorong Soil Landscape has a high wind erosion hazard, non-cohesive soils and localised waterlogging (DPE, 2020). The soil is described as acidic, having low wet bearing strength, low fertility, sodicity and moderate shrink-swell (DPE, 2020).

### 5.4.2.3 Water Quality

The NSW Water Quality Objectives (WQOs) have been developed to guide plans and actions to achieve healthy waterways. The WQOs are based on measurable environmental values (EVs) for protecting aquatic ecosystems, recreation, primary industries, drinking water and industrial water (ANZECC and ARMCANZ, 2000). There are no specific WQOs for the Shoalhaven River catchment area (refer to **Appendix H**).

In the absence of regionally defined objectives, the WQOs for upland rivers in southeast Australia (ANZECC and ARMCANZ, 2000) were considered appropriate to provide a guide for the receiving waters of the Project Area catchment and are presented in **Table 5.19**.

**Table 5.19 Relevant Water Quality Objectives (ANZECC and ARMCANZ, 2000)**

| Parameter | Units | Water Quality Objective |
|---|---|---|
| **pH** | - | 6.5 to 8.0 |
| **Electrical Conductivity (EC)** | µS/cm | 30 to 350 |
| **Turbidity** | NTU | 2 to 25 |
| **NOx** | mg/L | 0.015 |
| **Total Phosphorus (TP)** | mg/L | 0.02 |
| **Total Nitrogen (TN)** | mg/L | 0.25 |
| **Visual clarity and colour** | - | Natural visual clarity should not be reduced by more than 20%.<br>Natural hue of the water should not be changed by more than 10 points on the Munsell Scale.<br>The natural reflectance of the water should not be changed by more than 50%. |
| **Surface films and debris** | - | Oils and petrochemicals should not be noticeable as a visible film on the water, nor should they be detectable by odour. |

**Neutral or Beneficial Effect on Water Quality**

As the Project is located within the Sydney drinking water catchment area, it is required to have a Neutral or Beneficial Effects (NorBE) on water quality. *Neutral or Beneficial Effect on Water Quality Assessment Guideline* (WaterNSW, 2022) indicates that a development is considered to have a NorBE on water quality if the development:

- has no identifiable potential impact on water quality, or
- will contain any water quality impact on the development site and prevent it from reaching any watercourse, waterbody or drainage depression on the site, or
- will transfer any water quality impact outside the site where it is treated and disposed of to standards approved by the consent authority.

The Project is therefore required to demonstrate a NorBE on water quality (refer to **Section 5.4.5**).

#### 5.4.2.4 Water Extraction

The Project Area is located within the area regulated under by the Greater Metropolitan Region Unregulated River Water Sources Water Sharing Plan, which commenced in 2011 (NSW Government, 2011b). The WSP is divided into 49 Management Zones corresponding to sub-catchment boundaries. Surface water in the Project Area is managed under the Mid Shoalhaven River Management Zone.

Groundwater is understood to exist in two distinct aquifers beneath the Project Area (Ground Doctor, 2023). Under lower lying areas along the Shoalhaven River, groundwater is present in alluvium which is believed to be relatively narrow and less than 10 m thick under the proposed extraction area. The alluvium is underlain by granite (fractured rock) and given the limited extent of the alluvial system at the site it is managed as part of the Goulburn Fractured Rock Groundwater Source, which is regulated under the Greater Metropolitan Region Groundwater Sources WSP (NSW Government, 2011a).

#### 5.4.2.5 Water Users

A search of the NSW Water Register indicates that for the 2021/2022 financial year there were 298 Water Access Licences (WALs) with a total of 368,607.4-unit shares allocated in the Shoalhaven River Water Source. The majority of the unit shares are held for major utility and water supply and local water utility, with a combined 352,987-unit shares. The remaining unit shares are held for unregulated river, major utility power generation and for domestic and stock uses. There are no WALs allocated within the Shoalhaven Water Source on the land in which the Project is located or immediately downstream of the Project.

### 5.4.3 Water Management Measures

#### 5.4.3.1 Water Management System

A plan drawing of the operational Water Management System (WMS) and a schematic of the proposed WMS are presented in *Figure 3.1* and *Figure 3.2* respectively in **Appendix H**. The proposed WMS for the Project has been designed to exclude run-on from areas external to the pit, contain rainfall runoff within the Project WMS and consists of the following key components:

- A clean water diversion drain will be located on the southern boundary of the Quarry will direct upslope surface runoff to the east and west, where it will flow towards the Shoalhaven River.

- The Silt Pond which receives surplus water from the sand/gravel washing plant and direct rainfall. Used processing water that is transferred to the Silt Pond and captured rainfall will seep through the base of the Silt Pond to the downslope Clean Water Pond. In the event that inflows exceed the Silt Pond capacity, the Silt Pond will spill to the Clean Water Pond.

- The existing Clean Water Pond (with a floor level in the groundwater table) which receives seepage inflows from the Silt Pond, groundwater, direct rainfall and surface facilities runoff. The sand/gravel washing plant is supplied with water from the Clean Water Pond and also loses water via seepage to the groundwater table. In the event that inflows exceed the Clean Water Pond capacity, the Clean Water Pond will spill to the Pit.

- The Pit (with a floor level above the groundwater table) which receives inflows from rainfall runoff will typically be allowed to infiltrate into the highly permeable soils. Runoff captured in the Pit will be used to supplement operational demands if required.

All rainfall runoff on disturbed areas of the operating Quarry will be contained within the WMS. No surplus water will require off-site controlled discharges due to the highly permeable nature of the site soils. It is understood that for the existing operation (that does not presently direct runoff from undisturbed catchments) there has never been an uncontrolled discharge from the existing Quarry WMS, including for a period of two consecutive years with rainfall exceeding the 90th percentile in 2021 (1128 mm) and 2022 (1067 mm). The clean water pond and silt pond will have estimated capacities of 11.8 ML and 8.4 ML respectively.

**Amenities Water Supply and Disposal**

Potable water for the amenities will be supplied externally and stored in a water tank. Wastewater from amenities will be collected in a wastewater system and removed offsite by a licensed contractor.

### 5.4.3.2 Erosion and Sediment Controls

The conceptual WMS described in **Section 5.4.3.1** broadly outlines the operational phase erosion and sediment control plan for the Project. During all phases of the Project erosion and sediment controls (ESCs) will be established in general accordance with Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom, 2004) and Volume 2E: Mines and quarries (Department of Environment and Climate Change, 2008) (hereafter collectively referred to as the 'Blue Book'). Project ESC design standards and anticipated ESCs to be implemented at the Project are outlined in Section 3.2 of **Appendix H.** Should the Project be approved, a detailed soil and water management plan (SWMP) will be prepared by a suitably qualified person to facilitate implementation of best practise ESCs during all phases of the Project.

**General Site Management**

It is anticipated the ESC management for the Project will include (but not be limited to):

- Ground disturbance will be minimised during construction and operational activities including restricting vehicle and machinery movements, stockpiling, temporary vehicle parking and material laydown to designated work areas. The disturbance boundary is to be clearly delineated with construction fencing or barrier tape.

- All fuels, chemicals and liquids will be stored in an impervious bunded area, a minimum of 50 m away from drainage lines or waterways.

- Refuelling of plant and equipment is to be undertaken in an impervious bunded area located a minimum of 50 m from drainage lines or waterways.
- Emergency spill kits are to be kept on site at all times. All workers are to be made aware of the location of the spill kits and trained in their use.
- Any concrete washout undertaken on site will be in a bunded area that is not on waterfront land and at least 10 m from drains.
- Where possible, topsoil will be stripped and handled only when it is moist (not wet or dry) to avoid decline of soil structure.
- Topsoil stockpiles will be stabilised with vegetation (seeded) if they are to be inactive for long periods.
- Stockpiles of erodible material that have the potential to cause environmental harm if displaced will be located away from concentrated surface flow and excessive up-slope stormwater surface flows.
- Wherever reasonable and practicable, "clean" surface waters must be diverted away from sediment control devices and any untreated, sediment-laden waters.
- All runoff from the works is to be passed through sediment controls.
- Sediment traps should be located as close to the source of the sediment as practicable.
- Sediment control devices must be de-silted and made fully operational as soon as reasonable and practicable after a sediment-producing event. Sediment traps should be maintained to ensure that no more than 30% of their design capacity is lost to accumulated sediment.
- Sediment removed from any trapping device is to be disposed of in locations where further erosion and consequent pollution to downslope lands and waterways will not occur.
- Temporary soil and water management structures are to be removed only after the Project site is stabilised appropriately through revegetation measures.
- Erosion control measures will be implemented to ensure disturbed lands only have C-factors of 0.1 or less after 10 days of inactivity (i.e. approximately 60% ground cover).
- Sediment basins are to be installed and maintained in accordance with the 'Blue Book' (Landcom, 2004).

#### 5.4.3.3 Licensing, Monitoring and Reporting.

**Environmental Protection Licence**

The Quarry will be required to hold an Environmental Protection Licence (EPL) as they will be carrying out a premises-based activity listed in Schedule 1 of the POEO Act, i.e. Activity 19. Extractive activities, >30,000 tonnes/year.

CSG will also be required to complete and submit an Annual Return to the NSW Environment Protection Authority (EPA). In the event that an incident occurs that threatens or causes environmental harm CSG will notify the EPA immediately after becoming aware of the incident. CSG will also provide a written report to the EPA within seven days of the date on of becoming aware of the incident.

**Licensing Exemptions**

All surface water runoff will be captured within the Quarry WMS dams to prevent the contamination of a water source and therefore all Project dams/water storages are considered as excluded works. As such, a WAL to account for surface water take is not required for the Project.

**Harvestable Rights**

The Maximum Harvestable Rights Dam Capacity (MHRDC) for the Quarry land held by CSG (87 ha) has been estimated using the NSW MHRDC calculator to be 16.97 ML (i.e. 30% of the average regional runoff).

The proposed Clean Water Storage is planned to exist onsite post-rehabilitation. This water storage is a single body of water with a capacity of approximately 11.8 ML and is therefore less than the MHRDC for the Site.

**Groundwater**

A maximum licensable groundwater take of 18.8 ML to supplement surface water inflows to meet operational demands was estimated using a water balance approach (refer to **Section 5.4.4**). Given the groundwater inflows to the Clean Water Pond, there will also be an associated groundwater take associated with the incidental inflows to and evaporative losses from the Clean Water Pond (refer to **Section 5.5** for groundwater intake levels). CSG will obtain a WAL and sufficient entitlement in the groundwater source to cover the maximum predicted groundwater take associated with Project operation.

**Water Quality**

Controlled and uncontrolled discharges are not expected to occur during the operation of the Project, however monitoring locations have been developed for due diligence (refer to **Appendix H** for monitoring locations and water parameters).

Long term impact assessment criteria for receiving water quality monitoring locations downstream of the Project will be developed generally in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, 2018) (ANZG 2018). In the interim, water quality guideline values indicated in **Section 5.4.2.3** will be applied as trigger values for the implementation of a water quality Trigger Action Response Plan (TARP) that will be included in the Project SWMP.

**Amenities Potable Water**

CSG will implement inspections and water quality testing for potable water stored in tanks on site to ensure amenities water quality meets the *Australian Drinking Water Guidelines – Version 3.8* (ADWG) (National Health and Medical Research Council, 2022).

**Annual Review and Incident Reporting**

CSG will submit an Annual Review to DPE that will include a summary of the Quarry WMS performance. It is anticipated that the Annual Review will include the annual site water balance results, receiving water quality monitoring results and details of any incidents or complaints. Any environmental incidents will be notified and reported to the relevant authorities (including DPE and EPA) as required.

#### 5.4.3.4 Flooding

Preliminary high level flood modelling was undertaken for the Project (**Appendix H**). Existing flood information and mapping, or relevant hydrological studies of the main river catchment in the locality of the Project Area, have not been identified. Accordingly, site specific flood analysis was undertaken which forms the basis of the preliminary flood risk assessment.

A TUFLOW hydraulic model was developed to estimate indicative 1% Annual Exceedance Probability (AEP) flood extents to assist in consideration of site design and configuration. Setup and configuration details of the TUFLOW model is outlined as below:

- A 10 m resolution Digital Elevation Model (DEM) was available using 2015 LiDAR data. The ground surface elevations for the TUFLOW model grid points are sampled directly from the DEM. A TUFLOW 2-dimensional (2D) domain resolution of 5 m was adopted for the study area. It should be noted that TUFLOW samples elevation points at cell centres, mid-sides and corners, so a 5 m cell size results in elevation being sampled from the underling DEM every 2.5 m.
- The Shoalhaven River inflows were based on the highest recorded flow at the Shoalhaven River at Warri gauge. This flow corresponded approximately to a 1% AEP flow calculated using the Regional Flood Frequency Estimation (RFFE) method. Inflows for Reedy Creek and Durran Durra Creek were based on RFFE flows for the 1% AEP event.
- A constant hydraulic roughness value was applied to the model: a Manning's 'n' value of 0.06. It is recommended that this is refined based on aerial imagery in future refinements of the model.
- No hydraulic structures were included in the model. Durran Durra Creek at Larbert Road. This has been represented in the 2D model terrain which is considered appropriate for this high-level assessment.

### 5.4.4 Conceptual Water Balance Model

A daily time step water balance model (the WBM) was developed in the Goldsim software modelling platform to simulate the performance of the proposed WMS and estimate the:

- Annual gross water balance (i.e. excludes imports and outflows).
- Likely volume and frequency of water imports to the Project to meet operational demands.

#### 5.4.4.1 Water Sources and Demands

**Water Sources**

The modelled Project water sources are:

- Direct rainfall on water storages and WMS catchment runoff.
- Groundwater seepage into the Clean Water Pond.

**Water Demands**

The modelled Project water demands are:

- Daily evaporative losses from the Clean Water Pond and Silt Pond.
- Groundwater seepage out of the Clean Water Pond.
- Product moisture losses.
- Application of dust suppression on unsealed trafficked surfaces.

#### 5.4.4.2 Input and Underlying Assumptions

The following inputs and assumptions were applied in the WBM:

- Daily rainfall, evaporation and temperature (minimum and maximum) data sourced from the SILO climate database (refer to Section 2.2 of **Appendix H**) at grid point -35.30 latitude and 149.75 longitude for the period 1 January 1900 to 31 December 2022.
- A runoff factor of 0.65 was applied to rainfall depth to estimate runoff from the surface facilities catchment.
- The Silt Pond and the Clean Water Pond were modelled as a consolidated water storage.
- An evaporation pan factor of 0.75 was applied to estimate evaporative losses from the Clean Water Pond and Silt Pond.
- The consolidated Clean Water Pond and Silt Pond storage contains 0.5 ML of water at the start of the WMB simulation and has a maximum capacity of 20.2 ML.
- The WBM does not account for the volume of groundwater seepage into the Clean Water Pond as the rate is not known. Rather, to account for take of groundwater to meet operational demands when the estimated volume of available surface water from rainfall runoff is insufficient, the WBM "imports" groundwater at a rate of 0.05 ML/day.
- Groundwater seepage out of the consolidated Clean Water Pond and Silt Pond storage at a rate of 0.0375 ML/day. This rate has been applied to replicate historical WMS performance whereby uncontrolled discharges have not occurred even during high or prolonged rainfall events.
- Dust suppression was modelled to be required for 0.5 ha of unsealed trafficked areas.
- An estimated product moisture loss of 4,210 kL/year was applied based on 3% moisture in the extracted material and 5% moisture in outgoing product.

#### 5.4.4.3 Water Balance Results

**Gross Water Balance**

The annual gross water balance results presented in **Table 5.20** indicate that for the modelled climate period the Project will operate with water deficit in all but the wettest years and will require water "imports" from groundwater to meet operational demands.

**Table 5.20 Gross Water Balance Results (ML/year)**

| Minimum | 10th Percentile | 50th Percentile | 90th Percentile | Maximum |
|---|---|---|---|---|
| **-18.8** | -14.1 | -9.3 | -1.5 | 0.0 |

### Median Year Net Water Balance

**Table 5.21** presents the net water balance results for the modelled rainfall closet to the gross water balance 50th percentile (median) prediction.

**Table 5.21 Median Year Net Water Balance (ML/year)**

| Parameter | Result (ML) |
|---|---|
| **Inflows** | |
| Rainfall and runoff to Clean Water Pond | 14.1 |
| Groundwater extraction | 9.3 |
| **Total inflows** | 23.4 |
| **Outflows** | |
| Evaporation from Clean Water Pond | 0.5 |
| Product moisture losses | 4.2 |
| Dust suppression | 5.0 |
| Seepage to alluvium | 13.7 |
| Total Outflow | 23.4 |
| Change in Storage | 0.0 |
| **Net Water Balance** | **0.0** |

### Water Extraction

**Table 5.22** presents the Clean Water Pond groundwater extraction required. Results indicate that:

- The Project will rely on groundwater "imports" in all but the wettest years to meet operational demands.
- The maximum annual groundwater extraction is estimated to be 18.8 ML.

**Table 5.22 Clean Water Pond Groundwater Extraction (ML/year)**

| Minimum | Average | Maximum |
|---|---|---|
| **0.0** | 8.9 | 18.8 |

## 5.4.5 Impact Assessment

**Surface Water Quality**

The Project is not expected to result in controlled or uncontrolled discharges (refer to **Section 5.4.3.1**) and is considered to have a neutral effect on Shoalhaven River catchment water quality as per the NorBE assessment.

**Catchment Yield**

The Project will occupy a maximum area of approximately 68 ha within the Shoalhaven River catchment which accounts for approximately 0.009% of the Shoalhaven River catchment area. As such, it is considered that the loss in catchment yield associated with the Project is negligible.

**Water Security**

Water balance modelling indicates that rainfall, runoff and groundwater seepage inflows will provide an adequate and reliable supply of water to meet operational water demands for the Project (refer to **Section 5.4.4**). While the Quarry is considered to have a secure source of water, the Quarry will curtail production as required during persistent dry conditions and where water allocation assignments from the groundwater sources are reduced by WaterNSW.

**Flow Regimes and Stream Stability**

Rainfall runoff from the upslope catchment, south of the Project Area, will be diverted around the Project via a clean water drain (refer to *Figure 3.1* of **Appendix H**. The clean water drain will divert runoff from approximately 15 ha of undisturbed upslope catchment runoff to the west. The implementation of level spreaders (or similar energy dissipation discharge structure) at either end of the clean water drain will discharge runoff north towards the Shoalhaven River as overland flow in a non-erosive manner. The diversion therefore will not result in increased flows in minor streams and no impacts on receiving watercourse stream stability are expected.

**Flooding**

Results of the preliminary flood assessment indicate that depths up to 2 m and velocities up to approximately 2 m/s are predicted within the Project Area for the modelled scenario. Below is a summary of the potential flood impacts within the Project (refer to **Figure 3.2** for impacted areas):

- The majority of extraction cell E1 (and potentially part of E2) is at risk of flooding in high flow events.
- The northern side of extraction cell E5 is at risk of flooding in high flow events.
- Potential for flow to break out from Shoalhaven River west of the Site in high flow events and flow through E5 from west to east.

To reduce the potential impacts from flooding on the extraction cells of the proposed Project, the following measures are recommended:

- Bunding at western boundary of extraction cell E5 to divert flow path flowing from west to east.
- Bunding at north-eastern side of E5.
- Avoid extraction of northern corner of E5 or alternatively bund around it.
- Bunding along northern boundary of E1.

Based on the preliminary flood assessment the impacts of the proposed bunding on local flood regimes will be considered. However, it is expected that any impacts on flood regimes would be localised to Shoalhaven River adjacent to the Project Site.

### 5.4.6 Conclusion

An assessment of the potential impacts on surface water resources associated with the Project was undertaken and the following conclusions have been drawn from the assessment outcomes:

- The Project is not expected to have controlled or uncontrolled discharges to the receiving surface water environment and as a result the Project is considered to have a NorBE on water quality as required for developments within the Sydney Drinking Water catchment.
- Given that there are no expected controlled or uncontrolled discharges to the receiving surface water environment, no impacts to surface water environmental values are anticipated.
- The Project will have an adequate and reliable water source (i.e. rainfall runoff captured in the Quarry WMS and groundwater inflows to the CWP).
- It is considered that the estimated loss of catchment yield of approximately 0.009% to the Shoalhaven River will have a negligible impact on flow regimes and water availability to downstream water users.
- The impacts of the proposed bunding on local flood regimes will be considered. However, it is expected that any impacts on flood regimes would be localised to Shoalhaven River adjacent to the Project Site.

## 5.5 Groundwater

### 5.5.1 Introduction

The following sub-sections have been prepared by Ground Doctor to address the SEARs and key requirements of the EPA as relevant to impacts on groundwater. This section provides:

- A review of local setting (**Section 5.5.2**).
- A review of potential impacts to groundwater (**Section 5.5.3**).
- Groundwater Characterisation Works (**Section 5.5.4**).
- A conceptual Groundwater Model for the Project Site (**Section 5.5.5**).
- An assessment of the Sites impacts to Groundwater (**Section 5.5.6**).
- A conclusion of the work Ground Doctor had undertaken for the Groundwater Assessment (**Section 5.5.7**).

## 5.5.2 Local Setting

**Existing Site Features and Use**

Ground Doctor (2022) identified the site featured an existing sand and gravel quarry accessed via an unsealed driveway (Access Road) from Larbert Road. The excavation area was observed in the southern central portion of the site approximately 200 m long and 200 m wide with the deepest parts of the excavation area occurring along the northern side approximately 5 m below pre-disturbance surface elevation. Standing water was identified in the deepest parts of the excavation.

Stockpiling and processing of excavated material, and the stockpiling of finished product occurs in the southern portion of the excavation area. This area features a washing and screening plant. A series of settling ponds were also observed in the central portion of the excavation area and were used to polish wash water from the screening and washing plant.

Sloping parts of the site along the southern boundary were wooded with remnant native vegetation. Native woody vegetation was also located along the northern site boundary on or close to the bank of Shoalhaven River.

Historic sand and gravel extraction areas were located in the northeast corner of the site. These areas had been partially backfilled and were grassed open space. A pocket of woody vegetation remained on an elevated area in the middle of the former extraction area. Standing water was evident in low lying parts of the northeast corner of the site during the site inspection.

**Topography and Drainage**

Surface elevation contours presented in *Figure 4* of Ground Doctor (2022) were extrapolated from a 1 m digital elevation model (DEM) published by the Australia and New Zealand Intergovernmental Committee on Survey and Mapping "ELVIS" website (https://elevation.fsdf.org.au/, 18 May 2022). Ground Doctor identified the Shoalhaven River as the regional drainage feature which flows in a general southwest to northeast direction in the Larbert area. The Quarry is featured on the southern side of a prominent meander of the river. ELVIS surface elevation data indicates the typical River elevation is approximately 575 mAHD in the area closest to the southwest corner of the site and approximately 574 mAHD in the area closest to the northeast corner of the site.

The proposed disturbance area is situated on a terrace of alluvium on the southern and eastern sides of Shoalhaven River. The main terrace within the disturbance area has surface elevation ranging from approximately 581 mAHD to 583 mAHD with gradual fall from southwest to northeast consistent with regional gradient of Shoalhaven River. A lower terrace traversed the northwest corner of the site and was likely indication of the boundary of quaternary alluvium.

Land on the southern side of the site rises relatively steeply, presumably marking the boundary between the tertiary alluvial terrace and granite basement. A ridgeline is located approximately 800 m south of the southern site boundary and reaches an elevation of approximately 622 mAHD. Cleft Hill is the most elevated point within a 5 km radius of the site. Cleft Hill is located approximately 1.8 km south of the site and has an elevation of approximately 750 mAHD.

In the western part of the site there is an average gradient in a north westly direction toward Shoalhaven River. In the central and eastern portions of the site there is a general gradient in a northerly direction toward Shoalhaven River.

In the northeast corner of the site there is an area of lower terrain where the surface elevation is as low as 575 mAHD. Mr Trevor Allen (Canberra Sand and Gravel) indicated that the surface depressions are the result of historic sand and gravel extraction. Standing water was observed in the lower parts of the depressions at the time of the site inspections (at approximately 576 mAHD).

Durran Durra Creek was a secondary regional drainage feature and flowed adjacent to the northeast site boundary before joining the Shoalhaven River. Durran Durra Creek drained areas to the southeast of the site. Another major regional drainage was Reedy Creek, which drained areas to the northwest of the site (on the opposite side of the Shoalhaven River).

Standing water was observed in a small depression within the tertiary alluvium flood terrace in the western portion of the site at the time of the site inspection. The depression had an elevation of approximately 582 mAHD.

**Rainfall and Evaporation**

Rainfall and evaporation data was obtained from the Australian Bureau of Meteorology (BOM) website (www.bom.gov.au, 15 January 2023). Rainfall data was collected by the Braidwood (Wallace Street) station and evaporation data from the Goulburn Tafe station.

Available BOM rainfall and evaporation data at gauging stations most representative of the site indicate that the net rate of evaporation at the site ranges between 520 mm/yr to 655 mm/yr.

**Hydrogeology**

Ground Doctor conducted a search of the NSW Water groundwater works database (https://realtimedata.waternsw.com.au, 4 November 2022) for registered groundwater works located within an approximate 5 km radius of the proposed disturbance area.

A summary of the registered bore details and locations can be found in **Appendix I.** The closest registered groundwater work to the site was GW100322 and was located approximately 1700 m to the southeast. Bore depths ranged from 1.8 m to 105 m below ground level. Groundwater was encountered in alluvium (sand and gravel) in the upper 12 m of GW044932. Groundwater was encountered in other bore locations in fractured rock such as basalt, granite and rhyolite. Recorded standing levels ranged from 1.8 to 15 m below ground level.

**On-site Groundwater Monitoring Bores**

Ground Doctor installed six monitoring bores at six locations (MB01 – MB06) in September 2022. Monitoring bore details can be found in Ground Doctor (2022). Groundwater was identified in alluvium within the disturbance footprint at depths ranging from 1.9 m to 5.0 m below ground surface. Some of the monitoring bores were located outside the alluvium and encountered groundwater in weathered granite and granite in the upper 15 m of the subsurface.

**Relevant Groundwater Management Units**

The *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011* indicates that the site is situated above the "*Goulburn Fractured Rock*" groundwater management unit. The background document for the water sharing plan (2011) states the following regarding the "*Goulburn Fractured Rock*" groundwater management unit.

"The Goulburn Fractured Rock Groundwater Source is bounded to the north by the Murruin Range, the Pacific Ocean and rocks of the Sydney Basin to the east, and Great Dividing Range in the south and west. The groundwater source covers an area of 8,175.31 square kilometres, and rock types are a mixture of Palaeozoic rocks which are mainly volcanic in origin. Most of the groundwater found within these rocks is suitable for some domestic, agricultural and limited industrial uses. High salinity groundwater does underlie some areas near Goulburn. Although groundwater may be in supply, the water quality may limit potential uses. Bore distribution is well spread out, but there is some concentration around major townships like Goulburn."

As outlined in earlier sections of the report, groundwater appears to exist in two distinct aquifers beneath the site. Beneath lower lying areas along the Shoalhaven River groundwater is present in alluvium which is inferred to be relatively narrow and less than 10 m thick with the proposed extraction area. The alluvium is underlain by granite (fractured rock). Given the limited extent of alluvial system at the site it is managed as part of the "*Goulburn Fractured Rock*" groundwater management unit.

Based on conditions identified at the site and in nearby registered groundwater works, the aquifer at the site would be classed as a less productive porous or fractured rock aquifer.

### 5.5.3 Potential Groundwater Impacts

**Groundwater Dependant Ecosystems**

The "*Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011*" did not identify any high priority Groundwater Dependant Ecosystems (GDEs) within 5 km of the site as of 13 January 2023.

**Culturally Significant Groundwater Sites**

A search of the NSW Heritage Aboriginal heritage Information System (AHIMS) database was conducted in Ground Doctor (2022). Three aboriginal heritage sites were identified within a 1 km buffer of the site to the northeast of the proposed disturbance area.

A detailed aboriginal heritage survey was conducted by AREA to support the development application (**Appendix K**). The study indicates that the identified aboriginal heritage items identified in the AHIMS database are not groundwater dependant cultural sites and are not located within the disturbance area.

**Contamination Sources**

Ground Doctor conducted a search of the NSW EPA list of sites notified under Section 60 of the *Contaminated Land Management Act 1997*. No notifications were listed for the site or within a 5 km radius of the site boundary.

**Acid Sulphate Soils**

Acid Sulphate soil risk mapping presented on the NSW Department of Planning and Environment eSpade website (https://www.environment.nsw.gov.au/eSpade2Webapp#) indicates that the site is not located within an acid sulphate soil risk zone.

The measured pH of groundwater at six monitoring bore locations at the site including some located close to the existing quarry operations had a pH ranging 6.3 – 6.9 which was close to neutral. The results indicate that the existing operations have not encountered any significant amounts of acid generating material in the subsurface.

## 5.5.4 Groundwater Characterisation Works

**On-site Monitoring Bores**

Six monitoring bores were installed by Ground Doctor in September 2022. Monitoring bore locations were selected to assess groundwater conditions around the periphery of the existing and proposed disturbance areas. Monitoring bore locations can be found in Ground Doctor (2022) **Appendix I**.

Boreholes were drilled approximately 2–3 m beyond the uppermost groundwater bearing unit, or where groundwater inflow was noted in bedrock. Monitoring bores MB01, MB02, MB04 and MB05 encountered groundwater in alluvium comprised primarily of sand and gravel. In boreholes that intersected groundwater within alluvium (MB01, MB02, MB04 and MB05) boreholes were drilled to a depth at least 2 m below the water table. Weathered granite was believed to have been encountered below alluvium in the lower part of MB02, MB04 and MB05.

Monitoring bores MB03 and MB06 intersected groundwater in weathered granite basement. These boreholes were advanced to the first obvious water strike. There was a relatively thin layer of alluvium or colluvium (sand and gravel) in the upper 2 m of MB03 and MB06. MW03 was situated on level ground (assumed current or former floodplain) close to the Shoalhaven River. It is inferred that weathered granite encountered at MB03 is a subsurface extension of the ridgeline to the south of the proposed disturbance area covered by a veneer of alluvium less than 2 m thick.

**Groundwater Gauging and Elevation**

Boreholes were gauged in quick succession to limit potential variation over time. The depth to water was measured from a refence location on the top of the PVC casing using an electronic level meter. Relative elevations of the top of PVC casings were measured by a land surveyor (ACT Civil Surveys Pty Ltd).

Measured relative groundwater elevation was lowest at MB03 (575.53 mAHD) and highest at MB06 (580.16 mAHD).

In monitoring bores screened within the alluvium (MB01, MB02, MB04 and MB05) groundwater elevation ranged from 576.93 mAHD at MB02 to 578.59 mAHD at MW04. MB04 is situated at the most upgradient point along the Shoalhaven River.

MB06 was installed into weathered granite on the upslope (southern) side of the proposed disturbance area. MB03 was installed into weathered granite. The bore had a very low yield compared to other monitoring bores. It is possible that the water level within MB03 had not properly equilibrated at the time of gauging.

Measured groundwater elevation in all monitoring bores except MB03 appear to be higher than the inferred typical elevation of surface water in Shoalhaven River. This suggests that Shoalhaven River is a gaining stream in the vicinity of the site. That is, there is groundwater flow from alluvium and granite beneath the site toward the Shoalhaven River.

**Groundwater Sampling and Analytical Results**

Groundwater was sampled by Ground Doctor approximately 5 weeks after the bores had been installed. Monitoring bores were sampled using a low flow (micro-purge) sampling method. A peristaltic pump was used to purge and sample the bores.

Groundwater discharge was directed into a flow cell which housed a water quality meter. Wells were sampled once water quality parameters were stable, which typically coincided with stabilised well drawdown. Groundwater samples were appropriately collected into labelled containers and sent off for lab analysis at Envirolab Services, Sydney.

Stabilised water quality parameter data for each monitoring bores is presented in **Table 5.23**.

**Table 5.23 Measured Water Quality Parameters**

| Bore ID | Temperature (°C) | Dissolved Oxygen (mg/L) | Electrical Conductivity (µS/cm) | pH | Field Oxidation Reduction Potential (mV) |
|---|---|---|---|---|---|
| **MB01** | 15.8 | 0.32 | 87 | 6.88 | -28 |
| **MB02** | 15.2 | 4.45 | 69 | 6.93 | -25 |
| **MB03** | 15.3 | 1.83 | 289 | 6.51 | -19 |
| **MB04** | 14.9 | 0.11 | 88 | 6.30 | -49 |
| **MB05** | 16.2 | 7.14. | 49 | 6.62 | -5 |
| **MB06** | 17.2 | 0.82 | 345 | 6.30 | -43 |

The measured EC values of water sampled from MB03 and MB06 were observed to be notably higher than water sampled within other bores. MB03 and MB06 were screened within weathered granite. The results indicate that groundwater within the granite has a higher EC than groundwater within the tertiary and/or quaternary alluvium. Measured pH ranged from 6.3 to 6.9.

Analytical results are summarised and compared to the water quality guidelines in *Table B1* of **Appendix I**.

Water quality guidelines referenced in Ground Doctor (2022) include:

- National Health and Medical Research Council (NHMRC) (2011) **Australian Drinking Water Guidelines**. These guidelines apply to assessment of potential impacts to water resources that may be used for potable water supply.
- Default guideline values (DGVs) specified in the Australian and New Zealand **Guidelines for Fresh and Marine Water Quality** (August 2018). Ground Doctor adopted threshold relevant to moderately disturbed freshwater ecosystems (95% protection) as this is most appropriate for the nearest freshwater aquatic ecosystem (Shoalhaven River).

Groundwater samples were analysed for 28 common metals. Metals detected in groundwater samples included aluminium, arsenic, barium, cobalt, copper, iron, lithium, manganese, mercury, molybdenum, nickel, vanadium and zinc. Reported metals concentration were less than the laboratory practical quantification limit (PQL) and/or the Australian Drinking Water threshold and thresholds for the protection of freshwater ecosystems with the following exceptions:

- The report aluminium concentration in water sampled from MB05 was 1600 µg/L, which exceeded the threshold for the protection of freshwater ecosystems.

- The reported manganese concentrations in water sampled from MB01 and MB03 were 570 µg/L and 540 µg/L respectively, which exceeded the Australian Drinking Water threshold.
- The reported zinc concentrations in water sampled from MB01, MB03, MB04 and MB06 exceeded the threshold for the protection of freshwater ecosystems.

Ground Doctor (2022) determined that metals that were detected were most likely present due to natural occurrence. They observed that CSG currently applies aluminium sulphate and aluminium chlorohydrate to wash water to act as a coagulant / flocculant to enhance settlement of suspended fines. The wash water is currently settled within various ponds constructed within the excavation. It is likely that the elevated aluminium concentration at MB05 (located approximately 50 m from the nearest settlement pond) is related to application of aluminium sulphate and aluminium chlorohydrate to the settlement pond.
The absence of elevated aluminium in water sampled from MB01 and MB02 (located between MB05 and Shoalhaven River) indicates that aluminium detected at MB05 is unlikely to be migrating as far as the river due to aluminium binding with aquifer material.

Aluminium is soluble and biologically available in acidic (pH <5.5) soils and waters, but relatively insoluble and therefore innocuous in circumneutral (pH 6.0-8.0) conditions (Sparling and Lowe 1996). Measured pH at the site ranged from 6.3 to 6.9, so it is unlikely that the identified aluminium in groundwater would impact on the freshwater ecology of Shoalhaven River.

A Piper Trilinear diagram was conducted by Ground Doctor to observe the proportions of Major Anions and Cations of groundwater. This is presented in a piper trilinear plot in Plot 1.

The plotted anion and cation data indicates groundwater in all of the monitoring bores in the alluvium (MB01, MB02, MB04 and MB05) have similar basic chemistry. In addition to having higher concentrations of dissolved salts, the chemical composition of groundwater sampled from the granite monitoring bores (MB03 and MB06) differs from the alluvial bores and from each other.

Nutrients (nitrate and nitrite, ammonia and phosphorus were detected in water sampled at MB01, MB02, MB05 and MB06. The concentrations of nutrients were less than the referenced guideline concentrations for drinking water and freshwater aquatic ecosystems.

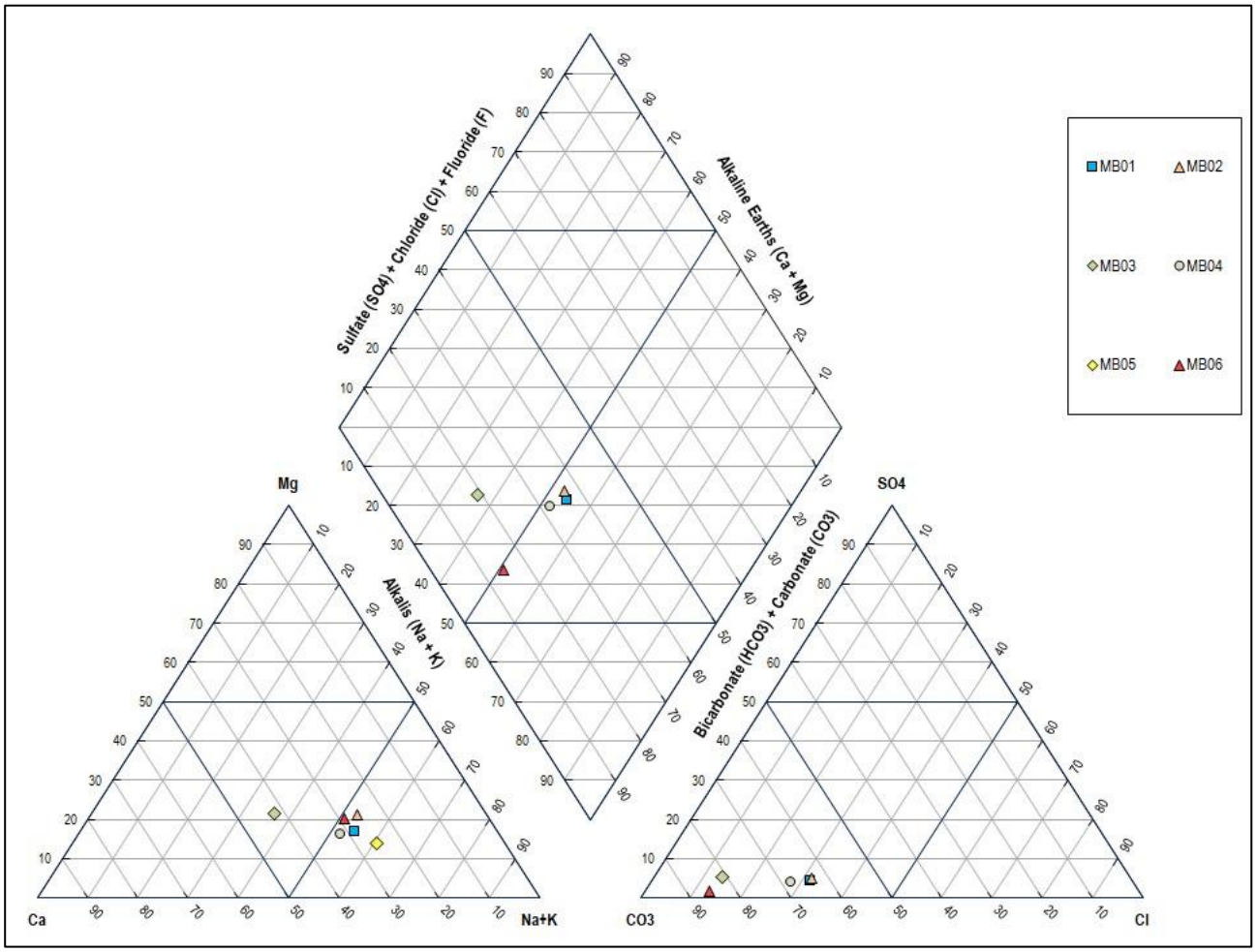



**Figure 5.2 Piper Trilinear Diagram showing the proportions of major Anions and Cations**

### 5.5.5 Conceptual Groundwater Model

Ground Doctor established a Conceptual Groundwater Model to describe the site hydrogeological setting. This was undertaken by using the following observations Ground Doctor observed:

- The alluvial plains surrounding the Shoalhaven River are comprised of quaternary and tertiary alluvium. The tertiary alluvium has been incised by the present-day Shoalhaven River such that the tertiary alluvium is situated above the present-day flood range of the Shoalhaven River. The quaternary alluvium is situated within the broader valley of tertiary alluvium. The proposed quarry excavations occur largely within the tertiary alluvium.
- Bedrock outcrop is visible in places along the Shoalhaven River indicating that the alluvium extends only marginally beneath the river level.
- The measured groundwater elevation in the on-site monitoring bores is higher than the estimated surface water elevation within Shoalhaven River indicating groundwater flow from the site toward the river. The water table elevation in granite on the southern side of the alluvial plains is higher than that within the alluvium indicating groundwater discharge from granite bedrock to the alluvium and Shoalhaven River.

- Groundwater elevation data indicates groundwater recharge occurs primarily from infiltration of precipitation which falls in the immediate surrounds and upslope areas of the site. The electrical conductivity (salinity) of groundwater in the alluvium is lower than that in the surrounding granite suggesting flow of groundwater from granite into the alluvium is a minor source of recharge to the alluvium.

- The existing extraction area extends approximately 5 m below the pre-excavation ground level which is estimated to be approximately 576 mAHD based on the digital elevation model for the site (see *Figure 4* of *Annex A*). It appears to have extended below the water table and water within the excavation is most likely comprised primarily of groundwater. The elevation of water in the existing excavations remains above the elevation of water in the Shoalhaven River. The base of the existing and proposed excavations will remain above the Shoalhaven River level ensuring water cannot flow from the Shoalhaven River into the open excavations.

- Groundwater loses will occur to evaporation due to exposure of the water table. Some water will also be lost in the product washing stage of production, where water could be taken from the site as a portion of the exported product. This may or may not result in localised lowering of the water table over time, depending on the hydraulic conductivity of the alluvium. In any case the maximum depth of extraction will be the limit of potential drawdown impacts. The maximum depth of extraction is 576 mAHD. Therefore, any drawdown within the proposed extraction areas cannot draw water from the Shoalhaven River.

- The existing and proposed quarry process involves excavation, haulage, sorting and screening of excavated alluvium. Acid sulphate soil risk mapping indicates the quarry has low risk of encountering iron pyrite rich material that would be acid generating if exposed to oxygen. The mapping is supported by water quality monitoring data for the site, which indicated groundwater had pH close to neutral in the vicinity of the existing quarry excavations.

- Water quality data collected as part of the groundwater impact assessment indicates that the application of aluminium sulphate and aluminium chlorohydrate to water within the existing quarry excavation may have resulted in measurable impacts to nearby groundwater (at MB05).

- A conceptual hydrogeological cross section of the site in the pre-development stage, during development and post-development based on the site conditions can be found in **Appendix I** and was inferred using data present in Ground Doctor (2022).

## 5.5.6 Impact Assessment

### 5.5.6.1 Aquifer Interference

The *Water Management Act 2000* defines an aquifer interference activity as that which involves any of the following:

- the penetration of an aquifer,

- the interference with water in an aquifer,

- the obstruction of the flow of water in an aquifer,

- the taking of water from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations, and/or
- the disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.

Based on the observed occurrence of groundwater in the existing quarry extraction area and measured groundwater elevations in six groundwater monitoring bores installed at the site, groundwater will be encountered in the proposed extraction areas. Therefore, the proposed development is an aquifer interference activity.

#### 5.5.6.2 Aquifer Interference Tests

The NSW Aquifer Interference Policy (NSW DPI, 2012) outlines "*minimum impact considerations*" for various aquifer types. If the predicted impacts are less than the "*minimal impact considerations*", then these impacts are considered acceptable.

#### 5.5.6.3 Aquifer Type

The proposed development will intersect an alluvial aquifer that forms part of the "*Goulburn Fractured Rock*" groundwater management unit.

The alluvium along the mid Shoalhaven River has not specific management unit. There are very few registered groundwater works in the vicinity of the site. As such, the alluvial aquifer at the site is classed as a "less productive" alluvial aquifer.

The NSW Aquifer Interference Policy 2012 discusses impacts within "highly connected" groundwater units, referring to aquifers with high connectivity to adjacent surface water features. The Aquifer Interference Policy 2012 indicates that "highly connected" systems are defined by the relevant regulations.

The NSW Department of Planning and Environment (2022) Groundwater Resource Description – Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources states the following with regard to connectivity of surface and ground water.

"While the surface water and groundwater connectivity to a varying degree is acknowledged in most water sources, the groundwater pumping impact on the river flow is considered 'subdued and/or delayed'. Most of the groundwater systems are considered to be "less highly connected" as described in the groundwater macro-planning method report. Therefore, the groundwater sources in the water sharing plan area are managed independently from surface water except for the Hawkesbury Alluvium which is considered as a connected system."

On this basis the alluvial aquifer subject to interference is not a "highly connected" system as defined by the regulations.

The minimum impact considerations for "*less productive alluvial aquifers*" are as follows.

**Groundwater Dependent Ecosystems and Cultural Sites**

The maximum potential extend of drawdown impacts would be limited to the depth of the proposed excavations below the water table. The proposed excavations will not exceed 576 mAHD and based on the water table elevation measured as part of this assessment the maximum potential drawdown impact would be less than 2 m below the pre-development water table elevation.

High priority groundwater dependent ecosystems were not identified within an approximate 5 km radius of the proposed excavation areas. High priority groundwater dependant cultural sites were not identified within a 1 km buffer of the site boundary.

**Drawdown Impacts**

The maximum potential extend of drawdown impacts would be limited to the depth of the proposed excavations below the water table. The proposed excavations will not exceed 576 mAHD and based on the water table elevation measured as part of this assessment the maximum potential drawdown impact would be less than 2 m below the pre-development water table elevation.

A search of the registered groundwater works database did not identify any groundwater works in the alluvium that could potentially be impacted by the development. The nearest registered groundwater work was located more than 1,700 m southeast of the proposed development, in a different valley to the development.

**Water Quality**

The existing and proposed quarry process involves excavation, haulage, sorting and screening of excavated alluvium. Acid sulphate soil risk mapping indicates the quarry has low risk of encountering iron pyrite rich material that would be acid generating if exposed to oxygen. The mapping is supported by water quality monitoring data for the site, which indicated groundwater had pH close to neutral in the vicinity of the existing quarry excavations.

Water quality data collected as part of the groundwater impact assessment indicates that the existing quarry development has not had a measurable impact on groundwater salinity in the surrounding monitoring bores.

Water quality data collected as part of this assessment indicates that the application of aluminium sulphate and aluminium chlorohydrate to water within the existing quarry excavation may have resulted in measurable impacts to nearby groundwater (at MB05). Preliminary assessment of the site data indicates that the identified aluminium impacts pose no unacceptable risk to human health or the environment. Aluminium concentrations in groundwater at monitoring bores located between MB05 and the Shoalhaven River were less than the relevant thresholds for the protection of freshwater aquatic ecosystems and the Australian Drinking Water thresholds. Groundwater pH was also in the range at which aluminium would not be expected to impact on freshwater aquatic ecosystems. Notwithstanding CSG will not apply coagulant or flocculant to standing water within the quarry excavations. CSG propose to use a physical process (e.g. natural filtration of sediments) to remove suspended sediment from wash water during future operation of the quarry.

The proposed activities have little if any potential to add contaminants that could adversely change groundwater quality.

The development requires operation of plant at the ground surface. Spillage of fuel, lubricants and hydraulic fluids poses a risk to underlying groundwater quality. This risk would be adequately managed by the establishment of dedicated vehicle servicing and refuelling areas and appropriate management controls, which would include fast containment of spills and fast removal and containment of impacted soil using on-site earth moving equipment.

Hazardous and non-hazardous chemicals to be used within the site would be managed in accordance with the specifications of the Material and Safety Data Sheets (MSDS) and relevant management plans. The following measures would be implemented to further minimise adverse environmental impacts associated with storage and use of reagents and chemicals within the Project Site.

- All chemicals would be stored and used in accordance with the manufacturer's instructions and the relevant MSDS.
- All liquid chemicals would be stored within an impermeable bunded area with a capacity of at least 110% of the capacity of the largest container.
- Chemicals with the potential to react with each other would not be stored in the same area to prevent any reactions between them in the event of a spill.
- Only the minimum volume of chemicals required for the ongoing operation of the quarry would be stored on-site.
- MSDS and appropriate spill management equipment would be available in the vicinity of all chemical storage areas.
- Personnel who will use chemicals would be provided with the appropriate training in the proper handling techniques.

Flow of water from the existing and proposed quarry excavations will occur through alluvium (clay, silt, sand and gravel) situated beneath the excavations and Shoalhaven River. The natural aquifer material will act as a filter to eliminate discharge of sediment laden water to Shoalhaven River.

Ground Doctor did not identify any records of significantly contaminated land within a 5 km radius of the proposed excavation areas.

#### 5.5.6.4 Groundwater Use and Evaporative Losses

The proposed Project will utilise water from the proposed excavations for water supply. Water accumulating within the existing and proposed excavations is likely to be comprised primarily of groundwater.

The proposed quarry excavations will need to be registered as a groundwater supply work. CSG will need to obtain a Water Access License (WAL) for groundwater taken from the Goulburn Fractured Rock groundwater management unit for commercial use.

The volume of groundwater used is difficult to measure given that the current and proposed development involves recycling of wash water within the quarry excavation. Groundwater use would be comprised of:

- Losses to evaporation from exposure of the water table to the atmosphere. This could be calculated by applying the average evaporation rate to the area of exposed groundwater within the open excavation at the site.

- Losses of groundwater in exported product. This could be calculated by measuring the moisture content of finished product and applying the measured percentage weight to the mass of exported product.

The post development landform will be rehabilitated so that the final landform is above the pre-development water table elevation. Therefore, there will be no ongoing groundwater losses once the development is completed.

### 5.5.7 Conclusion

Information gathered and reviewed by Ground Doctor indicates that the proposed Project will intersect water within an alluvial aquifer and therefore would be an aquifer interference activity.

The maximum potential extend of drawdown impacts would be limited to the depth of the proposed excavations below the water table. The proposed excavations will not exceed 576 mAHD and based on the water table elevation measured as part of this assessment the maximum potential drawdown impact would be less than 2 m below the pre-development water table elevation.

The existing and proposed development utilise groundwater as water supply for washing of excavated product. Indirect take of groundwater will also occur in the form of evaporative losses from exposed groundwater within the open excavations. The proposed quarry excavations will need to be registered as a groundwater supply work. CSG will need to obtain a Water Access License (WAL) for groundwater taken from the Goulburn Fractured Rock groundwater management unit for commercial use.

The existing and proposed quarry process involves excavation, haulage, sorting and screening of excavated alluvium. The proposed activities have little if any potential to add contaminants that could adversely change groundwater quality. Water quality data collected as part of the groundwater impact assessment indicates that the existing quarry development has not had a measurable impact on groundwater salinity in the surrounding monitoring bores.

Furthermore, water quality data collected as part of this assessment indicates that the application of aluminium sulphate and aluminium chlorohydrate to water within the existing quarry excavation may have resulted in measurable impacts to nearby groundwater (at MB05). CSG will not apply coagulant or flocculant to standing water within the quarry excavations. CSG propose to use a physical process (e.g. natural filtration of sediments) to remove suspended sediment from wash water during future operation of the quarry.

Potential risks to water quality can be managed by implementing appropriate procedures for storage and use of chemicals, refuelling and maintenance of plant and machinery and implementing appropriate spill response plans.

Potential impacts associated with the proposed development would not exceed the "*minimum impact considerations*" outlined in the NSW Aquifer Interference Policy (NSW DPI, 2012). Therefore, groundwater impacts associated with the project are acceptable.

# 5.6 Biodiversity

## 5.6.1 Introduction

A detailed assessment of the impacts of the Project has been completed and a Biodiversity Development Assessment Report (BDAR) has been prepared by AREA in accordance with the *Biodiversity Conservation Act 2016* (NSW) (BC Act). The BDAR assesses biodiversity values of the subject land in accordance with the biodiversity assessment method (BAM) and sets out the measures that CSG proposes to take to avoid or minimise the impact of the proposed development. The size of the resource that will be extracted is still to be determined, and it will be based on the final extraction area and depth. However, it will not exceed 5,000,000 tonnes. Impact to native vegetation is limited to an area of 23.13 hectares.

The findings of the BDAR (including proposed mitigation and offsetting strategies) are summarised in the following sections with the full report attached (refer to **Appendix J**).

## 5.6.2 Methodology

### 5.6.2.1 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity Methods

Native vegetation cover was initially identified using open-source current and historical aerial imagery (ESRI Satellite, Google Satellite and NSW Six Maps), GIS spatial data, and vegetation mapping during field assessment planning. Site visits occurring on 22 September 2022 and November 2022 were used to confirm the extent and condition of native vegetation cover in and around the subject land. Extent of native vegetation outside of the subject land but within the assessment area was estimated using aerial imagery.

Desktop review of potential native vegetation extent and Plant Community Types (PCTs) was conducted prior to field assessment. Extent of native vegetation was determined in conjunction with ground truthing PCT mapping during field assessment. Point data, field notes and plot data were all used to guide the mapping of native vegetation extent. Although not mapped as native vegetation on the NSW State Vegetation Type Map (SVTM), vegetation within the subject land was determined to be native vegetation during field assessment. The BioNet Vegetation Classification Tool was accessed for detailed PCT descriptions and associated data. This tool was also accessed to determine the Threatened Ecological Communities (TECs) which have associations with any PCT recorded in the development footprint.

Field assessment determined there to be two distinct vegetation zones across the subject land. Vegetation zones were distinct; therefore, no plot-based vegetation surveys were conducted. Vegetation integrity surveys were used to confirm vegetation zones.

Vegetation plots were completed in accordance with the BAM, including method for measuring vegetation composition, structure and function, and number of plots within a vegetation zone. Plots were defined using tape measures and pegs, laid out at the time of the assessment. Plots were located to be representative of the vegetation within the study area and proposed development footprint at the time of the assessment. The plots were also distributed across the property to ensure natural variation across the vegetation zone was captured. Of the plots collected during the field assessment, five have been used to best represent the vegetation zones within the final development footprint.

One of these plots lies outside the subject land as a result of reducing the area of the development footprint to avoid impacts. This plot is still considered representative of the zone (Zone 2). Standard 20 by 20 metre plots within 20 by 50 metre plots were used for this assessment. Habitat values including hollow bearing trees were identified and mapped using handheld GPS devices, during species search transects across the subject land.

#### 5.6.2.2 Threatened Flora Survey Methods

A default list of threatened flora species with potential to occur in the subject land was firstly identified using the assessment filtering tool in the Biodiversity Assessment Method Calculator (BAM-C) and was used to inform the field assessment and threatened species assessment.

Aerial imagery, contour maps and vegetation maps were reviewed to identify specific habitat constraints and microhabitats for threatened flora species, such as the presence of rocky or wetland habitat. Field surveys also included assessment of habitat constraints and microhabitats within the subject land. Targeted searches for threatened flora for species predicted in the EPBC Act Protected Matters Report and candidate species identified in the BAM-C were carried out in addition to the aforementioned vegetation integrity surveys.

Search transects were completed on foot and spaced approximately 15 metres apart. These transects were conducted in September and November to coincide with the seasonal search guidelines provided in the TSPD and the BAM-C. The targeted threatened fauna species assessment focused on listed fauna species highlighted by the BAM-C and the EPBC Act Protected Matters Report following all survey requirement identified on the BAM-C and BioNet data collection. All flora surveys were conducted in accordance with *Department of Planning Industry and Environment's Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method 2020* and *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft November 2004*.

#### 5.6.2.3 Threatened Fauna Survey Methods

The Biodiversity Assessment Method Calculator (BAM-C) was used to first identify a list of all threatened species with potential to occur on the subject land. This list was then used to guide the field assessment and assessments of threatened species. BioNet Species Sighting Records of the local area were interrogated to understand those species previously recorded in the area.

Aerial imagery, contour maps and vegetation maps were reviewed prior to field assessment to identify habitat constraints and microhabitats for threatened species. Prior to the field assessment, aerial imagery, contour maps, and vegetation maps were examined for potential habitat constraints and microhabitats for threatened species. Field surveys were also used to assess the subject land to determine habitat constraints and inform which species might require these constraints and possibly be present or absent.

The BAM (2020) guidance materials were followed for all field surveys. Threatened species searches were undertaken as per the threatened species survey guidelines. AREA conducted the initial field survey on 22 September 2022 with one ecologist conducting threatened species across the whole site via pedestrian survey.

Walked parallel transects were conducted across the subject land. Given the vegetation was highly degraded throughout this area, visibility during the assessment was good, with the landscape largely devoid of large shrubs and trees. Threatened flora and fauna species searches were able to be efficiently conducted simultaneously.

One ultrasonic insectivorous bat recorder was set within the Quarry site for seven nights from 22 to 28 September 2022 (inclusive). This was set within retained vegetation that has since been excluded from impact. One Bio-Acoustic recorder was deployed in the same location for the same duration as the above mentioned ultrasonic insectivorous bat recorders.

Microhabitat searches were also conducted during transects. Particular attention was given to habitat constraints or microhabitats on which predicted species depend. All microhabitat searches were evaluated in the field.

## 5.6.3 Biodiversity Assessment Results

### 5.6.3.1 Plant Community Types

Vegetation within the subject land has been assessed as aligning with the BioNet Vegetation Classification PCTs identified below (extent and locations can be seen in *Figure 8* of **Appendix J**):

- PCT 3347 Southern Tableland Creekflat Ribbon Gum Forest – Grassy Woodlands of the Tableland Clay Grassy Woodlands (23.13 ha). PCT 3347 occurs in two condition states, poor (cleared) and good (remnant vegetation).
- PCT 3338 Goulburn Tableland Frost Hollow Grassy Woodland was **excluded** due to field data captured being inconsistent with the vegetation description of this PCT.

### 5.6.3.2 Threatened Ecological Communities

No TECs were identified in the subject land, and no TECs are associated with PCT3347 – Southern Tableland Creekflat Ribbon Gum Forest.

### 5.6.3.3 Vegetation Zones

Vegetation zones within the subject land were determined based on vegetation composition and ancillary features. Two vegetation zones were identified as occurring, where each zone is representative of a PCT in a single condition.

**Zone 1** was assigned to vegetation cleared of the upper stratum and is identified as PCT3347 in poor condition. This zone was determined to have been cleared of all upper and mid stratum species with a mixture of native and exotic forbs and grasses comprising the ground stratum.

**Zone 2** was assigned to individual native trees within cleared paddock vegetation and is identified as PCT3347 in a moderate condition.

### 5.6.3.4 Threatened Species Surveys

Details of threatened species surveys carried out over the subject land are provided in **Table 5.24** and **Table** 5.25. No EPBC Act listed threatened species were recorded on the subject land. Further information can be found in **Appendix J**.

**Table 5.24 Threatened Species Surveys for Candidate Flora Species Credit Species on the Subject Land**

| Common Name | Scientific Name | Present | Further assessment required |
|---|---|---|---|
| **Black Gum** | *Eucalyptus aggregate* | No | No |
| **Silver-leafed Gum** | *Eucalyptus pulverulenta* | No | No |
| **Hoary Sunray** | *Leucochrysum albicans subsp. tricolor* | No | No |
| **Hoary Sunray** | *Leucochrysum albicans subsp. tricolor* | No | No |
| **Pale Pomaderris** | *Pomaderris pallida* | No | No |

**Table 5.25 Threatened Species Surveys for Candidate Fauna Species Credit Species on the Subject Land**

| Common name | Scientific name | Present | Further assessment required |
|---|---|---|---|
| **Eastern Pygmy possum** | *Cercartetus nanus* | No | No |
| **White-bellied Sea-eagle (Breeding)** | *Haliaeetus leucogaster* | No | No |
| **Giant burrowing Frog** | *Heleioporus australiacus* | No | No |
| **Little Eagle (breeding)** | *Hieraaetus morphnoides* | No | No |
| **Green and Golden Bell Frog** | *Litoria aurea* | No | No |
| **Square-tailed Kite (breeding)** | *Lophoictinia isura* | No | No |
| **Stuttering Frog** | *Mixophyes balbus* | No | No |
| **Southern Greater Glider** | *Petauroides volans* | No | No |
| **Squirrel Glider** | *Petaurus norfolcensis* | No | Yes |
| **Pink Robin** | *Petroica rodinogaster* | No | No |
| **Brush-tailed Phascogale** | *Phascogale tapoatafa* | No | Yes |
| **Koala** | *Phascolarctos cinereus* | No | No |

#### 5.6.3.5 Area or Count, and Location of Suitable Habitat for a Species Credit Species (a Species Polygon)

No threatened species were recorded in the subject land during field assessment, but species polygons are required for any species assumed to be present. The following species credit species were assumed to be present in the development footprint as targeted species surveys were not sufficient under the survey guidelines:

- Squirrel Glider (Petaurus norfolcensis).
- Brush-tailed Phascogale (*Phascogale tapoatafa*).

Species polygons detailing the extent (area) of suitable habitat for these species within the development footprint have been established. Species polygons for these species have been determined based on potential habitat within the development footprint referenced against habitat constraint information provided in the Threatened Biodiversity Data Collection (TBDC).

**Squirrel Glider (Petaurus norfolcensis)**

Squirrel Glider (*Petaurus norfolcensis*) is listed as Vulnerable under the BC Act. This species inhabits mature or old growth Box, or Box-Ironbark woodlands and River Red Gum forest west of the great dividing range and prefers mixed species stands with a shrub or Acacia midstory. This form of habitat will not be impacted however the TBDC lists paddock trees and important habitat. Based on these constraints all mature trees within the development footprint are suitable habitat.

**Brush-tailed Phascogale (*Phascogale tapoatafa*)**

Brush-tailed Phascogale (*Phascogale tapoatafa*) is listed as Vulnerable under the BC Act. This species prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter, but also inhabit heath, swamps, rainforest, and wet sclerophyll forest. The TBDC states "The species is associated with a wide range of PCTs across NSW and may occur in habitat without any hollow-bearing trees. Hollow bearing trees are not a habitat constraint for this species". Based on these constraints all mature trees within the development footprint are suitable habitat.

## 5.6.4 Impact Assessment

### 5.6.4.1 Direct Impacts

**Table 5.26** below outlines the direct impacts to the subject land, after steps have been taken to avoid and minimise impacts.

**Table 5.26 Summary of Residual Direct Impacts**

| Direct Impact | Project phase | Extent |
|---|---|---|
| **Zone 1 PCT 3347**<br>Vegetation clearing will impact PCT 3347 in zone 1 on the subject land. Vegetation in Zone 1 does not contain native trees and groundcover is low ecological value. This PCT is not a TEC and no credits are required for offsetting impact to this PCT. | Construction and Operation | 23.03 ha |
| **Zone 2 PCT 3347**<br>Vegetation clearing will impact PCT 3347 in zone 2 on the subject land. This zone includes three non-hollow bearing trees | Construction and Operation | 0.1 ha |
| **Subject land**<br>Dust emissions will potentially impact air quality which will require mitigation. | Construction and Operation | The subject land and surrounding study area |
| **Subject land**<br>Changes to surface water flow and capture, water contamination are potential impacts which will be mitigated in a water management plan. | Construction and Operation | Within the subject land |

### 5.6.4.2 Indirect Impacts

The Project is unlikely to result in any substantial indirect impacts on biodiversity values outside of the disturbance area, with the exception of the prescribed impacts discussed in the section below. Indirect impacts associated with noise, dust and weeds may occur during construction and operation and is summarised in **Table 5.27**. With regard to potential impacts on biodiversity, there will be little substantial change to water, weed species, pest animal, lighting or air quality related impacts given the existing quarry and history of clearing.

**Table 5.27 Summary of Residual Indirect Impacts**

| Indirect Impact | Impacted Entities | Extent | Project Phase | Likelihood and Consequences |
|---|---|---|---|---|
| Introduction and spread of disease and pathogens from the site to adjacent vegetation | Native vegetation surrounding the subject land | Assessment area | During construction and operation | Unlikely if adequately mitigated |
| Introduction and spread of weeds and pests from the site to adjacent vegetation | Native vegetation surrounding the subject land | Assessment area | During construction and operation | Unlikely if adequately mitigated |
| Dust, Noise and Vibration impacts to surrounding vegetation and habitat values | Native vegetation surrounding the subject land | Assessment area | During construction and operation | Unlikely if adequately mitigated |

### 5.6.4.3 Prescribed Impacts

The potential prescribed impacts associated with the Project include impacts to geological features of significance, man-made structures, non-native vegetation, habitat connectivity, water bodies and vehicle strikes. The prescribed impacts in relation to the proposed Project is summarised in **Table 5.28**.

**Table 5.28 Prescribed impacts**

| Feature | Present | Description of feature characteristics and location | Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike. |
|---|---|---|---|
| Karst, caves, crevices, cliffs, rocks or other geological features of significance | No | N/A<br>No significant geological features occur in the development footprint. | N/A |
| Human-made structures | Yes | Quarrying infrastructure exists in the proposal area; however, this infrastructure exists in the current quarry footprint therefore is in an area excluded from this assessment. This infrastructure is used frequently during quarry activities, | N/A<br>Given the proximity to extractive activities no threatened entities are considered likely to be impacted nor will there be a change in the use of this infrastructure by the proposal. |

| Feature | Present | Description of feature characteristics and location | Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike. |
|---|---|---|---|
| Non-native vegetation | Yes | Non-native ground stratum species occurred in conjunction with native vegetation and has been addressed as part of this BDAR.<br>Approximately ten Poplar trees, *Populus spp* will be removed by the proposal.<br>Some threatened bird species have been identified as potentially using these trees as either foraging, roosting or nesting habitat. | Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)<br>Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)<br>Varied Sittella (*Daphoenositta chrysoptera*)<br>Little Lorikeet (*Glossopsitta pusilla*)<br>Olive Whistler (*Pachycephala olivacea*)<br>Scarlet Robin (*Petroica boodang*)<br>Flame Robin (*Petroica phoenicea*)<br>Diamond Firetail (*Stagonopleura guttata*) |
| Habitat Connectivity | Yes | The subject land occurs on the edge of remnant forest. | N/A |
| Waterbodies, water quality and hydrological processes | Yes | The Shoalhaven River occurs within approximately 65 metres of the proposal area boundary.<br>No other mapped waterways occur within the proposal area. | N/A<br>If mitigation measures outlined in **Section 5.6.5** are implemented, then it is unlikely there will be impacts to threatened species. |
| Vehicle strikes | Yes | The proposal may result in a minor increase in vehicle movement in and around the subject area, but it is not anticipated to result in an increased risk of vehicle strikes. | None known |

## 5.6.5 Management and Mitigation

The biodiversity mitigation hierarchy requires, in order, avoiding impacts, minimising impacts and only then offsetting or compensating for residual impacts that remain after all steps are taken to avoid or minimise these impacts.

### 5.6.5.1 Avoidance and Mitigation of Impacts

**Direct and Indirect Impacts**

To avoid impacts on native vegetation the development site has been designed to impact the disturbed portion of the immediate landscape, largely devoid of remnant vegetation, trees, or suitable habitat for threatened species. Higher quality remnant native vegetation within the subject land has been specifically avoided by the proposal.

Despite the low occurrence of native vegetation within the development site, the proponent has sought to reduce impacts to biodiversity values with a project design informed by initial ecological assessments provided by AREA. Where possible, disturbed areas have been prioritised for the location of infrastructure to reduce the overall impacts on native vegetation.

Areas of *Southern Tableland Creekflat Ribbon Gum Forest* have been avoided where possible, with only a relatively small area of 0.1 ha of good condition vegetation and a further 5.66 ha of poor condition vegetation to be impacted.

A summary of measures to avoid and minimise impacts is provided in **Table 5.29**.

**Table 5.29 Avoidance and Minimisation Measures for Direct, Indirect, and Prescribed Impacts**

| Action | Outcome | Timing | Responsibility |
|---|---|---|---|
| Locating the project within a previously disturbed area | Avoids impact to high value undisturbed areas of native vegetation. | Planning phase | Proponent |
| Modified project design | Avoids impact to 1.37 ha of native vegetation. | Planning phase | Proponent |
| Using existing vehicle access | Avoids new impact to native vegetation within the subject land. | Planning phase | Proponent |
| Avoid mature trees within the proposed development area | Minimises the impact to existing fauna habitat by avoiding remnant large native trees within the development footprint. A buffer is applied to the trees to protect the root system. | Planning phase | Proponent |

**Prescribed Impacts**

The project location has avoided and minimised prescribed impacts by:

- avoiding geologically significant areas
- avoiding patches of remnant vegetation
- any trees impacted are in historically cleared areas and are non-hollow bearing
- minimised impact to habitat connectivity and undisturbed vegetation by site selection in a previously disturbed area
- selecting a site where non-native vegetation is low quality habitat
- using existing vehicular access.

The design of the project has also avoided and minimised prescribed impacts by:

- Minimising impact to habitat connectivity by avoiding areas of good quality native vegetation.
- Locating site access roads and internal roads on existing roads and tracks, where possible, to minimise increased risk of vehicle strike associated with new roads.

#### 5.6.5.2 Minimisation and Management of Impacts

CSG has committed to the design and implementation of the following mitigation measures to minimise the unavoidable impacts of the proposed Project on biodiversity values:

- Staff inductions.
- Delineation of physical vegetation clearing boundaries.
- Occurrence of vegetation clearance as per biodiversity recommendations.
- Erosion and sediment control.
- Dust, stockpile and waste rock control.
- Noise controls.
- Weed, pest and disease controls.

Each of the minimisation and management measures will be monitored at regular frequencies and will occur across one or more stages of the proposed Project. Further detail is provided in **Appendix J**.

#### 5.6.5.3 Serious and Irreversible Impacts

No candidate Serious and Irreversible Impacts have been identified as relevant to the proposed Project.

### 5.6.6 Biodiversity Credit Impact Summary

The NSW Biodiversity Offset Scheme applies to the proposed development, which exceeds the area clearing threshold for the associated minimum lot size, according to *Section 7.2* of the Biodiversity Conservation Regulation 2017.

The NSW BAM requires the use of an online credit calculator and project specific survey and impact data to calculate the number of biodiversity credits that account for the impact of a project on biodiversity. The proponent must then offset these credits as part of progressing the development if it is approved.

The biodiversity credits generated by the Project impacts are provided in **Table 5.30**. These credits will require offsetting under BAM as part of the implementation of the Project.

**Table 5.30 Ecosystem Credit Class and Matching Credit Profile**

| PCT/Species-credit species | Vegetation Zone | Impact area (ha) | Credits Required |
|---|---|---|---|
| 3347 Southern Tableland Creekflat Ribbon Gum Forest | 2 | 0.1 | 4 |
| **Ecosystem Credit Total** | | | **4** |
| Squirrel Glider (*Petaurus norfolcensis)* | N/A | 0.1 | 4 |
| Brush-tailed Phascogale (*Phascogale tapoatafa*) | N/A | 0.1 | 4 |
| **Ecosystem Credit Total** | | | **8** |

### 5.6.7 Conclusion

This Biodiversity Development Assessment Report assesses biodiversity values of the subject land in accordance with the biodiversity assessment method (BAM) and sets out the measures that the Applicant proposes to take to avoid or minimise the impact of the proposed Project.

Despite the low occurrence of native vegetation within the development site, the proponent has sought to minimise impacts to biodiversity values further with a project design informed by initial ecological assessments provided by AREA. Most areas of remnant vegetation will be avoided with 0.1 hectares of treed areas removed. Where possible, existing tracks and ancillary facilities will be used for the construction and operation of the proposal.

One plant community type (PCT) was recorded on the subject land, PCT3347 Southern Tableland Creekflat Ribbon Gum Forest, and occurs in two condition states on the subject land: poor and good. This PCT is not associated with a threatened ecological community (TEC) listed under the NSW *Biodiversity Conservation Act 2016* or the EPBC Act. The proposed Project will directly impact 23.03 hectares of PCT3347 in poor condition, and 0.1 hectares of PCT3347 in good condition.

No threatened species were recorded during field assessment; however, two threatened species are presumed to inhabit the subject land:

- Squirrel Glider (Petaurus norfolcensis).
- Brush-tailed Phascogale (*Phascogale tapoatafa*).

The proposed Project will not impact an entity nominated as being at risk of a serious and irreversible impact (SAII). Management measures provided in **Section 5.6.5** will mitigate residual direct, indirect or prescribed impact of the proposed Project. The residual impacts that require offset are provided in **Table** 5.30**.**

## 5.7 Aboriginal Cultural Heritage

### 5.7.1 Introduction

An Aboriginal Cultural Heritage Assessment Report (ACHAR) for the Project was undertaken by AREA in consultation with the Registered Aboriginal Parties (RAPs) to assess the Aboriginal heritage values (cultural and archaeological) of the Project Area and surroundings in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (*OEH, 2011*) and the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (*DECCW, 2010a*).

A summary of the key findings of the ACHAR is provided in this section and the full report is provided in **Appendix K**.

## 5.7.2 Assessment Methodology

The ACHAR has been prepared to satisfy the requirements of:

- The Burra Charter (Australia ICOMOS 2013).
- EPBC Act 1999.
- EP&A Act 1979.
- *National Parks and Wildlife Act 1974* (NPW Act)
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (NSW Department of Environment Climate Change and Water (DECCW 2010b).
- *Native Title Act 1994.*
- Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010a).

The approach taken acknowledged and respected that Aboriginal people have to directly participate in matters that may affect their heritage, and have the right to maintain culture, language, knowledge and identity.

The objective of the cultural heritage assessment was to achieve the following objectives:

- Search for any recorded Aboriginal archaeological sites by conducting database searches and assessing the likelihood of their existence based on background information.
- Engage with the local Aboriginal community to gather any relevant information they may have about the development footprint and seek their feedback on the Proposal.
- Conduct Aboriginal test excavations within the subject land to identify any unrecorded sites of Aboriginal heritage and determine if further investigation is necessary.
- Evaluate the significance of any cultural heritage sites within the subject land, in consultation with the Aboriginal community, and assess the potential impact of the proposal on these sites.
- Provide recommendations for the appropriate management of any cultural heritage remains within the subject land.

## 5.7.3 Consultation Process

Consultation was carried out with the local Aboriginal community according to the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (NSW Department of Environment Climate Change and Water (DECCW), 2010a). AREA corresponded with the following organisations requesting the details of Aboriginal people who may hold cultural knowledge relevant to determining the Aboriginal significance of Aboriginal objects and/or places within the local area of the Project:

- Heritage NSW.
- Batemans Bay Local Aboriginal Land Council.

- Ulladulla Local Aboriginal Land Council.
- Native Title Services.
- Southeast Local Land Services.
- Queanbeyan – Palerang Regional Council.
- The National Native Title Tribunal.
- The Native Title Services Corporation.

As a result of the Project Notification process, 13 individuals or Aboriginal service providers elected to be registered Aboriginal Parties (RAPs) and have been part of an active consultation process in relation to identifying and assessing the significance of the Aboriginal Cultural Heritage Values/Aboriginal objects and/or places and determining and carrying out appropriate strategies to mitigate impacts upon Aboriginal Heritage (see *Table 3-1* **Appendix K**).

A copy of the proposed assessment methodology, and a request for cultural knowledge was communicated to the RAPs on 29 September 2022 requesting feedback by the 27 October 2022. Responses were received from seven parties (*Table 3-2,* **Appendix K**), of which four specifically mentioned or commented on the methodologies proposed in their response.

## 5.7.4 Impact Assessment

### 5.7.4.1 Archaeology Survey

Two archaeological surveys were conducted across the Project area by AREA in conjunction with Robert Young of Konanggo Aboriginal Cultural Heritage Services, Dean Bell of Yurwang Gundana Consultancy Cultural Heritage Services and Amanda Bell of Didge Ngunawal Clan in September and November 2022. The objective of the surveys was to identify any Aboriginal sites that had not been previously detected and assess the need for further investigation, such as test-excavation.

The first survey was conducted on foot. Particular attention was paid to areas within 200 m of the drainage lines, exposures, flat areas and other areas that could contain archaeological potential. The entire subject land was surveyed. The second survey focussed on archaeologically sensitive landforms identified during the first. This process allowed for an intensive i.e., very closely spaced transects over areas with a higher potential to possess Aboriginal objects to mitigate reduced visibility across the subject land.

The subject land (minus the current disturbance area) was divided into three survey units based on landform. Riverine Plain (survey unit 1), Toe slope (survey unit 2), and the slight rise in the riverine plain (survey unit 3).

During the field surveys, four areas with potential archaeological deposits (PAD) were identified. Among them, three areas contained Aboriginal objects, shown in *Figure 6-9*, **Appendix K**. These areas are situated within 200 m of the Shoalhaven River, on slightly elevated landforms on the riverine plain or on the toe slope of the adjacent hill.

The three Aboriginal sites with PAD are named Larbert Quarry AS01, Larbert Quarry AS02, and Larbert Quarry AS03. PAD a and PAD b were identified as two parts of the same entity because a haul road was constructed in the past through the area by the land holder, resulting in the removal and replacement of all likely artefact-bearing deposits with road base. This area was slightly above the riverine plain similar to that associated with Larbert Quarry AS03 but did not possess Aboriginal objects on its surface.

The archaeological survey assessment was limited by the visibility of the ground surface. Since the sand deposit is deep across the land, there is a higher chance of intact subsurface archaeological deposits. Further investigation was therefore required to determine the nature of the archaeological remains in these areas. The precautionary principle has been applied to the potential archaeological deposits associated with Larbert Quarry AS03 and PAD a and PAD b. Archaeological test excavations were recommended to establish the burden of proof and prove otherwise.

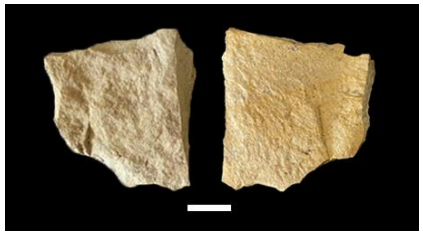
#### 5.7.4.2 Archaeological Test Excavation

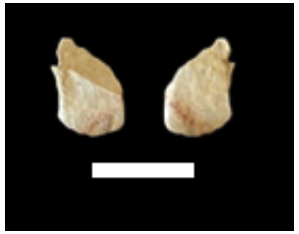
The Archaeological test excavation was conducted from 14 to 16 March 2023 by AREA with site officers from Konanggo Aboriginal Cultural Heritage Services, Mundawari Heritage Consultants, and Yurwang Gundana Consultancy Cultural Heritage Services. Test excavations were broken into four main groups across the Project area (Area 1–Area 4). Locations of these areas can be found in *Figure 7-1*, **Appendix K**.

The test excavations were carried out under requirements 14–20 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b). Test excavations are excluded from the definition of harm if they are carried out in accordance with the code. Based on the low density of surface finds within the assessment area, a low-density sampling strategy was defined across two areas. Initially, every second pit would be excavated, the continuation of this sampling strategy and the inclusion or exclusion of pits was determined based on localised disturbances and the ongoing results of excavations.

A total of 22 test pits were excavated. 13 pits were excavated in Area 2, two test pits were excavated in Area 3 and seven test pits were excavated in Area 4. Excavating alternating pits enabled a quick overview of the stratigraphic context across the testing area. In Area 2, every second test was excavated, then the pits surrounding the three artefact bearing pits were excavated. A total of six stone artefacts were uncovered in Area 2, one stone artefact was located on the surface of Area 3 and no artefacts were uncovered in Area 4. A summary of recovered artefacts from test excavations can be seen in **Table 5.31**. *Section 6.5* of **Appendix K** also provides a detailed explanation for each archaeological artefact site at Larbert Quarry.

**Table 5.31 Summary of artefacts recovered from test pit excavations**

| Pit ID | Spit | Layer | Length (mm) | Width (mm) | Thickness (mm) | Description | Photo (1 cm scale) |
|---|---|---|---|---|---|---|---|
| **2/A1** | 1 | 1 | *27.6 | *18.6 | 7 | Grey fine-grained silcrete proximal flake with longitudinal break. No cortex. |  |
| **2/A1** | 1 | 1 | *16.4 | 9.7 | 2.5 | Grey fine-grained silcrete distal flake. No cortex. |  |
| **2/A1** | 2 | 1 | 33.8 | *27 | 14 | Grey coarse-grained silcrete flake with longitudinal brake. No cortex. Dorsal surface is unmodified with no evidence of flaking. Siret fracture, conjoins with the other flake recovered from 2/A1 Spit 2. |  |
| **2/A1** | 2 | 1 | 33.9 | *36.5 | 14.5 | Grey coarse-grained silcrete flake with longitudinal brake. No cortex. Dorsal surface is unmodified with no evidence of flaking. Siret fracture, conjoins with the other flake recovered from 2/A1 Spit 2. |  |

| Pit ID | Spit | Layer | Length (mm) | Width (mm) | Thickness (mm) | Description | Photo (1 cm scale) |
|---|---|---|---|---|---|---|---|
| **2/B1** | 4 | 1 | 10.5 | 6.4 | 2.4 | Grey fine-grained angular fragment. No cortex. |  |
| **2/C1** | 4 | 1 | 25.2 | 9.5 | 5.5 | Quartz bipolar flake. Cortex visible on 50% of dorsal surface. |  |
| **3/B1** | NA | Surface | 24.6 | 16.3 | 6 | Quartz bipolar flake. Cortex visible on 30% of dorsal surface. |  |

**Denotes incomplete measurement.*

### 5.7.4.3 Impacts to Aboriginal Cultural Heritage

Cultural heritage values require management for any proposal where they have been identified (**Section 5.7.4.1** and **Section 5.7.4.2**). Whether an impact is direct, indirect, or possible, Aboriginal sites will require some level of intervention to avoid harm where possible. *Section 5* of the *NPW Act 1974* defines harm as "an object or place includes any act or omission that:

- destroys, defaces or damages the object or place, or
- in relation to an object--moves the object from the land on which it had been situated, or
- is specified by the regulations, or
- causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c)".

*The Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011) requires that both direct and indirect harm to Aboriginal objects and Aboriginal places be considered. Generally, direct harm is defined as any activity that may physically impact an Aboriginal site or objects. Indirect harm is usually taken to mean harm stemming from secondary consequences of the activity and may affect sites or objects as an indirect consequence of the activity.

The proposed Project will impact Aboriginal sites in the Project Area. The potential harm from construction activities from the proposal will include:

- The expansion of the current extraction area.
- Increasing the rate of operations to up to 150,000 tonnes per annum.
- Three Aboriginal sites and one PAD were recorded during the archaeological surveys and further investigated by test excavations. No artefacts were uncovered during the test excavations within the PAD. Larbert Quarry AS01 will be avoided by the Proposal, Larbert Quarry AS02 (AHIMS ID Pending) and Larbert Quarry AS03 (AHIMS ID Pending) will be impacted by the proposal.
- The impacts to Aboriginal cultural heritage are summarised in **Table 5.32** (see *Figure 9-1* in **Appendix K** for areas to be avoided in the Project area).

**Table 5.32 Summary of Impacts to Aboriginal Heritage from the Proposed Project**

| Development footprint Site ID | Impact Unless Managed | Effect of proposed project on Significance | Actual impact with implementation of the mitigation measures |
|---|---|---|---|
| **Larbert Quarry AS01** | Indirect | None | No loss of value |
| **Larbert Quarry AS02** | Direct | Total | Total loss of value |
| **Larbert Quarry AS03** | Direct | Total | Total loss of value |

### 5.7.5 Management and Mitigation

Cultural heritage values require management for any proposal where they have been identified. Whether an impact is direct, indirect, or possible, Aboriginal sites will require some level of intervention to avoid harm where possible.

As a general principal, avoidance of impact to sites of Aboriginal cultural heritage is the preferred method of management. This is advocated in the Burra Charter as well as various other guidelines and codes of practice. Total avoidance of all sites of heritage value is not always feasible. In the case avoidance presents a proponent with considerable difficulties, they may apply to damage or destroy a site. As the impact of Aboriginal sites and objects would be required as part of the proposal, the following mitigation measures are recommended (pending approval):

- The Registered Aboriginal Parties (RAPs) identified during the consultation process should be continued where RAPs are consulted in determining the management of Aboriginal objects.
- An Aboriginal Heritage Impact Permit (AHIP) is required before any impact to Aboriginal sites Larbert Quarry AS02 and Larbert Quarry AS03.
- Removal includes surface collection of the artefacts recorded within Larbert Quarry AS02 and Larbert Quarry AS03 and relocation of said Aboriginal objects to a suitable location in accordance with the *Code of Practice of archaeological Investigation of Aboriginal Objects in NSW* (DECCW, 2010b).
- Any conditions of consent for the removal of Aboriginal objects must be followed.
- Standard farm fencing constructed along the boundary of Larbert Quarry AS01 (AHIMS ID Pending) to avoid inadvertent impact.
- An Aboriginal cultural heritage management plan would be a requirement for the ongoing management of Aboriginal cultural heritage.
- The locations of the cultural heritage sites will be provided to the supervisors responsible for the construction and operation of the proposal. They should be informed cultural heritage sites are protected under the NPW Act and no harm is to come to them. The presence of the cultural heritage sites should be made clear to the workforce as part of an induction.
- Heritage management plan.

To undertake the proposed works an area based Aboriginal heritage impact permit (AHIP) will be necessary. An AHIP must be obtained before the surface collection occurs within the Project Area. The AHIP boundary is shown in **Figure 5.3** with corresponding AHIP point in **Table 5.33**.

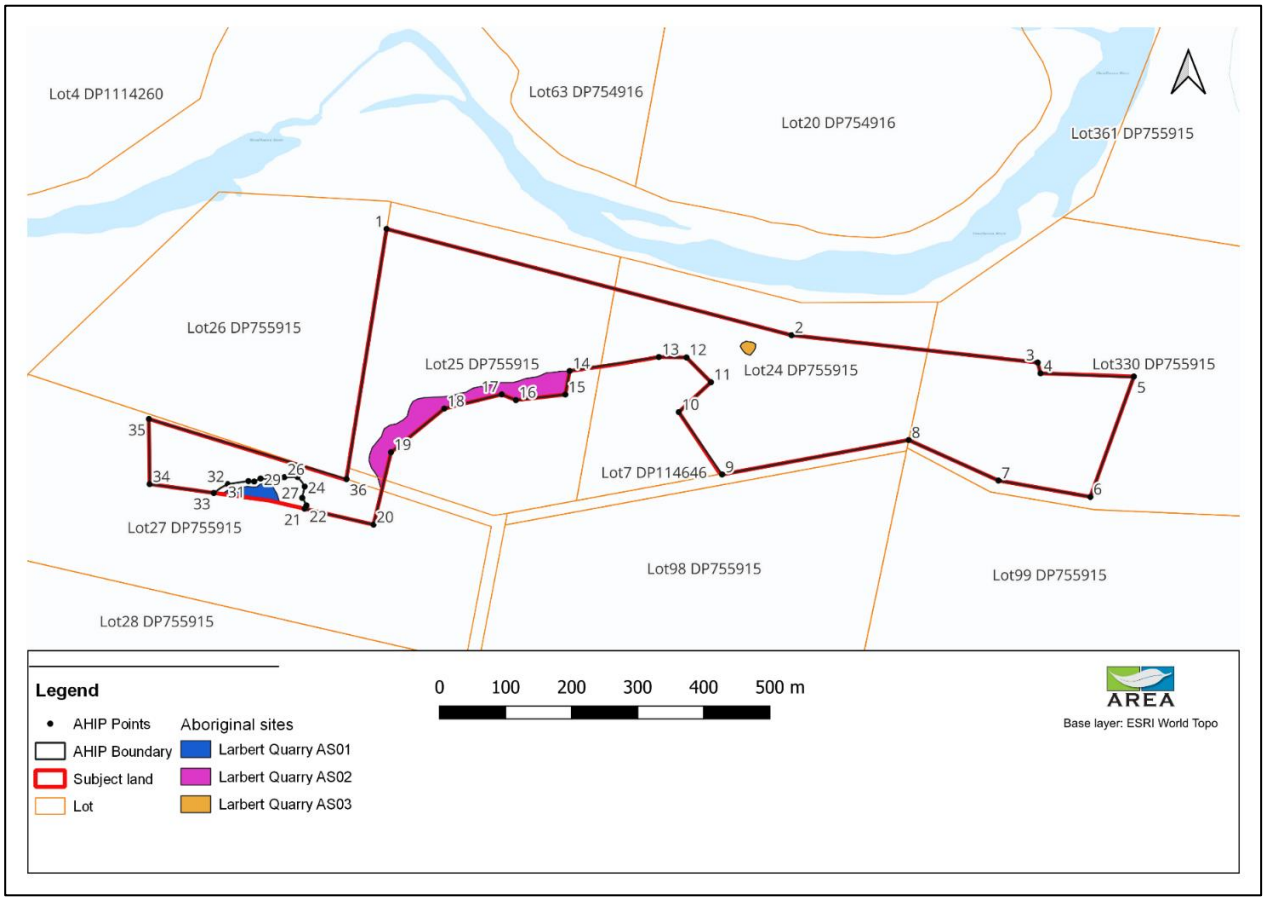



**Figure 5.3 Proposed AHIP Boundary**

**Table 5.33 List of AHIP points (GDA94 Zone 55)**

| ID | Easting | Northing | ID | Easting | Northing |
|---|---|---|---|---|---|
| **1** | 750270 | 6087904 | 18 | 750806 | 6087935 |
| **2** | 750566 | 6087784 | 19 | 750718 | 6087911 |
| **3** | 750640 | 6088245 | 20 | 750635 | 6087833 |
| **4** | 751248 | 6088032 | 21 | 750605 | 6087700 |
| **5** | 751619 | 6087971 | 22 | 750501 | 6087732 |
| **6** | 751623 | 6087951 | 23 | 750500 | 6087750 |
| **7** | 751764 | 6087941 | 24 | 750503 | 6087773 |
| **8** | 751692 | 6087721 | 25 | 750492 | 6087791 |
| **9** | 751554 | 6087755 | 26 | 750472 | 6087791 |
| **10** | 751420 | 6087833 | 27 | 750463 | 6087782 |
| **11** | 751135 | 6087778 | 28 | 750451 | 6087788 |
| **12** | 751073 | 6087895 | 29 | 750436 | 6087790 |
| **13** | 751123 | 6087948 | 30 | 750426 | 6087784 |
| **14** | 751088 | 6087995 | 31 | 750418 | 6087785 |
| **15** | 750910 | 6087975 | 32 | 750386 | 6087781 |
| **16** | 750902 | 6087932 | 33 | 750365 | 6087765 |
| **17** | 750827 | 6087924 | 34 | 750268 | 6087784 |

### 5.7.6 Conclusion

As a result of the cultural assessment, stone artefacts have been recorded in the Project Area in locations designated as Larbert Quarry AS01, Larbert Quarry AS02 and Larbert Quarry AS03. No artefacts were recorded on the PADs in Area 4, and this is therefore not a recorded site. The project has been redesigned to avoid Larbert Quarry AS01, however Larbert Quarry AS02 and Larbert Quarry AS03 will be impacted by the proposed development. The impacted sites will require an Aboriginal Heritage Impact Permit (AHIP) and it is proposed that the artefacts collected during the test excavation and during the surface collection as part of the proposed AHIP be reburied on site in a location agreed to with the RAPs. AREA proposes a location underneath a tree near to Larbert Quarry AS01, in an area designated to be avoided based on both Heritage and ecological constraints (*Figure 9.2*, **Appendix K**). Based on the assessment, the following recommendations are made:

- Formal consultation in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCRs; DECCW 2010) should be continued. An Aboriginal Heritage Impact Permit (AHIP) would be required to impact two Aboriginal sites which cannot be avoided and further consultation to support an AHIP application is needed.
- The boundary of Larbert Quarry AS01 (AHIMS ID Pending) to be fenced off using standard farm fencing. This is to ensure no inadvertent impacts to the Aboriginal sites.
- A condition of consent for the AHIP is likely to express a desire by the Registered Aboriginal Parties that Aboriginal sites which cannot be avoided are collected and reburied in consultation with the Aboriginal community expressing a formal interest in this proposal.
- Should an AHIP be issued, surface collection of Larbert Quarry AS02 and Larbert Quarry AS03 should be undertaken in accordance with *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b).
- The artefacts collected during the test excavations and surface collection to be reburied within a protected area of the subject land in a location agreed to by the RAPs. Reburial should occur after the surface collection.
- RAPs to be given the opportunity to provide feedback and input on interpretation signage within the study area.
- The locations of the cultural heritage sites should be provided to the supervisors responsible for the construction and operation of the proposal. They should be informed cultural heritage sites are protected under the *NPW Act 1974* and no harm is to come to them. The presence of the cultural heritage sites will be made clear to the workforce as part of an induction.
- If any objects of suspected Aboriginal heritage origin be encountered during the proposal, activity in the area of the find should cease and the unexpected finds protocols (refer to **Appendix K**) should be implemented.
- If changes are made to the proposal which could impact locations outside of the current study area, further archaeological investigation may be required.
- If suspected human remains are located during any stage of the proposal, work must stop immediately, and the NSW police must be notified.

## 5.8 Historic Heritage

### 5.8.1 Methodology

A desktop search of historic heritage sites within or in proximity to the Project was completed by Umwelt for the Environmental Impact Statement and included the following databases:

- QPRC LEP 2022.
- State Heritage Inventory.
- National Heritage List.
- Commonwealth Heritage List.
- World Heritage Sites.

### 5.8.2 Results

No listed heritage sites were recorded within or adjoining the Project. The closest listed heritage item is located approximately 2.5 km north of the Project and is listed as an item (I310) of local heritage under the QPRC LEP 2022. **Table 5.34** lists historic items within the QPRC council area of which the Project is located within.

**Table 5.34 Larbert Historical Heritage Items**

| LEP Listing No. | Name | Location | Distance to Site |
|---|---|---|---|
| **I307** | Durran Durra Ruin | Lot 2, DP 755932 | Approx. 5.58 km |
| **I308** | "La Vista", including doors and outbuildings | Lot 67, DP 755915 | Approx. 2.66 km |
| **I309** | Khama-lea homestead and outbuildings | Lots 10 and 11, DP 806191 | Approx. 3.53 km |
| **I310** | "Arnprior" Homestead | Lot 1, DP745022; Lot 7, Section 12, DP 758602; Lot F, DP 382901; Lots G and H, DP 393436; Lot 158, DP 754892 | Approx. 2.5 km |

No listed heritage sites are recorded within or adjoining the Project site. Given the distance to closest item of known heritage significance, and no blasting techniques are to be used in the proposed Project, the Project is considered unlikely to impact on any items of heritage significance directly or indirectly.

## 5.9 Visual

### 5.9.1 Introduction

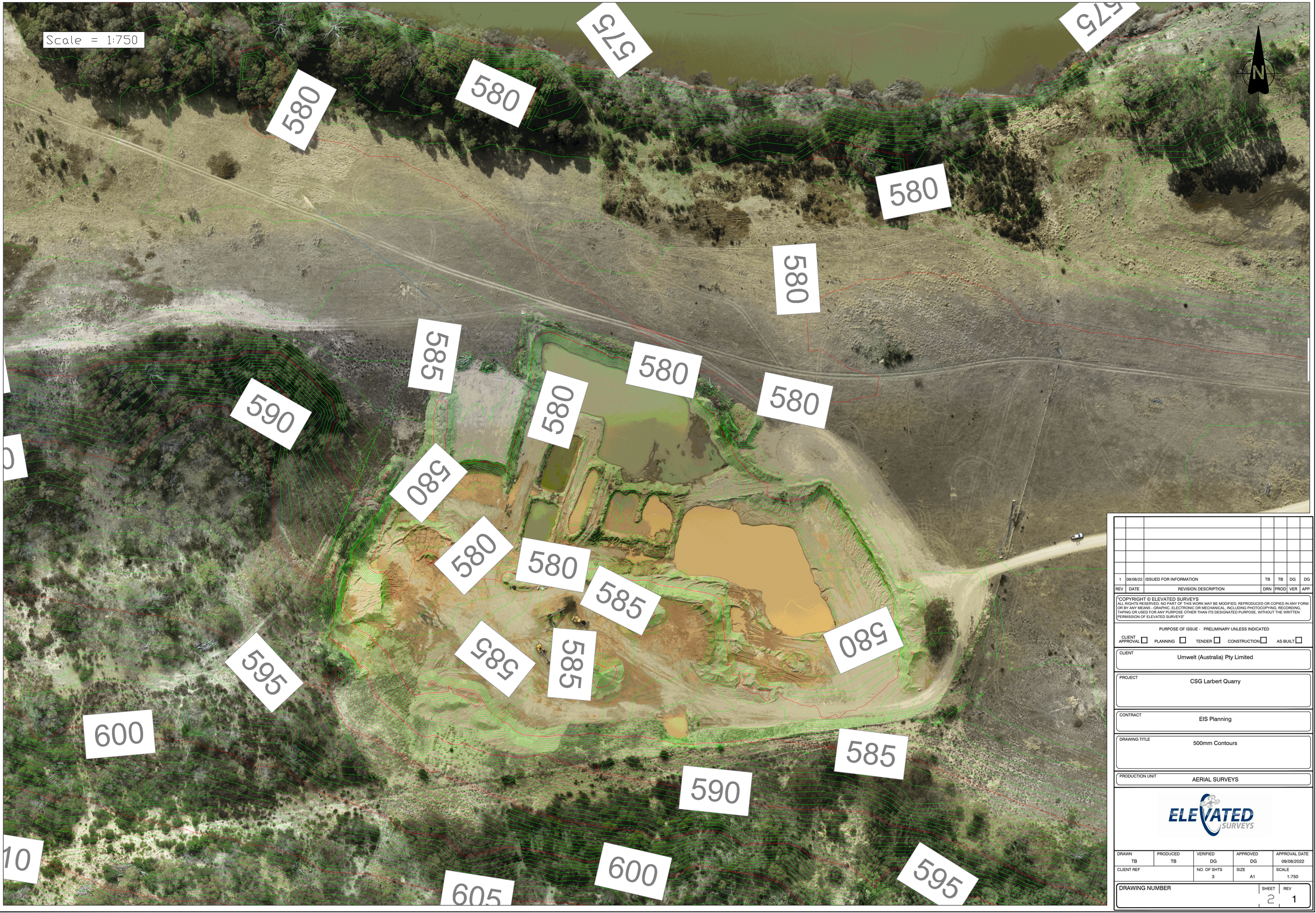
There are no Australian based adopted or agreed guidelines on the assessment of landscape and visual assessment. As such, this section has adopted a qualitative approach, and considered guidance available in the Guideline for Landscape Character and Visual Impact Assessment (Transport for NSW, 2020).
An assessment of visual impacts arising from the proposed expansion of quarry operations has been undertaken. This includes 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.

### 5.9.2 Existing Environment

The Proposal Area is an existing sand quarry in a rural setting. The surrounding area is well vegetated, with riparian vegetation along the Shoalhaven River to the north and with a woodland hill to the south providing additional visual screening from the quarry.

Existing quarry operations are on relatively flat terrain and are not visible from Larbert Road (see *Figure 3-5* of **Appendix G**), with operations commencing approximately 750 m west of Larbert Road.

There are several private landowners in the vicinity of the existing quarry and the proposed expansion. The current visual magnitude of the quarry is negligible. Residences are screened from the development by existing trees both along Larbert Road and along the southern side of the main operations. In addition, the elevation of the southern boundary of the Project Area rises from 585 mAHD adjacent quarry operations to 620 mAHD at the top of the ridge (refer to Figure 5.4). Figure 5.5 to **Figure 5.8** show the existing operations of Larbert Quarry in relation to the Shoalhaven River and show the extent of vegetation in the surrounding area.




| REV | DATE | REVISION DESCRIPTION | DRN | PROD | VER | APP |
|---|---|---|---|---|---|---|
| 1 | 09/08/22 | ISSUED FOR INFORMATION | TB | TB | DG | DG |



PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☐ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

CLIENT: Umwelt (Australia) Pty Limited

PROJECT: CSG Larbert Quarry

CONTRACT: EIS Planning

DRAWING TITLE: 500mm Contours

PRODUCTION UNIT: AERIAL SURVEYS

ELEVATED SURVEYS

| DRAWN | PRODUCED | VERIFIED | APPROVED | APPROVAL DATE |
|---|---|---|---|---|
| TB | TB | DG | DG | 09/08/2022 |
| CLIENT REF | | NO. OF SHTS | SIZE | SCALE |
| | | 3 | A1 | 1:750 |

DRAWING NUMBER | SHEET 2 | REV 1

e:\onedrive - act civil surveys\jobs\larbert quarry\plots\500mm controus.dwg

**Figure 5.5 Aerial image of current Larbert Quarry operations**

**Figure 5.6 Aerial image of Larbert Quarry to Shoalhaven River**

**Figure 5.7 Aerial image of Larbert Quarry and surroundings**

**Figure 5.8 Aerial image of cleared land west of Larbert Quarry**

### 5.9.3 Impact Assessment

Visibility of the proposed expansion to quarry operations will continue to be low. The proposed development area will commence approximately 350 m west of Larbert Road, on relatively flat terrain similar to existing operations. The Proponent is retaining trees where possible, and it is expected that the trees along the Access Road will continue to provide visual screening of quarry operations from the public along Larbert Road.

Given the location of residences to the existing and proposed development, the existing topography and location of treed areas surrounding the Project Area that will continue to provide visual screening, it is expected that the visual magnitude of the Proposal will remain low and that additional visual impacts are unlikely to occur.

### 5.9.4 Conclusion

The proposed expansion of the quarry operations is not expected to create a visual impact out of keeping with the existing use of the land as a sand quarry.

## 5.10 Socio-Economic

### 5.10.1 Introduction and Local Setting

The following sections discuss the existing socio-economic setting, the existing social and economic contributions of the quarry, the management and mitigation measures and residual impacts following the implementation of these management and mitigation measures. As this is not considered a State significant project, a Social Impact Assessment in accordance with the 'Social Impact Assessment Guideline for State Significant Projects' is not required (DPE, 2023). Nonetheless, important, and relevant potential socio-economic impacts and proposed mitigation measures are addressed in this section.

The Queanbeyan-Palerang Local Government Area (LGA) is located in the Southern Tablelands region of New South Wales, east of Canberra. It is bounded by the ACT and the NSW LGAs of Yass Valley, Upper Lachlan, Goulburn Mulwaree, Shoalhaven, Eurobodalla, and Snowy Monaro. The population of the Queanbeyan-Palerang LGA is 63,304, which has increased from 56,027 in 2016 (Australian Bureau of Statistics, 2021). The major towns are Queanbeyan and Bungendore, with populations in 2021 of 37,688 and 4,745 respectively.

The main industries of employment as reported by ABS (2021) are central government administration (11.0%), defence (7.6%), hospitals (3.0%), computer system design and related services (2.6%) and state government administration (2.3%). Employment is reflective of the proximity to Australian Government department locations and to Australian Defence Force operations, both in Canberra and in the Queanbeyan-Palerang LGA, with employment industries composition remaining reasonably stable compared to 2016. Median weekly personal income was $1,159 in 2021, which is up from $933 in 2016, and 43% above the NSW median weekly personal income of $813 in 2021.

The Queanbeyan-Palerang LGA has a predominantly rural land use, with growing residential areas in the west, closest to Canberra. Rural land is used mainly for sheep and cattle grazing, orchards, nurseries, crop growing, honey production and vineyards (QPRC, 2023).

### 5.10.2 Environmental, Social and Economic Impacts

Given the scale of the Project, the fact that the quarry is currently operating and minor reliance of the proposed operations on local services and infrastructure, the potential for impact on the local socio-economic climate is limited. The main potential impact would be on local amenity, that is the tangible or intangible features of a setting that contribute to its appeal or desirability.

In addition to the mitigation measures and management procedures relating to amenity aspects such as noise, air quality, visibility, and transportation, the Proponent would continue to engage with local landowners and residents regarding quarry operations.

### 5.10.3 Impact Assessment

Potential adverse impacts on local noise, air quality and traffic could each have a minor impact on the neighbouring properties of the quarry; however, given the quarry is now an established feature of the local setting and on the basis that surrounding vegetation screening (tree plantings) are maintained, and dust is managed, no additional impact is considered likely as a result of the Project.

Beneficial impacts include economic benefits for the region, and ongoing employment for quarry personnel and transport staff.

### 5.10.4 Conclusion

The potential for impact on the local socio-economic climate is limited, based on the scale of the Project, the fact that the quarry is currently operating and minor reliance of the proposed operations on local services and infrastructure.

## 5.11 Bushfire

### 5.11.1 Introduction and Local Setting

The Bushfire Risk and Hazard Assessment (BRHA) provides an assessment of potential hazards associated with bushfire and potential risks associated with the Proposed Project. Mitigation measures recommended in the BRHA aim to reduce bushfire risk as well as developing a coordinated response to bushfire. The BRHA considers the requirements of Planning for Bushfire Protection (PBP) (2019) published by the NSW Rural Fire Service (RFS) and associated plans of management currently relating to Larbert Quarry. A summary of the key findings of the BRHA is provided in this section and the full report is provided in **Appendix L**.

The Queanbeyan Palerang Regional Council LGA is grouped in NSW under the NSW RFS Fire Weather District and has a current average annual accumulated Fire Danger Index Rating classification of 80 (CSIRO, 2023). The average annual accumulated rating is developed from the daily Forest Fires Danger Index which combines a measure of vegetation dryness with air temperature, wind speed and humidity. These daily values over a year are combined to determine the annual accumulated rating.

## 5.11.2 Impact Assessment

Bushfire risk of the proposed Project is not expected to increase. The Project area is currently reserved for quarrying operations, in addition to large areas previously cleared or heavily disturbed as a result of past agricultural activities. The Project Area and large extents of the surrounding land is significantly disturbed which helps to reduce fuel load across the Project area. To align the assessment with PBP (2029), vegetation mapping of the Project Area follows the state-wide vegetation classification hierarchy in Keith (2006) to approximately calculate potential fuel loads.

Corresponding fuel loads of vegetation identified throughout the Project area and adjacent areas are identified below in **Table 5.35**, as referenced in NSW RFS Comprehensive Vegetation Fuel Loads (NSW RFS, 2019).

**Table 5.35 Fuel Loads for Vegetation Formations**

| Vegetation formation | Overall fuel load (including bark and canopy) |
|---|---|
| **Tableland Clay Grassy Woodlands** | 18.61 tonnes/ha |
| **Temperate Swamp Forests** | 34.1 tonnes/ha |

Furthermore, all designated developments located within bushfire prone areas are required to comply with the aim and objectives of PBP (2019) (**Table 5.36**).

**Table 5.36 PBP (2019) Compliance Assessment**

| Objective | Compliant | Comment |
|---|---|---|
| Afford occupants of any building adequate protection from exposure to a bushfire. | ☒ | The Project provides opportunity for all occupants to be shielded from any external bushfire. Construction material will comply with the relevant AS3959 requirements. |
| Provide for a defendable space to be located around buildings. | ☒ | Defendable space is provided on all sides of all buildings and critical structures found onsite. |
| Provide appropriate separation between a hazard and buildings, which, in combination with other measures, prevent the likely fire spread to buildings | ☒ | The structures are separated from the grassland vegetation areas and provide APZs and commensurate construction in accordance with AS3959. |
| Ensure that safe operational access and egress for emergency service personnel and occupants is available. | ☒ | The Project has direct access to public roads, and access and egress for emergency vehicles and evacuation is adequate. The development provides for the movement of heavy articulated trucks about the site. |
| Provide for ongoing management and maintenance of bushfire protection measures. | ☒ | APZ's onsite will be managed and landscaping maintained in accordance with PBP. |
| Ensure that utility services are adequate to meet the needs of firefighters. | ☒ | Utility services would be installed and managed to meet the needs of firefighters (and others assisting in bushfire fighting). |

Given the location of infrastructure within the disturbance area, the local setting of the Project Area, proposed water supply and potential fuel supply for the area, it is expected that the bushfire magnitude of the Proposal will not increase and that additional bushfire risks are unlikely to occur.

### 5.11.3 Management Measures

The Project would continue to undertake ongoing mitigation and management actions that currently exist for the site, aiming to provide bushfire protection and to appropriately manage bushfire risk. These measures are further discussed below**.**

**Asset Protection Zones**

APZ is a fuel-reduced area surrounding an asset to provide a buffer zone to the adjoining bushfire hazard. An APZ provides a defendable space for firefighting operations and if designed correctly and maintained regularly, will reduce the risk of:

- Direct flame contact to the asset.
- Damage to the asset from intense radiant Heat.
- Ember attack.

A minimum APZ of 10 m (maintained as an inner protection area) is required under PBP (2019) for all built infrastructure associated with the quarry development. Bushfire protection of the asset provided by the APZ is dependent on the size, while the minimum requirement is 10 m, where this APZ can be increased the protection of the asset and associated defendable space for firefighting purposes increases.

It is recommended APZ's are delineated and maintained around all buildings and critical infrastructure onsite. The vegetation inhibiting the APZ's will also be maintained in accordance with *Appendix 5* of PBP (2019), these vegetation maintenance requirements are shown in **Table 5.37**.

**Table 5.37 APZ Vegetation Maintenance Requirements**

| Vegetation | APZ Requirement |
|---|---|
| **Inner Protection Area** | |
| **Trees** | • Tree canopy cover should be less than 15% at maturity.<br>• Trees at maturity should not touch or overhang the building.<br>• Lower limbs should be removed up to a height of 2 m above the ground.<br>• Tree canopies should be separated by 2 to 5 m.<br>• Preference should be given to smooth barked and evergreen trees. |
| **Shrubs** | • Create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided.<br>• Shrubs should not be located under trees.<br>• Shrubs should not form more than 10% ground cover.<br>• Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation. |
| **Grass** | • Grass should be kept mown (as a guide grass should be kept to no more than 100 mm in height).<br>• Leaves and vegetation debris should be removed. |

| Vegetation | APZ Requirement |
|---|---|
| **Outer Protection Area** | |
| **Trees** | • Tree canopy cover should be less than 30%.<br>• Canopies should be separated by 2 to 5 m. |
| **Shrubs** | • Shrubs should not form a continuous canopy.<br>• Shrubs should form no more than 20% of ground cover. |
| **Grass** | • Grass should be kept mown to a height of less than 100 mm.<br>• Leaf and other debris should be removed. |

**Access Management**

Vehicle access to the proposed Project is provided through the existing road network (Access Rd, Larbert Rd and Kings Highway). No change to site access is proposed and will remain via the Site Access Road on Lot 330 and 24 of DP 755915 (refer to **Figure 1.2**).

Given the nature of the existing public road network and the existing design of the internal access, the proposal complies with the requirements of PBP (2019). The proposed internal access road provides heavy rigid and articulated vehicle access to the proposed building.

**Water Supply**

In accordance with the PBP (2019), the Project must ensure an adequate supply of water is provided that meets the NSW RFS requirements.

It is recommended at a minimum 10,000 litres static water supply is provided for firefighting purposes. The water tank shall be fitted with a 65 mm Storz outlet with a ball valve fitted to the outlet. Regular testing of firefighting equipment should also occur to ensure that it is that it is maintained in working order.

Proposed operations will maintain a clean water pond estimated to have a capacity of 11.8 ML. The proposed Project is also expected to maintain a potable water supply tank with a minimum capacity of 10,000 L.

### 5.11.4 Conclusion

Given that the additional building is planned to be a demountable building within the disturbance area and operations are similar to existing, the threat of bushfire is not expected to increase.

It is recommended that the bushfire protection measures identified in **Section 5.11.3** are employed throughout the operation and a Bushfire Management Plan is prepared in consultation with NSW RFS. The Bushfire Management Plan shall be prepared in accordance with requirements outlined in *Appendix 2* of the PBP (2019).

# 6.0 Justification

## 6.1 Introduction

The potential environmental impacts of the Project were the subject of comprehensive technical assessment to identify and assess the potential impacts of the Project on the existing environment and community. The results of these assessments are detailed in **Section 5.0** and the appendices of this EIS.

The environmental and social impacts of the Project have been minimised through refining the operational procedures in consideration of environmental constraints and implementation of appropriate control measures.

With proposed measures to avoid, minimise or manage impacts, it is anticipated that the Project can continue to operate within acceptable environmental standards without significantly adversely impacting the environment or local community.

## 6.2 Environmental, Social and Economic Impacts

As detailed in **Section 1.0** and **Section 3.0**, the Project is, in essence, a continuation of the existing approved operations with the inclusion of a new extraction limit, increased disturbance area and an increased Quarry lifespan.

As detailed in **Section 6.0**, the environmental, social and economic impacts of the Project have been identified and are the subject of a detailed assessment based on:

- assessment of the environmental and social setting of the Project Site
- engagement with local community and other relevant stakeholders
- focused consultation with key government agencies
- application of the principles of ecologically sustainable development, including the precautionary principle, inter-generational equity and conservation of biological diversity and ecological integrity
- expert technical assessment.

The key issues identified, including those required by the SEARs, were the subject of extensive specialist assessment of the potential impacts of the Project on the existing environment. The results of these assessments are detailed in **Section 6.0** and the appendices to this EIS. **Table 6.1** provides a summary of the key outcomes of the environment impact assessments associated with the Project.

**Table 6.1 Key Outcomes of the Environmental Impact Assessments**

| Aspect | Summary |
|---|---|
| **Air Quality, Greenhouse Gas and Energy** | The results of the dispersion modelling indicate the following:<br>• The predicted annual average $PM_{10}$ and $PM_{2.5}$ and dust deposition at the nearest sensitive receivers are all predicted to comply with the NSW EPA air quality criteria.<br>• The cumulative 24-hour assessment showed that there were no sensitive receivers predicted to experience maximum 24-hour cumulative $PM_{10}$ and $PM_{2.5}$ concentrations above the NSW EPA air quality criteria.<br>• In summary, there were no impacts to surrounding sensitive receivers predicted as a result of the proposed Project were modelled.<br>Diesel combustion is anticipated to be the only significant greenhouse gas emission source, comprising 135 tpa $CO_{2-e}$ as Scope 1. There will no mains electricity supply to the Site and thus no Scope 2 emissions are anticipated for the proposed Project. |
| **Noise and Vibration** | The Noise Impact Assessment demonstrated that the project would comply with the relevant criteria for both operational and traffic noise to be generated across all assessment periods. Construction activities are anticipated to exceed the NMLs at receiver R01 during quarry haul road upgrade works. However, where noise management strategies are implemented, it is anticipated to noise emissions will be reduced by up to 10 dB, and construction noise would remain below the relevant NMLs at all receiver locations. |
| **Traffic and Transport** | The proposed expansion is expected to generate 9 vehicle trips in the AM and PM peak hours to and from the Quarry. While an increase in overall truck movements is proposed, comparing traffic simulation results between the with and without development scenarios shows that the traffic generated from the development will have negligible effect on performance of key intersections, and no changes in the level of services have been identified. It is concluded that the Project will have no tangible effect on local traffic function. |
| **Surface Water** | The Project is anticipated to have limited impacts to surface water environmental values. The Project will have an adequate and reliable water source and is considered that the estimated loss of catchment (0.009%) to the Shoalhaven River will have negligible impact on flow regimes and water availability to downstream water users. The Site is likely to be affected by out of bank flooding from Shoalhaven River in high flow events. The impacts of the proposed bunding on local flood regimes will be considered. However, it is expected that any impacts on flood regimes would be localised to Shoalhaven River adjacent to the Project Site. |
| **Groundwater** | The maximum potential extend of drawdown impacts would be limited to the depth of the proposed excavations below the water table and equates to less than 2 m of drawdown below the pre-development water table elevation. Potential risks to water quality can be managed by implementing appropriate procedures for storage and use of chemicals, refuelling and maintenance of plant and machinery and implementing appropriate spill response plans.<br>Potential impacts associated with the proposed development would not exceed the "minimum impact considerations" outlined in the NSW Aquifer Interference Policy (NSW DPI, 2012). Therefore, groundwater impacts associated with the project are acceptable. |

| Aspect | Summary |
|---|---|
| **Biodiversity** | The Biodiversity Impact Assessment identified one plant community type (PCT) impacted by the proposed Project, PCT3347 Southern Tableland Creekflat Ribbon Gum Forest. This PCT is not associated with a threatened ecological community (TEC) listed under the NSW *Biodiversity Conservation Act 2016* or the EPBC Act. The proposed Project will directly impact 23.03 ha of PCT3347 in poor condition, and 0.1 ha of PCT3347 in good condition. Most areas of remnant vegetation will be avoided with 0.1 ha of treed areas needed to be removed.<br>No threatened species were recorded during field assessment; however, two threatened species are presumed to inhabit the subject land:<br>• Squirrel Glider (*Petaurus norfolcensis*) – 0.1 ha to be impacted.<br>• Brush-tailed Phascogale (*Phascogale tapoatafa*) – 0.1 ha to be impacted.<br>It is concluded the mitigation measures planned to be implemented with the proposed Project will mitigate any other residual impacts not offset by the biodiversity offset credits. |
| **Aboriginal Cultural Heritage** | The ACHAR recorded stone artefacts in the Project Area. The proposed Project has been redesigned to avoid these areas; however, areas designated AS02 and AS03 will be impacted by the proposed Project. The impacted sites will require an Aboriginal Heritage Impact Permit (AHIP) and it is proposed that the artefacts collected during the test excavation and during the surface collection as part of the proposed AHIP be reburied on site in a location agreed to with the RAPs. Mitigation measures identified in this report is planned to be implemented to reduce any further impacts from the proposed Project. |
| **Historic Heritage** | No listed heritage sites are recorded within or adjoining the Project site. Given the distance to closest item of known heritage significance, and no blasting techniques are to be used in the proposed Project, the Project is considered unlikely to impact on any items of heritage significance directly or indirectly. |
| **Waste** | The existing waste management practices will continue to be implemented on site and are appropriate for the project. |
| **Visual** | The proposed expansion of the quarry operations is not expected to create a visual impact out of keeping with the existing use of the land as a sand quarry. |
| **Social / Economic** | The potential for impact on the local socio-economic climate is limited, based on the scale of the Project, the fact that the quarry is currently operating and minor reliance of the proposed operations on local services and infrastructure. The proposed Project will continue to provide ongoing benefits for the local and wider communities through ongoing employment, flow- on benefits through use of local services, and through local and regional expenditure. |
| **Hazard and Risk** | The proposed expansion of the quarry is not expected to increase the bushfire risk of the Site. Mitigation measures identified in this assessment are planned to be implemented to reduce any bushfire risks of the proposed Project. A Bushfire Management Plan shall be prepared following approval of the proposed Project. |

## 6.3 Suitability of the Site

The Project is located within a primary production zoned area surrounded by extractive industry, agricultural activities and rural residents. The site is considered suitable for the Project for the following reasons.

- The Project Site is located within an area of extractive industries and is within the currently approved boundary.
- The Project will continue to provide a source of essential high-quality sand and gravel to meet the strong local and regional demand associated with public infrastructure and construction projects.
- The Project is compatible with surrounding land uses and can co-exist with these existing uses.
- The site includes suitable buffers to environmentally sensitive areas.

## 6.4 Benefits of the Project

The key benefits of the Project include:

- The Proposed Project will increase the availability of high-quality sand and gravel to meet the strong local and regional demand for raw construction material.
- Additional extraction areas will be situated on land that has already been previously disturbed.
- The Proposed Project will provide flexibility of operations to respond and meet regional and local demands.
- An increase in ongoing operational expenditure that will have flow-on economic benefits for the region.

## 6.5 Ecologically Sustainable Development

An objective of the EP&A Act is to encourage ESD within NSW. This section provides an assessment of the Proposed Project in relation to the principles of ESD.

To justify the Proposed Project with regard to the principles of ESD, the benefits of the Project in an environmental and socio-economic context should outweigh any negative impacts. The principles of ESD encompass the following:

- the precautionary principle
- inter-generational equity
- conservation of biological diversity, and
- valuation and pricing of resources.

Essentially, ESD requires that current and future generations should live in an environment that is of the same or improved quality than the one that is inherited.

### 6.5.1 The Precautionary Principle

The EP&A Regulation defines the precautionary principle as:

> *'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*
>
> *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
>
> *(ii) an assessment of the risk-weighted consequences of various options.'*

In order to achieve a level of scientific certainty in relation to the potential impacts associated with the Proposed Project, this EIS has undertaken an extensive evaluation of all the key components of the Proposed Project. Detailed assessment of all key issues and necessary management procedures has been conducted and is comprehensively documented in this EIS.

After a full evaluation of the potential environmental impacts of the Project, there are no activities or features for which achievement of an acceptable level of environmental performance is not possible. Features of the local environment such as water quality, soil resources, noise and air quality would be managed throughout the life of the Project. It would remain a guiding principle for the Proponent to be pro-active and anticipate problems rather than allow problems to develop.

### 6.5.2 Intergenerational Equity

The EP&A Regulation defines the principal of intergenerational equity as:

> *'that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.'*

Intergenerational equity refers to equality between generations. It requires that the needs and requirements of today's generations do not compromise the needs and requirements of future generations in terms of health, biodiversity and productivity.

The Project has been designed to ensure that no part of the community would be unacceptably disadvantaged. As discussed in **Section 5.10**, the economic benefits of the Project would be felt by the wider community through:

- provision of local employment and flow-on benefits to local goods and service providers
- supply of products including raw materials from regional suppliers, as well as the maintenance of necessary infrastructure and development of new infrastructure.

The non-material well-being or 'quality of life' of existing and future residents in the vicinity of the Project will be maintained throughout and beyond the life of the Project through:

- implementation of safeguard measures and operational controls to mitigate any environmental impacts
- upon completion of operations, the decommissioning and subdivision of the Project Site will allow for ongoing primary production use in accordance with the QPRC LEP 2022.

Ongoing communication between CSG and those landowners and residents surrounding the Proposed Project would be important in ensuring that issues associated with local amenity are appropriately managed.

### 6.5.3 Conservation of Biological Diversity and Ecological Integrity

Biological diversity or biodiversity describes life forms and is usually considered at three levels:

- genetic diversity
- species diversity
- ecosystem diversity.

Ecosystem integrity describes the condition of an ecosystem that is relatively unaltered from its natural state. The additional disturbance required by the Proposed Project is located on rehabilitated land previously disturbed by agricultural clearing and operation and a BDAR completed by AREA (**Appendix J**) confirms this includes primarily exotic species. Assessment of this disturbed land confirms the impact on local biodiversity would be minimal.

Based on the implementation of the proposed impact avoidance, minimisation and mitigation measures of the existing Quarry, and considering the area to be disturbed would not result in any additional impacts to any threatened species or vegetation community, it is concluded that the Proposed Modification would not increase the risk of local extinction of any species.

### 6.5.4 Improved Valuation and Pricing of Environmental Resources

The goal of improved valuation of natural capital has been included in Agenda 21 of Australia's Intergovernmental Agreement on the Environment. The principle has been defined in the EP&A Regulation as:

> *'that environmental factors should be included in the valuation of assets and services, such as:*
>
> *(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*
>
> *(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,*
>
> *(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems'*

This principle involves consideration of the materials proposed to be extracted, accepted and produced, and the surrounding environmental resources (e.g. air, water, land and living things) which may be affected. The valuation and pricing of quarry products comprises the cost of extraction, screening, backfilling and rehabilitation costs, delivery costs and the final cost to QPRC Council rate payers.

The value placed by CSG on the environmental resources, other than the extracted and imported resources, is evident through the existing management measures employed at the Quarry.

## 6.6 Conclusion

As outlined in **Section 6.5**, the proposed Project has been assessed against the principles of ecologically sustainable development as required by the EP&A Act. This assessment has indicated that the Proposed Project is consistent with the principles of ecologically sustainable development.

- The Project provides for the production and transportation of important high-quality sand and gravel materials whilst minimising the residual impacts on the biophysical environment.
- The Project maximises the efficient use of raw materials from the currently approved Larbert Quarry (owned and operated by CSG).
- The contribution of the proposed Project to the local and regional economy would be significantly increased by virtue of expenditure.

In light of the conclusions included throughout the EIS, it is assessed that the proposed Project could be undertaken in a manner that would satisfy all relevant statutory goals and criteria, environmental objectives and reasonable community expectations.

# 7.0 References

Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality – The Guidelines – Volume 1. https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf

Australian Bureau of Statistics (2021). 2021 Queanbeyan-Palerang Regional, Census All persons QuickStats. Available online: https://www.abs.gov.au/census. Accessed June 2023.

Australian Standard AS 1055:2018 – Acoustics – Description and measurement of environmental noise – General Procedures.

Commonwealth Scientific and Industrial Research Organisation (2023). Bushfire best practice guide: Forest Fire Danger Index. Available at: https://research.csiro.au/bushfire/assessing-bushfire-hazards/hazard-identification/fire-danger-index/

Department of Infrastructure, Transport, Regional Development and Local Government (2009). Australian Code for the Transportation of Dangerous Goods by Road and Rail (Dangerous Goods Code).

Department of Planning Industry and Environment's Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method 2020 and Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft November 2004.

Department of Planning and Environment (2020). Soil Landscapes of Central and Eastern NSW – Version 2.1, NSW Office of Environment and Heritage, Sydney.

Ground Doctor (2023). Groundwater Impact Assessment.

Indesco (2022). Traffic Impact Assessment Report (Indesco 2022).

International Organisation for Standardisation (ISO) 9613-1:1993 (ISO9613:1) – Acoustics – Attenuation of Sound During Propagation Outdoors – Part 1: Calculation of the Absorption of Sound by the Atmosphere.

International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) – Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation.

International Organisation for Standardisation (ISO) TR 17534-3 – Acoustics — Software for the calculation of sound outdoors — Part 3: Recommendations for quality assured implementation of ISO 9613-2 in software according to ISO 17534-1.

Lake George Bushfire Management Committee (2018) Lake George Bushfire Risk Management Plan.

Landcom (2004). Managing Urban Stormwater: Soils and construction – Volume 1. 4th Edition.

Muller Acoustic Consultants Pty Limited (2022). Noise Assessment, Larbert Quarry, 552 Larbert Road, Larbert NSW (MAC 2022).

National Health and Medical Research Council (2011). Australian Drinking Water Guidelines. Version 3.8.

New South Wales Consolidated Regulations (2018). Water Sharing Plan For The Greater Metropolitan Region Unregulated River Water Sources 2011.

NSW Department of Environment and Climate Change (2008). Managing Urban Stormwater: Soils and construction – Volume 2e: Mines and quarries.

NSW Department of Environment and Climate Change (DECCW), NSW Interim Construction Noise Guideline (ICNG), July 2009.

NSW Department of Environment Climate Change and Water (DECCW) (2010a). Aboriginal cultural heritage consultation requirements for proponents. Sydney.

NSW Department of Environment Climate Change and Water (DECCW) (2010b). Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales. Sydney.

NSW Department of Environment, Climate Change and Water (DECCW) – NSW Road Noise Policy (RNP), March 2011.

Department of Environment and Conservation (NSW) (2006). Assessing Vibration: a technical guideline. Sydney 2000. February 2006.

NSW Department of Planning and Environment (2023). Social Impact Assessment Guideline for State Significant Projects. NSW Government, July 2021.

NSW Department of Planning and Environment (2017). Southeast and Tablelands Regional Plan 2036. NSW Government, July 2017.

NSW Department of Planning and Environment (2023). Safeguarding our Agricultural Land - Biophysical Strategic Agricultural Land (BSAL). Strategic agricultural land map – sheet_sta_035.

NSW Department of Primary Industries Office of Water (2012). NSW Aquifer Interference Policy, September 2012.

NSW Environment Protection Authority (EPA) (2017). Noise Policy for Industry (NPI).

NSW Fire and Rescue (2023). Bushfire Research. NSW Government Available at: https://www.fire.nsw.gov.au/page.php?id=132

NSW Government (2011a). Greater Metropolitan Region Groundwater Sources 2011.

NSW Government (2011b). Greater Metropolitan Region Unregulated River Water Sources 2011.

NSW Government (2023). Braidwood 1:100,000 Geological Map (2nd Edition). https://gmaps.geoscience.nsw.gov.au/100K/Braidwood2ndEd/

NSW Government Transport for NSW (2019). Construction Noise and Vibration Strategy. ST-157/4.1 Standard – Applicable to Infrastructure and Place.

NSW Legislation (2022). Queanbeyan-Palerang Regional Council Local Environmental Plan 2022.

NSW Legislation (2023). Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011. NSW Government.

NSW Office of Environment and Heritage (OEH) (2011). Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW. Sydney.

NSW Rural Fires Services (2019b). Planning For Bush Fire Protection. A guide for councils, planners, fire authorities and developers. November 2019.

Queanbeyan-Palerang Regional Council (2020). Towards 2040 – Local Strategic Planning Statement. July 2020.

Queanbeyan-Palerang Regional Council (2023). Queanbeyan-Palerang Regional Council area: About the profile areas. Available online: profile.id.com.au/queanbeyan-palerang. Accessed June 2023.

Roads and Maritime Services (Roads and Maritime), Construction Noise and Vibration Guideline (CNVG), 2016.

Robson Environmental Pty Ltd (2019). Updated Addendum Statement of Environmental Effects Parish of Bruce near Braidwood Portion of Lot 24 DP755915 552 Larbert Road, Larbert NSW 2622. Canberra Sand and Gravel.

WaterNSW (2022). Neutral or Beneficial Effect on Water Quality Assessment Guideline.

World Resources Institute & World Business Council for Sustainable Development (2004). The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard.

Zephyr Environmental Pty Limited (2022). Larbert Quarry Expansion Project, Air Quality and Greenhouse Gas Assessment (Zephyr 2022).

umwelt
Environmental & Social
Consultants

**Umwelt (Australia) Pty Limited**

T| 1300 793 267 E| info@umwelt.com.au www.umwelt.com.au