Environmental Impact Statement

Murray's Crossing Quarry

July 2022

Project Number: 21-416

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Declaration

Project name: Murray's Crossing Quarry

Proposed development:

Bald Hill Quarry (BHQ) would like to amalgamate its current operations at Murray's Crossing Quarry in Tumbarumba and combine all disturbance areas under one approval. The proposal would include the construction, operation and rehabilitation of a quarry extension to existing quarry operations. Bald Hill Quarry Pty Ltd is approved to extract and process up to 95,000 tonnes per annum (tpa). The project proposes to extract up to 100,000 tpa with peak volumes of 200,000 tpa, over approximately 25 years.

Land to be developed:

The Murray's Crossing Quarry Proposal would be located on an approximately 15.41hectare (ha) area, within the Lots detailed in Table 1-1 of this EIS.

Applicant: Bald Hill Quarry Pty Ltd

Applicant address: 71 Murrays Crossing Road, Tumbarumba, NSW

EIS prepared by: NGH Pty Ltd

This EIS has been prepared in accordance with Part 8 Division 2 of the Environmental Planning and Assessment Regulations 2021. It contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates. To the best of my knowledge, the information contained in the EIS is neither false nor misleading.

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Signature:		
Date:	07/07/2022	04/07/2022

Table of contents

Figures

Tables

Appendices

Acronyms and abbreviations

AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ASL	Above sea level
AWS	Automatic weather station
BC Act	*Biodiversity Conservation Act 2016* (NSW)
Biosecurity Act	*Biosecurity Act 2015* (NSW)
BOM	Australian Bureau of Meteorology
Cwth	Commonwealth
DAWE	Department of Agriculture, Water and the Environment (Cwth) (formerly DoEE)
DECCW	(Former) Department of Environment, Climate Change and Water (NSW) (now DPIE)
DoEE	(Former) Department of the Environment and Energy (Cwth) (now DAWE)
DPE	Department of Planning and Environment (NSW)
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EIS	Environmental impact statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
FM Act	*Fisheries Management Act 1994* (NSW)
ha	hectares
Heritage Act	*Heritage Act 1977* (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007 (NSW)
KFH	Key Fish Habitat
km	kilometres
LEP	Local Environment Plan
m	metres
NES	Matters of National Environmental Significance under the EPBC Act (*c.f.*)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NV Act	*Native Vegetation Act 2003* (NSW)
OEH	(Former) Office of Environment and Heritage (NSW) (now EES)
REP	Regional Environmental Plan

SRPP	NSW Southern Regional Planning Panel
TIA	Traffic Impact Assessment
TKNIC	Toomaroombah Kunama Namadgi Indigenous Corp

Table of definitions

The Proponent	Bald Hill Quarry Pty Ltd (BHQ)
Proposal	All works involved in the implementation and operation of the development as described in this EIS.
Subject Land	All lots affected by the development. The Subject Land comprises freehold land and the Crown Quarry Reserve.
Development site	The Development site is the area surveyed for the assessment prior to identifying the constraints and exclusions. The area is 15.41 hectares (ha). Refer to Figure 1-1.
Development footprint	The uppermost area of land that would be directly impacted by the Proposal (including all temporary and permanent impacts). The development footprint is approximately 13.24ha, including a pit footprint of 8.68ha, refer to Figure 3-10 and involves: • Land directly impacted by the quarry (8.68ha) • Areas where vehicle and plant will cause ground disturbance • Land proposed for stockpiling and/or ancillary use.
Study area	The Development site.
Locality	The Development site plus a 10km buffer.

Executive summary

Proposal description

The proposed extension at Murray's Crossing Quarry would have a maximum extraction potential of 2.4 million tonnes over its twenty-five-year life cycle and would include:

- A quarry footprint of approximately 8.68ha (including the existing operation)
- Drill and blasting for extraction, up to five or six times a year
- Relocation of the existing workshop and amenities building
- Construction of a stockpile for surplus product
- Construction of a sediment dam
- Haulage of extracted rock via loader across quarry pit floor, to an existing processing plant, located within the quarry pit
- An increase in truck movements, from 24 per day to:
    - 30 per day during extraction periods of up to 100,000 tonnes per annum (tpa)
    - 60 per day during extraction periods of up to 200,000 tpa.

The Proposal seeks approval for extraction of 100,000 tpa with peak periods of 200,000 tpa. BHQ currently has development consent to extract and process 15,000 tpa on the freehold land; however, current operations involve the extraction and transportation of approximately 80,000tpa (from crown quarry reserve).

The Proposal would include the current operating conditions of the Murray's Crossing Quarry, including:

- Four to five full time staff
- No additional permanent buildings
- No additional water usage
- No new accesses to the local and regional road network.

The Proposal would be accessed via Murray's Crossing Road and internal haul roads. Batlow Road and Tooma Road provide access to the region's transport network.

BHQ received Development Consent for the Murray's Crossing Quarry in 1992. However, quarrying activities within the Crown Quarry Reserve have been evident since the 1940s. In 2009, BHQ entered into an existing land use rights agreement for the Crown Quarry Reserve with Snowy Valley Council (SVC). BHQ also have a permit from Murray Local Land Services (LLS) to use the TSR (R51191). Operational activities conducted on the TSR include stockpiling of material, water capture in a sediment dam, loading of trucks and site access. As such, the TSR has not been included in this assessment.

Landowners consent will be obtained from Crownlands as a formal process for work in the crown quarry reserve.

The Proposal is expected to operate for 25 years. The development is already operational and, as such, future construction and operational phases of the Proposal are expected to occur concurrently. After the operating phase, the Proposal will be decommissioned. Following closure, a Quarry Closure Plan would be enacted to rehabilitate the site before returning it to the landowner.

Strategic need

The *Riverina Murray Regional Plan 2036* (the Regional Plan) (DPE, 2017) guides the NSW Government's land use priorities for the next 20 years, providing an overarching framework to guide subsequent land use plans, development Proposals and infrastructure funding decisions.

The Regional Plan is broken down into a number of goals and directions, which detail a number of actions to be considered during the planning process.

SVC has prepared the *Envisage 2040: Local Strategic Planning Statement* (LSPS) (SVC, 2021), which sets out the 20-year vision for land-use in the local area, the special character and values that are to be preserved and how change will be managed into the future. The LSPS is the strategic document that distils strategic objectives, priorities and directions from relevant State and Regional policies to ensure these are reflected and furthered through land use planning in the Snowy Valleys LGA.

Project benefit

Social and Economic Benefits

Social and economic benefits have been considered for the Proposal. The Proposal would be beneficial to the community and economy of the region because:

- The Proposal would result in employment retention. The site currently has four to five Fulltime Equivalent (FTE) staff
- Support local employment and regional development and economic opportunities, outside of the operations on the site
- Over the life of the Proposal, it would provide approximately $1.1million of capital investment value to the region
- The use of the extracted material locally or within the region would result in increased visitation to towns and localities for services including food and accommodation, resulting in shared economic benefits
- The Proposal would meet local strategic and statutory provisions, endorsed by the local Council and community, that apply to the Proposal
- It would potentially reduce road kilometres to Subject Lands in the region, and in turn potentially reduce greenhouse gas emissions that contribute to climate change, by providing a resource that can be locally sourced and is well located to access major roads and train lines minimising travel.

Environmental Benefits

The Proposal would provide basalt, currently used for the purposes of aggregate and road base material to local councils and other clients within the region, reducing road kilometres and lessening the impacts of greenhouse gasses.

Benefits of the proposed rehabilitation works would include:

- Revegetated areas would reintroduce habitat and foraging resources back into the landscape
- The water collected and pumped from the sediment dams would be used for watering stock
- A portion of land within the development footprint would be returned to agricultural use following the rehabilitation process

Site suitability

The reasons the Subject Land was chosen include:

- The high-quality status of the hard rock resource
- Existing rock crushing and processing infrastructure occurs on site
- Existing site office occurs on site

Key environmental assessment issues

The following environmental risks were considered to be key issues for detailed assessment and consideration of mitigation strategies within the EIS:

- Biodiversity
- Noise and vibration
- Soils
- Surface water
- Air quality
- Transport
- Hazards
- Aboriginal heritage

In addition, the following were also identified as being environmental assessment issues of lower risk: land use, topography, geology and soils, historic heritage, socio-economic and community, resource use and waste generation, and cumulative impacts.

Biodiversity, Aboriginal heritage, traffic, flooding and air quality impacts were investigated by specialists.

Biodiversity

NGH prepared a Biodiversity Assessment (Appendix D) to assess potential impacts to biodiversity as a result of the Proposal. Vegetation determined to be present within the development footprint included one PCT and exotic vegetation. Exotic vegetation covers 9.35 hectares in the proposed development footprint.

Native vegetation identified on site included:

- 0.65 hectares of PCT 285 Broad-leaved Sally grass – sedge woodland on valley flats and swamps in the NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion.

No threatened fauna or flora species were identified during the site visit.

Based on habitat assessment, no federally listed migratory species are considered likely to occur within the Subject Land.

Based on habitat assessment, habitat value for federally listed threatened species the following species have suitable habitat and potential to occur in the development site:

- Austral Toadflax (*Thesium australe*) - Vulnerable
- Superb Parrot *Polytelis swainsonii* – Vulnerable
- Painted Honeyeater (*Grantiella picta*) - Vulnerable
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable
- Corben's Long-eared Bat *Nyctophilus corbeni* – Vulnerable
- Booroolong Frog (*Litoria booroolongensis*) — Endangered
- Spotted Tree Frog (*Litoria spenceri*) —Endangered
- Spotted tail Quoll *Dasyurus maculatus*—Endangered
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered.

An Assessment of Significance was completed for these species. A significant impact was considered unlikely for these species, given that:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- Only one HBT is proposed for removal
- No substantial contribution to any Key Threatening Process are expected
- No impact an important population of a species or EEC is expected as a result of the Proposal
- Aquatic habitat to be impacted consists of ephemeral streams within a highly modified pastureland
- Mitigation measures have been recommended to further reduce impacts to biodiversity.

No EPBC referral was considered necessary. The full assessments are available in Appendix E of the BA.

Water use and quality

Currently, sediment dams release water into Tumbarumba Creek during localised flooding events. As a part of the Proposal, clean water will be allowed to move off site, feeding into existing drainage lines. No other discharge of water into natural waterbodies is expected from the Proposal. No discharge of water into natural waterbodies is expected to take place from the Proposal. Due to the lack of groundwater encountered during operations to date, impacts to groundwater and groundwater dependant ecosystems are considered negligible during the construction and operational phases of the development.

Water demand for the Proposal during the construction and operational phases would be consistent. Water would be predominantly used for dust suppression. It is expected that a maximum of approximately 5,000L - 8,000L of water could be utilised per day in high summer. Water is currently sourced from two farm dams, and a sediment dam located within the existing pit footprint. The Proposal involves the gradual removal of both farm dams, which would be replaced by a second sediment dam. It is considered likely that there would be a minor increase in water demand during periods of excavation and pit expansion. However, pit expansion would occur incrementally. Potable water for staff is provided at the workshop, which is connected to town water. Amenities are supplied with rainwater.

The results of a Flood Frequency Analysis (L&A, 2022) assessment indicate that the quarry pit would act as flood storage area during a 1% AEP flood event. Flood storage would likely increase in relation to the pit footprint, which would also increase as part of the Proposal. In the event of a flood event, all mobile plant such as excavators and loaders are moved to higher ground. Larger plant remains in place and the generator is mounted above the anticipated flood level.

Climate and air quality

NGH engaged SLR (2022) to prepare an Air Quality Impact Assessment (AQIA) for the Proposal. No new impacts on air quality, different to that already experienced by nearby receptors, is expected as part of the proposed works. Dust generation would accompany clearing, excavation, and other earthworks as well as the movement of trucks and work vehicles along the unsealed access road during construction and operation of the development. Access tracks would be regularly maintained, and dust suppression applied as required.

Several pollutants, such as nitrogen oxides, sulphur dioxide, carbon monoxide and Volatile Organic Compounds (VOCs), are released during the operation of onsite quarry plant and equipment.

Periodic blasting is expected to have an impact on air quality and is expected to take place up to six times each year, dependent on quarry progression. Blasting creates a large short-term release of dust and rock emission as well as a by-product emission from the explosive chemical used. Overall, the proposed operations are predicted to have negligible increases in cumulative concentrations at all of the sensitive receivers (SLR, 2022). Mitigation measures have been recommended, to minimise potential impacts.

Transport (including operation of machinery) is likely to be the largest source of GHG emissions during operation from fuel combustion contributing to climate change, this includes minor additions to heavy vehicle movements along the extension of haul road. Explosive events are likely to generate GHG emissions; however, this would only occur 5 - 6 times per year. Land use change and vegetation clearing would also be a contributor to GHG emissions; the disturbed landscape would be revegetated during the rehabilitation phase of the project. All these minor additions to GHG emissions can be reduced with the implementation of the mitigation measures outlined in section 6.6.7 of this EIS.

Visual impacts

NGH completed a Visual Impact Assessment (VIA) utilising field surveys, background investigations, mapping, and an assessment of the viewshed and local vantages in order to evaluate the operational visual impact of the Proposal.

Numerous residences are located within 2km of the Subject Land. Four Landscape Character Units (LCU) were identified within Jugiong and surrounding areas:

- Rural (including agricultural lands)
- Residential (viewpoints near residences)
- Industrial (major roads, quarries, landfill, electrical and other built infrastructure)
- Commercial (businesses, town centre).

Eleven representative viewpoints were identified using the Bureau of Land Management (BLM) methodology and within the Zone of Visual Influence (ZVI). The operational visual impact assessment was undertaken considering:

- The scenic quality of the study area's LCU
- The expected sensitivity at representative viewpoints
- The proximity of each representative viewpoint.

All eleven viewpoints were assessed as having a low visual impact from the proposed quarry. The Subject Land is completely invisible from five of these locations. No mitigation is required for the Proposal.

Dust would be controlled in response to visual cues during construction of the development. Night lighting can also contribute to glare and waste energy. The operation of night lighting would be minimised to the maximum extent possible and compliant with all relevant standards, codes of practice and policies.

Aboriginal heritage

NGH prepared a Due Diligence (DD) assessment to provide an assessment of the Aboriginal cultural values associated with the Development site and to assess the cultural and scientific significance of any Aboriginal heritage sites recorded. Consultation was undertaken in consultation with the Toomaroombah Kunama Namadgi Indigenous Corp (TKNIC).

Ninety-eight Aboriginal sites were recorded within the search area and no Aboriginal places. No previously registered AHIMS sites are located within or adjacent to the survey area. However, 10 sites occur within approximately 5km of the survey area.

A probable location for camping was identified within the survey area on a spur approximately 50m south of a spring fed drainage line. A small potential archaeological deposit (PAD 01) was located on the spur within the survey area. A member of the TKNIC disclosed that PAD 01 was located on a significant song line.

Other than the identification of PAD 01, the impact of the Proposal on Aboriginal cultural heritage has been assessed to be low. Providing that the works avoid PAD 01 (including a 10m buffer) and that the appropriate mitigation measures are followed, works can proceed with caution. An Unexpected Finds Protocol (UFP) would be prepared and followed should there be an inadvertent discovery of Aboriginal objects during construction.

Noise and vibration impacts

The construction and operation of the quarry has the potential to affect the community due to noise and vibration. NGH engaged SLR (2022) to complete a Noise and Blasting Assessment (Appendix L) for the Proposal.

A review of the existing environment identified noise sources from land use adjacent to the development site would generally consist of livestock grazing, cultivation, harvesting of fodder, and road traffic. Noise generating equipment would include livestock, tractors, quad bikes, light vehicles, and heavy vehicles. These land uses characterise the background noise within the area. The proposed quarry extension also involves blasting five to six times a year.

Numerous sensitive receivers (rural residences) are located within 2km of the Subject Land. The nearest receiver (R28) is located approximately 240m north of the Site. Noise levels from the quarry operations are predicted to exceed the NPfI PNTLs at several receptors, particularly for quarrying, processing and product despatch. It is understood that noise-related complaints have not been received by the Proponent.

Operational noise

The predicted exceedances of the daytime PNTL were up to 11 dBA for all activities occurring at the same time – which may be relatively unlikely – at the nearest occupied receptor (R21). An exceedance of that magnitude would be considered significant. The predicted exceedance at R28, which is unoccupied, was 18 dBA. It is important to note that the quarrying activities were assessed at the highest point on the site. As quarrying progresses, noise levels would be likely to decrease at several receptors as activities are shielded by the quarry benches that are formed.

Noise from the Proposal is not expected to contain any ‘annoying’ characteristics, including a substantial low frequency component, when observed at the surrounding receptors, and therefore no modifying factor is required for the predicted noise levels.

Road traffic noise

Although the total amount of material extracted annually will increase at busy times, it is understood that the daily rate of material processed at the quarry would increase following the

expansion of the quarry. Therefore, it is expected that truck movements would increase. The surrounding road network has a low vehicle demand and is considered to have adequate capacity to readily accommodate the modest increase in traffic associated with the expansion of the quarry which is expected to be in the order of 4-10 truck movements during the peak hour. As such, the Proposal will have no discernible impact on the operation of the surrounding road network and the traffic can be accommodated in a safe manner.

Blasting

Results of the blasting assessment indicate that airblast overpressure is not expected to exceed the ANZEC guideline criteria of 115 dBL at the nearest residential receivers R21 and R03 up to an MIC of approximately 140kg. If the unoccupied dwelling R28 is occupied in future, there would be risk of exceeding the ANZEC Blast overpressure value at MIC of 40kg. However, as the pit expansion is moving to the east and away from R28, it is considered likely that blasting overpressure would decrease over time. Vibration levels would also be below the ANZEC annoyance criteria of 5 mm/s PPV. At the closest unoccupied receiver R28 and the Racecourse buildings, a maximum MIC of approximately 140 kg is predicted not to exceed the AS 2187.2 cosmetic damage criteria.

Noise and vibration safeguards and mitigation measures have been recommended in section 6.3.6 of this EIS.

Traffic, transport and road safety

NGH engaged Amber to prepare a Traffic Impact Assessment (TIA) (Appendix G) to assess the traffic impacts of the Proposal. Access to the site is proposed to remain via the existing connection with Murrays Crossing Road. Murray's Crossing Road has a sealed carriageway width of approximately 6m. This road accommodates two-way traffic, with unsealed shoulders provided on both sides of the road. Murray's Crossing Road is a rural, open road which adopts the default speed limit of 100km/h.

The TIA determined the following:

- The site is expected to generate up to 74 vehicle movements per day as part of the Proposal, which is an increase of up to 36 vehicle movements per day and 10 vehicle movements during the peak hour.
- The surrounding road network has a low vehicle demand and is considered to have adequate capacity to readily accommodate the modest increase in traffic associated with the expansion of the quarry. As such, the Proposal will have no discernible impact on the operation of the surrounding road network and the traffic can be accommodated in a safe manner.
- Access to the site is proposed to continue to be provided via the existing connection with Murray's Crossing Road. Turning movements are currently facilitated by an approximately 25m wide vehicle crossing which provides safe access for vehicles entering and leaving the site.

The TIA concluded that the proposed access arrangements for the quarry are suitable to accommodate the expected vehicle types and traffic volumes.

Landuse

NGH assessed the land use impacts of the Proposal, using a land use conflict risk assessment (LUCRA) carried out in accordance with the Department of Primary Industry's *Land Use Conflict Risk Assessment Guide* (DPI, 2017). Given the proposed quarry is different to the surrounding land use activities, primarily agriculture, this assessment aims to identify and rank potential land use

conflicts so that they may be adequately managed. Where expected conflicts are adequately managed, the rights of the existing and proposed land uses can be protected. The Proposal would result in a small permanent loss (approximately 2.98ha or 35.5%) of agricultural land.

The range of scores in the LUCRA revised risk rating were low to moderate, demonstrating that the proposed construction of the quarry would have minimal impact to surrounding land uses.

Topography, geology and soils

The Subject Land includes an active quarry, which is situated within the lower slopes of hilly terrain. The proposed extension would see the excavation of material from the upper slopes of the range. The Subject Land has a peak elevation of around 660m Australian Height Datum (AHD). The existing operation was observed to consist of bare earth, gravels and hard rock, while the undeveloped portions of the site were comprised of grasses. Shrubs and trees were observed sporadically throughout the site.

Earthworks required during construction include construction of haul roads, the removal and stockpiling of topsoil and overburden and creation of a sediment basin (refer to Figure 3-10).

Pit development is a staged process. Topsoil and overburden would be removed in stages. The area impacted by the existing development (3.76ha) and the proposed extension (7.35ha) gives a total development impact of 11.11ha. Topsoils would be removed and stockpiled separately to the overburden. Excavated subsoils would be stockpiled and contained to avoid potential dispersion and sediment transfer. The stockpile site would be located within the southwestern portion of the development footprint (refer to Figure 3-10).

Areas of disturbance would include the pit footprint, haul road, workshop / amenities, the stockpile location and sediment dams. Construction activities would remove the existing groundcover and disturb soils, potentially increasing their susceptibility to erosion and subsequent sedimentation in areas offsite. Groundcover would be retained as far as possible prior to, during and post-construction. Soil compaction would occur as new haul roads are created. This would reduce soil permeability thereby increasing run off and the potential for concentrated flows.

Overall, the risk of erosion is considered low. With the implementation of safeguards and mitigations measures, runoff is considered to be readily manageable and unlikely to cause substantial erosion or lead to substantial sediment loads entering any natural waterways.

Historic heritage

In the Snowy Valleys Local Government Area (LGA) there were:

- No items listed on the World Heritage list
- Four items listed on the National Heritage list
- No items listed on the Commonwealth Heritage list
- Five items on the NSW State Heritage Register
- Ten items/places on the NSW State Agency Heritage Register.
- One hundred and eight items listed items/places in the *Tumbarumba Local Environment Plan (LEP) 2010*.

Five of these items were located within 3km of the Subject Land. The closest, the Tumbarumba Pioneer Cemetery (I9), is located approximately 700m southeast of the Subject Land.

No impacts are considered likely on heritage values by the Proposal.

Socio-economic and community

The Proposal is unlikely to cause negative impacts on the local economy. BHQ and its employees would benefit a range of local and regional economies through direct spending of wages and employing contactors, consultants, trades people, transport operators and other associated service providers.

Hazards

Hazards onsite would be managed in accordance with the Bald Hill Quarry's Integrated Work, Health, Safety and Environment Management System and Health, Safety and Environment Management Plan (HSEMP), and within guidelines in accordance with the *Work Health and Safety Act 2011* NSW (WH&S Act), the Work Health and Safety Regulation 2017 and relevant Australian Standards.

Preliminary Risk Screening

Explosives would not be stored on site, instead brought to site by the contractor on the day of the blasting. Fuel (diesel (not considered a flammable liquid) or petrol) would be stored in a bunded trailer within the quarry pit and within an above ground, bunded tank at the workshop. The above ground tank would be relocated when the workshop is moved to its proposed location (refer to Figure 3-10).

The project is not considered to be a potentially hazardous development with respect to the storage, use or transportation of hazardous substances. Therefore, in accordance with the Resilience and Hazards SEPP, a PHA is not required, and no further risk analysis or assessment is required.

Bushfire

The Subject Land occurs on bushfire prone land (refer to Figure 6-16).

The majority of the existing active quarry area within the Subject Land was observed as bare earth. Land surrounding the active pit consists of open grassland and open woodland vegetation formations. The surrounding area is not identified as bushfire prone land (RFS 2021). However, the risk still exists due to the remote location and remnant vegetation, which represents a potentially significant fuel load capable of sustaining and promoting the spread of bushfire.

As such, the potential risks to the extraction operations from bushfire attack are assessed from the point of view of emergency evacuation and management in the case of a bushfire emergency and the potential for the operations to cause a bushfire for example, from the operation of machinery.

The existing bushfire management measures on site include:

- Maintained access road
- Water cart or sprinklers
- Fire extinguishers on all plant and equipment, in site offices and workshops
- Hose reel in the workshop.

The Proponent intends to continue to implement existing bushfire management measures currently in place at the site in consultation with the local RFS.

Resource use and waste generation

During construction and rehabilitation, resources used would be associated with:

- Formation of an additional haul road
- Relocation of the onsite workshop and amenities building

- Use of machinery and vehicles
- Maintenance activities.

Construction activities that would produce wastes include:

- Used oils and grease from plant and equipment maintenance

Topsoil and overburden would be reused on site. Topsoil would be used during rehabilitation activities. Overburden would be reused to fill the sediment dams and for blending with the product.

In accordance with definitions in the POEO Act and associated waste classification guidelines, most waste generated during the construction phase would be classified as building and demolition waste within the class general solid waste (non-putrescible). Materials taken from the existing workshop and amenities building would be utilised for the replacement building (refer to Figure 3-9 and Figure 3-10 for the location of existing and proposed infrastructure).

During operation, the solid waste streams would be associated with maintenance activities and presence of employees. Some materials, such as fuels, lubricants and metals may require replacement over the operational life of the Proposal.

Ongoing quarry operations are not expected to produce a significant amount of waste. The majority of the waste produced would result from staff on site (food waste, septic waste, etc).

Repair or replacement of infrastructure components at the processing plant would result in some waste generation. However, these activities would occur infrequently and there would be a high potential for recycling or reuse of any waste.

Cumulative impacts

The incremental effects of the Proposal on existing background conditions in the study area have been considered in the preceding assessment sections. The proposed extension to the Murray's Crossing Quarry would contribute to infrastructure development within the region.

Cumulative impacts may have a minor impact to State Significant Development (SSD) Proposals occurring within the LGAs. Mechanisms to consult with local industry are however, included in section 5 and Appendix C, and would assist to manage cumulative impacts should additional developments become relevant to the Proposal.

During construction and operation, key cumulative impacts may include community complaints regarding visual amenity impacts, stress on local business for supply and demand, staff accommodation, noise impacts, air quality, waste management, traffic etc.

Rehabilitation

Wherever possible, rehabilitation would be completed progressively as part of ongoing development of the quarry. Rehabilitation of areas disturbed during the establishment and construction phase for the Proposal would be completed progressively as part of ongoing development of the quarry. This approach would minimise the visual impact of the project from surrounding areas and stabilise the surfaces, thereby reducing the potential for erosion.

1. Introduction

1.1 Purpose and scope of this Document

This Environmental Impact Statement (EIS) identifies and assesses the potential environmental impacts associated with the construction and operation of the proposed Murray's Crossing Quarry (the Proposal). NGH Pty Ltd (NGH) has prepared this EIS on behalf of Bald Hill Quarry Pty Ltd (the Proponent).

The Proposal (extractive industries) is Designated Development under section 4.10 of the EP&A Act and Schedule 3 (26) of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation).

The Proposal is classified as integrated development under section 4.46 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) as it requires additional statutory authorisations.

This EIS has been prepared in accordance with Part 4 of the EP&A Act to support a Development Application (DA) to be lodged with Snowy Valleys Council (SVC).

The objective of this EIS is to fulfil the requirements of Part 8 Division 2 of the EP&A Regulation and Section 4.15 of the EP&A Act. The structure and content of the EIS is to address the Secretary's Environmental Assessment Requirements (SEARs), provided by the NSW Department of Planning and Environment (DPE) on 27 May 2020, which were revised 13 January 2021 (refer Appendix A).

The Proponent has engaged NGH to prepare the EIS. Other independent consultants have been engaged to provide specialist technical assessments as required. This EIS will be independently evaluated by the NSW Southern Regional Planning Panel (SRPP), considering input from the community provided during the public exhibition period. The process provides for public transparency, accountability, and participation in development approval decision-making.

The development assessment process places the onus on the Proponent to provide the information required for the SRPP to make an informed decision. It is considered that this EIS provides the required information to enable the assessment of the Proposal.

1.2 Proposal Overview

The Proposal is located in the SVC Local Government Area (LGA). The existing operation is accessible via Murray's Crossing Road, to the northwest of the Subject Land. The proposed quarry extension is located immediately south-southeast of the existing quarry operation (Figure 3-10) and would be accessed via an internal haulage route.

The Crown Quarry Reserve (81837) on Lots 732 and 623 DP 755892 is operating under an agreement between SVC and BHQ. Landowners consent will be sought with Crownlands. No impacts would occur to Lot 623. The freehold lots surrounding the Crown Quarry Reserve to the east and south are owned by BHQ.

The TSR located on Lot 7028 DP 96852 (51191) is Crown Land and managed by Local Land Services (Table 1-1) and is subject to a Land Title Claim. BHQ have a permit from Local Land Services (LLS) to stockpile material and load trucks on the TSR. No changes to the current permit conditions are required as a result of the Proposal and, as such, the TSR has not been included in the scope of the EIS.

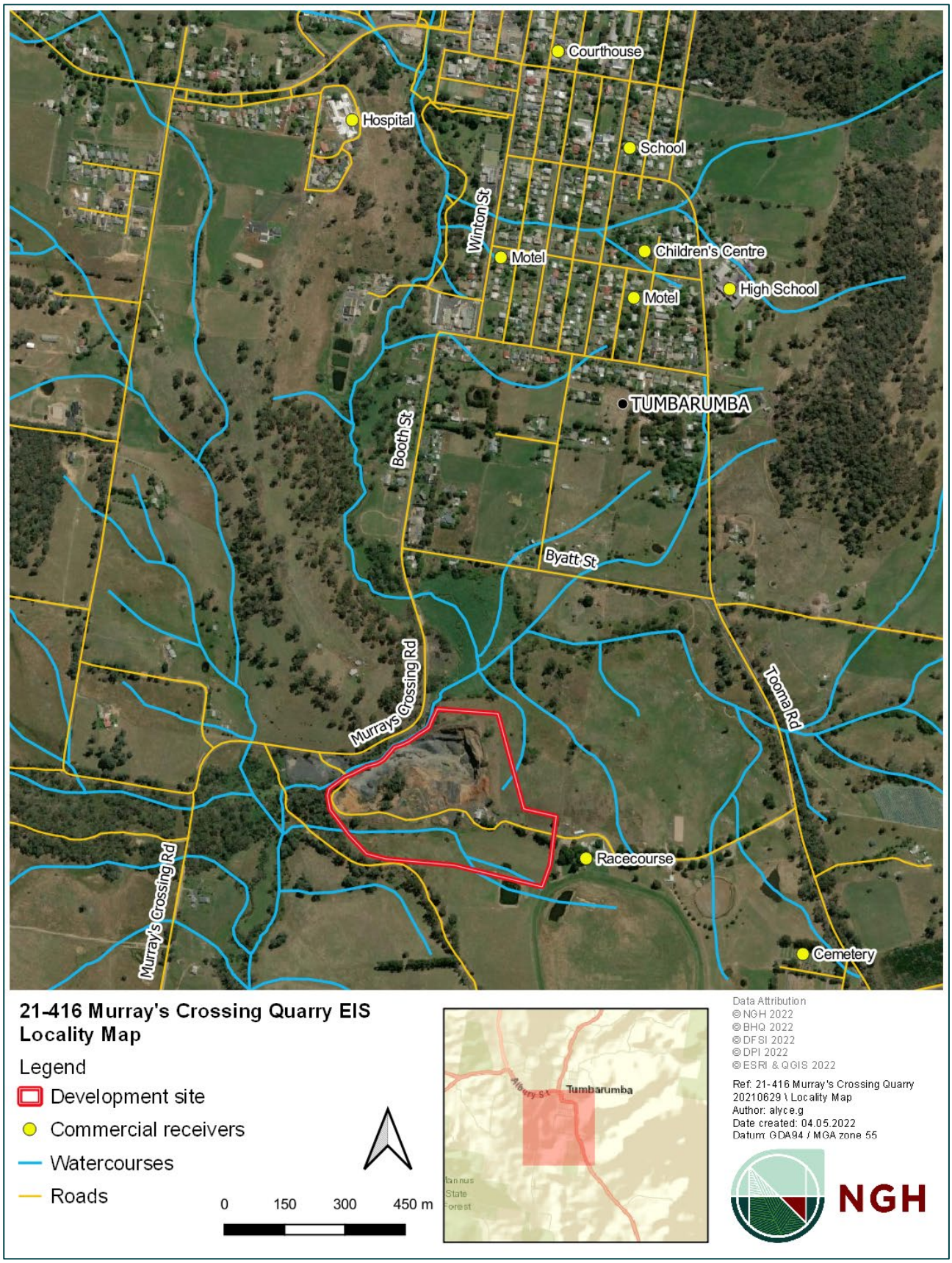

Figure 1-1 Locality map

1.2.1 The Proponent

In 1989, following significant investment and restructuring, Bald Hill Quarry Pty Ltd commenced a strategic marketing development plan to target a market specifically seeking high quality crushed rock products. BHQ currently operate three quarries in the Riverina and Murray River Region in New South Wales (NSW), as well as a regional landfill (Bald Hill Ecofill Landfill). Additionally, BHQ provides mobile crushing plants that operate on a contractual basis, providing crushing and screening services for local and state government enterprises, along with Tier 1 & 2 civil construction companies.

BHQ received Development Consent for the Murray's Crossing Quarry in 1992. Murray's Crossing Quarry is located approximately 2km south of Tumbarumba, NSW (refer to Figure 1-1). Quarrying activities within the Crown Quarry Reserve, including the extraction of blue metal and road base material, have been evident since the 1940s. BHQ have been operating the Crown Quarry Reserve for 12 years under an existing land use rights agreement with Snowy Valleys Council (SVC). BHQ also have a permit from LLS to stockpile material and load trucks on the TSR.

Murray's Crossing Quarry currently has Development Consent to extract and transport 15,000tpa on freehold land. Current operations involve the extraction and transportation of approximately 80,000tpa from the Crown Quarry Reserve. The Proposal aims to continue to extract and transport up to 100,000tpa, with a project specific peak volume of 200,000tpa.

The quarry boundary is currently at the limits of the Crown Quarry Reserve. Development consent for the surrounding BHQ owned land (Table 1-1) was granted in March 1992 (Development Application (DA) 91/23). However, these consent conditions are no longer sufficient for the size of the operation.

Extractive industries including crushing, grinding and separating is defined as an activity that requires an Environmental Protection Licence (EPL) when the operations exceed 30,000tpa. The quarry currently transports 80,000tpa and does not operate under an EPL. This was identified and consultation ensued with the NSW Environment Protection Authority (NSW EPA). In order to issue an EPL an appropriate approval for the existing and proposed operation is required.

The Proposal aims to extend the operations at Murray's Crossing Quarry by:

- Obtaining Development Consent for the existing Crown Quarry operation
- Obtaining an EPL for current and proposed operations.

Amending the current Development Consent (DA91/23) to BHQ owned land.

1.2.2 Proposal locality

The Proposal is located in an undulating landscape. Large portions of land within the surrounding landscape are zoned RU1 Primary Production and have been cleared for agricultural purposes, namely broadacre cropping and grazing. Forested areas, associated with the Travelling Stock Route (TSR), occur to the west of the Proposal. Farm dams are located along drainage lines, which discharge into Tumbarumba Creek, located immediately northwest of the Subject Land. Vehicles, existing quarry operations and stockpiling sites are the main land disturbances within the Subject Land.

Murray's Crossing Quarry is located approximately 2km south of Tumbarumba. Tumbarumba has a population of 1,862 people and is accessible via Batlow Road and Tooma Road (ABS, 2016). A racecourse, located approximately 85m east of the Development site, and a cemetery, located approximately 670m southeast of the Development site, are the other land uses in proximity to the Proposal (refer to Figure 1-1).

Bogandyera National Park and Mannus State Forest are located approximately 2.4km south and 2km west of the Development site, respectively.

1.2.3 Subject Land

The Subject land is defined as all lots affected by the Proposal. The Development site would occupy approximately 15.41ha. The location of the Subject Land is provided in Figure 1-2.

The existing operations at Murray's Crossing Quarry are located across all or part of the Lots and Deposited Plans (DP) outlined in Table 1-1.

The Proposal would involve an extension of approximately 5ha into freehold land owned by BHQ. Table 1-2 outlines the Lot and DP and components of the extension.

Lots involved in the existing and proposed development are detailed in Figure 1-2.

Table 1-1 Existing operations at Murray's Crossing Quarry

Lot/DP	Zoning	Owner	Components
Lot 659, 663, 665, 452, 20, 172, 173, 174, 175, 176, 177, 178, DP755892 Lot 179 DP1100528 Lot 1 DP1150973 Lot 1 DP111861	RU1 Primary Production.	Bald Hill Quarry Pty Ltd.	Quarry, sediment dam, topsoil stockpiles, waste dumps, workshop, office.
Lot 732 DP755892 Crown Reserve (81837)	RU1 Primary Production.	Crown Lands and Snowy Valley Council.	Quarry, processing plant, sediment dam and office.
Lot 7028 DP96852 Travelling Stock Reserve (51191)	RU1 Primary Production.	Crown Lands and Snowy Valley Council	Material stockpiles and sediment dam.

Table 1-2 Proposed quarry extension

Lot/DP	Components
Lot 1 DP1150973	Quarry extension, waste stockpile, haul roads
Lot 20 DP755892	Quarry, workshop, haul roads
Lot 452 DP755892	Quarry extension
Lot 659 DP755892	Quarry extension, waste stockpiles, sediment dam, haul roads

Figure 1-2 Lots involved in the existing and proposed development

1.2.4 Capital investment

The Proposal would have a capital investment of approximately $70,900.

2. Strategic Justification and Alternatives Considered

2.1 Strategic need

The Proposal is needed to maintain the local supply of hard rock resources in the region. The resources within the existing operation are depleting and the quarry boundary is at the limits of the Crown Quarry Reserve. Therefore, an extension of the local hard rock quarry is required. The need for this Proposal is supported by the:

- *Riverina Murray Regional Plan 2036*
- Snowy Valleys Regional Economic Development Strategy (2018-2022)
- Snowy Valleys Council - Envisage 2040: Local Strategic Planning Statement

These plans and strategies are discussed below.

2.1.1 Riverina Murray Regional Plan 2036

The *Riverina Murray Regional Plan* (the Regional Plan) (DPE, 2017) establishes a framework to grow the region's cities and local centres, supports the protection of high-value environmental assets and makes developing a strong, diverse and competitive economy central to building prosperity and resilience in the region. The Regional Plan will guide the NSW Government's land use planning priorities and decisions over the next 20 years.

The Regional Plan is broken down into a number of goals and directions, which detail a number of actions to be considered during the planning process. The goals and priorities for SVC outlined in Table 2-1 are applicable to the Proposal and were considered as part of this EIS.

Table 2-1 Riverina Murray Regional Plan 2036 considerations

Goal/Priority	Application/Relevance to this Proposal
Goal 1 A growing and diverse economy: • Direction 1: Protect the region's diverse and productive agricultural land. • Direction 9: Support the forestry industry.	The regional plan states that the region relies on an efficient transport network. This Proposal supports this and the region's potential growth of forestry and tourism growth sectors. Material from the quarry would be made available to contractors completing local and regional road projects, including forestry road network upgrades, highway upgrades and Council projects. The Proposal would maximise use of existing infrastructure, decrease supply chain costs, increase economies of scale and may potentially attract further investment within the region. The Proposal avoids and minimises impacts on important agricultural land.
Goal 3 Efficient transport and infrastructure networks: • Direction 18: Enhance the road and rail freight links. • Identify and protect future transport corridors.	The Proposal would provide high quality crushed basalt to local and State government enterprises and Tier 1 & 2 civil construction companies.

2.1.2 Snowy Valleys Regional Economic Development Strategy (2018 – 2022)

The *Snowy Valleys Regional Economic Development Strategy* (the Regional Strategy) (SVC, 2018) sets out the strategy for the economic development of the Snowy Valleys LGA. It builds on the economic strengths and specialisations of the Region to guide investment over the next four years.

The Regional Strategy is broken down into a number of strategies to be considered during the planning process. The goals and priorities for SVC outlined in Table 2-2 are applicable to the Proposal and were considered as part of this EIS.

Table 2-2 Snowy Valleys Regional Economic Development strategies

Strategy	Application/Relevance to this Proposal
1. Support the growth of the Forestry and Timber Processing and Agriculture through improving access to and reliability of infrastructure and utilities.	Material from the quarry would be made available to contractors completing local and regional road projects, including forestry road network upgrades, highway upgrades and Council projects. The Proposal would maximise use of existing infrastructure, decrease supply chain costs, increase economies of scale and may potentially attract further investment within the region.
2. Continue to develop and grow the Tourism sector to diversify the Region's economy.	The Proposal would provide opportunities for the Tourism sector and drive economic growth within the region. The Proposal provides materials for local and regional use, including road construction and improved road quality, which makes the area more accessible for tourism.
3. Boost and sustain the supply of skilled workers for the Region's core industries with regional skills development and initiatives to attract new residents.	The Proposal would provide employment opportunities for the local population and subcontractors. By improving tourism and attracting investment, increased local job opportunities would encourage younger generations to remain and support the growth of rural towns and villages.

2.1.3 Snowy Valleys Council 2040 Local Strategic Planning Statement (LSPS)

SVC has prepared the *Envisage 2040: Local Strategic Planning Statement* (LSPS) (SVC, 2021) which sets out the 20-year vision for land-use in the local area, the special character and values that are to be preserved and how change will be managed into the future. The LSPS is the strategic document that distils strategic objectives, priorities and directions from relevant local Council and state regional policies to ensure these are reflected and furthered through land use planning in the Snowy Valleys LGA.

The LSPS outlines the importance of the rural landscape within the LGA, including highlighting the huge impact rural uses have on the region's economy. It is noted that it is essential to sustain the capacity of these lands to support competitive and successful agricultural and forestry sectors. The LSPS also highlights the importance of growth within the region, in response to increases in tourism.

The Proposal would facilitate the growth of agricultural, forestry and tourism sectors within the region, through the provision of valuable road base materials. The Snowy Mountains Highway is a major transport corridor and, as such, the region is reliant on an efficient transport network.

The Proposal would facilitate economic growth within the region through the continued operation of a successful quarry. In addition to this, the EIS shows that the extractive activity, as proposed, in consideration of the topography, soil types, and potential environmental impacts to the environment and the community, can be supported as the impacts of the development are avoided, minimised, mitigated or offset as required.

Land zoning objectives

The Proposal occurs on land zoned RU1 – Primary Production under the Tumbarumba LEP (2010). The objectives of the RU1 zone are:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To protect and enhance the scenic qualities of rural areas of Tumbarumba in a manner that encourages and promotes tourist orientated development and activities.*

For the life of the Proposal, the development would involve the extraction of natural resources (hard rock). The activity would impact on land availability for primary production; however, it would be developed in a way that would minimise fragmentation and alienation of resource land and minimise land use conflict. Upon completion of the Proposal, the development footprint would be rehabilitated, and agricultural use could recommence around the pit.

Further analysis of the proposal against the provisions of the Tumbarumba LEP is provided in section 4.4.1 of this EIS.

2.2 Proposal benefits

2.2.1 Socio-economic benefits

Social and economic benefits have been considered for the Proposal. The Proposal would be beneficial to the community and economy of the region because:

- The Proposal would result in employment retention. The site currently has four to five Fulltime Equivalent (FTE) staff.
- Support local employment and regional development and economic opportunities, outside of the operations on the site.
- Over the life of the Proposal, it would provide approximately $1.1million of capital investment value in the region.
- The use of the extracted material would support the construction of additional roads and improve the quality of existing roads, thereby resulting in increased access to local towns, resulting in shared economic benefits.

- The Proposal would meet local strategic and statutory provisions, endorsed by the local Council and community, that apply to the Proposal.
- It would reduce the dependence on other developments in the region, and in turn potentially reduce greenhouse gas emissions that contribute to climate change, by providing a resource that can be locally sourced and is well located to access major roads and train lines minimising travel.

2.2.2 Environmental benefits (during extraction and post rehabilitation)

The Proposal would provide hard rock, currently used for the purposes of aggregate and road base, thereby reducing the need to rely on quarries located further away, which would lessen the impacts of greenhouse gas emissions from long haul transport.

Benefits of the proposed rehabilitation works would include:

- The water collected and pumped from the sediment dams would be used for watering stock
- Upon decommissioning, land within the development footprint would be returned to agricultural production as part of the rehabilitation plan.

2.3 Proposal objectives

The objectives of the Proposal are to:

- Obtain a Development Consent for the existing Crown Quarry operation
- Obtain an EPL for current and proposed operations
- Amend the current development consent (DA91/23) to BHQ owned land
- Continue the supply of blue metal and road base material to local councils and other clients within the region
- Conform with the requirements of the relevant statutory authorities in the operation of the quarry
- Minimise the environmental impacts associated with construction and operation of the Proposal

2.4 Alternatives considered

Various options relating to the location, technology and scale of the Proposal were evaluated in developing the Proposal. These were considered, accounting for the objectives of the Proposal and how the benefits of the Proposal could be maximised. This section outlines the alternatives that were considered and justification for the preferred option that is the subject of this EIS.

2.4.1 Option 1 - ‘do nothing’ option

The ‘do nothing’ option must be considered in the evaluation of options. It represents the status quo situation; avoiding all development impacts but similarly not realising any potential benefits.

The ‘do nothing’ option would still result in the extension of the quarry; however, BHQ would not be able to increase their annual peak extraction limits. This option would not meet the economic demands for hard rock resources in the region. Additional materials would need to be sourced elsewhere for local projects which may result in a greater environmental impact.

The ‘do nothing’ option would not meet the following objectives of the Proposal:

- Obtain a Development Consent for the existing Crown Quarry operation

- Obtain an EPL for current and proposed operations
- Amend the current development consent (DA91/23) to BHQ owned land
- Continue the supply of blue metal and road base material to local councils and other clients within the region
- Conform with the requirements of the relevant statutory authorities in the operation of the quarry
- Minimise the environmental impacts associated with the operation of the Proposal

The 'do nothing' option would avoid the environmental impacts associated with the construction and operation of the Proposal. However, current land use/actions would have the potential to result in:

- Unintentional impacts resulting from further operations at Murray's Crossing quarry
- Unintentional harm to heritage
- Biosecurity impacts including weed and pathogen spread

2.4.2 Option 2 – Extend quarry operations

This option would meet the objectives of the Proposal. Amending the current development consent (DA91/23) to BHQ owned land and extending the operation would enable an increase in production. The Proposal would maximise use of existing infrastructure, decrease supply chain costs, increase economies of scale and may potentially attract further investment within the region.

Obtaining an EPL for the development would ensure that the Proposal conforms with the requirements of the relevant statutory authorities and would be managed in a way that minimises the environmental impacts associated with the operation of the Proposal.

2.4.3 Suitability of the Subject Land

The Subject Land is suitable for the Proposal as it provides:

- High-quality hard rock resources
- Ample area to expand the operations adjacent to the existing quarry
- Existing rock crushing and processing infrastructure on site
- Existing site office and amenities
- Proximity to major transport routes, including Batlow and Tooma Roads, to optimise distribution of the quarried material

Characteristics of the resource

Seventeen Percussion Drill Holes (PDH) were drilled by BHQ used to determine the lateral extent of the deposit and determine its nature. Eight holes were drilled to depths of more than 25m to confirm the deposit homogeneity and quality and extent. The maximum total depth of basalt was confirmed to be approximately greater than 30m over the entire area.

The resource was assessed by Geochempet Services (Appendix M) using petrographic analysis. Resource estimates indicate that approximately 2.4 million tonnes of resource are available for extraction. Materials testing undertaken on approximately 2kg of material retrieved during sampling indicated that the resource consisted of a hard, non-porous Olivine Basalt. The deposit meets all relevant hard rock product specifications.

3. Proposal Description

3.1 Development site description

The Proposal comprises about 15.41ha of Crown Quarry Reserve and freehold land (the Development site). The development footprint would occupy 13.24ha.

Murray's Crossing Road is located immediately northwest of the Development site. Access within the Development site is via a private unsealed haul road (refer to Figure 3-9).

There are no residences within the Development site. Quarrying is the dominant land use within the Development site with light grazing occurring on freehold land around the existing operation. The Proposal is located on sloped terrain. The Development site has been predominantly cleared for quarry and agricultural activities (Figure 3-1). Figure 3-2 and Figure 3-3 show the current operation and regenerating vegetation occurring on the outskirts of the active pit.

Remnant woodland patches occur within the Development site (Figure 3-4). Some small, fragmented pockets of remnant woodland and isolated remnant trees occur throughout the site. Remaining vegetated areas are dominated by exotic vegetation such as Blackberry (**Rubus fruticosus*) and exotic pasture grasses such as Phalaris (**Phalaris aquatica*) and **Dactylis glomerata.*

Two farm dams (Figure 3-5) and two unnamed ephemeral drainage lines are located within the Development site. Both drainage lines feed into Tumbarumba Creek (Figure 3-7), which is mapped as a Strahler Order 5 waterway. Tumbarumba Creek is also mapped as Key Fish Habitat (KFH) and as Biodiversity Value (BV) land.

Figure 3-1 Current stockpiling area, located within the TSR

Figure 3-2 Current operations at Murray's Crossing Quarry

Figure 3-3 Regenerating vegetation on the outskirts of the active pit

Figure 3-4 Remnant vegetation occurring within the Development site

Figure 3-5 Farm dam observed within the Development site

Figure 3-6 Ephemeral drainage line occurring within the Development site

Figure 3-7 Tumbarumba Creek, located immediately north west of the Development site

3.1.1 Proposal layout

The proposed layout has been developed iteratively in tandem with the environmental assessment to ensure potential impacts are avoided or minimised wherever possible. The design of the layout has also been developed in consultation with the Department of Planning and Environment – Division of Resources and Geoscience *Mining Design Guidelines*. The Proposal constraints, which comprise a sensitive Heritage Potential Archaeological Deposit (PAD) and Biodiversity elements (Plant Community Types) are provided in Figure 3-8.

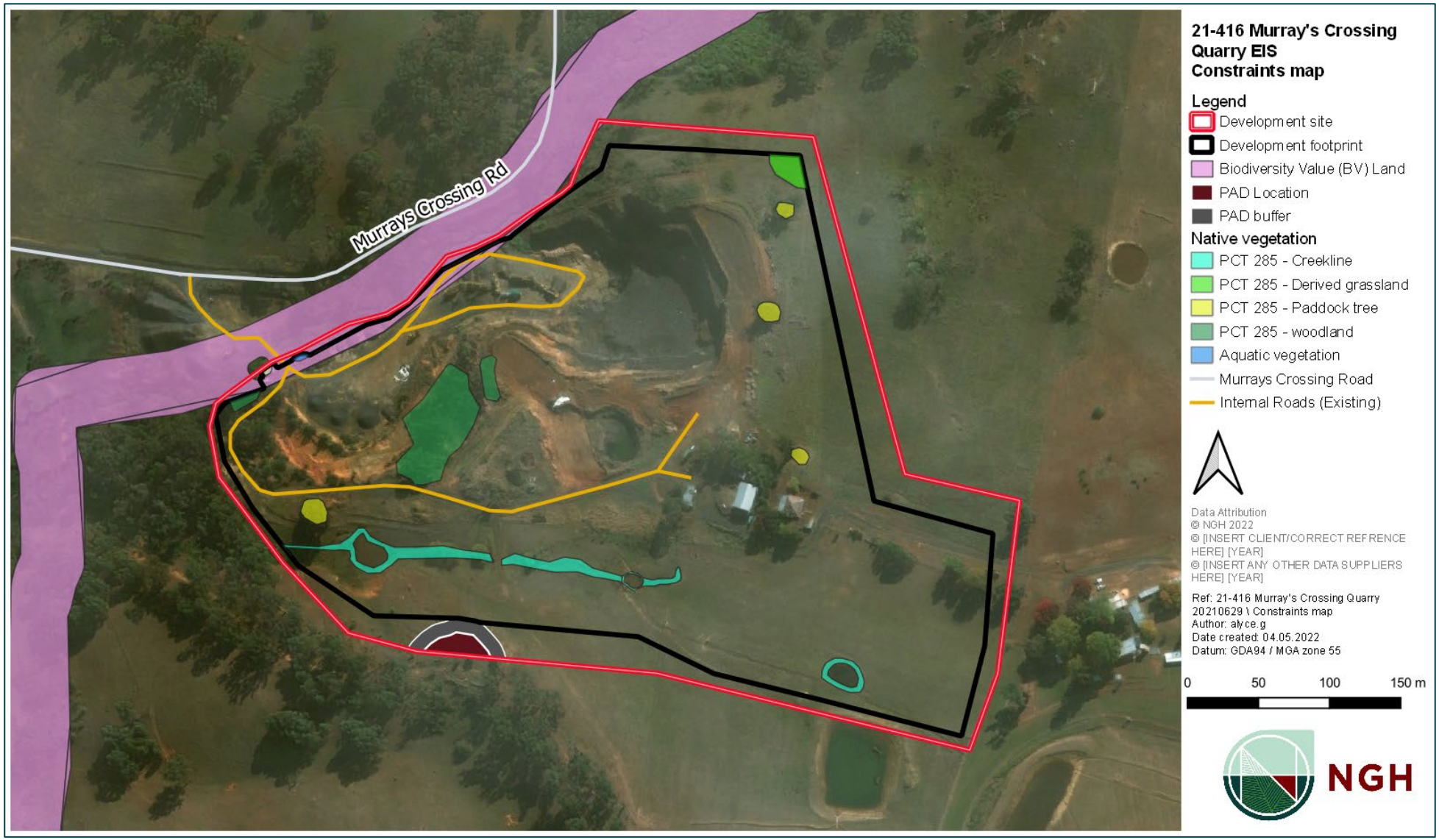

Figure 3-8 Constraints map

3.1.2 Key components of the Murray's Crossing Quarry

The Proposal involves the operational expansion of an existing quarry within the Subject Land. The operational expansion would occur progressively and as needed over the life of the quarry. As such, this EIS has concurrently assessed the construction and operational impacts of the Proposal.

The operational expansion of the Proposal (Figure 3-10) would involve:

- A 15.41ha development site
- A 13.24ha development footprint, which would include:
    - A quarry footprint of approximately 8.68ha, which would involve:
        - The existing quarry (2.88ha)
        - The proposed quarry extension (5.8ha)
- Construction of a stockpile for surplus product
- The diversion of one ephemeral watercourse
- Construction of a sediment dam
- Relocation of the existing workshop and amenities (septic) building
- New internal haul road, to the relocated workshop and amenities building
- Drill and blasting for extraction, up to five or six times a year
- Use of existing equipment for road construction and quarry operations
- Haulage of extracted rock via loader across quarry pit floor, to an existing processing plant, located within the quarry pit
- An increase in truck movements, from 24 per day to:
    - 30 per day during extraction periods of up to 100,000 tonnes per annum (tpa)
    - 60 per day during extraction periods of up to 200,000 tpa.

The Proposal seeks approval for extraction of 100,000 tpa with peak periods of 200,000 tpa over a period of 25 years. Total extraction would not exceed 2.4 million tonnes of hard rock (basalt) for the life of the project.

3.1.3 Existing and proposed infrastructure

The Proposal involves the use of the existing site office, sediment dam and equipment for internal road construction and quarry operations. No additional permanent buildings are required as part of this Proposal. The existing workshop and amenities building would be relocated to the southeast of its current location. No permanently lit night lighting would be installed as part of the Proposal.

Currently, the development utilises a stockpile and loading area within the TSR as per the Proponent's permit agreement with LLS. No changes to the existing arrangement are proposed as part of this EIS. An additional waste stockpile is proposed within the southwest portion of the Development site.

Access to the Development site is via the existing connection between Murray's Crossing Road and the existing haul road. Murray's Crossing Road is facilitated by a 25m wide vehicle crossing and is considered to have very low traffic volumes. Accounting for the site traffic generation, the existing site access is appropriate for the proposed development. The existing access arrangement provides safe and efficient movement from the road network and can accommodate the minor increase in traffic as part of the Proposal. As such, no new accesses to the local and regional road network are required.

The Proposal would involve the construction of an extension to the internal vehicle access road (refer to Figure 3-10) which would be constructed with engineered fill, to a width of 8m.

Internal vehicle access roads would be maintained throughout the construction and operation of the development. If required, water trucks would be used to suppress dust on unsealed roads during the construction and operation phases. Additional stabilising techniques and/or environmentally acceptable dust control measures would also be applied as required to suppress dust.

The Proposal would involve the diversion of an ephemeral creek, the removal of two farm dams and the construction of an additional sediment dam within the western portion of the Development site. No additional water usage is required.

Refer to Figure 3-9 and Figure 3-10 for a comparison of the existing and proposed development.

Figure 3-9 Existing development

Figure 3-10 Proposed development

3.2 Construction

Construction of the quarry extension would be undertaken progressively. As the quarry extends into the development footprint, construction activities would include:

- Vegetation removal
- Ground preparation, drainage and erosion and sediment controls.

Site preparation would include clearing and earthworks using excavator and dozer. Soils within the development footprint have been disturbed by decades of quarry and farming activities. Ground disturbance resulting from the earthworks associated with the Proposal would be minimal and limited to:

- Removal of overburden of the pit footprint
- Construction of a sediment dam.

There is currently one sediment dam utilised for the control of surface runoff on site (refer to Figure 3-9). Currently, no water monitoring is undertaken onsite. An additional sediment dam is proposed (refer to Figure 3-10). All sediment dams relating to the Proposal would be monitored, repaired and maintained as conditions dictate. Sediment control and water quality are discussed in detail in section 6.4 and section 6.4 of this report.

Topsoil and overburden from the development footprint would be retained on-site and would be used for blending with rock material, as bunds in the initial stages of the development of the pits, and during the rehabilitation process. Where required, weed treatments would be undertaken prior to earthworks commencing to reduce the potential for spread of these species within the development footprint.

Access to the site would be via Murray's Crossing Road, Booth Street, Winston Street and Bridge Street, which connects with Batlow Road. No additional movements on public roads are expected during construction activities.

3.2.1 Materials and resources

The main construction materials would include:

- Sediment and erosion control material (gabion, fencing, scour protection rock).

Aggregates and road base would be sourced from the existing operation.

Estimated quantities or required resources are shown in Table 3-1 and would be confirmed during the detailed design stage.

Table 3-1 Volume of material required for construction

Resource	Estimated Quantity Quarry Extension
Aggregates / road base	100 tonnes
Sediment and silt fencing	80m

3.2.2 Labour, machinery and equipment

Construction and upgrades to the existing internal vehicle access road will be undertaken by BHQ employees and equipment already onsite. The construction process would include up to four

operational crew members, at any one time. Construction works would be completed progressively. Every effort would be made to hire staff locally.

Staff would be accommodated at Tumbarumba, Tumut, or nearby surrounding areas.

Plant to be used during construction may include:

- Dozer
- 30 tonne excavators
- Grader
- Water truck
- Truck and dog trailers
- Wheeled loader.

3.2.3 Construction water requirements

A maximum of 5,000 litres (L) - 8,000L of water could be utilised per day during the summer months. Water is currently sourced from two farm dams and a sediment dam located within the existing pit footprint (refer to Figure 3-9). The Proposal involves the gradual removal of both farm dams, which would be replaced by a second sediment dam. It is considered likely that water demand would increase slightly during periods of excavation and pit expansion. However, pit expansion would occur incrementally. Pit sequencing plans are provided in Appendix N. Potable water for staff is provided at the workshop, which is connected to town water.

3.2.4 Construction hours

Construction activities would be undertaken during standard daytime construction hours:

- 7.00 am to 6.30 pm Monday to Friday
- 8.00 am to 4.00 pm on Saturdays and Sundays, as required.

If required, any construction outside of these normal or agreed working hours would only occur with prior approval from relevant authorities or in emergency circumstances e.g., to make work safe.

3.3 Operation

Operation activities would include:

- Continuation of staged extraction of material through mechanical methods and drill and blast processes
- Drill and blast would occur approximately five to six times a year
- Extracted materials would be processed via the mobile processing plant, located within the Development footprint. Material would be processed at an average of 1,000 tonnes per day.

Fuel storage for plant and equipment would be contained within a bunded fuel trailer within the pit. A bunded above-ground fuel tank is also located at the existing workshop. It is proposed to move this fuel tank in conjunction with the proposed workshop relocation.

3.3.1 Labour

The operation of the quarry would result in the employment retention of between four and five FTE, who would operate the quarry. The Proposal would provide continuing employment for subcontractors for various activities including maintenance.

3.3.2 Operation water requirements

During operation, non-potable water would be used for dust suppression during quarrying activities and where required, on haul roads and the processing plant. Around 1.5 megalitres (ML) to 2.92ML annually (5,000L to 8,000L per day) would be required and sourced from the proposed sediment dams. Potable water for staff would be provided at the proposed workshop, which would be connected to town water. Amenities are supplied with rainwater.

3.3.3 Operating hours

Daily operations and maintenance by site staff would be undertaken indicatively during standard working hours. The current approved working hours for the site are

- Monday to Friday 7.00am – 6.30pm
- Saturday and Sunday 8.00am – 4.00pm
- No work on public holidays
- No blasting on Sundays.

3.4 Closure and rehabilitation

BHQ is committed to the effective rehabilitation of work areas following quarry closure. This would be achieved through progressive rehabilitation where practicable and managing the quarry throughout operation.

As part of the detailed quarry closure planning process, a detailed Quarry Closure Plan will be developed approximately three years prior to cessation of quarrying activities. The Quarry Closure Plan will describe in detail the Proposal operational and progressive rehabilitation procedures for the remainder of the quarry life and subsequent quarry closure. Closure objectives and criteria for the quarry are outlined in section 7 of this EIS.

4. Legislative and Planning Context

Secretary's Environmental Assessment Requirements

The EIS must take into account all relevant State Government environmental planning instruments, guidelines, policies, and plans. While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies and plans that may be relevant to the environmental assessment of this development.

In addition, the EIS must assess the development against the Tumbarumba Local Environmental Plan 2010 and any relevant development control plans/strategies.

This section of the EIS confirms the planning assessment pathway. The Proposal has been considered against the relevant Commonwealth, State and Local legislation. Included is a summary of approvals and licences required for the Proposal.

For the consideration of local strategies, refer to section 2.1 of this report.

4.1 Commonwealth legislation

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is administered by the Commonwealth Department of Environment and Energy (DEE). Under the EPBC Act, if the Minister determines that an action is a 'controlled action' which would have or is likely to have a significant impact on a Matter of National Environmental Significance (MNES) or Commonwealth land, then the action may not be undertaken without prior approval of the Minister.

The EPBC Act identifies nine MNES:

- World heritage properties.
- National heritage places.
- Ramsar wetlands of international significance.
- Threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).
- A water source, in relation to coal seam gas development and large coal mining development.

When a person proposes to take an action that they believe may be a 'controlled action' under the EPBC Act, they must refer the Proposal to the DEE for a decision about whether the proposed action is a 'controlled action'.

A search of the Commonwealth Protected Matters Search Tool on 11 September 2021 indicated that there are no World Heritage Properties or National Heritage Places within the Subject Land. Search results listed four Wetlands of International Importance that are either known to occur or have potential to occur in the area; however, no Ramsar wetlands are located within 10km of the Subject Land. Section 6.2 of this EIS discusses the results of searches in relation to threatened species, ecological communities and migratory species. Table 4-1, Table 4-2 and Table 4-3 summarise the results of the searches.

Table 4-1 Summary of Matters of National Environmental Significance (10km search radius)

Matters of National Environmental Significance	Addressed in this EIS
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Significance	7
Great Barrier Reef Marine Park	N/A
Commonwealth Marine Areas	N/A
Threatened Ecological Communities	3
Listed Threatened Species	38
Listed Migratory Species	11

Table 4-2 Summary of other matters protected by the EPBC Act (10km search radius)

Other matters protected by the EPBC Act	Addressed in this EIS
Commonwealth Lands	1
Commonwealth Heritage Places	None
Listed Marine Species	N/A
Whales and Other Cetaceans	N/A
Critical Habitats	None
Commonwealth Reserves Terrestrial	None
Australian Marine Parks	N/A

Table 4-3 Summary extra information (10km search radius)

Extra information	Addressed in this EIS
State and Territory Reserves	5
Regional Forest Agreements	1
Invasive Species	32
Nationally Important Wetlands	None
Key Ecological Features (Marine)	N/A

Commonwealth listed threatened ecological communities, threatened species, migratory species and invasive species are discussed in the Biodiversity section (section 6.2) of this report and the

Biodiversity Assessment (Appendix D). A significant impact to any of these entities is considered highly unlikely and the proposed activity is considered highly unlikely to be a controlled action. No other MNES would be affected by the proposed development. Therefore, a referral to the Minister is not considered necessary.

4.1.2 Native Title Act 1993

The *Native Title Act 1993* provides a legislative framework for the recognition and protection of common law native title rights. Native title is the recognition by Australian law that Indigenous people had a system of law and ownership of their lands before European settlement. Where that traditional connection to land and waters has been maintained and where Government legislation has not removed it, the law recognises the persistence of native title.

Native title may exist in areas such as:

- Vacant Crown land
- Some national parks, forests and public reserves
- Some types of pastoral lease
- Some land held for Aboriginal communities
- Beaches, oceans, seas, reefs, lakes, rivers, creeks, swamps and other waters that are not privately owned.

A search of the National Native Title Tribunal Register was carried out on 22 October 2021. No native title claims have been made in the Snowy Valleys LGA.

4.2 NSW Legislation

4.2.1 Environmental Planning and Assessment Act 1979

The Proposal requires development consent and is considered to be Designated Development pursuant to Section 4.10 of the EP&A Act. The Proposal is also considered to be Integrated Development pursuant to section 4.46 of the EP&A Act. This section of the EIS considers the provisions of the EP&A Act relevant to the Proposal.

Objects

Development in NSW is subject to the requirements of the EP&A Act and the EP&A Regulation. Environmental planning instruments prepared under the Act set the framework for development approval in NSW.

The objects of the EP&A Act are:

(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,
(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,
(c) to promote the orderly and economic use and development of land,
(d) to promote the delivery and maintenance of affordable housing,
(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,

(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),
(g) to promote good design and amenity of the built environment,
(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,
(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,
(j) to provide increased opportunity for community participation in environmental planning and assessment.

The objects of the EP&A Act have been considered throughout this environmental assessment, including natural resources and competing land uses. The Proposal aims to promote the orderly and economic use of the land through the extension of an existing quarry, which would benefit from existing infrastructure, reducing the overall net impact of the Proposal. The Proposal would provide for the considered management of an essential natural resource, thereby providing high quality crushed basalt to local and State government enterprises and Tier 1 & 2 civil construction companies. The Proposal has been located and designed so that it would avoid environmentally sensitive land and clearing of native vegetation as much as possible. For these reasons it is considered that the Proposal is consistent with the objects of the EP&A Act.

Section 4.10 Designated Development

Under section 4.10(1) of the EP&A Act, the development is declared to be Designated Development. Schedule 3 (26) of the EP&A Regulation lists the thresholds for which an extractive industry is considered to be Designated Development. For consideration of the Proposal against the provisions of Schedule 3 refer to section 4.2.2 below.

Section 4.46 Integrated Development

In accordance with Section 4.46 of the EP&A Act, Integrated Development is defined as development that requires development consent and one or more approvals. The Proposal requires an Environmental Protection License (EPL) pursuant to Section 48 of the *Protection of the Environment Operations Act 1997 (NSW)* (POEO Act) to authorise carrying out of scheduled activities at any premises. Requirements under the POEO Act are detailed in section 4.2.3 of this report.

Section 4.15 Matters for consideration

Under section 4.15 of the EP&A Act, the consent authority is required to consider several matters when determining a DA under Part 4. These matters are listed in Table 4-4 and assessed in terms of their relevance to the Proposal.

Table 4-4 Matters of consideration under the EP&A Act.

Provision	Relevance to the Proposal and where it is addressed in this EIS
Any environmental planning instrument	Relevant Environmental Planning Instruments (EPIs) are discussed in sections 4.3 and 4.4of this report.
Any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the consent authority	There are no draft instruments relevant to the Proposal.
Any development control plan (DCP)	The Subject Land falls under the provisions of the

Provision	Relevance to the Proposal and where it is addressed in this EIS
	Tumbarumba DCP (TSC, 2011). Refer to section 4.4.2 of this report for details relevant to the DCP.
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	There are no planning agreements that have been entered into, nor are there any proposed planning agreements that relate to the Proposal.
The regulations (to the extent that they prescribe matters for consideration)	Section 61 of the EP&A Regulation identifies additional matters requiring consideration. There are no additional matters relevant to the Proposal.
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	The potential impacts of the Proposal are detailed in sections 6 and 7 of this report. This EIS demonstrates that the environmental impacts of the Proposal have been avoided or minimised through careful project design. Overall impacts are considered manageable with the implementation of recommended safeguards and mitigation measures.
The suitability of the site for the development	The suitability of the site for the development is assessed in this EIS. Characteristics that make the land suitable for the extension of a quarry are identified and justified. The EIS addresses land use and compatibility with surrounding land uses, strategic need, the resource need, and the low environmental constraints and minimised impacts to the community and environment, as discussed in sections 6 and 7 of this report.
Any submissions made in accordance with the EP&A Act or the regulations	Public submissions would be sought by Council and responded to as part of the EIS determination process. The Proponent would consider and respond to any submissions made in relation to the Proposal following the public exhibition (notification) period, if or as directed to by Council.
The public interest	The development is considered to be in the public interest and would result in a number of public benefits as discussed in section 2.2 of this report. Specifically, the Proposal would: • Meet local strategic and statutory provisions, endorsed by the local Council and community, that apply to the Proposal. Therefore, the Proposal is considered to meet the expectations of the community for desired character and is considered to be a permissible and suitable development for the site and region • Provide local employment • Support regional development opportunities • Provide local economic opportunities within the region

4.2.2 Environmental Planning and Assessment Regulation 2021

The EP&A Regulation Schedule 3, Part 2, clause 26, prescribes thresholds for the declaration of extractive industries as Designated Development. A review of the declared provisions (whether by reference to the type, purpose or location of development or otherwise) for extractive industries is listed in Table 4-5 below.

Table 4-5 EP&A Regulations - Schedule 3 Designated Development - extractive industries

Extractive industries	As applicable to this Proposal
Extractive industries (being industries that obtain extractive materials by methods including excavating, dredging, tunnelling or quarrying or that store, stockpile or process extractive materials by methods including washing, crushing, sawing or separating):	
(1) that obtain or process for sale, or reuse, more than 30,000 cubic metres of extractive material per year, or	The Proposal is Designated Development as it would obtain more than 30,000 cubic metres of basalt per year. The Proposal would result in a maximum total extraction of 200,000 tonnes of hard rock per year from a total resource not exceeding 2.4 million tonnes.
(2) that disturb or will disturb a total surface area of more than 2 hectares of land by— *(a) clearing or excavating, or* *(b) constructing dams, ponds, drains, roads or conveyors, or* *(c) storing or depositing overburden, extractive material or tailings*	The Proposal is Designated Development as it would disturb an area greater than 2ha. The proposed excavation area is around 8.68ha.
(3) that are located— *(a) in or within 40 metres of a natural waterbody or environmentally sensitive area of State significance, or* *(b) in or within 100 metres of a wetland, or* *(c) within 200 metres of a coastline, or* *(d) in an area of contaminated soil or acid sulphate soil, or* *(e) on land that slopes at more than 18 degrees to the horizontal, or* *(f) if the facility involves blasting, within 1,000 metres of a residential zone or within 500 metres of a dwelling not associated with the development, or* *(g) within 500 metres of the site of another extractive industry that has operated during the last 5 years.*	The Proposal is Designated Development because it is: • On land that slopes at more than 18 degrees to the horizontal. • Within 40 metres of a natural waterbody and within an environmentally sensitive area. • Involving blasting, within 1,000 metres of a residential zone or within 500 metres of a dwelling not associated with the development.

4.2.3 Protection of the Environment Operations Act 1997

The POEO Act is administered by the NSW EPA. Under section 48 of the POEO Act, premises-based scheduled activities (as defined in Schedule 1 of the POEO Act) require an Environment Protection Licence (EPL). Clause 19 of Schedule 1 of the POEO Act concerns extractive industries. Extraction of more than 30,000 tpa is a scheduled activity and requires an EPL.

Current operations at Murray's Crossing quarry involve the extraction and transportation of approximately 80,000 tpa from the Crown Reserve. The Proposal would result in the extraction of more than 30,000 tonnes of material a year, therefore, the Proponent requires an EPL, under the

POEO Act. In order to issue an EPL an appropriate approval for the existing and Proposed operation is required.

Sections 143 and 145 of the POEO Act also creates offences relating to pollution and the transport and disposal of waste and imposes a duty on the occupier of a site to notify certain 'pollution incidents.' The Proponent must comply with the POEO Act in carrying out the Proposal.

4.2.4 Roads Act 1993

The *Roads Act 1993* (Roads Act) provides for the classification of roads and for the declaration of roads authorities for both classified and unclassified roads. It also regulates the carrying out of various activities in, on and over public roads.

Any work within the road reserve, such as upgrades that interfere with the structure of the road, require consent from the road authority under section 138 of the Roads Act. SVC is the roads authority for the Murray's Crossing Road. The internal access track off Murray's Crossing Road is located on Crown land leased by the Proponent.

Section 138 consent is not required. No work would be conducted on roads under the authority of SVC.

4.2.5 Crown Lands Management Act 2016

The main aims of the *Crown Lands Management Act 2016* (CLM Act) are to provide for the ownership and management of Crown land in NSW. The Act provides clarity concerning the law applicable to Crown land. Works within a Crown Reserve require environmental, social, cultural heritage and economic considerations to be considered and must facilitate the use of land by the NSW Aboriginal people.

BHQ received Development Consent for the Murray's Crossing Quarry in 1992; however, quarrying activities within the Crown Quarry Reserve (Lot 732 and 623 DP755892) have been evident since the 1940s. In 2009, BHQ entered into an existing land use rights agreement for the Crown Quarry Reserve with SVC. BHQ will request landowners consent from Crownlands as a formal part of this process for the Crown Quarry Reserve. BHQ also have a permit from LLS to stockpile material and load trucks on the TSR (Lot 7028 DP96852), immediately west of the Development site (refer to Figure 3-9). The TSR is subject to a land title claim. A submission will be made to the Crown Lands Aboriginal Land Claims Unit to expedite a determination. No changes to the current permit conditions are required as a result of the Proposal and, as such, the TSR has not been included in the scope of the EIS.

The Proposal is considered to be consistent with the objectives of the CLM Act whereby:

- The use and management of the land have been clearly established
- Environmental, social, economic and cultural heritage considerations have been taken into consideration
- The use of Crown land by Aboriginal people has been acknowledged.

4.2.6 Water Management Act 2000 and Water Management Regulation 2018

The *Water Management Act 2000* (WM Act), currently administered by the Department of Industry (Water), is progressively being implemented throughout NSW to manage water resources. The aim of the WM Act is to ensure that water resources are conserved and properly managed for sustainable use benefiting both present and future generations. It is also intended to provide formal

means for the protection and enhancement of the environmental qualities of waterways and their in-stream uses as well as to provide for protection of catchment conditions.

Water access licences are issued under the WM Act with some issued under the *Water Act 1912.*

The two existing farm dams and sediment retention dam will be used for dust suppression during construction. The two dams will be progressively filled before operation starts. During operation, water for dust control will be sourced from the newly built sediment retention dam.

The construction of the sediment retention dam is exempt from a Water Supply Work pursuant to Clause 39(1) (a) and Clause 1 and 3 of Schedule 1 of the Water Management Regulation 2018. Redirection of the ephemeral watercourse and construction of the additional sediment dam is also exempt from the need for a controlled activity approval (Appendix O).

The water take from the sediment retention dam is exempt from a Water Access License, pursuant to Clause 21(1), Clause 12 of Schedule 4 and Clause 1 and 3 of Schedule 1 of the Water Management Regulation 2018.

The existing development at Murray's Crossing Quarry involves the stockpile of material and loading of trucks on a TSR (Lot 7028 DP96852). Under the WM Act, a controlled activity approval is required for activities that involve depositing material on land that is located within 40m of a waterbody's high water mark. However, Section 4, Part 2(18) of the Water Management Regulation states that any activity carried out in accordance with a lease, permit, or other right in force under the *Crown Land Management Act 2016* is exempt from obtaining a controlled activity approval. As BHQ has a permit from LLS to stockpile material and load trucks on the TSR, the Proponent would not need to obtain a controlled activity approval for the development.

4.2.7 National Parks and Wildlife Act 1974

Under the *National Parks and Wildlife Act 1974* (NPW Act), the Director General of the Office or Environment and Heritage (OEH), now the Biodiversity and Conservation Division (BCD) of DPE, is responsible for the care, control and management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and state game reserves. The Director General of BCD is also responsible under this legislation for the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

The provisions of the NPW Act have been considered for the Proposal. The nearest nature reserves and national parks to the Proposal are the Bogandyera Nature Reserve, located approximately 2km south of the Proposal, followed by the Courabyra Nature Reserve, located 6.2km northwest of the Proposal.

A Potential Archaeological Deposit (PAD) was identified within the Development site. Two mature native trees also require further assessment, due to site limitations at the time of survey (refer to section 6.9 for details on Aboriginal Heritage). Works may proceed with caution after the two trees have been assessed and providing that the work remains outside of the PAD (with a 10m buffer). If Aboriginal objects are recovered during the testing programme an Aboriginal Heritage Impact Permit (AHIP) must be obtained from Heritage NSW before the proposed development can proceed.

4.2.8 Wilderness Act 1987

There are no wilderness areas within proximity to the Proposal.

4.2.9 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to conserve heritage values. The Heritage Act defines 'environmental heritage' as those places, buildings, works, relics, moveable objects and precincts listed in the Local or State Heritage Significance Register. A property is a heritage item if it is listed in the heritage schedule of the local Council's Local Environmental Plan or listed on the State Heritage Register, a register of places and items of particular importance to the people of NSW.

No relics or other items protected under the Heritage Act were located on the Development site. The closest site of local significance, Tumbarumba Pioneer Cemetery (I9), is located approximately 700m southeast of the Development site, as outlined in section 6.10 of this report. A permit under the Heritage Act is not required.

Section 146 of the Heritage Act requires any person who believes they have discovered or located a relic (in any circumstances) to notify the NSW Heritage Council.

4.2.10 Biosecurity Act 2015

The objects of the *Biosecurity Act 2015* (Biosecurity Act) are:

> *(1) The primary object of this [Biosecurity] Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.*
>
> *(2) The other objects of this [Biosecurity] Act are as follows:*
>
> *(a) to promote biosecurity as a shared responsibility between government, industry and communities.*
>
> *(b) to provide a framework for the timely and effective management of the following:*
>
> *(i) pests, diseases, contaminants and other biosecurity matter that are economically significant for primary production industries.*
>
> *(ii) threats to terrestrial and aquatic environments arising from pests, diseases, contaminants and other biosecurity matter.*
>
> *(iii) public health and safety risks arising from contaminants, non-indigenous animals, bees, weeds and other biosecurity matter known to contribute to human health problems.*
>
> *(iv) pests, diseases, contaminants and other biosecurity matter that may have an adverse effect on community activities and infrastructure.*
>
> *(c) to provide a framework for risk-based decision-making in relation to biosecurity.*
>
> *(d) to give effect to intergovernmental biosecurity agreements to which the State is a party.*
>
> *(e) to provide the means by which biosecurity requirements in other jurisdictions can be met, so as to maintain market access for industry.*

The Proponent as a land manager would comply with the general biosecurity duties under the Biosecurity Act through management of on-site weeds and pests.

Prior to commencement, a weed management procedure would be developed as part of the Biodiversity Management Plan for the Proposal to prevent and minimise the spread of weeds. This would include:

- A management protocol for declared priority weeds under the Biosecurity Act during operation and rehabilitation stages
- A weed hygiene protocol in relation to plant and machinery and stockpile sites.

4.2.11 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) establishes a new regulatory framework for assessing and offsetting the biodiversity impacts of proposed developments. The BC Act contains provisions relating to flora and fauna protection, threatened species and ecological communities listing and assessment, a biodiversity offsets scheme (BOS), a single biodiversity assessment method (BAM), calculation and retirement of biodiversity credits and biodiversity assessment and planning approvals. The BC Act is supported by the Biodiversity Conservation Regulation 2017.

The BC Act has been considered in the preparation of this EIS, in the provision of a Biodiversity Assessment (BA) (refer to Appendix D). The BA is summarised in section 6.2 of this report.

As detailed in section 5.1.6 of the BA, no BOS thresholds would be exceeded as a result of the Proposal. Therefore, a BDAR was not required as part of this DA.

4.2.12 Fisheries Management Act 1994

The FM Act aims to protect fishery resources and marine species, and conserve habitats and diversity. The FM Act works in conjunction with the EP&A Act. If the following activities form part of a Proposal, section 201 of this Act requires a permit from DPI prior to works commencing:

- Aquaculture
- Dredging or reclamation
- Harm marine vegetation (mangrove, seagrass, seaweed)
- Obstruct free passage of fish.

The Proposal involves the diversion of a 1st order ephemeral waterway. NGH consulted with Fisheries on 2 March 2022. Fisheries confirmed that a permit would not be required for the works. Refer to section 5.1.3 of this report for details regarding consultation.

4.2.13 Waste Avoidance and Resource Recovery Act 2001

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The Proposal's resource management options would be considered against a hierarchy of the following order:

- Avoidance of unnecessary resource consumption
- Resource recovery (including reuse, reprocessing, recycling and energy recovery)
- Disposal.

Waste management during the operations would be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (NSW) (WARR Act).

The Proposal aims to reduce waste by reusing materials where appropriate. This includes the reuse of water for dust suppression and processing, reuse of the dust generated at the processing plant and the reuse of overburden for erosion controls and rehabilitation. Waste minimisation and management is addressed in section 6.14 of the EIS.

4.3 NSW Environmental Planning Instruments

4.3.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

The State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP) was introduced to facilitate the effective delivery of infrastructure across the State by improving regulatory efficiency through a consistent planning regime for infrastructure and services across NSW.

Schedule 3Traffic-generating development

The Proposal is not considered to be traffic generating development, in accordance with Schedule 3 of the TISEPP, given that the Proposal is expected to generate an additional six truck movements during the morning peak hour and 50 truck movements per day, which is below the 200 vehicles an hour specified for development with no direct access to a classified road.

4.3.2 State Environmental Planning Policy (Planning Systems) 2021

The aims of the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP) are to identify and facilitate development or infrastructure of State or regional significance.

State Significant Development

Section 2.6 of the Planning Systems SEPP states that development is declared to be SSD for the purposes of the EP&A Act if:

- the development is not permissible without consent under Part 4 of the EP&A Act
- the development is specified in Schedule 1 or 2 of the Planning Systems SEPP

Section 7 of Schedule 1 of the Planning Systems SEPP includes:

> *(1) Development for the purpose of extractive industry that—*
>
> *(a) extracts more than 500,000 tonnes of extractive materials per year, or*
>
> *(b) extracts from a total resource (the subject of the development application) of more than 5 million tonnes, or*
>
> *(c) extracts from an environmentally sensitive area of State significance.*
>
> *(3) Development for the purpose of extractive industry related works (including processing plants, water management systems, or facilities for storage, loading or transporting any construction material or waste material) that—*
>
> *(a) is ancillary to or an extension of another State significant development project, or*
>
> *(b) has a capital investment value of more than $30 million.*

The Proposal is not state significant development because:

- The Proposal would not exceed a total extraction of 200,000 tonnes of hard rock per year from a total resource not exceeding 2.4 million tonnes
- The site is not an environmentally sensitive area of State significance
- There are no extractive industry related works ancillary to, or an extension of another State significant development project.

Regionally Significant Development

Clause 20 of the Planning Systems SEPP provides that development is declared to be regionally significant development for the purposes of the EP&A Act if:

- the development is specified in Schedule 6 of the Planning Systems SEPP.

According to Schedule 6, Section 7 of the Planning Systems SEPP the development is be considered Designated Development:

Development for the purposes of—

(a) extractive industries, which meet the requirements for designated development under clause 19 of Schedule 3 to the Environmental Planning and Assessment Regulation 2000.

The Proposal is Designated Development; therefore, it is also considered to be regionally significant development. The Proposal would therefore require determination by the relevant NSW Planning Panel.

4.3.3 State Environmental Planning Policy (Resources and Energy) 2021

The State Environmental Planning Policy (Resources and Energy) 2021 (Resources and Energy SEPP) is designed to provide for the proper management and development of mineral, petroleum and extractive material resources and establish appropriate planning controls to encourage ecologically sustainable development through environmental assessment and management.

In particular, the Resources and Energy SEPP outlines land that has been classed as Biophysical Strategic Agricultural Land (BSAL) and Critical Industry Clusters (CIC). The land has not been identified as BSAL or CIC.

The Resources and Energy SEPP also identifies development permissible with consent and outlines matters for consideration in the assessment of development applications. Relevant to this development are the provisions for extractive industries:

- *Section 2.9 Extractive industry - Development for any of the following purposes may be carried out with development consent — (a) extractive industry on land on which development for the purposes of agriculture or industry may be carried out (with or without development consent).*

This Proposal complies with this provision as the quarry is for an extractive industry, and not mining, and is proposed on land where agriculture may be carried out.

- *Section 2.19 Compatibility of proposed mine, petroleum production or extractive industry with other land uses. Before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must—*

  (a) consider—

    (i) the existing uses and approved uses of land in the vicinity of the development, and

    (ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and

    (iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and

  (b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a)(i) and (ii), and

(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a)(iii).

This EIS has considered the surrounding land uses and potential for impacts to land use (refer to section 6.12), socio-economic and community impacts (refer to section 6.12), and cumulative impacts of the Proposal (refer to section 6.15).

Benefits of the Proposal (including public benefits) are listed in section 2.2 of this report.

The full list of mitigation measures proposed to avoid or minimise any incompatibility are provided in section 8.2 of this report.

4.3.4 State Environmental Planning Policy (Resilience and Hazards) 2021

The State Environmental Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) aims to define and regulate the assessment and approval of potentially hazardous or offensive development. The SEPP defines 'potentially hazardous industry' as:

> *"…development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality—*
>
> *(a) to human health, life or property, or*
>
> *(b) to the biophysical environment,*
>
> *and includes a hazardous industry and a hazardous storage establishment"*

'Potentially offensive industry' is defined as:

> *…a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.*

Potentially hazardous development

The Resilience and Hazards SEPP requires a Preliminary Hazard Assessment (PHA) to be prepared for potentially hazardous or offensive development. Appendix 3 of the Applying SEPP 33 guidelines (DOP, 2011) lists industries that may fall within the Resilience and Hazards SEPP; the guidelines do not include extractive industries as they are not classed as an Industry under the LEP definitions, however the guidelines refer to the EPA's IAEA Table II, from the Multi-level Risk Assessment, for further indication of potentially hazardous industries and correspondingly the most important substances likely to be handled.

IAEA Table II lists activities such as fuel storage, transport of fuel, and explosive use. As these activities would occur on the site and to ensure best practice and minimise impacts of the development the guidelines have been considered. Appendix 2 of the guidelines provides a risk screening procedure and a checklist to identify Hazardous and Offensive Development in instances where the applicability of the Resilience and Hazards SEPP is not immediately apparent. Information relevant to the risk screening and the checklist is provided below.

The Resilience and Hazards SEPP screening procedure is based on the quantity of dangerous goods stored or transported, the frequency of transportation movements and, in some cases, the distance of the materials from the site boundary. The guidelines require goods to be classified according to the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). The ADG Code lists the following classes of dangerous goods:

- Class 1 Explosives
- Class 2 Gases
- Class 3 Flammable liquids
- Class 4 Flammable solids
- Class 5 Oxidising substances and organic peroxides
- Class 6 Toxic and infectious substances
- Class 7 Radioactive material
- Class 8 Corrosive substances
- Class 9 Miscellaneous dangerous substances and articles, including environmentally hazardous substances.

There is no proposed change to the management of explosives at the site as they are not kept on site. An external Contractor is used for all explosives related work. There are no proposed changes to the transportation threshold or methods, or existing storage quantities or storage arrangements for fuels for machinery used at the quarry. The Hazards and Resilience SEPP provides for the systematic assessment of potentially hazardous and offensive development for the purpose of industry or storage. For development Proposals classified as 'potentially hazardous industry' the policy requires a preliminary hazard analysis (PHA) to determine risks to people, property and the environment. The development would not be considered potentially hazardous and would not require the preparation of a PHA.

A Blast Management Plan (BMP) has been provided in Appendix H. Refer to section 6.8 of the EIS for details on the PHA assessment.

Potentially offensive development

The *Hazardous and Offensive Development Application Guidelines, Applying SEPP 33* (NSW Planning, 2011) states in deciding if a Proposal is 'potentially offensive industry' consent authorities need to determine whether, in the absence of safeguards, the Proposal would emit a polluting discharge which would cause a significant level of offence, including odours, liquid run-off, noise, waste, etc.

An Environment Protection Licence (EPL) is required under the *NSW Protection of the Environment Operations Act 1997*.

The Proposal would result in noise generation and dust emissions and would require surface water management. The potential for impacts on the community and surrounding environment have been considered:

- The operation of the quarry has the potential to affect the community due to noise and vibration. A quantitative noise assessment in accordance with the NPI (EPA 2017) and the Transport for NSW (TfNSW) NSW Construction Noise Estimator Tool (CNET) (TfNSW 2016) was undertaken for the general operation works of the quarry. The assessment also considered the impacts of blasting from ground vibration and overpressure.
- The Proposal would result in some vehicle and machinery exhaust and dust emissions during operation. The emissions occur outside, in a rural locality, would be readily dispersed and would typically consist of road dust or dust from quarrying activities. The air quality emissions would not be considered offensive within the context of the Resilience and Hazards SEPP.

Earthworks would be required progressively and would include:

    - Construction/upgrade of the vehicle access road extension
    - Construction of a sediment dam
    - Quarry operations.
- Processing areas (during operation) would drain towards one of two sediment dams, due to the enclosed nature of the pit. No discharge of processing waters from the site would occur under normal conditions and impact upon the regional surface water regime.

The potential impacts, as discussed above, would be avoided or minimised with the implementation of the mitigation measures committed to in this EIS. Refer to section 8.2 for the full list of mitigation measures to avoid potentially offensive effects of the Proposal.

Remediation of land

The Hazards and Resilience SEPP also promotes the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment.

Section 4.6 of the Hazards and Resilience SEPP requires that the remediation of land be considered by a consent authority in determining a development application.

A search of the NSW Environment Protection Authority (EPA) contaminated land public record (EPA, 2021) was undertaken for contaminated sites within the Snowy Valleys LGA on 12 January 2021. The search did not return any results for the site or the Tumbarumba locale. The closest listed site was in Talbingo, approximately 34km northeast of the Subject Land.

4.3.5 State Environmental Planning Policy (Primary Production) 2021

The Primary Production SEPP aims to ensure local industry and community have greater access to and awareness of the agricultural land use planning provisions that apply. The intent of the SEPP is to deal with agricultural land use matters of State or regional significance only.

The aims of the Primary Production SEPP are:

(a) to facilitate the orderly economic use and development of lands for primary production.
(b) to reduce land use conflict and sterilisation of rural land by balancing primary production, residential development and the protection of native vegetation, biodiversity and water resources.
(c) to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations.
(d) to simplify the regulatory process for smaller-scale low risk artificial waterbodies, and routine maintenance of artificial water supply or drainage, in irrigation areas and districts, and for routine and emergency work in irrigation areas and districts.
(e) to encourage sustainable agriculture, including sustainable aquaculture.
(f) to require consideration of the effects of all proposed development in the State on oyster aquaculture.
(g) to identify aquaculture that is to be treated as designated development using a well-defined and concise development assessment regime based on environment risks associated with site and operational factors.

The objectives of Part 2.2, Primary Production SEPP are as follows:

(a) to identify State significant agricultural land and to provide for the carrying out of development on that land,

(b) to provide for the protection of agricultural land:

i. that is of State or regional agricultural significance, and

ii. that may be subject to demand for uses that are not compatible with agriculture, and

iii. if the protection will result in a public benefit.

Land that is considered State significant agricultural land is listed in Schedule 1 of the Primary Production SEPP. Schedule 1 of the SEPP is currently incomplete/blank. Table 4-6 lists the land classification systems that have been considered in relation to State significant agricultural land and this Proposal.

Table 4-6 Land classification systems considered in relation to the Proposal (DPI, 2017)

Land classification system	Description	Relevance to Proposal
Important Agricultural Land	Important Agriculture Land is the existing or future location of local or regionally important agricultural industries or resources. It includes a combination of biophysical resources and socio-economic (infrastructure, proximity to processing facilities, markets etc) requirements for local or regionally important agricultural industries.	The Proposal is not located on Important Agricultural Land.
Regional Farmland Mapping	Regional Farmland Mapping was developed to identify and protect State Significant, Regionally Significant and Significant Non-contiguous farmland to maintain strong resource base for the current and future production of food and fibre.	Regional Farmland Mapping has been undertaken in the Northern Rivers and Mid-North Coast regions of the state only. Given that the Development site contains an active quarry operation, it is considered unlikely that it would be mapped as regionally significant farmland.
Land and Soil Capability (LSC)	LSC maps are classified into 8 classes based on a range of agricultural practices that can be sustained, ease of management and risk of degradation. The limitations to agricultural use are determined by factors including, but not limited to soil properties and climate. The more limitations for agricultural practices, the higher the classification and the lower the agricultural versatility or value.	The Proposal occurs on Class 4, Class 5 and Class 6 land, having moderate to severe limitations for high-impact land uses. Refer to section 6.12.1 of the EIS for details on land and soil capability classes.
Critical Industry Cluster (CIC)	Critical Industry Cluster mapping identifies localised concentrations of interrelated productive industries based on an agricultural product that provides significant employment opportunities and contributes to the identity of the region.	Two critical industry clusters exist in NSW – for equine and viticulture industries in the Upper Hunter region. Therefore, the Proposal is not located within a CIC.
Biophysical Strategic	BSAL maps identify the inherent land and	The Proposal is not located on

Land classification system	Description	Relevance to Proposal
Agricultural Land (BSAL)	water resources that are important on a national and state level for agriculture – particularly, but not exclusively broad acre cropping across NSW. These lands intrinsically have the best quality soil and water resources, topography, are naturally capable of sustaining high levels of agricultural productivity and require minimal management practices to maintain this.	BSAL.

The Proposal is consistent with the aims of the Primary Production SEPP, whereby:

- The Development site already contains an operational quarry
- The Proposal would result in a minor permanent reduction (2.98ha) of lower quality grazing land
- The Development site does not occur within an area of State significant agricultural land
- The Development site would be returned to its former use, namely grazing, after quarry closure and rehabilitation.

4.3.6 State Environmental Planning Policy (Biodiversity and Conservation) 2021

The State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) was gazetted on 1 March 2022. No policy changes have been made. The following chapters are relevant to the proposed development:

Chapter 4: Koala Habitat Protection 2021

The Development site is located within the Snowy Valleys LGA, which is listed in Schedule 1, Chapter 4, of the Biodiversity and Conservation SEPP. The Development site occurs on land zoned RU1 Primary Production. According to Clause 6, Chapter 4 does not apply to land zoned RU1 Primary Production within the Snowy Valleys LGA.

Chapter 3: Koala Habitat Protection 2020

Koala Habitat Protection 2020 applies to all RU1, RU2 and RU3 zoned land outside of the Sydney Metropolitan Area and the Central Coast.

The Development site is located on land zoned RU1 Primary Production within the Snowy Valleys LGA, which is listed on Schedule 1, Chapter 3, of the Biodiversity and Conservation SEPP. The provisions of Chapter 3 apply to the Proposal.

There was no detection of Koala or evidence of their presence during a site visit undertaken on 17 September 2021 by two NGH ecologists. No trees were found to have scratches and no Koalas were observed within any of the trees in the development site. No NSW Bionet Atlas records for Koala occur within the Development site. One historic record pre 1970 of the Koala occurs in Tumbarumba township but it is believed to be a vagrant record.

NGH ecologists therefore do not consider the land to be potential or core Koala habitat, as defined under the Biodiversity and Conservation SEPP 2021, and a Koala Management Plan is not required for this proposed development.

4.4 Local Planning Provisions

4.4.1 Tumbarumba Local Environment Plan 2010

The development area is located within the Snowy Valleys LGA and is subject to the provisions of the *Tumbarumba Local Environment Plan* (Tumbarumba LEP).

> *(2) The particular aims of this Plan are as follows—*
>
> *(aa) to protect and promote the use and development of land for arts and cultural activity, including music and other performance arts,*
>
> *(a) to develop local planning controls that manage human settlement, rural activities and the natural environment in a manner that contributes to the unique quality of Tumbarumba,*
>
> *(b) to encourage development that supports the long term economic viability of the local community,*
>
> *(c) to ensure development is undertaken in a manner that mitigates impacts on the natural environment,*
>
> *(d) to encourage development that promotes positive social outcomes for the local community.*

It is considered that the Proposal is compatible with the aims of the Tumbarumba LEP. The Proposal would be undertaken in a manner that mitigates impacts on the natural environment, while supporting long term employment and economic growth within the region.

Land zoning and permissibility under the Tumbarumba LEP

Land is zoned under the relevant LEP and has a set of objectives to guide development with the aim to achieve the future desired character and land uses or maintain the existing character and land uses.

The development area is zoned RU1 Primary Production under the Tumbarumba LEP. Extractive industry is listed as development permitted with consent within the zone.

Extractive industry, as defined under the LEP means:

> *the winning or removal of extractive materials (otherwise than from a mine) by methods such as excavating, dredging, tunnelling or quarrying, including the storing, stockpiling or processing of extractive materials by methods such as recycling, washing, crushing, sawing or separating, but does not include turf farming.*

The Proposal is classified as an extractive industry (and not mining) because the material proposed to be extracted is rock (basalt) and is defined as an extractive material under the LEP (as listed below):

> ***extractive material*** *means sand, soil, gravel, rock or similar substances that are not minerals within the meaning of the Mining Act 1992.*

Land zoning objectives

The Tumbarumba LEP states that the consent authority must have regard to the objectives for development in a zone when determining a development application. The objectives of the RU1 zone are:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To protect and enhance the scenic qualities of rural areas of Tumbarumba in a manner that encourages and promotes tourist orientated development and activities.*

The Proposal aims to minimise the fragmentation and alienation of resource lands by extending the existing quarry operation at Murray's Crossing. The Proposal would benefit from existing onsite infrastructure, which would also reduce the overall net impact of the Proposal. The Proposal would provide for the considered management of an essential natural resource, providing high quality crushed basalt to local and State government enterprises and Tier 1 & 2 civil construction companies. Extractive industries are considered a compatible non-agricultural use in the zone, according to the Resources and Energy SEPP. The environmental and amenity impacts of the Proposal on surrounding receivers are considered acceptable as outlined in Section 6 of this report.

Additional Local provisions of the LEP

Flood prone land

The Proposal is not located within land mapped as flood prone, or as land or water sensitive under the Tumbarumba LEP; however, the pit is known to flood during high rainfall events.

A summary of the results of the Flood Report, completed by Lyall & Associates has been detailed in section 6.5.3 of this EIS. The full report is available in Appendix K.

Terrestrial biodiversity

The Development site is located on land mapped on the Natural Resources Biodiversity Map as 'sensitive land' (refer to Figure 4-1). Clause 6.2 of the LEP applies to land with this overlay. The objective of this clause is to maintain terrestrial biodiversity. In assessing the application, the potential impacts to biodiversity must be considered. This EIS has addressed the potential impacts of the Proposal in accordance with the BC Act. Refer to the findings summarised in section 6.2 of this EIS.

Figure 4-1 Terrestrial biodiversity mapped within Development site

4.4.2 Tumbarumba Development Control Plan 2019

The Tumbarumba Development Control Plan (DCP) 2019 contains provisions relevant to the proposed development. Provisions relevant to the development are discussed in Table 4-7.

Table 4-7 Relevant DCP 2011 provisions

DCP provision	Comment
General Principles	Consider the character of the neighbourhood – The proposed quarry is considered an appropriate use for the Development site and the visual character suitable for its intended use. Use the site's attributes to your advantage – The quarry is utilising the sites attributes of slope and available material. The quarry is also well located and orientated to minimise visual impacts to sensitive receivers. Ensure landscape qualities are retained –Trees, grasses and groundcover vegetation would be retained where possible. Hardstand areas would be limited to the proposed internal access and manoeuvring areas. Drainage would be managed on site. Rehabilitation would include the introduction of organic matter and planting/seeding with local perennial native species, free from weeds.
1.7 Notification of DA's	It is understood the Council would notify the DA.
3.2.1 Vehicle Access Standards Vehicle access to all development is to be designed to be safe. Adequate sight distance, in each direction, is to be provided for any internal site/property access road.	An extension to the existing internal access road is proposed as part of the development (refer to Figure 3-10). The internal road design allows entry and exit in a forward direction. Adequate sight distances are provided. Refer to section 6.7 of the EIS for details on traffic and transport.
3.2.2 Bushfire	The NSW Rural Fire Service Planning for Bushfire Protection 2019 Guideline (PBP) has been considered for this proposal. The PBP is addressed in Section 6.8.2 of this EIS.
3.2.3 Car Parking 3.2.3.1 Car Parking Requirements Sufficient on-site car parking is to be provided for all development proposals. The demand for car parking generated by any development should be provided for on-site (within the development footprint). 3.2.3.2 Car parking layout	Quarries are not a listed use in Table 1, as such parking for the site has been determined for the numbers of staff proposed to service the site. All other vehicles would collect material within the turning zone, parking for the public, including for vehicles with trailers, would not be required. A Traffic Impact Assessment (TIA) has been prepared to support this EIS (Appendix G).

DCP provision	Comment
3.2.5 Contaminated Land	Potential contamination at the site has been addressed in the Resilience and Hazards SEPP (section 4.3.4) and in section 6.4.6 of this EIS.
3.2.9 Erosion and Sediment Control	Erosion and sediment controls would be in accordance with the Blue Book. Refer to section 6.4.7 of this EIS for erosion and sediment controls.
3.2.13 On-site Wastewater Management	No new facilities are proposed. The workshop would be relocated east of its current location (refer to Figure 3-9 and Figure 3-10). Toilet facilities, located within the workshop, would be used by quarry staff.
3.2.14 Provision of Services	No new service connections are proposed.
3.2.16 Safer By Design	The proposed quarry is consistent with the CPTED principles (principles of crime prevention through environmental design).
3.2.17 Stormwater/roof Water Management	Stormwater management is proposed, refer to section 6.4 of this EIS.
6.0 Industrial Development	
6.3.1 Air Quality	The management plan to be developed for the quarry would include measures to control dust impacts on surrounding land (refer to section 6.6.7 of this EIS).
6.3.5 Car Parking and Access 6.3.5.1 Accessible Industrial Car Parking 6.3.5.6 Landscaping of Industrial Car Parking Areas 6.3.5.8 Construction 6.3.5.9 Service Vehicles and Loading Docks 6.3.5.11 Vehicular Access	At least one car space would be provided for people with a disability to the minimum specifications of AS/NZ 2890.6. Due to the separation from other developments and minor scale of the parking area, landscaping is not considered necessary for the proposal. The carparking and access road would have a gravel finish and proposed drainage of these areas is controlled through the grading of the road surface, inclusion of culverts, deflection banks and swales. All loading would occur within the boundaries of the subject land and associated TSR. Vehicles would enter and leave the site in a forward direction. Refer to section 6.7 of the EIS for details on access and transport.
6.3.8 Fencing	The site has existing boundary fencing.
6.3.10 Hazardous Goods and Site Contamination	Fuel (diesel (not considered a flammable liquid) or petrol) would be stored in a bunded trailer within the quarry pit or within an above ground tank at the workshop. The above ground tank would be

DCP provision	Comment
	relocated when the workshop is moved to its proposed location (refer to Figure 3-10). Explosives would not be stored on site, instead brought to site by the contractor on the day of the blasting. BHQ's Integrated Health, Safety and Environment Management System and their Health Safety and Environment Management Plan (HSEMP) would include measures for the control of hazardous good (fuel) stored on site including but not limited to: • The quarry operator must prevent contamination of the environment by the release of fuels and/or lubricants. • The quarry operator must ensure that all fuels and/or lubricants are stored in accordance with the relevant requirements of Australian Standards. • The quarry operator must ensure that spill prevention and clean-up equipment is readily available and accessible in the vicinity of all plant and machinery, including the existing fixed fuel storage. • The quarry operator must ensure that spills of fuels and/or lubricants are cleaned up as quickly as practicable. Such spillage must not be cleaned up by hosing, sweeping or otherwise releasing such contaminant into waterways. Equipment and soil contaminated by fuels and/or lubricants and clean up substances which cannot be salvaged must be disposed of in an approved waste facility.
6.3.14 Landscaping	Rehabilitation and natural regeneration is proposed to stabilise areas such as batters and earth banks. Rehabilitation would include the introduction of mulch and/or a soil binder, to protect the site from erosion until groundcover has re-established. As the quarry benches consist of rock, there is no risk of erosion in these areas and no regeneration is expected.
6.3.15 Noise	The Noise and Blasting report indicated that noise levels from the quarry operations are predicted to exceed the NPfI PNTLs at eight receivers, particularly for quarrying, processing and product despatch. The predicted exceedances of the daytime PNTL were up to 11 dBA for all activities occurring at the same time – which may be relatively unlikely – at the nearest occupied receptor (R21). An exceedance of that magnitude would be considered significant. The predicted exceedance at R28, which is unoccupied, was 18 dBA. It is important to note that the quarrying activities were assessed at the highest point on the site. As quarrying progresses, noise levels would likely decrease at several receptors as activities are

DCP provision	Comment
	shielded by the quarry benches that are formed. Mitigation measures have been provided in section 6.3.6 of this report.
6.3.19 Facilities/Services	Staff facilities are present on the site; however, they would need to be relocated in conjunction with the proposed workshop. A septic system is proposed. This system would comply with the relevant guidelines and policies, plumbing standards and codes and Section 68 approvals from Council. The Proponent would provide a copy of the septic system plans to Council, including any proposed effluent application areas.
6.3.24 Stormwater Management	Stormwater management is discussed in section 6.4 of the EIS.
6.3.25 Waste Management	Waste management is discussed in section 6.14 of the EIS.

4.5 Summary of licences required by legislation

The approvals and licence needed for the Proposal are summarised in Table 4-8. Any additional licences or approvals that may be required would be obtained prior to the commencement of relevant activities.

Table 4-8 Summary of approvals/licences/permits required

Instrument	Licence or approval requirement
EP&A Act, Part 4	This Proposal requires consent from Council, to be determined by the Regional Planning Panel. This DA is seeking development consent and an EPL from the NSW EPA.
Section 68 approval	The Proposal requires a section 68 approval from Snowy Valleys Council regarding the installation of an onsite sewage management system (OSMS).

4.6 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In 1992, the Commonwealth and all State and Territory Governments endorsed the National Strategy for Ecologically Sustainable Development.

In NSW, the concept has been incorporated in legislation such as the EP&A Act and EP&A Regulation. For the purposes of the EP&A Act and other NSW legislation, the Intergovernmental Agreement on the Environment (1992) and the Protection of the Environment Administration Act 1991 outline principles which can be used to achieve ESD. These principles are presented below along with a description of how the Proposal and this EIS have considered each principle.

a) The precautionary principle, namely, that 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.*
The precautionary principle has been adopted in the assessment of expected impacts. All potential impacts have been considered and mitigated commensurate with risk. Where uncertainty exists, measures have been included to address the uncertainty. For this EIS, a worst-case assessment has been undertaken to remove uncertainty about the project.
b) Inter-generational equity, namely, 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.
The Proposal would result in a change to the landscape. However, the potential impacts of the Proposal are proposed to be carefully managed and would be localised. The Proposal would not have significant impact on the health, diversity and productivity of the land surrounding the proposed quarry. The Proposal includes rehabilitation to return the site to a state capable of either rural land use or environmental regeneration.
c) Conservation of biological diversity and ecological integrity should be a fundamental consideration.
The impacts of the Proposal on biodiversity have been assessed in detail in section 6.2. The Proposal includes measures to minimise impact on biodiversity including avoidance of higher conservation value

areas where possible and management measures to minimise, manage and offset residual impacts. The impacts are considered to have been reduced as much as possible in this context.
d) Improved valuation, pricing and incentive mechanisms, namely, 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 lifecycle 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.*
Attributes of the Development site such as existing native vegetation, soil and hydrology have been valued in terms of their broader contribution to the catchment and catchment processes. Pollution risks have been assessed and would place any cost of remediation solely upon the Proponent, refer to section 8 for details of the environmental framework and mitigation measures the Proponent is committing to, to avoid and minimise any pollution risk. The proposed excavation of high-quality crushed basalt (virgin excavated material) has nil potential for contamination on or off site.

5. Consultation

Stakeholder consultation is key to the planning and assessment process to assist in determining the relevant issues to be considered in the Proposal design and environmental impact assessment process. Consultation with relevant stakeholders including affected landholders, the surrounding community, community groups, government authorities, service provides, Aboriginal groups and other relevant stakeholders commenced during the early project planning phase and has continued through the preparation of the EIS.

BHQ has an established relationship with the surrounding community and other stakeholders through its ongoing operations since 1980's and has implemented a process for ongoing engagement regarding its operations.

The engagement process that has been undertaken as part of the EIS and approval process provide the opportunity for the stakeholders to provide input into project planning, to identify stakeholder needs, concerns and opportunities, and to be involved in the environmental and social assessment process.

Details of agency consultation are outlined in section 5, with details of consultation with the Aboriginal community outlined in section 5.2 and the broader community outlined in section 5.3 of this report.

Secretary's Environmental Assessment Requirements

Consultation –

In preparing the EIS for the development, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers and any surrounding landowners that may be impacted by the development.

The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.

Department of Primary Industry

Adequate consultation with community:

- *Consult with the owners / managers of affected and adjoining agricultural operations in a timely and appropriate manner about: the proposal, the likely impacts and suitable mitigation measures or compensation.*

5.1 Agency consultation

A preliminary environmental assessment was prepared, and SEARs were requested. This was provided by DPE on 6 April 2021 (refer Appendix A). The SEARs are intended to guide the structure and content of the EIS and reflect the responsibilities and concerns of NSW government agencies in relation to the environmental assessment of the Proposal.

Appendix A provides a summary of the SEARs from the various agencies and cross reference where specific issues are addressed within this EIS. Additional consultation was undertaken with several of the agencies to clarify some of the issues raised in the SEARs or seek further advice. Additional consultation with agencies is summarised below.

5.1.1 Biodiversity and Conservation Division (BCD) consultation

NGH contacted BCS via a phone call on 27 August 2021 to discuss flood study requirements for the Proposal. As no previous flood studies have been conducted for the development, BCS felt it was important to gain an understanding of the operational impact to floodways in proximity to the Proposal. BCS indicated that a flood assessment, including the 1% Annual Exceedance Probability, would be sufficient for the proposed development. An email summary of the flooding requirements provided by BCS is available in Appendix C of the EIS.

5.1.2 Crown Lands consultation

NGH met with Crown Lands on 27 April 2021 to discuss Proposal requirements regarding involvement of the TSR. The Crown Lands representative acknowledged that Lot 7028 DP96852 is a Travelling Stock Reserve (TSR), Reserve 51191, reserved for the purpose of Travelling Stock and currently managed by Riverina Local Land Services. This TSR currently has an agreement in place with Riverina Local Land Services to use the eastern most portion of the reserve for access & stockpiling in relation to quarrying operations.

The Crown waterway (Tumbarumba Creek) located to the west of the proposal area is not expected to be impacted by, or involved in the Proposal

No changes to the current permit conditions are required as a result of the Proposal and, as such, the TSR has not been included in the scope of the EIS.

Consultation with Crown Lands is provided in Appendix C of the EIS.

5.1.3 DPI Fisheries consultation

NGH consulted with DPI Fisheries via email on 2 March 2022. A response was received on 7 March 2022 (Appendix C). Fisheries indicated that there were no legislative requirements for the Proposal, as the development footprint was not located within Key Fish Habitat.

Fisheries recommended that the Proposal should include a threatened aquatic species assessment to address whether there are likely to be any significant impacts downstream on listed threatened species, populations or ecological communities listed under the FM Act, particularly the Murray Crayfish (*Euastacus armatus*) as per the attached guidelines.

Potential impacts to the Murray Crayfish have been assessed in the Biodiversity Assessment (Appendix D). A significant impact was considered unlikely, given that:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- No substantial contribution to any Key Threatening Process are expected
- No impact an important population of a species or EEC is expected as a result of the Proposal
- Aquatic habitat to be impacted consists of highly modified pastureland
- Mitigation measures have been recommended to further reduce impacts to biodiversity.

5.1.4 SVC consultation

NGH sent an email to SVC on 14 March 2022 to determine whether the Proposal was located on flood prone land. No response was received.

Consultation with SVC has been provided in Appendix C of this EIS.

5.2 Aboriginal community consultation

Engagement with the Aboriginal community included communication with the Toomaroombah Kunama Namadgi Indigenous Corp (TKNIC). The TKNIC were determined to be the appropriate Aboriginal community group for this Project and were invited to participate in the site inspection. Three members (Uncle John Casey, Mark Small and Bink Wilesmith) attended the site inspection on 23 September 2021. BHQ conducted all consultation with respect to the Due Diligence process.

Members of the TKNIC were not involved in the field visit on 17 December 2021. However, BHQ discussed the findings and recommendations relating to the December survey with representatives of TKNIC. A copy of the draft report was provided to the TKNIC for comment. No amendments were required.

5.3 Broader community consultation

The Proposal involves an extension to an existing operation. Therefore, only surrounding landholders and the neighbouring racecourse have been consulted. BHQ have undertaken all community consultation. Consultation was conducted via a letter drop on the 4th April 2022 (refer to Appendix C). Fourteen properties were visited, and eight letters mailed to close neighbours. Where neighbours were home, letters were hand delivered and a conversation had in regards to the expansion and a time for them to raise any concerns with the operation or blasting notification process. Some requested to be added to the blasting notification process, with the main concerns being from dust, rather than noise. Local landholders have been invited to provide comment on the DA and EIS.

The Racecourse Board were contacted via phone call to discuss the development and the proposed blasting. BHQ have now added their phone to blast notifications and have established email contact.

5.4 TISEPP consultation

Part 2.2 of the TISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. This is in Table 5-1.

Table 5-1 TISEPP consultation

Is consultation with public authorities other than councils required under Section 2.15 of the Transport and Infrastructure SEPP?		
2.15(2)(a) Are the works adjacent to land reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	☐ Yes	☒ No
2.15(2)(b) Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	☐ Yes	☒ No
2.15(2)(c) Are the works comprising a fixed or floating structure in or over navigable waters?	☐ Yes	☒ No
2.15(2)(d) Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	☐ Yes	☒ No

Is consultation with public authorities other than councils required under Section 2.15 of the Transport and Infrastructure SEPP?		
2.15(2)(e) Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	☐ Yes	☒ No
2.15(2)(f) Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	☐ Yes	☒ No
Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	☐ Yes	☒ No
2.16(1) Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	☐ Yes	☒ No

6. Environmental Impact Assessment

6.1 Impact assessment approach

Following the preparation of the request for SEARs, an impact assessment was prepared to characterise the likely adverse environmental risks associated with the construction, operation and rehabilitation of the Proposal. The aim of the impact assessment is to ensure that all relevant risks are identified, investigated and mitigated as part of the EIS submission, relative to the degree of environmental risk they represented.

The environmental impact assessment below addresses all impacts likely to be attributed to the Proposal. This includes consideration of:

- Direct impacts – impacts directly attributable to the construction, operation, and rehabilitation phases such as:
    - Disturbances to cultural heritage, native vegetation, soil, water and air quality
    - Noise and vibration generated by blasting, equipment and traffic movements
    - Public safety, pollution risks and hazards.
- Indirect impacts – follow-on or cascading impacts such as:
    - Impacts on the local economy
    - Impacts to visual amenity
    - Potential to impact existing and future land uses.
- Cumulative impacts – the combined potential effects of different impact types as well as the potential interaction with other Proposals. For example:
    - The combined impact of construction noise, traffic and visual impacts for nearby residences
    - The combined effects of the construction phase coinciding with other infrastructure works, including nearby quarry pits, that may be planned in the area.

Table 6-1 summarises the results of the impact assessment. Fourteen environmental impacts were investigated.

Table 6-1 Analysis of adverse environmental issues

Aspect	Outcomes	Unmitigated Impact	Mitigated Impact
Biodiversity	• The Development site is largely cleared and disturbed from existing quarry use and agricultural activities. Some small fragmented pockets of remnant woodland and isolated remnant trees occur throughout the site. • An Assessment of Significance (AoS) was conducted and determined that a significant impact on threatened species was unlikely to occur as a result of the Proposal. • Tumbarumba Creek is mapped under the NSW Biodiversity Values Map as Biodiversity Value (BV) Land. No further clearing of native vegetation would occur on BV land.	High	Low

Aspect	Outcomes	Unmitigated Impact	Mitigated Impact

Noise and vibration	• Regular maintenance on site access roads and haul road would be undertaken.
	• Noise generating equipment will be kept maintained and lubricated.
	• Product stockpiles will be located to the northwest of fixed plant, where possible.
	• The Proponent would investigate reasonable measures to reduce noise, including:
	  ○ Relocation of processing plant to afford screening due to quarry benches and local topography
	  ○ Purpose-built noise reduction bunds/barriers (where local topography allows)
	• Adjoining landowners will be notified of any blast 7 days prior to the blast event. Livestock to be relocated away from blasts as necessary.
		Medium	Low

Geology	• The Development site occurs on the consolidated volcanic rocks of the Nine Mile hydrogeological landscape (HGL) (NSW Government, 2021). The Nine Mile HGL has a patchy distribution and comprises a number of soil landscapes of basaltic origin, with some derived from underlying granites.	Low	Low
Soils	• The majority of the Development site is located on the Nacki Nacki Variant A (nnwa) soil landscape (NSW Government, 2021). This landscape is characterised by undulating rises on granodiorite and minor granite. A tertiary basalt flow overlies the Development site. • Soil landscape mapping identified that Rudosols and Dermosols were more likely to be present on the upper slopes and hillcrests in the area. Alluvial rudosols occur in the northern portion of the Subject Land and are associated with deposition from Tumbarumba Creek. • Soils within the Development site are minimally to moderately erodible when stripped of vegetation. • Mitigation measures would be put in place for minimising soil disturbance and progressively re-vegetating all disturbed areas where practicable.	Medium	Low
Water quality (surface water)	• Surface water resources are limited to two farm dams and Tumbarumba Creek, which is located immediately west of the Development site. • Results of a Flood Frequency Analysis indicate that the quarry pit would act as a flood storage area in the event of a 1% Annual Exceedance Probability. • Results of water quality monitoring conducted along Tumbarumba Creek indicate that the Proposal would not have an impact on water quality within Tumbarumba Creek.	Medium	Low

Aspect	Outcomes	Unmitigated Impact	Mitigated Impact
	• Mitigation measures have been proposed to protect surface water quality within proximity to the development.		
Water quality (groundwater)	• Eleven groundwater wells are located within a 1km radius of the Development site. • Test holes at Murray's Crossing Quarry have reached approximately 10m below creek level. Solid rock was observed, with no significant inrush of groundwater. Small quantities of pooled water have been observed seeping from rock fractures within the quarry. Where drilling has occurred within the development footprint, small volumes of groundwater seepage were observed within the rock fractures. • Impacts to groundwater and groundwater dependant ecosystems are considered negligible during the construction and operational phases of the development.	Low	Low
Climate and air quality	• Application of water to trafficked areas, processing areas and blasting areas will reduce dust to acceptable levels. • Blasting would be undertaken by an external contractor using best practice methods. • Loading trucks would be covered prior to dispatch. • The proposed operations are predicted to result in negligible increases in cumulative concentrations of emissions for all sensitive receivers.	Medium	Low

Traffic, transport and road safety	• Traffic impacts from dispatching product would be mitigated with safeguards such as:
	  • Restricting speeds on site access roads
	  • Adhering to transport policy
	• Use of trucks that are properly maintained.
		Medium	Low

Hazards	• Fire preparation measures would be put in place in consultation with Planning for Bushfire Protection Guidelines (RFS 2019). • Explosives would not be stored onsite. • Fuel would be stored within a bunded trailer within the quarry pit and within an above ground, bunded tank at the workshop.	Medium	Low
Aboriginal heritage	• The Due Diligence assessment site survey with the Toomaroombah Kunama Namadgi Indigenous Corp identified one Potential Archaeological Deposit (PAD) within the Development site. • Mitigation measures have been provided, including a buffer around the identified PAD, to protect Aboriginal Heritage within the Development site.	Medium	Low

Aspect	Outcomes	Unmitigated Impact	Mitigated Impact
Historic heritage	• No registered heritage places would be impacted by the Proposal.	Low	Low
Visual amenity	• Surrounding vegetation and surrounding topography are sufficient to screen views from sensitive receivers. • The pit wall would provide natural screening for sensitive receivers as the pit footprint increases.	Low	Low
Land use	• Due to the small size of the development footprint, the impacts of the Proposal on regional agricultural productivity would be minimal. • Grazing capacity would be returned to the site post-rehabilitation.	Low	Low
Socioeconomic and community	• The Proposal would maintain the existing workforce of the Bald Hill Quarry operations. • Bald Hill Quarry would continue to work with and support the local community.	Low	Low
Resource use and waste generation	• Drilling confirmed a resource quantity of 2.4 million tonnes of basalt. • Materials testing of rock samples indicate that the resource consists of a hard, non-porous Olivine Basalt. The deposit meets all relevant hard rock product specifications.	Low	Low
Cumulative impacts	• Cumulative impacts may have a minor impact to SSD Proposals occurring within the LGA. • During construction and operation, key cumulative impacts may include additional stress on local business for supply and demand, staff accommodation, noise impacts, air quality, waste management, traffic etc.	Low	Low

In summary, the following environmental risks were considered to be key issues for detailed assessment and consideration of mitigation strategies within the EIS:

- Biodiversity
- Noise and vibration
- Soils
- Surface water
- Air quality
- Transport
- Hazards
- Aboriginal heritage.

In addition, the following were also identified as being environmental assessment issues of lower risk: land use, topography, geology and soils, historic heritage, socio-economic and community, hazards, resource use and waste generation, cumulative impacts and rehabilitation.

Biodiversity, Aboriginal heritage, traffic, flooding and air quality impacts were investigated by specialists.

The visual impact assessment is provided in section 6.7. The reports for biodiversity, Aboriginal heritage, air quality, traffic, blast management, flooding and noise are attached as Appendices D, E, F, G, H, K and L respectively (also summarised in sections 6.2, 6.4, 6.6, 6.2, 6.7 & 6.9).

6.2 Biodiversity

6.2.1 Approach

A specialist Biodiversity Assessment (BA) was prepared by NGH to investigate and assess the potential impacts of the proposal on biodiversity. The BA has been prepared in accordance with the EP&A Act and BC Act. The development footprint as defined in the BA is the survey area to which the BA applies for the Proposal and encompasses all areas surveyed in the assessment. The development footprint is approximately 13.24ha and includes the quarry extraction area, an additional waste stockpile, extensions to the existing internal haul road and the relocation of ancillary facilities.

The aims of the report were to address the biodiversity matters raised in the SEARs and to address the requirements of the NSW *Biodiversity Conservation Act 2016* (BC Act). The BA also addresses the assessment requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The full report is included in Appendix D and has been summarised below.

6.2.2 Existing environment

The Proposal is located within the Bondo subregion of the South Eastern Highlands Bioregion. This Bioregion is dominated by a temperate climate, characterised by warm summers and no dry season (DPE, 2021).

The Development site slopes gently west, down towards Tumbarumba Creek. The Development site is largely cleared and disturbed from existing quarry use and agricultural activities. Some small, fragmented pockets of remnant woodland and isolated remnant trees occur throughout the site. Remaining vegetated areas are dominated by exotic vegetation such as Blackberry (**Rubus fruticosus*) and exotic pasture grasses such as Phalaris (**Phalaris aquatica*) and **Dactylis glomerata.* Two ephemeral streams/drainage lines pass through the Development site and feed into Tumbarumba Creek, located immediately northwest of the Development site. The drainage lines lack a native overstory but contain a mix of native sedges and rushes. The surrounding landscape consists of an undulating topography and relatively large portions of remnant, contiguous vegetation, especially to the west within the TSR.

Biodiversity values

The Proposal does not fall within an Area of Outstanding Biodiversity Value (AOBV). Tumbarumba Creek is mapped under the NSW Biodiversity Values Map as Biodiversity Value (BV) Land (refer to Figure 6-1). Tumbarumba Creek is identified under the NSW BV Map as an area of 'Protected Riparian Land'. BV Mapped land is identified as land with '*high biodiversity value that is particularly sensitive to impacts from development and clearing'* (DPIE, 2021).

No further clearing of native vegetation would occur within the BV land as part of this Proposal.

Consideration of prescribed impacts under cl6.1 of the BC Regulation on BV mapped land is undertaken in section 6.2.3 of this EIS.

Threatened species

The results of the desktop study identified 26 flora species, six Threatened Ecological Communities (TECs), as well as 70 fauna species and/or populations with the potential to occur within the locality.

Figure 6-1 Biodiversity Value land

Groundwater dependent ecosystems

Groundwater dependent ecosystems are vulnerable to pressures such as agriculture, mining, urban and commercial development (BOM, 2017). Both terrestrial and aquatic GDEs are present within the Development site. Moderate potential aquatic GDEs are present in the form of Tumbarumba Creek, while high potential terrestrial GDEs are present as woodlands.

6.2.3 Field surveys

An initial site survey was undertaken by two NGH Ecologists on 17 September 2021. The Development site was surveyed via foot to determine the PCTs and zones present. Additional surveys were undertaken on 20 October 2021, in response to changes to the Development site boundary.

The random meander method (Cropper, 1993) was used to survey vegetation within the study area. These methods provide good coverage in terms of area and microhabitats and maximises opportunities for detecting rare or sparsely distributed species. Species were recorded progressively with abundance recorded within the Development site. Any priority weeds were recorded opportunistically.

Survey results

One PCT (Figure 6-2) was identified within the development footprint:

- PCT 285 Broad-leaved Sally grass – sedge woodland on valley flats and swamps in the NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion.

Other key biodiversity features identified within the development footprint included:

- Remnant Riverina Dry Sclerophyll Forest
- Isolated Mature Trees
- One hollow-bearing tree (HBT)
- Two farm dams
- Two ephemeral streams, which feed into Tumbarumba Creek.

Threatened species

No threatened fauna or flora species were identified during the site visit.

Threatened ecological communities

PCT 285 does not form part of a threatened ecological community (TEC).

One aquatic TEC was identified within the Development site:

- The aquatic ecological community in the natural drainage system of the lower Murray River catchment (Murray River EEC) – FM Act Listed EEC.

Figure 6-2 Vegetation mapping within the development

6.2.4 Potential impacts

Vegetation loss

The proposed works would predominately impact PCT 285: *Broad-leaved Sally grass – sedge woodland on valley flats and swamps in the NSW South Western Slope Bioregion and adjoining South Eastern Highlands Bioregion*. The impact would occur to isolated paddock trees, creek line, grassland and woodland. Approximately 0.65ha of native vegetation and 9.35ha of exotic vegetation would be impacted by the Proposal. One HBT is proposed for removal.

Areas of terrestrial vegetation and aquatic habitat that may be impacted from the proposed works are detailed below within Table 6-2 and Table 6-3.

Table 6-2 Vegetation impacts

Vegetation	Zone	Development footprint (ha)
PCT 285	Creek line	0.21
PCT 285	Grassland	0.04
PCT 285	Paddock Tree	0.07
PCT 285	Woodland	0.33
Total		**0.65**

Table 6-3 Aquatic habitat impacts

Vegetation	Development footprint (ha)
Aquatic Habitat (existing dams) and streams	0.21

Threatened species and ecological communities

It has been assumed that all areas within the development footprint would be impacted by the proposed works through:

- Excavation and modification (quarrying)
- Ground disturbance (vehicle and plant movement)
- Ancillary facilities (stockpile, workshop).

Approximately 0.65ha of native vegetation would be removed for the Proposal. The proposed development would largely extend into areas of exotic pasture grasses and, as such, impacts to native flora species are considered minor.

Ground disturbance from the movement of plant machinery and vehicles is expected to occur throughout the development footprint. Post-construction, plant and machinery would utilise the internal haul roads, allowing for the regeneration of native species onsite.

Edge effects are not expected to increase as a result of the development, as vegetation within the development footprint was observed to already be heavily fragmented. Weed encroachment and establishment is currently being experienced throughout the site, reducing the quality of habitat.

Prescribed impacts on BV mapped land

Tumbarumba Creek is identified as BV mapped land, - no native vegetation would be cleared within this area. However Prescribed biodiversity impacts (listed under clause 6.1 of the Biodiversity Conservation Regulations) on BV mapped land must be assessed to determine if the BOS threshold would be exceeded.

Prescribed biodiversity impacts relevant to this Proposal include impacts on:

- Human made structures that sustain threatened entities
- Non-native vegetation that sustains threatened entities
- Water quality, waterbodies and hydrological processes that sustain threatened entities.

Based on the habitat assessment (Appendix C of the BA), no threatened entities are considered to be associated with the man-made structures or non-native vegetation associated with the Quarry operations within the BV mapped land.

Tumbarumba Creek provides habitat for threatened species such as the Murray Crayfish, Booroolong Frog and Spotted Tree Frog. Assessments of impacts to aquatic species have been undertaken and no significant impact is considered likely to occur to these species.

No prescribed impacts on threatened entities are considered likely to occur and the BOS threshold is not exceeded for this criterion.

Groundwater dependent ecosystems

Moderate potential aquatic GDEs are present in the form of Tumbarumba Creek, while high potential terrestrial GDEs are present as woodlands. As discussed in section 6.5.4 of this report, it is unlikely that the Proposal would impact on GDEs within the Development site.

Priority weeds

One priority weed, Blackberry (*Rubus frutcosus* species aggregate), was recorded within the Development site. There is a prohibition on certain dealings for this species under the *Biosecurity Act 2015.* This species must not be imported into the state, sold, bartered exchanged or offered for sale.

The Biosecurity Act dictates that all priority weeds are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any land managers or authorities who deal with any priority has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. Other exotic flora that were identified within the study area are common within the region and are often encountered within disturbed areas.

Waterways

The proposed development involves the diversion of a waterway within the southern portion of the Development site (refer to Figure 6-5 for surface hydrology). Potential impacts include:

- The disturbance/removal of approximately 0.21ha of aquatic habitat
- Sedimentation and increased turbidity of nearby waterways, such as Tumbarumba Creek

- Changes to the natural flow regime and degradation of natural waterways
- Introduction of pollutants into the waterway
- Erosion.

The Booroolong Frog, Spotted Tree Frog and Murray's Crayfish have the potential to occur within the Development site. An AoS and ToS was conducted for threatened aquatic fauna under the BC Act and EPBC Act. A significant impact for these species was considered unlikely, based on the following conclusions:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- No substantial contribution to any Key Threatening Process are expected
- Mitigation measures have been recommended to further reduce impacts to biodiversity
- No impact to any important population is expected by the proposed works.

Impacts to Matters of National Environmental Significance (MNES)

No wetlands of international importance would be impacted by development with the nearest wetland of importance occurring 200km upstream of the Development site.

No federally listed ecological communities are considered likely to occur within the Development site.

Based on habitat assessment, no federally listed migratory species are considered likely to occur within the Development site.

Based on habitat assessment, habitat value for federally listed threatened species the following species have suitable habitat and potential to occur in the development site:

- Austral Toadflax (*Thesium australe*) - Vulnerable
- Superb Parrot *Polytelis swainsonii* – Vulnerable
- Painted Honeyeater (*Grantiella picta*) - Vulnerable
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable
- Corben's Long-eared Bat *Nyctophilus corbeni* – Vulnerable
- Booroolong Frog (*Litoria booroolongensis*) — Endangered
- Spotted Tree Frog (*Litoria spenceri*) —Endangered
- Spotted tail Quoll *Dasyurus maculatus*—Endangered
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered.

An Assessment of Significance was completed for these species. A significant impact was considered unlikely for these species. The full assessment is provided in Appendix E of the BA.

No referral is considered necessary to the Federal Department of Agriculture, Water and Environment (DAWE) for threatened species.

Summary of impacts

Potential impacts to biodiversity are listed in Table 6-4.

Table 6-4 Potential impacts during the construction phase of the Proposal

Impacted entity	Impacts	Impact assessment: Pre-mitigation	Impact assessment: Post-mitigation
Terrestrial fauna	• Disruption to breeding fauna • Disturbance to mature flora plants and associated seedbank, therefore inhibiting potential regeneration of foraging and breeding habitat for fauna species • Invasion and spread of pathogens and disease • Temporary indirect disturbance to wildlife (noise, dust, light, spill, vibration).	Moderate	Low
Terrestrial flora	• Disturbance to mature flora plants and associated seedbank, therefore inhibiting potential regeneration • Invasion and spread of weeds, pathogens and disease	Low	Low
Aquatic fauna	• The disturbance/removal of aquatic habitat, suitable to these species • Sedimentation and increased turbidity of nearby waterways, such as Tumbarumba Creek • Changes to the natural flow regime and degradation of natural waterways • Introduction of pollutants into the waterway • Erosion	Low	Low
Threatened ecological community	• The disturbance/removal of aquatic habitat • Sedimentation of nearby waterways, such as Tumbarumba Creek • Removal of mature aquatic vegetation and their associated seedbanks from within the EEC • Changes to the natural flow regime and degradation of natural waterways • Introduction of pollutants into the waterway • Erosion	Moderate	Low

Conclusion

Assessments of Significance (AoS) were conducted for threatened species with the potential to occur in the development footprint. A significant impact was considered unlikely to occur as a result of the Proposal, given that:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- Only one HBT is proposed for removal

- No substantial contribution to any Key Threatening Process are expected
- No impact an important population of a species or EEC is expected as a result of the Proposal
- Aquatic habitat to be impacted consists of highly modified pastureland
- Mitigation measures have been recommended to further reduce impacts to biodiversity.

6.2.5 Safeguards and mitigation measures

Table 6-5 Safeguards and mitigation measures for biodiversity impacts

No.	Safeguards and mitigation measures	C	O	R
BA1	• All weed material containing seed heads, weeds that contain toxins, and weeds that are able to reproduce vegetatively will be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth. • All herbicides will be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application should be trained to do so and have the proper certificate of completion/ competency or statement of attainment issued by a registered training organisation. • Plant equipment and machinery will be cleaned of all biological matter prior to entering the site.	C	O	R
BA2	• The site induction will include measures to make employees aware of potential threatened flora and fauna during works and understand the procedures if threatened fauna are detected, this will be recorded as a part of the induction procedure and toolbox talks: o Stop work o Alert an Ecologist or suitably qualified person for assessment and possible re–location during works.	C	O	R
BA3	• Only one HBT will be removed during the proposed works. If the proposed design changes to include HBT removal further assessment would be required prior to commencement of work.	C	O	R
BA4	• All fallen timber within the Development site is to be relocated from the development footprint to an adjacent area.	C	O	
BA5	• All woodland to be removed is to be surveyed by an ecologist or suitably qualified person to record the presence of any nesting fauna. • Vegetation to be retained within the study area is to be clearly marked. • Exclusion zones at the extent of the works corridor to limit works encroaching outside the corridor should be used.	C	O	
BA6	• Impacts to aquatic habitat will be kept to the smallest possible extent. • An Erosion and Sediment Control Program (ESCP) will be implemented, prior to the commencement of work. • Erosion controls will be implemented prior to channel diversion. This would ensure that the natural flow regime of Tumbarumba Creek is not impacted and that downstream sedimentation does not occur. Erosion controls will remain in place until the site is revegetated and stabilised.	C	O	R

No.	Safeguards and mitigation measures	C	O	R
	• BHQ will restrict works within aquatic and riparian areas, to periods of low rainfall, to coincide with natural aquatic processes and reduce unnecessary sedimentation within waterways. • BHQ will divert the watercourse and provide sufficient time for the dam to dry out, allowing invertebrates and aquatic fauna sufficient time to relocate. • No herbicide use will occur within aquatic areas. • Vehicle hygiene protocols should be in line with Roads and Maritime Biodiversity Guidelines - Guide 7 (Pathogen Management) for the control of Chytrid.			
BA7	• All weed material containing seed heads, weeds that contain toxins, and weeds that are able to reproduce vegetatively will be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth. • All herbicides will be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application should be trained to do so and have the proper certificate of completion/ competency or statement of attainment issued by a registered training organisation. • Plant equipment and machinery will be cleaned of all biological matter prior to entering the site.	**C**	**O**	**R**

C: Construction; O: Operation; R: Rehabilitation

6.3 Noise and vibration impacts

6.3.1 Approach

SLR Consulting Pty Ltd were engaged to complete a Noise and Blasting Assessment for the Proposal (SLR, 2022). The full report is available in Appendix L.

No background noise monitoring was conducted for this assessment. In order to predict noise levels associated with the Proposal at nearby receptors, a SoundPLAN computer model was developed (SLR, 2022). The Conservation of Clean Air and Water Europe (CONCAWE) prediction methodology was utilised within SoundPLAN. This prediction method was specially designed for industrial facilities and incorporates the influence of wind and the stability of the atmosphere on the propagation of noise.

Airblast overpressure and ground vibration levels for the project have been considered based on the methodology contained within Australian Standard (AS) 2187.2-2006 *"Explosives - Storage and use, Part 2: Use of explosives"* (AS 2187.2) (SLR, 2022).

The proposed quarry would be an extension of the existing Murray's Crossing Quarry operation. The pit footprint would increase incrementally over the life of the quarry. As a result, construction and operational impacts have been assessed concurrently.

6.3.2 Existing environment

Noise sources from land use adjacent to the Development site would generally consist of livestock grazing, cultivation, harvesting of fodder and road traffic. Noise generating equipment would include livestock, tractors, quad bikes, light vehicles and heavy vehicles. These land uses characterise the background noise within the area. Noise levels from farm activities would likely be concentrated at peak times within given seasons. The proposed quarry extension would involve blasting five to six times a year.

Sensitive receivers

As shown in Figure 6-3, there are numerous receivers within 2km of the Development site. The closest residential receptor (R28) is located approximately 240m north of the Development site.

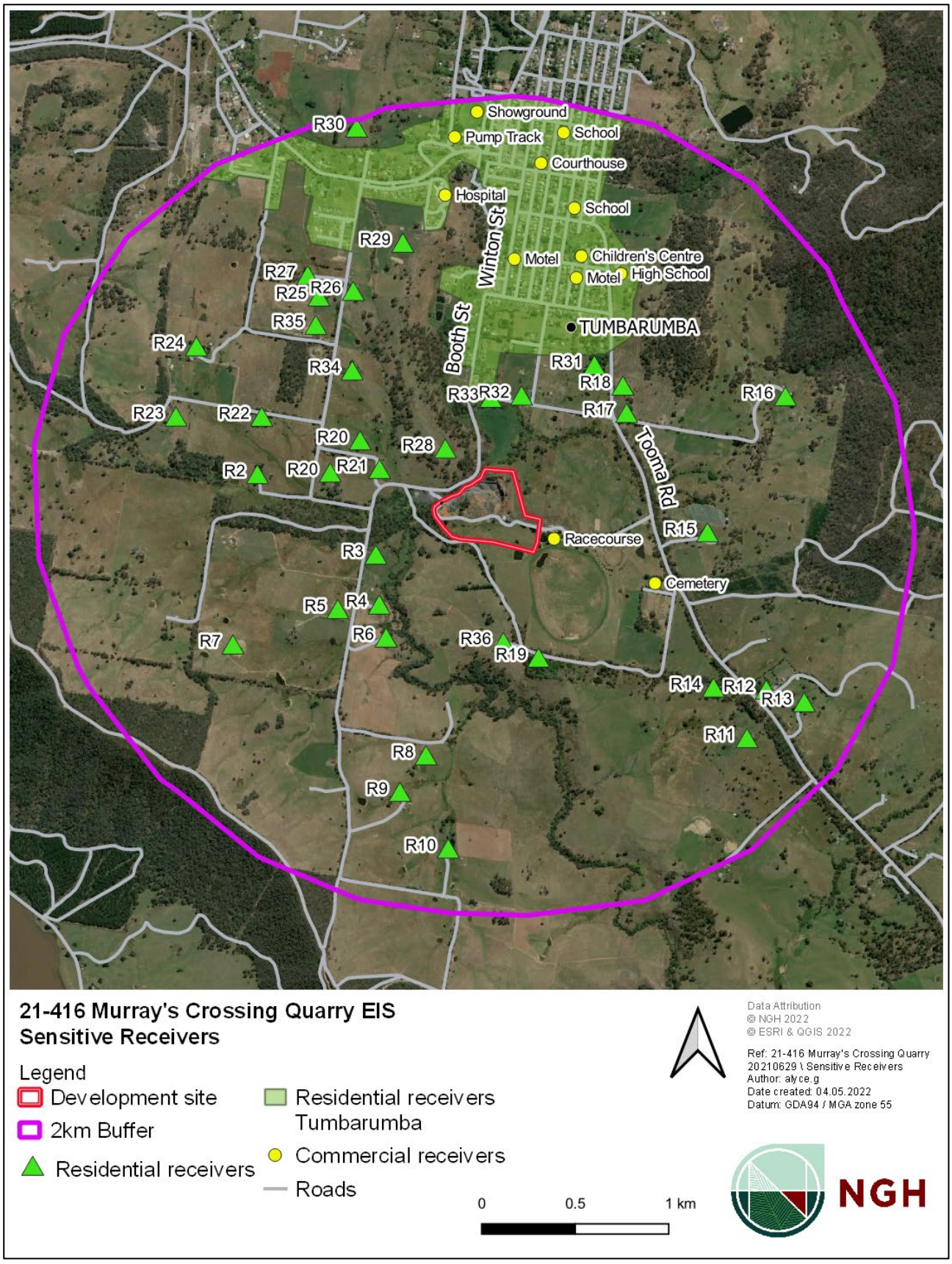

Figure 6-3 Sensitive receivers within 2km of the Development site

6.3.3 Background noise and vibration data

Noise

This assessment has adopted the minimum Rating Background Level (RBL) values described in the NPfI, based on the high likelihood that the ambient background noise levels would be 'low' in the context of the NPfI, as is common in rural environments with few sources of noise-generating infrastructure. The trigger levels for industrial noise for the Proposal are summarised in Table 6-6.

Table 6-6 Construction Noise Management Levels – all receivers

Period	Recommended "rural" amenity noise level dBA L_{Aeq}	Minimum noise level, dBA		Project noise trigger levels, dBA $L_{Aeq(15\ min)}$	
		RBL	$L_{Aeq(period)}$	Intrusiveness	Amenity[1, 2]
Daytime[3]	50	35	40	40	48

1. No other sources of industrial noise are present in the area and are not likely to be in the future. As such, the recommended amenity noise levels have been taken as the project amenity noise levels, as outlined in the NPfI.

2. The project amenity noise levels have been converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.

3. Day – the period from 7:00 am to 6:00 pm Monday to Saturday or 8:00 am to 6:00 pm on Sundays and public holidays.

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, intermittency or significant low-frequency content. The NPfI specifies the following modifying factors (Table 6-7) applicable to the Project and which are to be applied to the received noise level where annoying characteristics are present.

Table 6-7 NPfI modifying factors

Factor	Assessment / measurement	When to apply	Correction[1]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by the levels defined in the NPfI.	5dB[2]
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements	Measure/assess source contribution C and A weighted Leq,t levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and the level to which the thresholds defined in the NPfI are exceeded.	2 or 5dB[2]
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated.	Maximum correction 10 dB[2] (excluding duration correction)

When trucks and other vehicles are operating within the boundaries of the Development site, noise contributions are included in the predicted noise emissions. When Proposal-related traffic moves

onto the public road network a different noise assessment methodology is appropriate, as vehicle movements are regarded as 'additional road traffic' rather than as part of the works and are assessed in accordance with the NSW *Road Noise Policy* (RNP).

An initial assessment is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2 decibels (dB) (i.e., equates to an increase in traffic volumes of approximately 60%) due to construction traffic. Where noise levels increase by more than 2dB (i.e., 2.1dB or greater) further assessment is required using the criteria presented in the RNP, as shown in Table 6-8.

Table 6-8 RNP criteria for assessing Proposal-related traffic on public roads

Road Category	Road Category Type of Project/Land Use	Daytime Assessment Criteria, dBA (7.00am – 10.00pm)
Freeway / arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq(15hour) 60 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	LAeq(1hour) 55 (external)

Blasting

Long-term data for the blasting assessment was taken from a monitoring station approximately 500m north of the Tumbarumba quarry on the corner of Byatt and Booth Streets. It is noted that some residences will be closer to the blast positions than the monitoring location.

Airblast overpressure

The recommended maximum level for airblast overpressure is 115 dB Linear Peak.

That may be exceeded for up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dB Linear Peak at any time.

Ground vibration

The recommended maximum level for ground vibration is 5 mm/s (peak particle velocity, PPV). It is recommended that a level of 2 mm/s be considered as a long term regulatory goal.

The PPV level of 5 mm/s may be exceeded for up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time.

Timing and frequency of blasting

Blasting should only occur during the hours of 9:00 am to 5:00 pm Monday to Saturday and should generally take place no more than once per day.

The proposed blasting times between 10:00 am and 3:00 pm occur within that time period.

Refer to the Noise and Blasting Assessment (Appendix L) for a detailed review of blasting methodology.

6.3.4 Operational noise assessment

Quarry activities

The quarry will utilise conventional extraction and processing methods which includes the following:

- Blasting is used to loosen rock material
- The loosened material is fed directly into a primary impact crusher and secondary crusher
- The material then feeds into a screen to sort the various products
- The screened and sorted material is stockpiled on site using a front-end loader, which is also used to load the delivery trucks (eg “dog and trailer”)
- Material is transported off-site along a dispatch road of approximately 490m.

The acoustically significant plant/equipment associated with the quarrying operations has been provided in Table 6 of the Noise and Blasting Assessment (refer to Appendix L).

The sources were modelled relative to the existing local ground height of the additional pit and haul road locations at Proposal commencement in order to represent a “worst case” situation. Noise sources will gradually lower into the pit as the quarry progresses.

The results of the noise modelling for each of the Proposal activities and the overall predicted noise level (i.e. all activities operating simultaneously) have been provided in Table 6-9.

Table 6-9 Predicted noise levels – all operations

Receptor	NPfI Daytime PNTL dBA $LA_{eq(15min)}$	Predicted Noise Level, dBA LAeq(15minute)					
		Quarrying	Processing	Stockpiling	Maintenance	Product Dispatch	Total
R01	40	40	42	25	26	41	**46**
R02	40	35	37	20	20	36	**41**
R03	40	26	35	25	24	34	38
R04	40	21	26	21	10	25	29
R05	40	21	31	20	16	27	33
R06	40	19	23	19	< 10	23	27
R07	40	19	34	10	13	30	36
R12	40	11	12	< 10	< 10	10	16
R14	40	13	14	< 10	< 10	12	18
R15	40	17	18	< 10	< 10	15	22
R16	40	12	13	< 10	< 10	15	19
R17	40	21	21	16	13	25	28
R18	40	20	22	19	15	35	35

Receptor	NPfl Daytime PNTL dBA $LA_{eq(15min)}$	Predicted Noise Level, dBA LAeq(15minute)					
		Quarrying	Processing	Stockpiling	Maintenance	Product Dispatch	Total
R19	40	20	20	14	< 10	15	24
R20	40	42	35	27	28	43	**46**
R21	40	44	47	30	33	47	**51**
R22	40	35	37	20	20	35	**41**
R25	40	21	21	17	12	21	27
R26	40	19	21	19	< 10	19	25
R27	40	20	19	16	10	19	25
R28 (unoccupied)	40	51	55	35	37	52	**58**
R31	40	21	32	22	17	35	37
R32	40	27	45	25	24	36	**45**
R33	40	28	46	27	24	30	**46**
R34	40	33	24	22	20	29	35
R35	40	35	22	17	15	29	36
R36	40	22	17	< 10	< 10	15	24

As can be seen in Table 6-9, noise levels from the quarry operations are predicted to exceed the NPfl PNTLs at eight receptors, particularly for quarrying, processing and product despatch.

The predicted exceedances of the daytime PNTL were up to 11 dBA for all activities occurring at the same time – which may be relatively unlikely – at the nearest occupied receptor (R21). An exceedance of that magnitude would be considered significant. The predicted exceedance at R28, which is unoccupied, was 18 dBA.

Noise from the activities is not expected to contain any ‘annoying’ characteristics (described in Table 6-8) including a substantial low frequency component, when observed at the surrounding receptors, and therefore no modifying factor is required for the predicted noise levels.

Quarrying and processing generally generate the highest predicted noise levels, in particular at receptors that are not shielded by the quarry benches. This is also the case for product dispatch, which is done within line-of-sight of the nearest receptors to the northwest.

It is important to note that the quarrying activities were assessed at the highest point on the site. As quarrying progresses, noise levels would be likely to decrease at several receptors as activities are shielded by the quarry benches that are formed.

Acoustic screening was investigated for the fixed activities to reduce noise to potentially affected receivers. The topography of the surrounds does not suit the use of acoustic screening as many receptors to the north and northwest are at higher elevation meaning that the effectiveness of the screen is easily diminished. Nonetheless, some reduction benefit (albeit relatively small) may be obtained from judicious positioning of stockpiles relative to fixed plant.

The predicted noise levels suggest that the level of noise from the current quarry operations exceed the minimum PNTLs established as part of this assessment. It is understood that noise-related complaints have not been received by the Proponent.

It is also possible that the level of quarry noise received at most receptors is not dominant in the context of the ambient environment which may be influenced by natural or other noise sources and potentially 'mask' quarry noise. This would be confirmed during the proposed monitoring program.

Road traffic noise

The daily rate of material processed at the quarry would increase following the expansion of the quarry. Therefore, it is expected that additional trucks movements would also increase, with an additional 38 truck movements per day. The surrounding road network has a low vehicle demand and is considered to have adequate capacity to readily accommodate the modest increase in traffic associated with the expansion of the quarry. As such, the Proposal will have no discernible impact on the operation of the surrounding road network and the traffic can be accommodated in a safe manner. It is expected that the Project would not noticeably increase the traffic volume on the local road network, so the RNP +2 dB criterion would not be exceeded.

6.3.5 Operational blasting assessment

The results of the blasting assessment are provided in Table 6-10.

Table 6-10 Blasting impacts for Maximum Instantaneous Charge (MIC) of 40kg – 150kg

Receptor	Description	Direction and distance	Predicted vibration (mm/s PPV) at MIC			Overpressure (dB linear peak) at MIC		
			40kg	70kg	140kg	40kg	70kg	140kg
R28	Residential (not occupied)	NW, 300 m	4.6	7.2	13.2	118.4	120.7	123.7
R21	Residential	WNW, 620 m	1.4	2.2	4.1	109.2	111.6	114.5
R03	Residential	WSW, 700 m	1.2	1.8	3.4	107.7	110.1	113.0
Racecourse	Buildings	E, 270 m	5.4	8.5	15.6	119.7	122.1	125.0

Airblast overpressure is not expected to exceed the ANZEC guideline criteria of 115 dBL at the nearest residential receivers R21 and R03 up to an MIC of approximately 140kg.

If the unoccupied dwelling R28 is occupied in future, there would be risk of exceeding the ANZEC Blast overpressure value at MIC of 40kg. Vibration levels would also be below the ANZEC annoyance criteria of 5 mm/s PPV.

At the closest unoccupied receiver R28 and the Racecourse buildings, a maximum MIC of approximately 140 kg is predicted not to exceed the AS 2187.2 cosmetic damage criteria.

Notwithstanding the above assessment, it is recommended that blasting noise and vibration monitoring be continued at the quarry, to further develop the 'Site Law' for the quarry. The purpose of the Site Law is to refine the efficiency of each blast whilst maintaining compliance with the applicable limits.

The blasting variables are readily managed through good blasting practices and the continuation of the current BMP should ensure the potential for impacts are minimised such that adverse effects are fully avoided.

6.3.6 Safeguards and mitigation measures

Table 6-11 Safeguards and mitigation measures for noise and vibration impacts

No.	Mitigation Strategy	C	O	R
NV1	An Operational Environmental Management Plan (OEMP) will be developed. The OEMP will include the following, as necessary: • Noise monitoring requirements • Notification procedures for the sensitive receivers identified in this report • Complaints handling procedure and point of contact • Noise monitoring program and implementation procedure • Record of blasting dates, blast charges and locations • Complaints registered • Map of on-site noise barriers/berms	**C**	**O**	**R**
NV2	An annual monitoring program will be undertaken to establish / confirm: • The noise level and characteristics of the current quarry activities • The sound emission of quarry plant/equipment items • Actual ambient background noise levels (to be used as a basis for the PNTLs and update this assessment as appropriate)	**C**	**O**	
NV3	Blasting will be restricted to daytime hours (9.00am – 5.00pm, Monday to Saturday).	**C**	**O**	**R**
NV4	Product stockpiles will be located to the northwest of fixed plant, where possible.	**C**	**O**	**R**
NV5	Avoid dropping extracted material from excessive height into carry vehicles.	**C**	**O**	**R**
NV6	The Proponent would investigate reasonable measures to reduce noise, including: • Relocation of processing plant to afford screening due to quarry benches and local topography • Purpose-built noise reduction bunds/barriers (where local topography allows)	**C**	**O**	
NV7	Keep noise generating equipment well maintained and lubricated.	**C**	**O**	**R**
NV8	Plant and equipment to be operated in a quiet and efficient manner, including: • Turning off plant and equipment that is not being used. • Ensuring plant is regularly maintained. • Repairing or replacing equipment that becomes noisy.	**C**	**O**	**R**
NV9	All staff on-site to be informed, through toolbox meetings, training and education, of procedures to operate plant and equipment in a quiet and efficient manner.	**C**	**O**	**R**
NV10	Adjoining landowners to be notified of any blast 2-3 days prior to the blast event.	**C**	**O**	**R**

No.	Mitigation Strategy	C	O	R
	Livestock to be relocated away from blasts as necessary.			
NV11	It is estimated that blasting activities (excluding drilling and charging) will occur five to six times a year during the following hours: • Monday to Saturday 9am to 5pm.	**C**	**O**	**R**
NV12	All blasts should be monitored in accordance with EPL requirements. Monitoring will confirm noise constants and compliance with blasting criteria.	**C**	**O**	
NV13	Blast monitoring will be in accordance with the monitoring requirements for blasting activities outlined in the Australian and New Zealand Environment Council Technical Basis for Guidelines to Minimise Annoyance Due to the Blasting Overpressure and Ground Vibration (1990).	**C**	**O**	**R**
NV14	The BMP will be updated, as required, to incorporate proposed operations of the quarry and detail the mitigation and management procedures for minimising potential impacts.	**C**	**O**	
NV15	The quarry operator is to keep a record of all complaints made in relation to noise arising from quarry operations. The record must include the following detail: • The date and time of the complaint. • The method by which the complaint was made. • Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect. • The nature of the complaint. • The action taken by the quarry operator in relation to the complaint, including any follow-up contact with the complainant. • If no action was taken by the licensee, the reasons why no action was taken.	**C**	**O**	**R**

C: Construction; O: Operation; R: Rehabilitation

6.4 Topography, geology and soils

6.4.1 Approach

A desktop survey was undertaken by NGH to evaluate soil characteristics of the Development site and surrounding nearby landscape. eSPADE profiles from nearby areas were investigated with the closest profile located approximately 1km southeast of the site and around 30m higher in the landscape (NSW Government, 2021). SEED mapping was used to determine the soil landscapes and soil limitations of the Development site (NSW Government, 2021).

6.4.2 Existing environment

The Development site includes an active quarry, which is situated within the lower slopes of hilly terrain. The proposed extension would see the excavation of material from the upper slopes of the range. The existing operation was observed to consist of bare earth, gravels and hard rock, while the undeveloped portions of the site were comprised of grasses. Shrubs and trees were observed sporadically throughout the site.

6.4.3 Topography and geology

The Development site is located at an elevation range of approximately 620m to 660m AHD. The land immediately surrounding the Development site is relatively flat or lightly undulating in all directions for a radius of approximately 2.5km. Outside this radius, the land to the east rises steeply over approximately 2km to a height of approximately 1100m AHD. Land to the west initially increases in height and then over approximately 600m it decreases to a height of approximately 500m AHD. Two first order drainage lines occur within the eastern and southern sections of the Development site (refer to Figure 6-5). These drainage lines feed into Tumbarumba Creek, which is a fifth order stream and located immediately west of the Proposal.

Soils have formed on parent materials consisting of Tertiary basalt. These flat-topped basaltic hills are associated with consolidated volcanic rocks of the Nine Mile hydrogeological landscape (HGL) (NSW Government, 2021). The Nine Mile HGL has a patchy distribution and comprises a number of soil landscapes of basaltic origin, with some derived from underlying granites. Minerology includes unnamed mafic volcanic rocks, including basalt, trachyte, trachybasalt, trachyandesite, leucite, basanite, nephelinite, limburgite, rhyolite and tuff. Minimal land degradation is apparent as associated soils are very stable.

The majority of the Development site is located on the Nacki Nacki Variant A (nnwa) soil landscape (NSW Government, 2021). This landscape is characterised by undulating rises on granodiorite and minor granite. Elevations generally range from 300 to 1000m AHD. Local relief is between 20m to 50m with a modal slope of 3% to 10%. Vegetation is comprised of extensively cleared dry sclerophyll forest, with dry montane forest occurring in upland areas.

The Tooma (toq) soil landscape was identified within the northern portion of the Development site on either side of Tumbarumba Creek (NSW Government, 2021). This landscape is characterised by the small, narrow floodplains of Tumbarumba Creek and the Tooma River. Elevations generally range from 500m to 670m AHD. Local relief is generally <10m with a modal slope of <5%. Vegetation is comprised of extensively cleared montane moist forests.

The Courabyra (com) soil landscape was identified along the western boundary of the Development site. This landscape is characterised by gently undulating low hills on basalt in the highlands. Elevation ranges from 500m to 1040m AHD. Local relief is generally to 30m with a

modal slope of 10%. Vegetation is comprised of extensively cleared montane forest and dry sclerophyll forest.

6.4.4 Soil

Soil landscape mapping identified that Rudosols and Dermosols were likely to be present on the upper slopes and hillcrests in the area. Alluvial rudosols occur in the northern portion of the Development site and are associated with deposition from Tumbarumba Creek. A nearby eSPADE profile, located approximately 1km southeast of the Development site, identified that Tenosols (ASC) and Red Podzolic Soils (Great Soil Groups) comprised the soil profile. Soils are derived from the underlying granite lithology, which have experienced overland flows of basalt.

6.4.5 Limitations

The Courabyra soil landscape is an erosional landscape. The Nacki Nacki and Tooma soil landscapes experience minimal erosion, providing that good ground cover is maintained. Riling of batters and evidence of sodic subsoils occur within the lower slopes and poorly drained areas of the Nacki Nacki soil landscape.

The digital soil maps for key soil properties over New South Wales (NSW Government, 2021) was used to refine limitations identified from the soil landscape. Limitations include:

- Engineering hazards
- Sheet and gully erosion hazards.
- Steep slopes.
- Rocky outcrops.

Acid sulphate soils

Acid Sulphate Soils (ASS) are not considered to be present on site. According to eSpade (NSW Government, 2021), the Development site is not identified as an area that contains ASS.

Naturally occurring asbestos

Naturally Occurring Asbestos (NOA) occurs within the Snowy Valleys LGA (NSW Government, 2021). However, the Development site is not mapped in an area with potential for NOA to occur (Appendix O).

6.4.6 Potential contamination

A search of the NSW EPA contaminated land public record (EPA, 2021) was performed for contaminated sites within the Snowy Valleys LGA on 12 January 2022. The search did not return any results for the site or the Tumbarumba locality. The closest listed site was in Talbingo, approximately 34km northeast of the Development site.

A quarry is currently operational within the Development site. Other land uses within the undeveloped portion of the Development site include grazing. No mining has occurred within the site. There is a low risk that contamination associated with the quarry operation could be present at the Development site, due to plant operations and blasting activities.

6.4.7 Potential impacts

The proposed quarry would be an extension of the existing Murray's Crossing Quarry operation. The pit footprint would increase incrementally over the life of the quarry. As a result, construction and operational impacts have been assessed as a gradual and ongoing process.

Earthworks required during construction include the construction of haul roads, the removal and stockpiling of topsoil and overburden and the creation of an additional sediment dam (refer to Figure 3-10).

Pit development is a staged process. Topsoil and overburden would be removed gradually as required. The area of land already impacted by the existing development, as well as the proportion of land to be impacted by the proposed extension, is provided in Table 6-12.

Table 6-12 Area of land impacted at each stage of the development

Stage	Activity	Amount of land (ha) impacted
Existing operation	Existing pit, haul roads, sediment dam, site office and workshop/amenities.	3.76
Proposed operation	Pit extension, haul roads, stockpiling locations, sediment dam and relocation of workshop/amenities.	7.35
Total development impact		**11.11**

Topsoils would be removed and stockpiled separately. The stockpile site would be located within the southwestern portion of the development footprint (refer to Figure 3-10).

Areas of disturbance would include the pit footprint, haul road, workshop / amenities, the stockpile location and sediment dams. Construction activities would remove the existing groundcover and disturb soils, potentially increasing their susceptibility to erosion and subsequent sedimentation in areas offsite. Groundcover would be retained as far as possible prior to, during and post-construction. Soil compaction would occur as new haul roads are created. This would reduce soil permeability thereby increasing run off and the potential for concentrated flows.

Overall, the risk of erosion is considered low. With the implementation of safeguards and mitigations measures, runoff is considered to be readily manageable and unlikely to cause substantial erosion or lead to substantial sediment loads entering any natural waterways.

Operational maintenance activities and vehicles would be largely confined to formalised access tracks, minimising impacts to soils. Runoff from these areas could lead to increased soil erosion along drainage lines. Roads are likely to be built from the underlying rock material, drain internally towards the centre of the pit and be consistently compacted by moving plant and heavy vehicles.

The use of fuels and other chemicals onsite poses a risk of soil contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and (minimally) herbicides. Spills of these contaminants can alter soil health, affecting its ability to support plant growth. When mobilised, such as in a rain event or flooding, the substances may spread via local drainage lines, affecting much larger areas including aquatic habitat. Overall, these risks are low and considered readily manageable.

As NOA is not likely to occur within the Development site, it is unlikely that the minor earthworks required during construction would impact on any NOA.

Erosion and Sediment Control

The guideline for statutory requirements and erosion and sediment control strategies is the *Managing Urban Stormwater: Soils and Construction Volume 2E Mines and Quarries* (DPIE, 2008). Management objectives of erosion and sediment control strategies are to ensure no pollution to surface water or nearby water tributaries. The aim would be to firstly minimise erosion and then capture sediments from disturbed areas.

As water is used for daily quarry operations, it is unlikely the sediment dams would fill enough that there would be a threat to the surrounding environment from dirty water discharge. However, to ensure that this would not occur, the sediment dams would be inspected monthly. Accumulated sediment depth would be measured to ensure sufficient storage capacity remains.

Road batters would be stabilised with regenerating vegetation. Methods of stabilisation prior to regeneration of vegetation can include soil binder applications, mulch and topsoil mixes to prevent erosion. The most appropriate method would be investigated prior to vehicle access road construction and detailed in the ESCP.

A contour bank would be located south of the proposed pit extension and proposed waste stockpile (refer to Figure 6-4). The contour bank would be approximately 1 metre wide. The contour bank would be created from excavated spoil to intercept clean water runoff and divert it away from the development. Runoff would be diverted to an existing ephemeral stream.

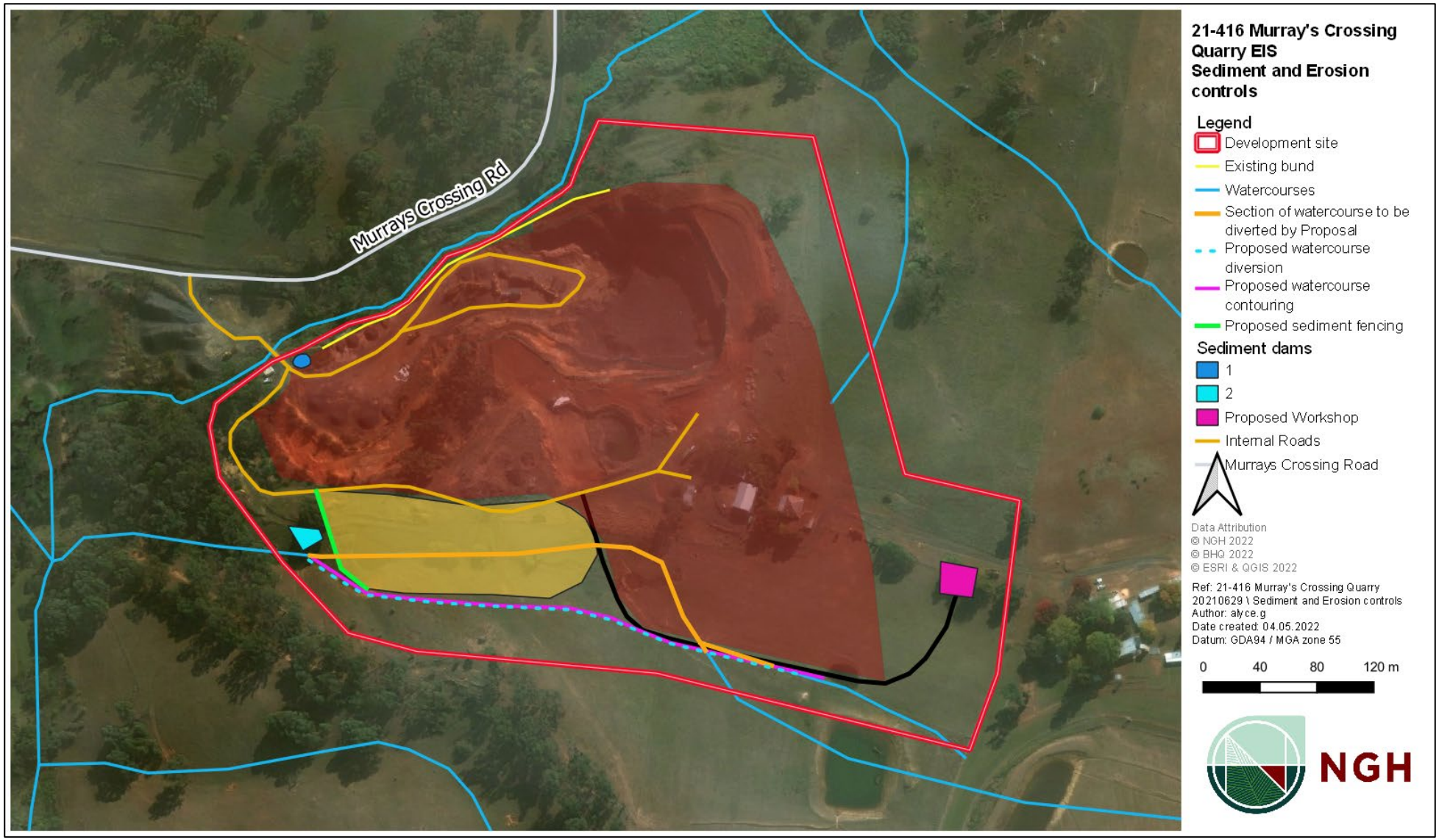

Figure 6-4 Sediment and erosion controls for the proposed development

6.4.8 Safeguards and mitigation measures

Table 6-13 Safeguards and mitigation measures for soil impacts

No.	Safeguards and mitigation measures	C	O	R
SO1	Clearly mark out areas of operation for construction and stripping purposes	**C**		
SO2	A Soil and Water Management Plan (SWMP) and Erosion and Sediment Control Plan (ESCP) would be prepared as part of the CEMP and OEMP. These plans would be implemented and monitored during the construction and operation of the Proposal, in accordance with Landcom (2004) and DPIE (2008) to minimise soil (and water) impacts. Refer to section 6.12.3 for details on what to include in the SWMP and ESCP.	**C**	**O**	
SO3	Best practice management measures to be employed where applicable to reduce the risk of erosion and sedimentation control: • Preserve and stabilise disturbed areas, drainageways and steep slopes. • Minimise the extent and duration of disturbance. • Install perimeter controls. • Employ the use of sediment control measures to prevent off- and on-site damage. Inspect and maintain sediment and erosion control measures regularly. • Control stormwater flows onto, through and from the site in stable drainage structures. Protect inlets, storm drain outlets and culverts. • Provide access and general construction controls.	**C**	**O**	
SO4	Any area temporarily used during construction (laydown and trailer complex areas) will be restored to original condition or re-vegetated with native plants where possible.	**C**		

C: Construction; O: Operation; R: Rehabilitation

6.5 Water use, quality (surface and groundwater) and hydrology

The quality of water resources is closely linked to the surrounding environment and land use. Poor water quality has a negative impact on public health, the health of our ecosystems, recreational activities, farming and other activities. Measures of water usage help evaluate the level of demand from industrial, agricultural, and domestic users.

6.5.1 Existing environment

The Development site is located within the upper Murray Catchment area (DPI, 2022). The catchment covers an area of 35,170km^2 and contributes 17% of water flows into the Murray-Darling Basin in NSW. The Murray River is Australia's longest river, extending for 2,500km from Mount Kosciuszko in the Australian Alps to the Southern Ocean at Goolwa, in South Australia (DPI, 2022).

Surface water

The surface waters of the Development site are regulated under the Water-sharing Plan for the *Murray Unregulated River Water Sources 2011*. Two ephemeral watercourses intersect the Development site (refer to Figure 6-5). Runoff waters flow to the north and west via unnamed ephemeral drainage lines to Tumbarumba Creek. Two man-made farm dams occur within the Development site and are located along the drainage line traversing the south of the site. Tumbarumba Creek is located immediately west of the Proposal.

Tumbarumba Creek is a perennial 5th order stream under the Strahler Stream Classification System (DPI, 2018), which drains into the Tooma River approximately 42.5km south east of the Development site. Tooma River is a 7th order stream and feeds into the Murray River, which is classified as an 8th order stream (DPI, 2018).

There are no protected wetlands or water bodies within the Development site.

A water quality technical report for the Murray Lower Darling surface water resource plan area (WRPA) (SW8) was used to establish water quality for the area (DPIE, 2020). The water quality data used in the report was compiled from 14 routine water quality monitoring stations located within the Murray-Darling Basin. Water quality readings taken at the closest monitoring point to Tumbarumba (Jingellic, station number 401201A) indicated that the water was of 'good' quality (DPIE, 2020).

Long-term monitoring data for Tumbarumba Creek (1997 – 2008) is provided in Table 6-14 (TSC, 2009).

Table 6-14 Water quality at Tumbarumba monitoring site

Tumbarumba Creek	Median values			Default trigger values*
	1997-2000	2000-2004	2004-2008	
Dissolved oxygen (mg/L)	11	10	9	No guideline value
Dissolved oxygen saturation (%)	-	-	92	Between 90-110
Electrical conductivity (µS/cm)	48	35	24	350

Tumbarumba Creek	Median values			Default trigger values*
	1997-2000	2000-2004	2004-2008	
pH	7.6	7	6.9	Between 6.5 - 7.5
Temperature (degrees C)	20	10	15	No guideline value
Total phosphorus (µg/L)	100	58	-	20
Total suspended solids (mg/L)	-	9	6	No guideline value
Turbidity (NTU)	64	12	7	25

*Trigger values were based off ANZECC guidelines (ANZECC, 2000)

Figure 6-5 Surface hydrology

6.5.2 Water quality monitoring

The Proposal involves an extension of the existing operations at Murray's Crossing Quarry. BHQ have been operating the Crown Quarry Reserve for 12 years under an existing land use rights agreement with SVC. As such, no environmental assessments or water quality monitoring has occurred to determine the potential impact of the development on nearby watercourses, such as Tumbarumba Creek. To determine baseline conditions and management requirements for the Proposal, a six-month water quality monitoring program (WQM) was undertaken.

The overarching key objectives of surface WQM are to inform and respond to changes in water quality to ensure that:

- Water quality is maintained to protect aquatic ecosystems
- Water quality is maintained for water supply, primary and secondary contact recreation and consumption of cooked aquatic foods
- Maintain visual amenity.

Methodology

NGH were engaged to complete a WQM program at three locations, once a month, for a period of six months (refer to Table 6-15). Surface WQM was undertaken in accordance with the Queensland Department of Environment and Science (DES) Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2018.

Table 6-15 Timing of sampling events

Sampling event	Date
Event 1	20 September 2021
Event 2	20 October 2021
Event 3	19 November 2021
Event 4	21 December 2021
Event 5	21 January 2022
Event 6	18 February 2022

Monitoring locations

Three water sampling locations were chosen. The locations of the sampling points are detailed in Table 6-16 and Figure 6-6.

Refer to Appendix I for WQM data.

Table 6-16 Sampling point locations

Sample ID	Description	Easting	Northing	UTM
Point 1	Upstream of wetland	591126.86	6038959.61	55
Point 2	Downstream of wetland and upstream of quarry	591176.60	6038679.87	55
Point 3	Downstream of quarry	590823.461	6038474.501	55

Sampling methodology

NGH performed the water sampling at each location as identified in Figure 6-6. The following methodology was followed:

- Surface water samples were collected using a grab sample technique. Samples were collected into unpreserved laboratory containers with the use of a telescopic sampling pole. The sample was collected 100mm to 500mm below the surface of the water
- Visual observations were recorded
- Coordinates were recorded from a hand-held GPS
- Sample containers were labelled appropriately, with sample details recorded onto the chain of custody documentation (Appendix I). Samples were immediately placed into an esky cooled with ice bricks. The esky was packed to minimise the likelihood of samples being damaged during transit
- Reusable sampling equipment was decontaminated between sampling locations by rinsing the equipment and sampling bottle with stream water at the subsequent location three times
- Field analysis was undertaken by placing the water quality multi-probe directly into the water and allowing for the parameters to stabilise before taking a recording. The water quality meter was calibrated prior to use and calibration certificates stored electronically and provided with the monthly results report (Appendix I)
- Samples were dispatched to the laboratory as soon as practicable following sampling.

Field and laboratory analysis

Surface water monitoring included:

- Field parameters – A YSI ProDSS (digital sampling system) water quality multiparameter instrument (or similar) for the measurement of several critical parameters including pH, turbidity, temperature, dissolved oxygen (% and mg/L), oxidation reduction potential, electrical conductivity, and GPS coordinates
- Visual observation – Oil and grease (i.e., hydrocarbon sheen)
- Laboratory analysis –Total suspended solids (TSS) analysed by the Environmental Analysis Laboratory (EAL) at Charles Sturt University
- Field observations – weather and rainfall (prior to and at the time of the sampling event), surrounding influencing factors e.g., land use activities, events, incidents
- Comparisons with long-term data from Tumbarumba Creek (station number 401007), refer to Table 6-14, and ANZECC (2020) guidelines.

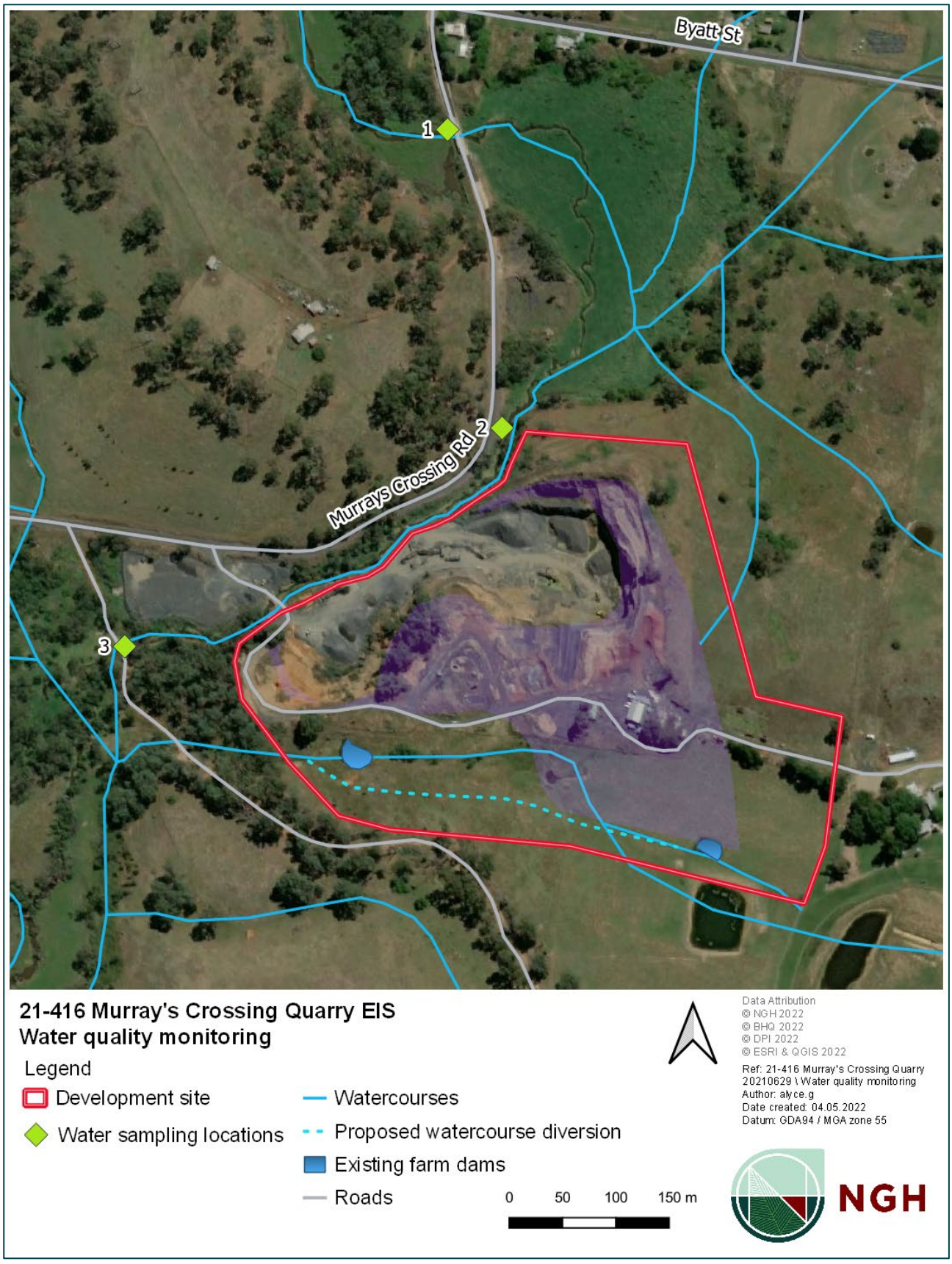

Figure 6-6 Water sampling locations

Results

Table 6-17 Monthly water quality monitoring results for each location (September 2021 to February 2022)

Parameter	Unit	Point 1		Point 2		Point 3		Comment
		Result range	Mean	Result range	Mean	Result range	Mean	
Grease /oil / sheen	Presence/ absence	Absent	Absent	Absent	Absent	Absent	Absent	No evidence of grease / oil / sheens was noted. A sheen was observed at Point 3 during the February 2022 sampling period. The sheen was not caused by hydrocarbons.
Temperature	°C	8.1 – 17.2	13.5	8.8 – 16.9	13.4	8.4 – 16.7	13.2	Temperature readings were consistent with long-term monitoring undertaken at Tumbarumba Creek (refer to Table 6-14).
Dissolved oxygen	%	87.2 – 133	104.1	66 – 128.7	97.5	83.7 – 126.8	101.4	The ANZECC (2020) guidelines for upland streams indicate that dissolved oxygen (DO) should be between 90 - 110%. The results obtained are largely within those parameters.
Dissolved oxygen	mg/L	9.61 – 13.35	10.9	7.65 – 13.03	10.3	9.31 – 12.89	10.8	DO readings were consistent with long-term monitoring undertaken at Tumbarumba Creek (refer to Table 6-14).
Specific conductivity	SPC µS/cm	0.036 – 47.1	31.9	0.06 - 44	31.5	0.001 – 39.3	31.2	
Conductivity	µS/cm	24.4 – 36.4	30.1	29.7 – 42.2	35.4	1 – 32.6	24.9	Conductivity generally falls between 30-350 µS/cm within upland streams in NSW (ANZECC, 2000). On average, conductivity fell within the lower limits of this range. Conductivity in upland streams will vary,

Parameter	Unit	Point 1		Point 2		Point 3		Comment
		Result range	Mean	Result range	Mean	Result range	Mean	
								depending on catchment geology (ANZECC, 2000). The majority of the Development site occurs on Nacki Nacki Variant A (nnwa) soil landscape, which is characterised by undulating rises on granodiorite and minor granite. Streams that run through areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize (dissolve into ionic components) when washed into the water (EPA, 2022).
pH	-	6.7 – 10.95	7.7	6.32 – 9.95	7.5	6.47 – 9.46	7.5	These values are within the pH range of 6.5 – 7.5 (ANZECC, 2000).
Turbidity	NTU	14.51 – 72.3	28.6	15.12 - 49	26	0.4 – 34.08	18.2	Turbidity is a measure of the opacity of water and measured in Nephelometric Turbidity Units (NTU). Turbidity measurements include the suspended and dissolved loads. The average NTU for Point 1 was slightly higher than the range provided (2 – 25) in ANZECC (2020). Tumbarumba Creek was observed to be nearing bank full during all six sampling events. Higher NTU values can be obtained during high flow periods (ANZECC, 2000).
Total suspended solids	mg/L	8 – 47	29.2	7 – 52	19.7	9 – 49	23.7	Total Suspended Solids (TSS) refer to the particles that are larger than 1.2 microns and measured in the water column. TSS for Point 1 were observed to be higher than that

Parameter	Unit	Point 1		Point 2		Point 3		Comment
		Result range	Mean	Result range	Mean	Result range	Mean	
								recorded during the long-term monitoring program (refer to Table 6-14). This could be attributed to the high level of pyrite observed during collection periods.

Conclusion

Mean WQM results obtained along Tumbarumba Creek were largely consistent across the three sites. Average TDS and turbidity readings were observed to be lower at Point 3, which is located downstream from the operating quarry. Average TSS at Point 3 were also observed to be lower than Point 1, which was located approximately 300m downstream from the development.

Particulates were observed on the water at Point 3 during the February 2022 sampling period. The particulates consisted of dust which had settled on the water. No other evidence of grease, oil or a sheen was noted during the sampling periods. Tumbarumba Creek flows through the Tumbarumba township, which is located 2km north of the site. Storm water flows can contribute pollutants, such as nutrients and hydrocarbons, to local waterways. Run off from the site would be captured in sediment dams; therefore, it is not expected that stormwater would be entering the waterways from the site. Given the results of the WQM assessment and providing that the safeguards and mitigation measures provided in section 6.5.6 of this report are adhered to, it is considered unlikely that the Proposal would have an impact on water quality within Tumbarumba Creek.

6.5.3 Flooding

There is no Floodplain Risk Management Plan listed on the SVC website or on the NSW Flood Data Portal (NSW SES, 2022). An email was sent to SVC regarding flood information for the area (refer to section 5.1.4 of this report).

Lyall & Associates (L&A) were engaged to prepare a flood frequency analysis (FFA) for stream flow along Tumbarumba Creek (L&A, 2022). Stream flow records were taken from Tumbarumba stream gauge (*Tumbarumba Creek No. 2* stream gauge, station no. 401007) (refer to Figure 6-7), and a decommissioned gauge, located approximately 2km north of Tumbarumba stream gauge.

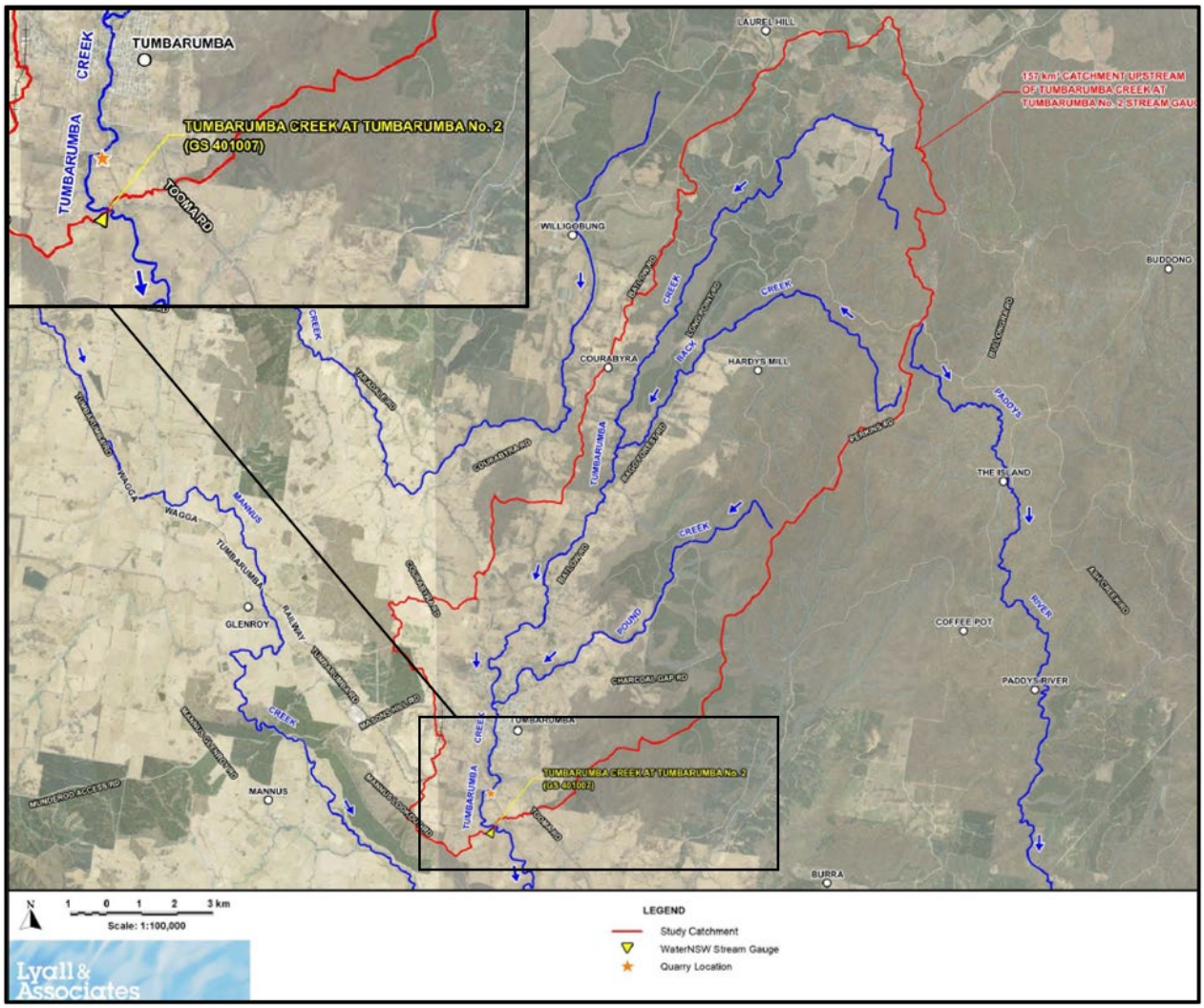

Figure 6-7 Location of *Tumbarumba Creek No.2* stream gauge (L&A, 2022)

Methodology

Long-term peak flow estimate data was used from two gauges and modelled using HEC-RAS software to determine peak flood levels and flow velocities within proximity to the Development site. The results of the modelling were used to plot the indicative extent of inundation in the vicinity of the quarry for design floods with Annual Exceedance Probabilities (AEPs) of 5% (1 in 20) and 1% (1 in 100).

The complete methodology is available in Appendix K.

Results

The FFA assessment found that due to the low-capacity nature of the in-channel area of Tumbarumba Creek in combination with the steep sided nature of the floodplain, flood fringe areas are confined to the very edges of the inundated areas. Flood storage areas in the immediate vicinity of the quarry are also limited to the quarried area which is inundated by floodwater to a depth of about 1m in a 1% AEP flood event. Figure 6-8 shows the hydraulic categorisation of the floodplain in the immediate vicinity of the quarry for the best estimate 1% AEP design peak flow of 183m^3/s.

The results of the FFA suggest that the quarry pit would act as flood storage area during a 1% AEP flood event. Flood storage would likely increase in relation to the pit footprint, which would also increase as part of the Proposal. In the event of a flood event, all mobile plant such as excavators and loaders are moved to higher ground. Larger plant remains in place and the generator is mounted above the anticipated flood level.

6.5.4 Groundwater

Groundwater in the area forms part of the Lachlan Fold Belt Murray-Darling Basin (MDB) Groundwater source and is regulated by the *NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011* Water Sharing Plan (DPI, 2011). The Lachlan fold belt groundwater source covers an area of 16,722,000ha and consists of Cambrian to Lower Carboniferous rock successions. Both terrestrial and aquatic GDEs are present within the Development site. Moderate potential aquatic GDEs are present in the form of Tumbarumba Creek, while high potential terrestrial GDEs are present as woodlands. Refer to section 6.2 of this report for indicative mapping.

Eleven registered groundwater bores are located within 1km of the Development site. Standing water levels were not available for any of these sites at the time of reporting. The closest registered bore (GW505442) with available data was drilled to a depth of 130m with groundwater encountered at 23m with a yield of 0.25L/s (WaterNSW, 2011). This bore is located approximately 290m northwest of the Development site. Refer to Figure 6-9 for registered groundwater boreholes within 1km of the Development site.

Test holes at Murray's Crossing Quarry have reached approximately 10m below creek level. Solid rock was observed, with no significant inrush of groundwater. Small quantities of pooled water have been observed seeping from rock fractures within the quarry. This is more common in the winter months, with the summer periods being mostly dry. Where drilling has occurred within the development footprint, small volumes of groundwater seepage were observed within the rock fractures.

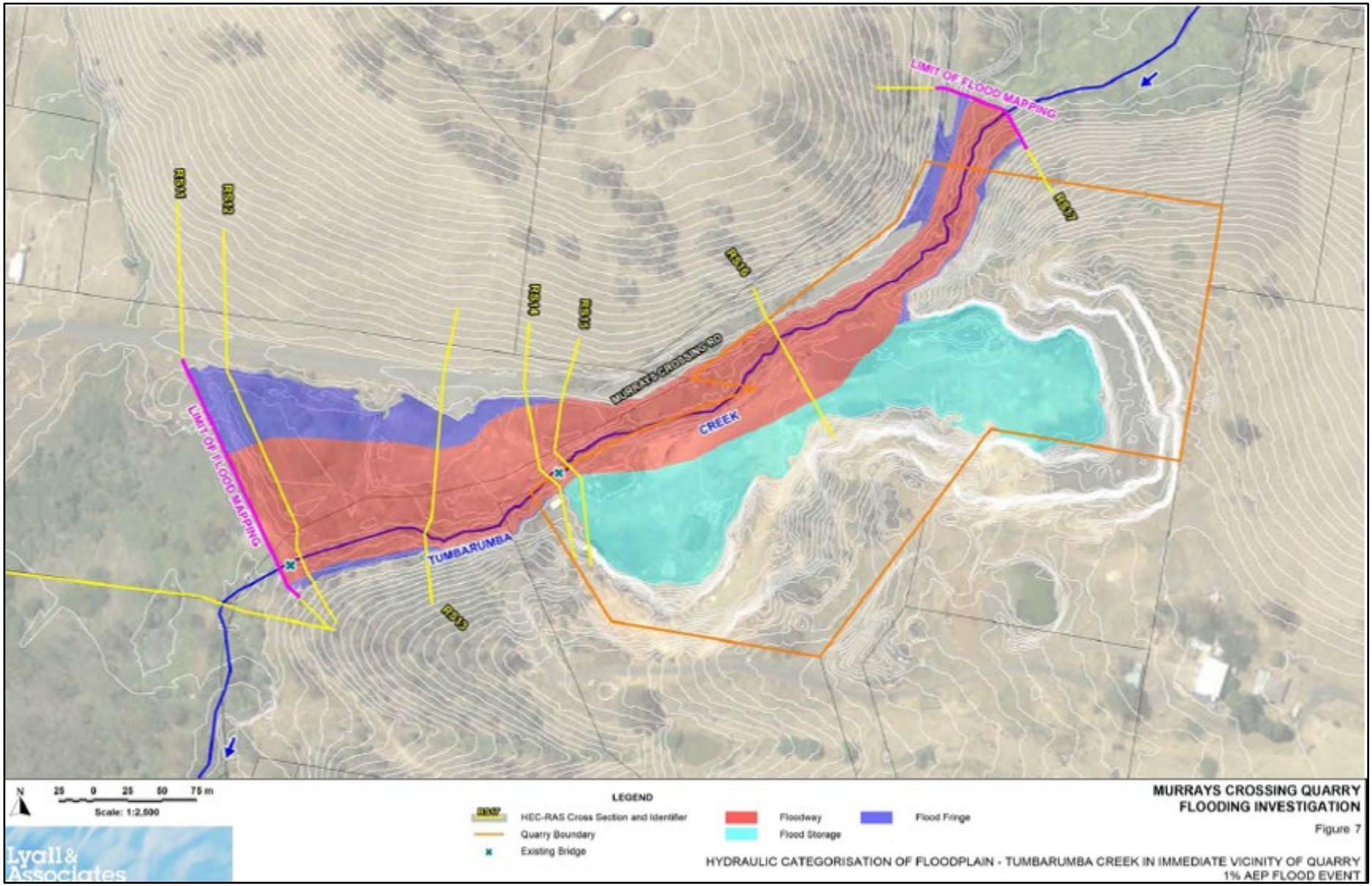

Figure 6-8 Predicted floodway during a 1% AEP flood event

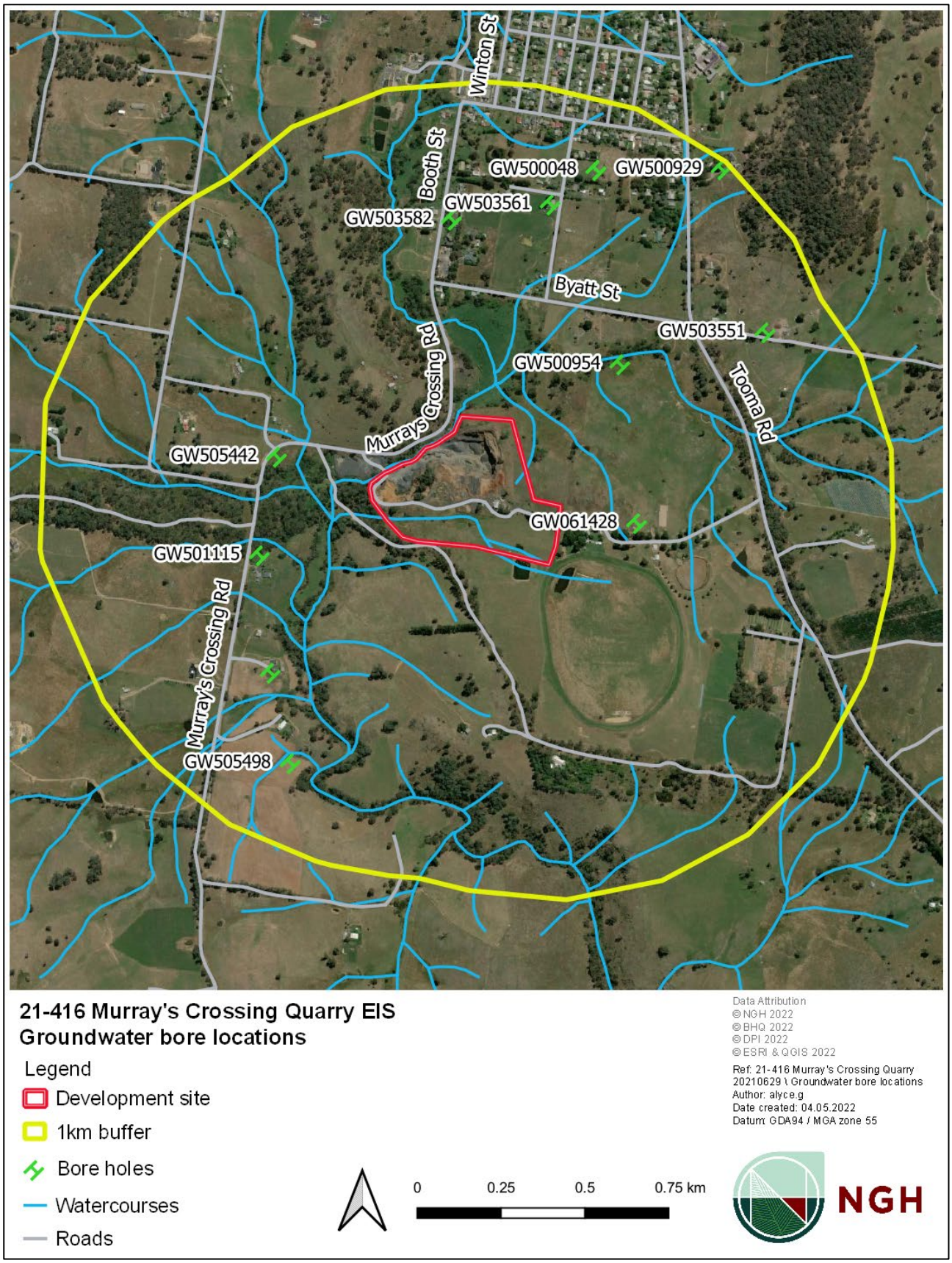

Figure 6-9 Groundwater bore locations

6.5.5 Potential impacts

Construction and operation

The proposed quarry would be an extension of the existing Murray's Crossing Quarry operation. The pit footprint would increase incrementally over the life of the quarry. As a result, construction and operational impacts have been assessed as a gradual and ongoing process.

Water Use

Water demand for the Proposal during the construction and operational phases would be consistent. Water would be predominantly used for dust suppression. It is expected that approximately 5,000L - 8,000L of water would be utilised per day. Water is currently sourced from two farm dams, and a sediment dam located within the existing pit footprint (refer to Figure 3-9). The Proposal involves the gradual removal of both farm dams, which would be replaced by a second sediment dam. It is considered likely that there would be a minor increase in water demand during periods of excavation and pit expansion. However, pit expansion would occur incrementally. Potable water for staff would be provided at the proposed workshop, which would be connected to town water (refer to Figure 3-10). Amenities are supplied with rainwater.

Surface Water Quality

Earthworks would be required progressively. Prior to the progression of quarry operations, the shallow topsoils (overburden) on site would be removed. Earthworks would include construction of the haul road extension, erosion and sediment controls, creation of new sediment dam and removal of overburden from the pit. Overburden would be used to construct the external batters of the pit.

The removal of groundcover has the potential to increase surface runoff and erosion risk during construction and operation. The topography of the Development site also has the potential to amplify erosion risk within the site. The removal and reuse of topsoil would be incremental throughout the construction phase and progressive rehabilitation would occur where practicable.

The addition of the proposed waste stockpile and pit expansion would impact on the ephemeral drainage line, located within the southern portion of the development site. A contour bank is proposed to re-route surface water around the waste stockpile. In the latter stages of pit sequencing, the surface water of the existing dam in the south-east would be lost to the pit void.

Surface water from the waste stockpile would be stored in the proposed sediment dam and reused onsite for dust suppression and for the rock crushing plant (refer to Figure 3-10). Any accumulated water within the pit would evaporate over time or be pumped out and re-used onsite for dust suppression. A detailed site water balance would be provided in the supplementary Soil and Water Management Plan (SWMP).

The use of fuels and other chemicals onsite poses a risk of surface water and groundwater contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and (minimally) herbicides. Spills of these contaminants can impact water quality. When mobilised, contaminants may spread via local drainage lines, affecting much larger areas including aquatic habitat. Overall, these risks are low and considered readily manageable.

Currently, the sediment dams release water into Tumbarumba Creek during localised flooding events. Clean water will be allowed to move off site, feeding into existing drainage lines. No other discharge of water into natural waterbodies is expected from the Proposal.

Details of erosion and sediment controls are provided in section 6.4.8 of this report.

Groundwater

Groundwater would not be utilised on site as part of this Proposal.

Due to the lack of groundwater encountered during operations to date, impacts to groundwater and groundwater dependant ecosystems are considered negligible during the construction and operational phases of the development.

Groundwater Dependent Ecosystems

Nearby GDEs are not likely to be impacted by the Proposal. Refer to section 6.2 of this report for further detail on GDEs.

Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions (EPA, 2017)

The Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions (EPA, 2017) has been developed in direct response to increasing development and a lack of integrated management of urban development, waterway health and the community's expectations in the state's waterways. Impacts from increased loads of pollutants in waterways can reduce the aquatic biodiversity and health of our waterways. Refer to Table 6-18 for the steps undertaken as part of this framework to make decisions to determine management responses for the Proposal that meet the waterway health outcomes.

Table 6-18 Framework steps

Steps	Outcomes
1. Establish context	• The Proposal involves an industrial development • Tumbarumba Creek is located immediately west of the Proposal. Tumbarumba Creek is a perennial 5th order stream under the Strahler Stream Classification System (DPI, 2018). Tumbarumba Creek is listed as KFH. • Waterway quality objectives are outlined above in section 6.5.1.
2. Effects-based assessment	Will the Proposal change the current health of the waterway? No, results of the WQM indicate that the Proposal would not have an impact on Tumbarumba Creek.
3. Compare against waterway objectives	Allowing the nearest waterways (Tumbarumba Creek) to be affected up to the numerical criterion in the trigger values should be avoided where possible. Precautionary approach where uncertainty in environmental outcomes of the Proposal should be adopted. Safeguards and mitigation measures, intended to protect local waterways, have been provided in section 6.5.6 of this report.
4. Strategic impact assessment	The risks associated with the impacts of the Proposal on the waterway are low, based on feasibility of achieving the intended outcomes of each management response. Management responses are to be developed based on Steps 2 to 4 of the Framework.
Are the risks acceptable?	Yes
5. Design and Implementation	Detailed planning would identify specific controls or treatment measures to achieve the intended management responses.

Flooding

Results of the FFA indicate that the quarry pit is prone to flooding and acts as a flood storage area during high rainfall events. Due to the enclosed nature of the proposed pit, no additional runoff is expected from the Proposal that would impact regional flood behaviour on properties, assets, and infrastructure. In the unlikely event of storm water flooding, where water may pool from heavy rainfall events, the quarry pit would likely remain stable with the implementation of benching quarry walls. Excess water within the pit would be directed or pumped to one of two sediment dams located on site. The requirements of the EIS assessment for flooding are outlined in Table 6-19 below.

Table 6-19 Identification of flood hazards

Impact	Assessed by this EIS
Any impacts the Proposal may have on the social and economic costs to the community as a consequence of flooding.	Numerous sensitive receivers (rural residences) are located within 2km of the Development site (Figure 6-3). The nearest receiver is a farmstead located about 240m north of the Development site. Given the topography of the area, flooding impacts from the Proposal to nearby sensitive receivers are unlikely.
The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood (PMF), or an equivalent extreme flood.	The results of the FFA indicate that in the event of a 1% AEP flood event, the quarry pit would act as a flood storage area.
Impacts of the Proposal on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazard categories and hydraulic categories.	Some redirection of flow may occur during a 1% AEP flood event. It is likely that the Proposal would reduce flooding activities further downstream.
Impacts of earthworks and stockpiles within the flood prone land up to the PMF level. The assessment should be based on understanding of cumulative flood impacts of construction and operational phases.	Quarrying activities would continue within the pit, as part of the Proposal. It is considered that no additional impacts would occur as part of the Proposal.
Relevant provisions of the NSW Floodplain Development Manual 2005.	Not applicable.
Whether there will be detrimental increases in the potential flood affectation of other properties, assets, and infrastructure.	The development is unlikely to further impact on flood behaviour and will not increase potential flood affection of other property, assets, and infrastructure. In the event of flooding, the quarry pit would likely remain stable. Flood water would be re-directed via pumps to sediment dams for reuse onsite.
Consistency with Council floodplain risk management plans. Consistency with any Rural Floodplain Management Plans. Compatibility with the flood hazard of the land.	There is no Council floodplain risk management plan or rural flood management plan for Tumbarumba.
Compatibility with the hydraulic functions of flow conveyance in floodways' and storage in flood	Flooding caused by heavy rainfall events within the quarry pit would be captured within low-lying areas

Impact	Assessed by this EIS
storage areas of the land.	and pumped into sediment ponds for re-use onsite where required. If captured rainwater is not obstructing pit operations, it is left to evaporate in the pit.
Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site.	The nature of the infrastructure of the Proposal would be unlikely to impact inundation of any floodplain environment.
Whether there will be a direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.	Mitigation measures to reduce soil erosion and sedimentation are addressed in section 1.1.1 of this report.
Appropriate mitigation measures to offset potential flood risk arising from the Proposal. Any proposed mitigation work should be modelled and assessed on the overall catchment basis in order to ensure it fits its purpose and meets the criteria of the Council where it is located, and to ensure it has no adverse impact to surrounding areas.	Onsite water pumps would be used to off-set potential flooding that would occur from heavy rainfall within the quarry pit to sediment ponds. All mobile plant such as excavators and loaders are moved to higher ground. Larger plant would remain in place. The generator is mounted above the anticipated flood level.
Any impacts the Proposal may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the NSW SES and Council.	It is unlikely that the Proposal would impact upon existing community emergency management arrangements for flooding. Emergency management procedures would be prepared in consultation with Council and SES.
Whether the Proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the NSW SES and Council.	Staff amenities building would be located away from floodways and flood storage zones. A flood evacuation procedure would be in place for staff on site for a flooding event and embedded within emergency management procedures.
Emergency management, evacuation and access, and contingency measures for the Proposal during both construction and operational phases considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the NSW SES.	Emergency management procedures would be prepared in consultation with Council and SES.

Site Water Balance

The size of the Development site is 15.41ha with a development footprint of 13.24ha. Rainfall within the current pit is captured within depressions in the pit and within the sediment dam. As the proposed pit continues to expand, surface water from the dam and ephemeral drainage line in the south-east of the Development site would drain into the pit and accumulate in the lowest point. Accumulated runoff would be used for dust suppression and other quarrying activities or left to evaporate.

A site water balance has been calculated for the Development site (development footprint and haul road) once in operation (Appendix J). The fraction impervious value and runoff coefficient C was extracted from the Wagga Wagga City Council Engineering Guidelines for Subdivisions and Development Standards (WWCC, 2017) as this information was not available for Snowy Valleys Council. The engineering guidelines were developed from work involving Wagga Wagga, Griffith, Albury, Wodonga, and other Councils. The conservative runoff coefficients that have been used are presented in Table 6-20 below.

Table 6-20 Runoff coefficients

Feature	Fraction impervious	Runoff coefficient – C
Development footprint (rock)	0.85	0.04 (1 year period return)
Road	0.85	0.04 (1 year period return)

The values for fraction impervious (WWCC, 2017) have been selected based on the ground surface of the development footprint. Since the Proposal is for quarrying rock material, the impervious fraction would be consistent with that of a road surface.

Water balance calculations used the design rainfall event for a 63.2% Annual Exceedance Probability (AEP) for a 24-hour period. The latest 2016 rainfall Intensity Frequency Duration (IFD) data was obtained from the Bureau of Meteorology (BOM). The IFD Design Rainfall Depth for the Proposal (-35.793, 148.010) for a 63.2% AEP with a 24-hour duration is 56.1mm. This is a very conservative figure when compared to the annual average daily decile 5 (median) rainfall statistic of 2.63mm sourced from the Tumbarumba Post Office Automatic Weather Station (station number 072043), which has a continuous record for 57 years. Table 6-21 presents the land size and approximate precipitation volume for the design rainfall event and runoff for each feature.

Table 6-21 Site water balance for the operational phase of Murray's Crossing Quarry using a design rainfall event of 63.2% AEP 24-hour duration

Feature	Fraction impervious	Size (m^2)	63.2% AEP 24-hour duration (m^3)	Runoff (m^3)	Comment
Development footprint	0.20	53,342	2,987	5731	It is expected that precipitation within undeveloped development footprint would be captured within the sediment basin or diverted off-site via a clean water diversion. Once the pit footprint reaches its maximum extent,

Feature	Fraction impervious	Size (m^2)	63.2% AEP 24-hour duration (m^3)	Runoff (m^3)	Comment
					precipitation would be managed by evaporation, channelled into sediment dams or diverted as clean water flows offsite. There would be two flood storages, to a total volume of 1240m^3
Pit footprint	0.85	86,800	4,861	39,631	Precipitation captured within the pit would be managed by evaporation or stored within sediment dams.
Vehicle access road	0.85	13,300	745	6,073	Associated drainage would be required to divert stormwater.
Site office	1.0	120	7	65	Drainage has been installed to divert stormwater into rainwater tanks, to a total volume of 65m^3
Workshop	1.0	538	30	289	Drainage would be installed to divert stormwater into rainwater tanks, to a total volume of 289m^3
Total		**154,100**	**8,630**	**51,789**	

A total of **8.63**ML of rainfall falls within the boundary of the development footprint during a 63.2% AEP for a 24-hour duration. Of this volume of rainfall, approximately 65% (5.643 ML) is runoff (captured within the quarry pit) due to the impervious nature of the compaction of the gravel roads and rock material of the quarry pit.

6.5.6 Safeguards and mitigation measures

Table 6-22 Safeguards and mitigation measures for surface and groundwater

No.	Safeguards and mitigation measures	C	O	R
WA1	Best practice management measures to be employed where applicable to reduce the risk of erosion and improve sediment control: • Preserve and stabilise disturbed areas, drainageways and steep slopes • Minimise the extent and duration of disturbance • Install perimeter controls • Employ the use of sediment control measures to prevent off- and on-site damage. Inspect and maintain sediment and erosion control measures regularly • Control stormwater flows onto, through and from the site in stable drainage structures. Protect inlets, storm drain outlets and culverts • Provide access and general construction controls.	**C**	**O**	
WA2	All chemicals and fuels used on-site must be stored and handled in accordance	**C**	**O**	

No.	Safeguards and mitigation measures	C	O	R
	with: • The requirements of all relevant Australian Standards • The NSW EPA's *Storing and Handling of Liquids: Environmental Protection – Participants Handbook* if the chemicals are liquids • In the event of an inconsistency, the most stringent requirement must prevail to the extent of the inconsistency.			
WA3	A protocol shall be developed in relation to discovering buried contaminants within the development site (e.g. pesticide containers, if any). It will include stop work, remediation and disposal requirements. If significant contamination is found on site during construction or operation activities, it must be reported in line with *Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites (OEH, 2011)*. Further action shall be undertaken when necessary in line with the *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (EPA, 2015).*	**C**	**O**	
WA4	Any area temporarily used during construction (laydown and trailer complex areas) to be restored to original condition or re-vegetated with native plants where possible.	**C**		
WA5	A Spill Response Management Plan will be prepared, implemented and monitored during the construction and operation of the Proposal.	**C**	**O**	
WA6	Vehicles, plant and equipment will be maintained to minimise leakages during construction and operation of the Proposal	**C**	**O**	

C: Construction; O: Operation; R: Rehabilitation

6.6 Climate and air quality

6.6.1 Existing environment

The Development site, south of Tumbarumba NSW, steadily rises to the north, east and south from Tumbarumba Creek. Surrounding land use consists of a mixture of agricultural activities, such as grazing and broadacre cropping, sporting industries (including a racecourse), infrastructure services (schools and hospitals) and numerous rural dwellings and commercial industries (refer to Figure 6-23). An operational quarry, including a haul road, stockpiling site and associated site buildings are already located within the Development site and adjoining TSR (refer to Figure 3-9).

The Proposal involves an extension of the existing operations at Murray's Crossing Quarry. In order to assess the existing and future impact of the proposed development on air quality, an Air Quality Impact Assessment (AQIA) was prepared by specialist consultants SLR Consulting Australia Pty Ltd (SLR, 2022). The full report has been provided as Appendix F.

6.6.2 Climate

Temperature

The Snowy Valleys LGA is part of the South Eastern Highlands Bioregion and Bondo Subregion. This Bioregion is dominated by a temperate climate characterised by warm summers with no dry season (OEH, 2021). Temperature statistics for Cabramurra SMHEA AWS between 1996 and 2021 are summarised in Figure 6-10. Mean maximum temperatures range from 3.9°C in winter to 21.6°C in summer. While mean minimum temperatures range from -0.8°C in winter to 11.7°C in summer.

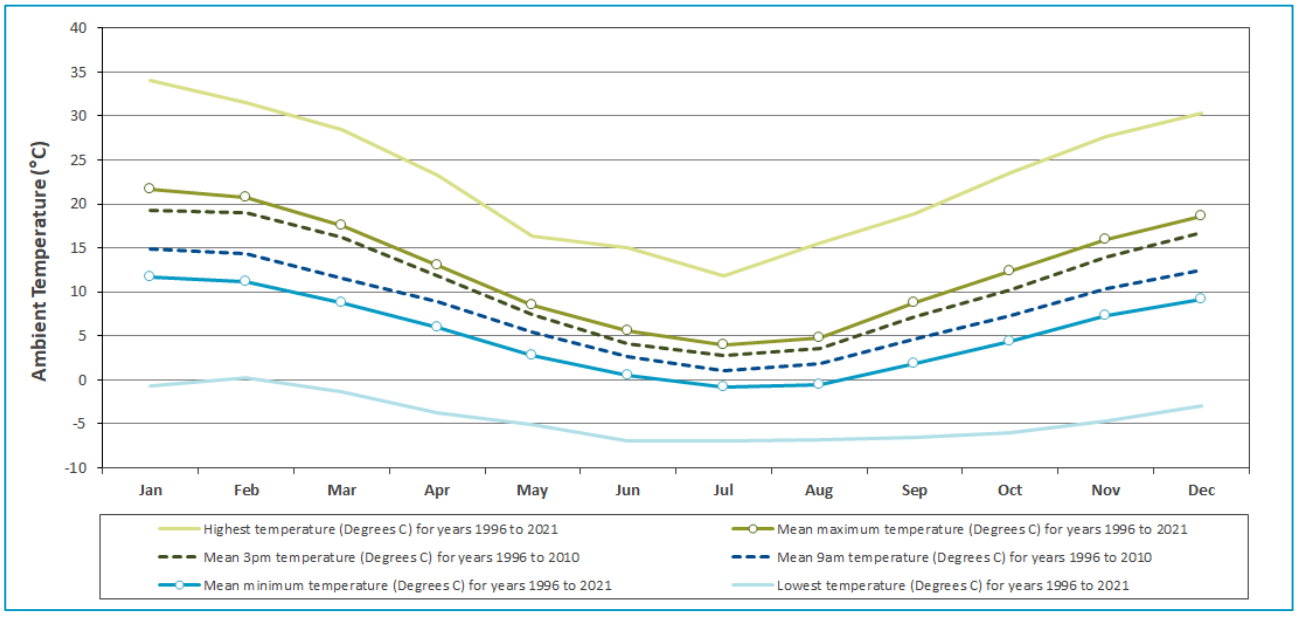

Figure 6-10 Mean long term temperature trends for Cabramurra AWS (1996 – 2021) (SLR, 2022)

Rainfall

Rainfall statistics for Cabramurra SMHEA AWS for the years 1996 to 2021 are summarised in Figure 6-11. The mean annual rainfall is 1190.3 millimetres (mm) over 124.3 days. The highest average monthly rainfall of 126.1mm was recorded in August over an average of 14 rain days. The lowest monthly average of 66.2mm was recorded in January, with an average of 7.6 days of rain.

Note that while rainfall may scavenge dust / particulates from the air, for the purposes of modelling it has conservatively not been considered in this assessment.

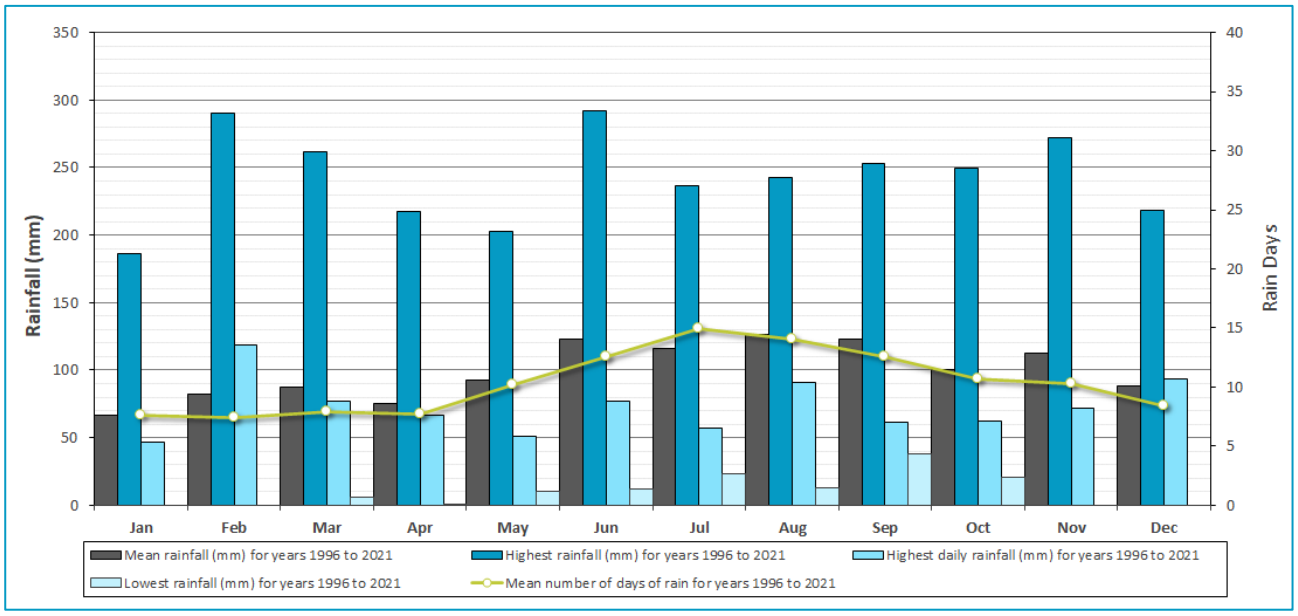

Figure 6-11 Long term monthly rainfall data for Cabramurra AWS (SLR, 2022)

Relative humidity

Humidity statistics (9am and 3pm monthly averages) for Cabramurra SMHEA AWS (1996 – 2010) are summarised in Figure 6-12. Morning humidity levels range from an average of around 84% in winter to around 65% in summer. Afternoon humidity levels are slightly lower, at around 83% in winter dropping to around 54% in summer.

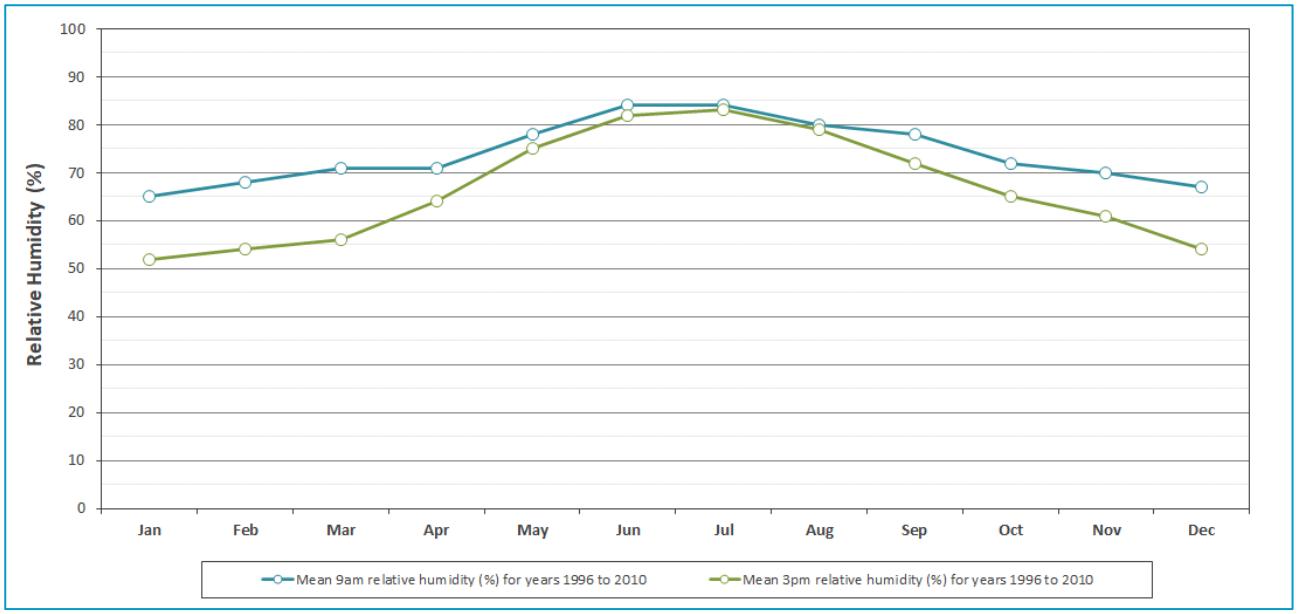

Figure 6-12 Humidity data for Cabramurra AWS (SLR, 2022)

Wind

Annual and seasonal wind roses for Cabramurra SMHEA AWS for the years 2016 to 2020 show that on an annual basis, winds from west and west-northwest are predominant, with fewer winds from the east-south-east (SLR, 2022). Spring, summer, and autumn are consistent with the overall

distribution. Winter has winds distributed more evenly between west-northwest and north-northwest with very few winds from northeast and southwest (SLR, 2022).

Climate change

Climate change refers to the warming temperatures and altered climatic conditions associated with the increased concentration of greenhouse gases (GHGs) in the atmosphere. GHGs includes carbon dioxide, methane and water vapour. Climate change projections for Australia include more frequent and hotter hot days and fewer frost days, rainfall decline in southern Australia and more extreme weather events including intense rainfall, more severe drought and harsher fires (CSIRO, 2020).

6.6.3 Local air quality

Air in the locale of the Development site is generally expected to be of a good quality and typical of that found in a rural NSW setting.

Sources of air pollution within the area of the Development site include:

- Vehicle emissions and dust generation
- Agricultural activities including sowing, lime application, burning of paddocks or earth moving
- Existing quarry activities including crushing, blasting, carting, loading, etc.

6.6.4 Background air quality concentrations

Background dust generation is likely to be highly influenced by climatic and seasonal conditions as well as random events such as dust storms and bushfires. Dust generation is likely to be higher towards the end of the summer months due to the drier conditions and the state of ground cover as the impact of long periods of high temperatures on soil include drying and dust generation.

The representative background ambient air quality concentrations adopted for use in this assessment are summarised in Table 6-23.

Table 6-23 Adopted background concentrations for cumulative impact assessment (SLR, 2022)

Pollutant	Averaging Period	Background	Notes
TSP	Annual	39.6µg/m^3	Assumed to be equal to 2x PM_{10} concentrations at Albury Air Quality Monitoring Station (AQMS) during 2018.
PM_{10}	24-hour	Daily varying	From 1-hour average as monitored at Albury AQMS during 2018
	Annual	19.8µg/m^3	
$PM_{2.5}$	24-hour	Daily varying	
	Annual	7.3µg/m^3	

It is considered that the use of the monitoring data from Albury AQMS is a conservative assumption of existing air quality in the vicinity of the Proposal. The Albury AQMS is located within a residential area, with a population of approximately 98,000 people and in proximity to major roads, compared to Tumbarumba that has a population of less than 2,000 people.

6.6.5 Assessment methodology

The existing and proposed quarry emissions have been modelled using AERMOD (American Meteorological Society (AMS)/USEPA Regulatory Model (AERMOD) to predict maximum pollutant ground level concentrations (GLC) resulting from emissions to air.

AERMOD requires a range of inputs to describe the Proposal environment:

- Topographical data
- Meteorological data
- Background pollutant concentrations.

The sources of the required data are summarised in Table 6-24 and these inputs are discussed in the following sections.

Table 6-24 Air quality model input and processing data

Item	Source	Description
Topographical data	Shuttle Radar Topography Mission (SRTM)	3 second (~90m) resolution
Meteorological data	TAPM	Wind speed, wind direction, temperature, relative humidity, mixing height and insolation
Background pollutant concentrations	EPA Albury AAQMS	24-hour average concentrations of PM_{10} and $PM_{2.5}$ (from 1-hour averaged concentrations)

Refer to the AQIA (Appendix F) for a complete review of the methodology used in the assessment.

The emission rates for existing and proposed operations is provided in Table 6-25.

Table 6-25 Emission rates for existing and proposed operations – stage one (SLR, 2022)

Parameter	Quantity	Units	Comment	Source
Summary				
Throughput	200,000	t/yr	Excavated material	Client
Rock Extraction				
Drilling	171	holes/yr	-	Clienta
Blasting	6	blasts/y	Area per blast = 600 m2	Clienta
Front-end-loader (FEL) pushing off bench	200,000	t/yr	6% moisture	Client
FEL picking up to travel	200,000	t/yr	6% moisture	Client
FEL travel to crushing circuit	200,000	t/yr	6% moisture	Client
Crushing and Screening				
Crushing/Screening (Ten	200,000	t/yr	6% moisture	Client

Parameter	Quantity	Units	Comment	Source
transfers)				
Crushing/Screening - Primary & Secondary Crushing (controlled)	200,000	t/yr	-	N/A
Crushing/Screening - Tertiary Crushing (controlled)	200,000		-	N/A
Crushing/Screening - Primary Screening (controlled)	200,000		-	N/A
Crushing/Screening - Fines Screening (controlled)	200,000		-	N/A
Unloading from crusher/screening to stockpile – 70%	140,000		6% moisture	Client
Loading product from crushing circuit to pre-coating plant - 30%	60,000		6% moisture	Client
Wheel Generated Dust (unsealed roads)				
Extracted material: FEL return travel to crushing plant.	3.42	kg/VKT	10% silt; 6.5t per load; 27.2 t average mass; return travel distance 0.5 km	Client /Calculated
Product: FEL transfer from crushing plant to product stockpile			10% silt; 6.5t per load; 27.2 t average mass; return travel distance 0.5 km	Client /Calculated
Product: empty and laden product trucks onsite to exit	4.8	kg/VKT	10% silt; 33t per load; 58.5 t average mass; return travel distance 0.7 km	Client /Calculated
Wind Erosion				
Extraction area	0.3	ha	100% active	Client
Bulk storage stockpile	0.6	ha	100% active	Client
Inactive but exposed	2.9	ha	100% active; 50% control to account for revegetation	Client

The resulting emission inventories are summarised in Table 6-26.

Table 6-26 Predicted particulate emissions for proposed operation – stage one (SLR, 2022)

Activity	TSP emissions (kg/y)	PM_{10} emissions (kg/y)	$PM_{2.5}$ emissions (kg/y)
Rock Extraction			
Drilling	1	1	0.05
Blasting	19	10	1
FEL pushing off bench	50	24	4
FEL picking up to travel	50	24	4
FEL travel to crushing circuit	26,326	7,770	777
Crushing and Screening			
Crushing/Screening (Ten transfers)	249	118	18
Crushing/Screening - Primary Crushing (controlled)	No data		
Crushing/Screening - Secondary Crushing (controlled)	No data		
Crushing/Screening - Tertiary Crushing (controlled)	120	54	10
Crushing/Screening - Primary Screening (controlled)	2,500	860	5
Crushing/Screening - Fines Screening (controlled)	360	220	1
Unloading from crusher/screening to stockpile	35	16	2
Transfer from Crushing and Screening plant to Pre-coating Plant			
Loading product from crushing circuit to pre-coating plant - 30%	15	7	1
Unloading from pre-coating plant - 30%	-		
Transfer from Crushing and Screening plant to Product Stockpile			
FEL picking up to travel to Product Stockpile	35	16	2
FEL travel to from crushing circuit to Product Stockpile	18,428	5,439	544
Unloading product from FEL to bulk storage stockpile	50	24	4
Transfer Product offsite			
Loading product from bulk storage stockpile to trucks for off-site haulage - 70%	35	16	2
Hauling product offsite on unpaved roads	10,255	3,027	303

Activity	TSP emissions (kg/y)	PM_{10} emissions (kg/y)	$PM_{2.5}$ emissions (kg/y)
Waste Stockpile Activities (Not used in Stage 1)			
Load waste to dog-and truck from crushing plant for transfer to waste stockpile	-	-	-
Hauling from crushing plant to waste stockpile (unpaved roads)	-	-	-
Unload from dog-and truck for transfer to waste stockpile	-	-	-
Wind Erosion			
WE - Active Extraction Area/Exposed	1,051	526	49
WE - Bulk Storage Stockpile	2,102	1,051	98
WE- Other	5,081	2,540	238
Total emissions (kg/yr)	**66,763**	**21,744**	**2,063**

6.6.6 Potential impacts

Climate can act to influence the impacts of construction and rehabilitation on the environment. For example, hot, dry or windy conditions can exacerbate adverse air quality impacts, while prolonged rainfall can increase soil compaction impacts (Dean & Green, 2017). For these reasons, the specific climatic conditions of the site are considered in the assessment of impacts.

The proposed quarry would be an extension of the existing Murray's Crossing Quarry operation. As such, no new impacts on air quality, different to that already experienced by nearby receivers, is expected as part of the proposed works. The pit footprint would increase incrementally over the life of the quarry. Dust generation would accompany clearing, excavation, and other earthworks as well as the movement of trucks and work vehicles along unsealed haul roads during construction and operation of the development. Impacts of dust and emissions include interference with visibility when driving or lead to adverse health impacts when exposure is severe or prolonged (Dean & Green, 2017).

There were several activities identified in the AQIA (SLR, 2022) that might contribute to dust generated during construction and operation of the development. Estimated emission rates from the proposed operations are summarised in Table 6-26. There is a risk that unsealed haul roads may create additional dust during windy conditions. Vehicle access roads would be regularly maintained and dust suppression applied as required.

Dispersion modelling has predicted that the cumulative annual average PM_{10} and TSP concentrations, and annual average dust deposition rates, would be below the respective NSW EPA impact assessment criteria at all sensitive receivers for the proposed operations.

Exceedances of the cumulative annual average $PM_{2.5}$ impact assessment criteria were predicted at each of the sensitive receivers due to the background concentrations already being above criteria.

Incremental increases due to the proposed operations were less than 1% of the criteria in most cases.

When considering the cumulative maximum 24-hour average PM_{10} concentrations, with the exception of one predicted exceedance at R28, the additional exceedances predicted occur when the assumed background was already measuring at least 47 $\mu g/m^3$.

The predicted additional exceedances predicted for cumulative maximum 24-hour average $PM_{2.5}$ concentrations all occur when the assumed background at Albury was measured to be 25 $\mu g/m^3$, with the Proposal contributing less than 1% of these emissions. Adopting background concentrations from Albury is considered conservative for Tumbarumba, being a less rural area, and the Albury data are impacted by anthropogenic emissions of PM_{10} and $PM_{2.5}$. It is concluded that the proposed operations are likely to cause no, or minor additional exceedances of the 24-hour average PM_{10} and $PM_{2.5}$ criterion at the identified receptor locations.

Several pollutants, such as nitrogen oxides, sulphur dioxide, carbon monoxide and Volatile Organic Compounds (VOCs), are released during the operation of onsite quarry plant and equipment. Periodic blasting is expected to have an impact on air quality and is expected to take place up to six times each year, dependent on quarry progression. Blasting creates a large short-term release of dust and rock emission as well as a by-product emission from the explosive chemical used.

Operational impacts on local, regional, and global generation of global GHG emissions are considered likely. GHGs would be generated during construction and operation and include:

- Emissions associated with operations, such as electricity and fuel utilisation, transportation of materials to processing batch facilities and sales
- Emissions from consumption of explosives
- Emissions from chemicals processed during quarry operations
- Emissions embodied in reagents
- Emissions from solid and liquid wastes
- Carbon uptake from land-use change
- Vegetation clearing.

According to NSW Department of Planning and Environment (DPIE), transport accounts for the second largest GHG emissions in NSW, equating at 22% followed by stationary energy at 51%. Transport (including operation of machinery) is likely to be the largest source of GHG emissions during construction and operation from fuel combustion, which includes minor additions to heavy vehicle movements along the extension of the haul road. Explosive events are likely to generate GHG emissions. However, only five to six blasts would occur each year. Land use change and vegetation clearing would also be a contributor to GHG emissions. The landscape would be revegetated during the rehabilitation phase of the project.

Overall, the proposed operations are predicted to have negligible increases in cumulative concentrations at all of the sensitive receivers. Mitigation measures have been recommended, to minimise potential impacts.

6.6.7 Safeguards and mitigation measures

Table 6-27 Safeguards and mitigation measures for climate and air quality impacts

No.	Safeguards and mitigation measures	C	O	R
AQ1	General transport controls include: • All loads leaving the site will be covered with a vehicle fitted tarpaulin system • A speed limit of 20km/hr will be adopted on all unsealed roads across the site • Water cart spraying will be utilised on all unsealed roads at a rate of >2L/m^2/hr, as required • Low silt aggregates will be used on unsealed roads • Wheel washing bay will be considered at the meeting point of sealed and unsealed roads	**C**	**O**	
AQ2	Dust suppression controls at crusher, screening and dumping areas include: • Periodical water spraying • Minimising dust generating activities during periods of excessive wind • Reduction of rate of activity in response to excessive dust generation		**O**	
AQ3	Dust suppression controls for quarry activities including blasting, drilling, stripping of overburden and on-site dumping to include: • Periodical water spraying. • Minimising dust generating activities during periods of excessive wind • Reduction of rate of activity in response to excessive dust generation • Locating and relocating high impact activities to less sensitive on-site areas where possible		**O**	
AQ4	Stockpiles and exposed areas of soil and rock will be contained through wetting or covering with an appropriate seal if left for periods of time.	**C**	**O**	
AQ5	Monitor local weather conditions and manage the site if any conditions will exacerbate air quality (e.g. wind). Minimise or cease activity in proximity to R28 when winds are blowing form the south-southeast at a windspeed of 2m/s or greater for 4 hours or longer.	**C**	**O**	
AQ6	Fires and material burning are prohibited on the Development site.	**C**	**O**	
AQ7	The single transportation route to the development will be utilised to maximise use of sealed roads.	**C**	**O**	
AQ8	Vegetation skirting the site to be retained. Exposed areas that are not part of active operational areas will be revegetated as soon as practically possible.	**C**	**O**	
AQ9	Using technologies to optimise blast patterns for consistent energy distribution and reducing the explosive overconsumption.	**C**	**O**	
AQ10	All pumps and machinery are to use appropriately sized and high energy efficient motors to reduce the carbon footprint.	**C**	**O**	**R**
AQ11	Time switches and sensor lights are to be used across the Development site to maximise energy efficiency to reduce the carbon footprint.	**C**	**O**	**R**
AQ12	Variable speed drivers (VSD) are to be used on electric motors to maximise energy efficiency to reduce the carbon footprint.	**C**	**O**	**R**
AQ13	Fuel economy and energy consumption of vehicles are to be considered before purchasing new vehicles and machinery; regular servicing is to be undertaken.	**C**	**O**	**R**

C: Construction; O: Operation; R: Rehabilitation

6.7 Traffic, transport and road safety

6.7.1 Relevant approvals

The existing development at Murray's Crossing Quarry currently operates under a Carriageway Licence, issued to BHQ by the local road authority (SVC). The terms of the Carriageway Licence detail that:

> *4.1 The Licensor grants the Licensee its servants, agents, subcontractors and invitees a non-exclusive licence to pass and re-pass at all times during the continuance of this Agreement with or without vehicles over the Land identified in the plan*
>
> *4.2 In consideration of the granting of the Carriageway Licence and in accordance with the provisions of Development Approval D91/23 as modified by this Agreement the Licensee shall pay Royalties to the Licensor computed in accordance with Item 5.*

As per Item 5.1:

The Licensor grants to the Licensee the following non exclusive rights:

> *(c) to construct properly formed roads where necessary, with such roads to take the shortest practicable route to the boundary of the Land and then traverse to the nearest public road.*

The proposal would utilise the same haulage route as the existing operation. In order to address the SEARs, NGH engaged Amber Organisation Pty Ltd to prepare a Traffic Impact Assessment (TIA) for the Proposal.

A summary of the TIA has been provided below. The complete TIA is available in Appendix G.

6.7.2 Existing environment

Road network

As shown in Figure 6-13, access to the Proposal is via a connection with Murray's Crossing Road, which has been designed to accommodate the heavy vehicles that currently service the quarry. Murray's Crossing Road has a sealed carriageway width of approximately 6m. This road accommodates two-way traffic, with unsealed shoulders provided on both sides of the road. Murray's Crossing Road is a rural, open road which adopts the default speed limit of 100km/h.

Booth Street extends north of Murray's Crossing Road to Clara Street. It has a sealed carriageway width of approximately 6m accommodating two-way traffic, with unsealed shoulders on both sides of the road. Booth Street has several residential access driveways along its 540m length.

An 80m stretch on the western extent of Clara Street will be used for quarry traffic between Booth Street and Winton Street. Clara Street is a sealed, two-way street approximately 12.5m wide with parking on both sides. Winton Street extends north of Clara Street and provides access for quarry vehicles from Regent Street. Winton Street is a sealed, two-way street approximately 12.5m wide with sealed parking on both sides. The intersection of Winton Street and Regent Street is controlled by a give-way, with Regent Street as the priority movement. The intersection has good visibility in both directions.

Regent Street provides access to the wider road network and delivery locations for quarry vehicles. Regent Street has a 12.5m sealed carriageway with parking both sides. It extends east away from Tumbarumba becoming William Street and then Tooma Road, all of which are approved B-double routes and suitable as the primary access route for the quarry development. Trucks travel in a westerly direction, towards Holbrook and then north to Wagga Wagga, NSW.

No public transport services are provided within the vicinity of the site.

Figure 6-13 Proposed haulage route

Restricted vehicle access

A number of roads in the immediate vicinity are rated to accommodate B-double movements as identified within the TfNSW Restricted Access Vehicle Map, provided in Figure 6-14.

Figure 6-14 Restricted access vehicle map (Amber Organisation Pty Ltd, 2021)

Key routes to surrounding demand areas include:

- Tooma Road is located 1.5 kilometres east of the site and extends to the southeast
- Batlow Road extends northeast from Tumbarumba
- Wagga Road extends northwest from Tumbarumba
- Jingellic Road extends southwest from Tumbarumba.

Accordingly, the surrounding road network is designed to accommodate heavy vehicle movements, including B-Doubles.

Traffic volumes

Traffic volume data has been collected from the TfNSW Traffic Volume Viewer. The closest available survey location was 90m north of Albury Street on The Parade in Tumbarumba, which is approximately 1.8km north of the Development site. The most recent survey (from December 2011) recorded 3,646 vehicles per day in both directions. The vehicle movements include 1,881 northbound vehicles and 1,765 southbound vehicles.

In order to calculate the current traffic volumes on the road network a growth rate of 1.5% was applied to The Parade, which resulted in an estimate of 4,295 vehicles per day. Hourly vehicle movements are provided in Figure 6-15.

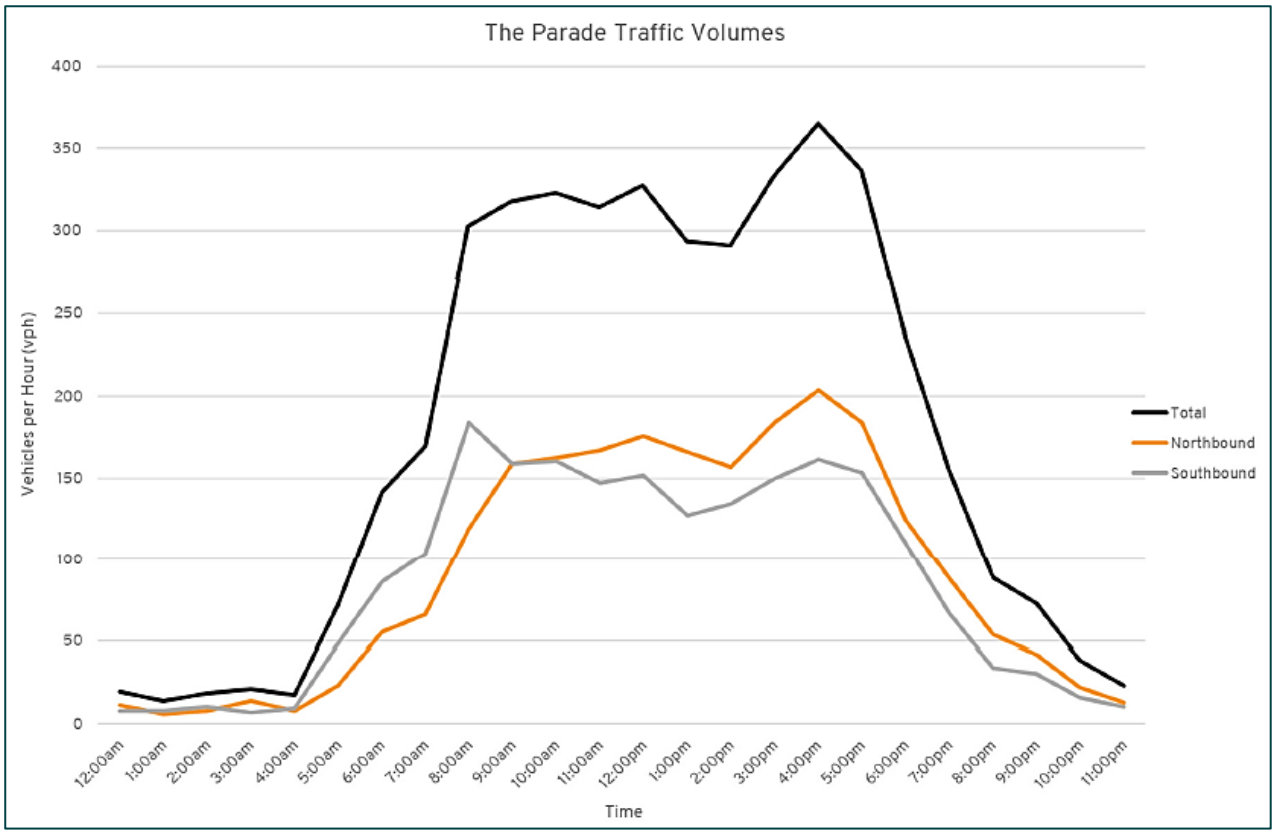

Figure 6-15 The Parade traffic volume data (Amber Organisation Pty Ltd, 2021)

The graph demonstrates that traffic volumes are relatively constant between 8.00am and 5.00pm, with a maximum of 365 vehicles per hour recorded at 4.00pm. Within a closer vicinity of the Development site, on Murray's Crossing Road, the traffic volumes are expected to be much lower due to the smaller number of origin and destination demand generators and that Murray's Crossing Road is not a main access in or out of the Tumbarumba township.

Crash history

A review of the TfNSW Centre for Road Safety Crash and Casualty Statistics database for all injury crashes within one kilometre of the site access was conducted (Amber Organisation Pty Ltd, 2021). The crash database provides the location and severity of all injury and fatal crashes for the five-year period from 2015 to 2019. The crash search revealed no crashes within the search area and as such, it is concluded that the road network is currently operating in a safe manner.

6.7.3 Potential impacts

Construction and rehabilitation

Associated Noise and Dust

The increase in traffic during construction and rehabilitation may increase noise and dust in the local area. However, the majority of vehicles would be traveling at low speed. Impacts from dust generated from the proposed activity, including that associated with increased traffic are considered in section 6.6.6 of this report.

The increase in traffic and heavy vehicle movement during construction and rehabilitation would result in a minor increase in noise as a result of the proposed works. Noise impacts resulting from increase vehicle movements has been detailed in section 6.3.4 of this report. Tooma Road and

Batlow Road, located within 1.5km of the Development site, already experience moderate levels of traffic including heavy vehicles.

Damage to Road Infrastructure

Murray's Crossing Road is already sealed. The Proponent would manage construction impacts on Murray's Crossing Road with a Traffic Management Plan (TMP). This may require periodic road improvements and lane closures to preserve traffic flow.

Operation

Traffic Generation

A maximum of five staff are on-site at any one time, which is not proposed to change as part of the Proposal. The quarry is expected to generate six light vehicle movements during the morning and evening peaks associated with staff arriving and departing the site, which represents 12 light vehicle movements per day.

Truck and dog vehicles would primarily be used to transport the quarry material. Murray's Crossing Quarry currently generates up to 24 truck and dog movements per day, including up to 10 truck and dog movements in the peak hour. The Proposal would increase this to 30 truck movements per day. During periods of peak demand, the quarry may operate at a higher capacity, which would result in up to 60 truck movements per day (including 20 truck movements during peak hour). The truck movements would typically commence at 7:00am and be completed by 4:00pm in order to allow time for the last load to be delivered to the relevant destination. However, it is noted that the operating times may extend outside of these times and on weekends.

Existing and proposed traffic movements for the quarry operation have been summarised in Table 1 of the TIA (Appendix G).

Local Road Network

Material from the quarry would be utilised for road upgrades/maintenance and construction projects within the surrounding area, resulting in the traffic movements being distributed on the surrounding road network. All vehicles would access and exit the site via Murray's Crossing Road to the north of the Development site. Vehicles exiting the site will travel north along Murray's Crossing Road and Booth Street to Clara Street. Vehicles will then utilise Winton Street to travel north or connect with Regent Street and predominantly travel south on Tooma Road (refer to Figure 6-13). Vehicles will be able to utilise Batlow Road and Albury Street to access other locations as required.

The surrounding road network has a low vehicle demand and is considered to have adequate capacity to readily accommodate the modest increase in traffic associated with the expansion of the quarry which is expected to be in the order of 4-10 truck movements during the peak hour. As such, the Proposal will have no discernible impact on the operation of the surrounding road network and the traffic can be accommodated in a safe manner.

Site Access

Access to the site is proposed to continue to be provided via the existing connection with Murray's Crossing Road. Turning movements are currently facilitated by an approximately 25m wide vehicle crossing which provides safe access for vehicles entering and leaving the site.

Murray's Crossing Road is considered to have very low traffic volumes and accounting for the site traffic generation, it is deemed that the existing site access is appropriate. The existing access

arrangement provides safe and efficient movement from the road network and can accommodate the minor increase in traffic as part of the proposal.

Damage to Road Infrastructure

The increase in traffic and heavy vehicle movements could impact the condition of roads on the haulage network. Along Tooma Road and Batlow Road, the impact is expected to be negligible due to the existing capacity of the road network. However, the impact of turning traffic at the Murray's Crossing Road intersection would likely require monitoring to ensure that the road is maintained to an adequate condition.

Associated Noise and Dust

A constructed natural sound barrier for the existing quarry protects receivers to the east, west and south from operational noise impacts. An internal haul road is proposed, which would circle the existing quarry operation before moving to the south of the Development site. The Development site already experiences moderate levels of traffic including heavy vehicles. Noise from operational activities associated with the Proposal are predicted to exceed the NPfI PNTLs at several receptors, particularly for quarrying, processing and product despatch. It is important to note that the quarrying activities were assessed at the highest point on the site. As quarrying progresses, noise levels would be likely to decrease at several receptors as activities are shielded by the quarry benches that are formed. Refer to section 6.2 of this EIS for the noise assessment.

6.7.4 Safeguards and mitigation measures

Table 6-28 Safeguards and mitigation measures for traffic, transport and safety impacts

No.	Safeguards and mitigation measures	C	O	R
TT1	A Traffic Management Plan (TMP) would be implemented, as part of the CEMP and OEMP, prior to construction commencing.	**Design**		

C: Construction; O: Operation; R: Rehabilitation

6.8 Hazards

6.8.1 Hazardous materials and development

Hazards onsite will be managed in accordance with the BHQ's Integrated Health, Safety and Environment Management System and Health Safety and Environment Management Plan (HSEMP), and within guidelines in accordance with the N*ew South Wales Work Health and Safety Act 2011* (WH&S Act), the *Work Health and Safety Regulation 2017* and relevant Australian Standards.

BHQ aims to eliminate all injuries, occupational illnesses, and preventable vehicular incidents. The company seeks to achieve this by:

- Identifying and reducing the risks of all types of work activities that have the potential to produce personal injury or occupational illness
- Ensuring that everyone (including visitors and contractors) complies with appropriate legal and workplace requirements relating to safety and health
- Establishing measurable objectives and targets for safety and health to ensure continuous improvement aimed at elimination of work-related illness and injury
- Providing instruction, training, and supervision to improve individuals' understanding of workplace hazards, including safe work practices and emergency procedures
- Involving individuals in safety and health matters within the workplace, and consulting with them in ways to recognise, evaluate and control workplace hazards via the risk management process
- Communicating safety and health information to all employees, contractors, labour hire employees and visitors to the workplace
- Effectively implementing the Work, Health and Safety (WHS) Policy.

Preliminary Risk Screening

HIPAP No. 6 – Guidelines for Hazard Analysis (DoP 2011) and Multi-level Risk Assessment (DoP 2011) notes that a Preliminary Hazard Analysis (PHA) should identify and assess all hazards that have the potential for off-site impact. The expectation is that the hazards would be analysed to determine the consequence to people, property and the environment and the potential for hazards to occur. It is also noted that BHQ HSEMP (Section 9.8 – hazardous chemicals) meets the requirements.

Hazardous materials that would be transported and stored as part of this Proposal include:

- Class 1 Explosives
- Class 3 Flammable liquids.

Explosives would not be stored on site, instead brought to site by the contractor on the day of the blasting. Fuel (diesel (not considered a flammable liquid) or petrol) would be stored in a bunded trailer within the quarry pit and within an above ground, bunded tank at the workshop. The above ground tank would be relocated when the workshop is moved to its proposed location (refer to Figure 3-10).

The Proposal is not considered to be a potentially hazardous development with respect to the storage, use or transportation of hazardous substances. Therefore, in accordance with the

Resilience and Hazards SEPP, a PHA is not required, and no further risk analysis or assessment is required.

6.8.2 Bushfire

Bushfire Threat Assessment

The Development site occurs on bushfire prone land (refer to Figure 6-16).

A bushfire threat assessment involves assessing the vegetation formations and the slope of the land to determine the appropriate Asset Protection Zones (APZs) required in accordance with the methods in Planning for Bushfire Protection (PBP) (RFS, 2019). It is noted that PBP was developed to provide a guide to the necessary planning considerations when developing areas for residential use which are likely to be affected by bushfire. While the requirements do not specifically apply to this Proposal, the methods provided for calculating APZs from PBP (RFS 2019) have been used as a general guide in this assessment.

Figure 6-16 Location of bushfire prone land in relation to the development

Vegetation Formations

Vegetation formations play a key role in bushfire behaviour. Woodland and forest vegetation formations represent large fuel loads due to the presence of understorey vegetation, leaf litter and often, the connectivity of the canopy. The majority of the existing active quarry area within the Development site was observed as bare earth. Land surrounding the active pit consists of open grassland and open woodland vegetation formations.

Slope Analysis

Slope plays an important role in the rate a bushfire can spread. As a bushfire spreads it preheats the fuel source through radiation and convection. As a consequence of this heat transfer, fire accelerates when travelling uphill and will decelerate when travelling downhill.

The slope across the site varies significantly. The quarry pit is gently sloping, while the quarry walls rise as steep slopes. Land immediately surrounding the quarry pit slopes steeply upwards, increasing from 620m AHD to 660 AHD.

Asset Protection Zones

An Asset Protection Zone (APZ) is a fuel reduced area surrounding a built asset or structure. While PBP (RFS, 2019) has been developed for residential development, the method for the development of an APZ provided by PBP (RFS, 2019) can be used as a guide for all developments which may be affected by bushfire.

In order to expand on current operations, the Proposal requires the movement of the existing workshop to the west of the Development site (refer to Figure 3-9 and Figure 3-10). There will be no additional infrastructure established as part of this Proposal.

The mobile equipment will all be placed on bare disturbed unvegetated ground negating the requirements to set APZ.

Clearance of vegetation within the approved disturbance area and hazard reduction measures within the surrounding vegetation would be continually maintained throughout the life of the Proposal. Hazard reduction measures would continue to be assessed on an annual basis by the Quarry Manager in consultation with the local RFS and designed to minimise impacts on biodiversity.

6.8.3 Potential fire impacts

The majority of the Development site would be cleared of existing vegetation. The surrounding area is subject to previous quarrying activities. The development is located on the outskirts of the Tumbarumba township. Surrounding remnant vegetation represents a significant fuel load, which is capable of sustaining and promoting the spread of bushfires.

As such, the potential risks to the extraction operations from bushfire attack are assessed from the point of view of emergency evacuation and management in the case of a bushfire emergency and the potential for the operations to cause a bushfire for example, from the operation of machinery. Risks to neighbouring infrastructure, such as the Tumbarumba Turf Club, located immediately south east of the development, and neighbouring receivers are also considered.

Bushfire Management

The project represents the continuation of existing quarry operations and expansion towards the southeast of the current operations.

The existing bushfire management measures on site include:

- Maintained access road
- Water cart
- Fire extinguishers on all plant and equipment, in site offices and workshops
- Hose reel in the workshop.

The Proponent intends to continue to implement existing bushfire management measures currently in place at the site in consultation with the local RFS.

6.8.4 Safeguards and management measures

Table 6-29 Safeguards and mitigation measures for hazard impacts

No.	Safeguards and mitigation measures	C	O	R
HA01	Update the BHQ Bushfire Emergency Response Plan as part of the Health Safety and Environment Management Plan (HSEMP) and Emergency Management Plan. The updated plan will be prepared in consultation with the local Rural Fire Service and details of the plan would be provided in the updated CEMP and OEMP for the project.	**C**	**O**	**R**
HA02	Dangerous or hazardous materials will be transported, stored, and handled in accordance with *AS1940-2004: The storage and handling of flammable and combustible liquids*, and the ADG Code where relevant. All potential pollutants kept on-site will be stored in accordance with relevant HAZMAT requirements and bunded.	**C**	**O**	**R**
HA03	All design and engineering will be undertaken by qualified competent persons with the support of specialists as required.	**Design**		
HA04	All electrical equipment will be designed in accordance with relevant codes and industry best practice standards in Australia.	**Design**		
HA05	All chemicals and fuels used on-site must be stored and handled in accordance with: • The requirements of all relevant Australian Standards • The NSW EPA's *Storing and Handling of Liquids: Environmental Protection – Participants Handbook* if the chemicals are liquids In the event of an inconsistency, the most stringent requirement must prevail to the extent of the inconsistency.	**C**	**O**	**R**
HA06	Water for use in firefighting will be provided by the site water management system, to ensure there is sufficient water available on site for bushfire fighting purposes.	**C**	**O**	**R**
HA07	The haul road on the site provides access across the site for fire fighting vehicles. Water for use in firefighting will be provided by an extraction groundwater bore onsite. Firefighting equipment including fire extinguishers and hose reel (landfill shed only) will continue to be provided at all infrastructure areas and mobile equipment will be maintained in accordance with Australian Standards and WH&S guidelines.	**C**	**O**	**R**
HA08	A Fire Management and Emergency Response will be developed and implemented during construction, operation and rehabilitation to prevent contaminants affecting adjacent surrounding environments. The FMER will include spill and contamination responses to: • Manage the storage of any potential contaminants onsite.	**C**	**O**	

No.	Safeguards and mitigation measures	C	O	R
	Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and EPA notification procedures and remediation).			
HA09	A protocol will be developed in relation to discovering buried contaminants within the Development site (e.g., pesticide containers, if any). It would include stop work, remediation and disposal requirements. If significant contamination is found on site during construction or operation activities, it must be reported in line with *Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites (OEH 2011)*. Further action should be undertaken when necessary in line with the *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA 2015).	**C**	**O**	

C: Construction; O: Operation; R: Rehabilitation

6.9 Aboriginal heritage

6.9.1 Existing Environment

NGH was commissioned by BHQ to prepare an Aboriginal Heritage Due Diligence (DD) assessment in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW, 2010) (Due Diligence Code). The DD assessment is prepared to evaluate whether Aboriginal objects are present, or likely to be present, within the proposed impact area of the development activity, and if those objects would be harmed by the activity.

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) database was undertaken over an approximate 50km^2 area, centred on the survey area The results yielded a total of 98 Aboriginal sites recorded within the search area and no Aboriginal Places. No previously registered AHIMS sites are located within or adjacent to the survey area. However, 10 sites occur within approximately 5km of the survey area (refer to Figure 6-17).

The Murray's Crossing Quarry consists of a tertiary basalt flow. Prior to its use as a quarry, it was a high point overlooking Tumbarumba Creek. It is believed that the area was an important source of basalt material to the Ngarigo people (pers comm John Casey, 2021). The survey area is situated on a moderately flat to sloping area approximately 3km to the southwest of Tumbarumba Hill. Tumbarumba Creek cuts through the general area along an approximate north-south course, amplifying local relief and providing ample high sensitivity areas for heritage recovery. There are a series of springs (ephemeral drainage lines) leading down to Tumbarumba Creek. These springs were noted by local Aboriginal representative Uncle John Casey to remain active even in the driest of summers and would have been an important resource during such times (pers comm John Casey, 2021).

The desktop assessment indicated that there are landscapes present within the survey area that have the potential to contain Aboriginal objects and a site inspection by an NGH Archaeologist with representatives from the Toomaroombah Kunama Namadgi Indigenous Corp (TKNIC) was required.

Figure 6-17 AHIMS sites within 5km of the survey area

6.9.2 Site assessment

A visual inspection of the survey area was carried out on the 23 September 2021 and again on 13 December 2021 after an amendment to the development footprint. The TSR was surveyed for assessment in the DD; however, it has not been included in this EIS.

Visibility within the survey area was generally very poor (<2%) at the time of survey, due to the presence of long, dense grasses. Due to poor visibility and unsafe conditions, the trunks of two mature native trees were not assessed for cultural modification. Despite the poor visibility, some exposures were present, including:

- A vehicular track in the TSR on the western boundary
- A number of erosion banks along the south eastern and north eastern sections of the survey area.

A probable location for camping was identified within the survey area on a spur approximately 50m south of a spring fed drainage line. A small potential archaeological deposit (PAD 01) was located on the spur within the survey area (Figure 6-18, Figure 6-19 and Figure 6-20). Uncle John (a representative from TKNIC) disclosed that the area of the PAD was also located on a significant song line.

The western boundary of the survey area consists of a low-lying wetland associated with Tumbarumba Creek. It was noted to be quite disturbed through the construction, use and maintenance of the unsealed vehicular track forming the current TSR, land clearing, historic mining activity, quarry activity and the construction of a small bridge. It was also evident that the area is subject to frequent and intensive flooding. Given the landforms and noted disturbance there is little likelihood of *in situ* archaeological deposits occurring within and along the TSR. However, the TKNIC representatives spoke of the highly significant intransient values of the TSR to the local Aboriginal people. The TSR bordering the western boundary of the survey area is known locally as Gudja Gudja Mura (5 Ways) and it is not only the location of a large gathering place for many Aboriginal groups in the past, but also the location where 7 different story lines converge. Gudja Gudja Mura was not only important to Aboriginal people in the past but is still highly valued and used by the local community today.

Figure 6-18 PAD location, looking west

Figure 6-19 Overview looking south towards PAD

Aside from the PAD 01, the survey area was considered to have low potential for Aboriginal objects and in situ subsurface deposits to occur due to:

- Significant levels of prior ground disturbance
- The steep sloping nature of the landform in the north west and south west portion of the survey area
- The low-lying nature of the landform in the south east and western sections of the survey area.

Figure 6-20 Results of the Aboriginal heritage site survey

6.9.3 Potential impacts

Construction and operation

Providing that the works avoid PAD 01 (including a 10m buffer), physical inspection of the two trees identified in Figure 6-20 is undertaken and, providing that the appropriate mitigation measures are followed, no further heritage assessment is required within this area and works can proceed with caution. An Unexpected Finds Protocol (UFP) would be prepared and followed should there be an inadvertent discovery of Aboriginal objects during construction and operation.

BHQ is reminded that it is an offence under the *NSW National Parks and Wildlife Act 1974* to disturb, damage or destroy any Aboriginal object without a valid Aboriginal Heritage Impact Permit (AHIP).

Recommendations for safeguards and mitigation methods have been provided as part of the DD, refer to Appendix E.

6.9.4 Safeguards and mitigation measures

Table 6-30 Safeguards and mitigation measures for Aboriginal heritage impacts

No.	Safeguards and mitigation measures	C	O	R
AH1	Works must avoid the area of Potential Archaeological Deposit (PAD) with a minimum 10 m buffer to ensure there are no inadvertent impacts to potential Aboriginal objects.	**C**	**O**	**R**
AH2	BHQ is encouraged to not undertake activities within the TSR as identified in Figure 6-20 due to the significant cultural value placed on the area by the local Aboriginal community. Open and ongoing dialogue with local representatives of the Toomaroombah Kunama Namadgi Indigenous Corp (TKNIC) is recommended.	**C**	**O**	**R**
AH3	Prior to works proceeding near the two mature native trees identified in Figure 6-20, BHQ must undertake physical inspection of the trunk of the trees which were unable to be assessed at the time of inspection due to safety concerns. BHQ is to photograph the trunk of each tree with a scale and forward the photographs on to an NGH archaeologist. Works can only proceed with caution following written advice by an archaeologist to confirm the presence or absence of cultural modification. If deemed to be necessary, a physical inspection may be required.	**C**	**O**	**R**
AH4	Works within the survey area that are outside the area of Potential Archaeological Deposit (PAD 01) and the two trees identified in Figure 6-20 can proceed with caution.	**C**	**O**	**R**
AH5	If the proposed works cannot avoid the PAD, then further assessment in the form of an Aboriginal Cultural Heritage Assessment (ACHA) must be undertaken, including a programme of subsurface testing to establish the true archaeological potential and extent of archaeological sites within the portion of the PAD proposed to be impacted. All subsurface testing must comply with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW. If Aboriginal objects are recovered during the testing programme an Aboriginal Heritage Impact Permit (AHIP) must be obtained from Heritage NSW before the proposed development can proceed.	**C**	**O**	**R**

No.	Safeguards and mitigation measures	C	O	R
AH6	Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment.	**C**	**O**	**R**
AH7	If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and Heritage NSW notified. The find will need to be assessed and if found to be an Aboriginal object an Aboriginal Heritage Impact Permit (AHIP) may be required.	**C**	**O**	**R**
AH8	In the unlikely event that human remains are identified during development works, all work must cease in the immediate vicinity and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, Heritage NSW must be notified by ringing the Enviroline (131 555).	**C**	**O**	**R**

C: Construction; O: Operation; R: Rehabilitation

6.10 Historic heritage

6.10.1 Approach

A desktop search was completed for historical heritage in September 2021, which concluded that there are no registered heritage sites within or near the Development site.

A search of listed items (under the Heritage Act, the Australian Heritage Database and those listed by local Councils and State Government agencies) was completed for the Snowy Valleys LGA on 11 September 2021.

A desktop study was undertaken to identify any historic heritage (non-indigenous) items or places in proximity to the Development site. The Snowy Valleys LGA (formerly Tumbarumba LGA) was used in the search as the Development site is now situated within the Snowy Valleys Council area. Heritage databases searched as part of this assessment included:

- The NSW State Heritage Inventory (SHI) (includes items on the State Heritage Register and items listed by state agencies and local government) to identify any items currently listed within or adjacent to the Development site. The area searched was the Snowy Valleys LGA
- The Australian Heritage Database (includes items on the National and Commonwealth Heritage Lists) to identify any items that are currently listed within or adjacent to the Development site
- The Environmental Heritage (Schedule 5) of the Tumbarumba LEP 2010 for locally listed heritage items that are within or adjacent to the Development site.

A general site inspection was also undertaken, with no items of historical heritage identified.

6.10.2 Results

A summary of the results of the heritage searches are illustrated in Table 6-31. Details of listed items are provided below.

Table 6-31 Summary of heritage listings in the Snowy Valleys LGA

Name of register	Number of listings
World Heritage List	0
National Heritage List	4
Commonwealth Heritage List	0
NSW State Heritage Register	5
Tumbarumba LEP 2010	108

State Heritage Register

A search of the NSW heritage Register on 11 September 2021 for the Snowy Valleys LGA identified five items under the Heritage Act, four Aboriginal Places and 108 items listed under the Tumbarumba LEP and by state agencies. Five items listed in the State Heritage Search were located within 3km of the Development site:

- Tumbarumba Pioneer Cemetery (I9), located approximately 700m to the southeast
- Tumbarumba Post Office (I5), located approximately 1.5km to the northeast
- Tumbarumba Court House (I3), located approximately 1.6km to the north
- Tumbarumba Public School (I6), located approximately 1.8km to the north
- Wolters Cottage (I7), located approximately 1.8km to the northwest.

The Proposal would not have an impact on State Heritage listed items located within proximity to the Development site.

Local Heritage Schedule

A search of the Tumbarumba LEP 2010 was completed on 11 September 2021, which found five items of local significance in proximity to the Development site. None of these items would be impacted by the Proposal; with the closest site located 700m southeast of the Development site. Heritage items within proximity to the Development site are provided in Figure 6-21.

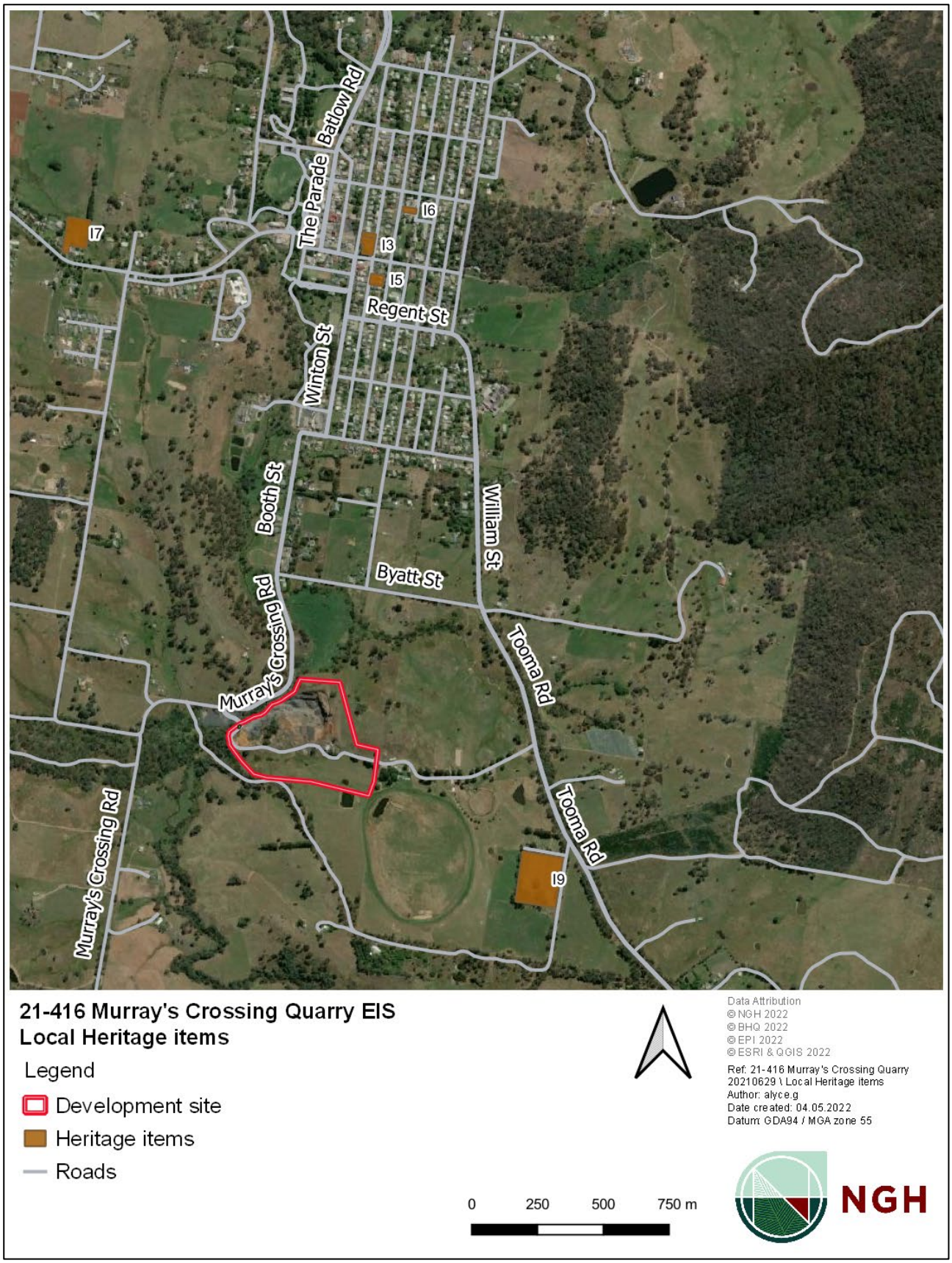

Figure 6-21 Local heritage items

6.10.3 Potential impacts

Construction

Heritage items identified from the desktop study are outlined above. Most of these items are found in the township of Tumbarumba. The closest site is approximately 700m southeast of the Development site.

The Proposal is not considered likely to have a significant impact on heritage values in accordance with the Heritage Act, the EP&A Act, and the EPBC Act.

Operation

No operational impacts on Heritage items are anticipated as a result of the Proposal.

6.10.4 Safeguards and mitigation measures

Table 6-32 Safeguards and mitigation measures for historic heritage

No.	Safeguards and mitigation measures	C	O	R
HH1	Should an item of historic heritage be identified, the Heritage Division (DPIE) shall be contacted prior to further work being carried out in the vicinity.	**C**	**O**	**R**

C: Construction; O: Operation; R: Rehabilitation

6.11 Visual amenity

6.11.1 Approach

The visual impact assessment (VIA) was completed by NGH in the following stages:

- Background investigations and mapping, including identifying Land Character Units (LCUs), defining where infrastructure may be visible in the landscape, and identifying key viewpoints such as major travel routes, residences and built-up areas
- Field survey including reconnaissance, ground truthing and photography, and understanding the likely sensitivity of LCUs within the landscape
- Impact assessment, describing the potential impact on visual amenity during construction and operation of the Proposal

The impact assessment methodology used in this VIA for operational impacts is based on the Bureau of Land Management (BLM) Visual Resource Management System, developed by the BLM, US Department of the Interior (n.d.). The BLM developed a systematic process to analyse the visual impact of proposed developments. The basic philosophy states that the degree to which a development affects the visual landscape depends on the visual contrast imposed by the project. Key steps undertaken to assess the visual impact are as follows:

- Define Landscape Management Zones (LMZ) for the representative viewpoints, based on:
- The scenic quality of the Proposal area LCU
- The expected sensitivity at representative viewpoints
- The proximity of each representative viewpoint.
- Evaluate the degree of contrast the quarry would generate at representative viewpoints in consideration of the management objectives of the relevant LMZ
- Determine the acceptability of the contrast with the management objectives of the relevant LMZ; this is the resultant visual impact, rated as high, medium or low.

Murray's Crossing Quarry, as shown in Figure 3-2, is in an undulating landscape at an elevation ranging from 620m to 660m Australian Height Datum (AHD). Variable topography and vegetation surrounding the Development site provides some screening for the development.

For the purpose of this VIA, visual elements of the Proposal include:

- The quarry face, which would extend south of the existing operation, occupying the northern portion of the hill face.
- The proposed haulage road, which would connect the existing operation with the proposed extension.
- The movement of heavy vehicles.

Landscape character

LCUs take into account topography, vegetation, land use, and other distinct landscape features. They are a way to summarise differences in the receiving environment that may affect the visual impact of the proposed quarry at different locations.

Four LCUs were identified within Tumbarumba and the surrounding areas:

- Rural (including agricultural lands)

- Residential (viewpoints near residences)
- Industrial (major roads, quarries, landfill, electrical and other built infrastructure)
- Commercial (businesses, town centre).

The scenic quality was rated in each LCU as follows:

- A high scenic quality rating describes areas with outstanding, unusual or diverse features
- A moderate scenic quality rating applies to areas with the features and variety normally present in the character type
- A low scenic quality rating is given to areas lacking features and variety.

The four LCUs identified are characterised in Table 6-33 in terms of their scenic quality.

Table 6-33 Key features of LCUs within Tumbarumba and surrounds

Key features of LCUs within Tumbarumba and surrounds
Rural LCU
Rural and agricultural lands within the locality are used predominantly for grazing with some rotational cropping of grains, cereals and pulses in flatter lower lying parts of the landscape. The Proposal is nestled within the surrounding landscape at approximately 620m to 660m. Expansive views within this LCU are generally limited given the undulating relief and screening provided by established vegetation. Surrounding blocks are made up of primary production land uses, with residences within this landscape being sparsely distributed but more concentrated towards the Tumbarumba townsite to the north. Residences are commonly associated with additional vegetation plantings. Other infrastructure includes agricultural sheds, grain silos and water tanks. Secondary sealed and unsealed roads including Tooma Road, Byatt Street, Mitchell Street and Murray's Crossing Road are the main vantage points from which to view agricultural areas. Substantial remnant native vegetation screens views of agricultural land from roadways. In addition to sections of road, livestock fences are visible that reinforce rectilinear shapes and are common in rural landscapes. Given the undulating nature of the topography and the established nature of the vegetation along Murrays Crossing Road, it is estimated that receivers would have views of the Proposal along approximately 800m of this road. Therefore, visual impacts would be short-term and minor. **Scenic quality is considered moderate. Built elements are production-related and include linear fences, powerlines, roads, agricultural buildings and rural homes. Forms are typically uniform, of undulating elevation and linear. This LCU is common and the dominant LCU in the study area. The proposed quarry is located within this LCU.**
Residential LCU
Residential areas of Tumbarumba and surrounds include viewpoints from the road near residents' homes. The Residential LCU varies from relatively flat to rolling topography, with expansive views generally limited given the undulating relief and screening provided by vegetation. Residents are broadly and unevenly distributed around the Proposal, becoming more concentrated in the Tumbarumba township to the north. Properties are commonly associated with additional vegetation planting and screening. Numerous residences (refer to Figure 6-23) occur within 2km of the Proposal. The results of the VIA suggest that the Proposal would be well screened from receivers located within 1km of the development, given the mature nature of the vegetation in the area and the undulating topography. **Scenic quality is considered moderate. Views vary in colour and form, and the proportion of large lot agriculture and smaller lot residential vary between residences, normal in this character type. Built elements include linear fences, powerlines, roads, farm dams, agricultural buildings and rural homes. This LCU is common in the study area.**

Key features of LCUs within Tumbarumba and surrounds
Industrial LCU
Industrial areas within the locality include major roads such as Tooma Road, Batlow Road and Masons Hill Road. Key features in the Industrial LCU include the existing Murray's Crossing Quarry, as well as the Tumbarumba Resource Recovery and Recycling Centres and Hyne Timber Mill to the northwest and the Tumbarumba Water Treatment Plant, located northeast of the Proposal. Other industrial features include the regular movement of heavy haulage vehicles. **Scenic quality is considered low, with features matching the land use. Substantial screening is present in the form of vegetation across grazed paddocks and along creek lines, however, key industrial features are located at elevated positions in the landscape. This LCU is common in the study area, with the Proposal located approximately 700m west of Tooma Road.**
Commercial LCU
Commercial lands within the locality include the Tumbarumba central business district, which includes three churches, a pub, two service stations, a shopping centre, several motels, a caravan park and a racecourse. The Proposal is located at approximately the same height as the Tumbarumba township. Despite this, Murray's Crossing Quarry is not visible from Tumbarumba, due to the undulating nature of the topography and the established nature of the vegetation within the area. **Views of the Proposal from Tumbarumba are well screened by mature native vegetation and undulating topography, which blocks views of the Proposal from most locations within the Tumbarumba township.**

Representative viewpoints

The BLM methodology requires identification of representative viewpoints in the study area. These may be travel routes such as roads, waterways and recreational tracks, residential areas, tourist facilities, houses and farmland.

Eleven representative viewpoints were identified using the BLM methodology and within the Zone of Visual Influence (ZVI) and are mapped in Figure 6-2.

Visual sensitivity

The predicted sensitivity of each viewpoint can be determined considering its proximity to the Development site and factors such as use, scenic quality and regional significance.

Criteria for proximity are as follows:

- Foreground 0 – 1 km
- Middle ground 1 – 2 km
- Background More than 2 km.

Criteria for scenic quality are as follows:

- High sensitivity:
    - high use routes or areas
    - routes or areas of national or state significance
    - areas with high scenic quality.
- Moderate sensitivity:

    - moderate use routes or areas
    - routes or areas of regional or local significance
    - areas with moderate scenic quality.
- Low sensitivity:
    - low use routes or areas
    - routes or areas of low local significance
    - areas with low scenic quality.

Considering the sensitivity of local viewpoints, the following assessments were made:

- **Rural viewpoints** were assessed as generally having a low to moderate scenic quality given the surrounding agricultural activities. Rural views are located on moderate to low routes, or areas only accessed by local traffic. As motorists use local roads, views increase as vehicles approach the Development site. View durations are generally short as vehicle speeds are up to 100km/hr, and the expected number of local vehicles on these local roads is considered low. Regional and local significance is low, with scenic quality being moderate.
- **Residential viewpoints** were assessed as generally having a moderate to high sensitivity. If there is a view of the quarry, the view duration could be expected to be high from a residence.
- **Commercial viewpoints** from the Tumbarumba townsite were assessed as having low to moderate sensitivity given the functional nature of this land use and close proximity to high density development including busy local roads and powerlines.

The sensitivity of each viewpoint is provided in Table 6-34.

Figure 6-22 Visual impact assessment locations

Table 6-34 Representative viewpoints and assessed proximity, scenic quality and sensitivity

ID	LCU	Distance to site	Scenic quality	Sensitivity
V1	Rural	Foreground	Low	Low
V2	Residential	Foreground	Moderate	High
V3	Rural	Foreground	Low	Low
V4	Rural / Residential	Foreground	Low	High
V5	Rural	Foreground	Low	Low
V6	Rural	Foreground	Low	Low
V7	Residential	Foreground	Moderate	High
V8	Rural	Foreground	Moderate	Moderate
V9	Rural	Foreground	Moderate	Moderate
V10	Rural	Foreground	Moderate	Moderate
V11	Commercial	Foreground	Low	Moderate

Definition of landscape management zones

Visual landscape management zones (LMZs) were assigned to each representative viewpoint. The zones were derived by combining scenic quality (from the LCUs described in Table 6-33), viewer sensitivity and the distance to the Proposal. Combined they produce a three-tiered management hierarchy: A – C, as provided in Table 6-35. Only foreground proximity has been included. There are no representative viewpoints in the middle or background.

Table 6-35 Visual LMZ decision matrix

	Proximity / sensitivity			
Scenic quality		**Foreground High**	**Foreground Moderate**	**Foreground Low**
	High	A	A	B
	Moderate	A	B	C
	Low	B	B	C

Each zone has associated objectives to guide management of visual change and to help evaluate proposed project impacts. These are shown in Table 6-36.

Table 6-36 Visual LMZ management objectives

Management priority	Management objectives
A	Maximise retention of existing visual amenity. Landscapes are least able to absorb change. Developments may lead to a major change.
B	Maintain existing visual amenity, where possible. Protect dominant visual features. Developments may be allowed to be visually apparent.
C	Less importance for retaining existing visual amenity. Landscapes can absorb change. Developments may be allowed to dominate but should reflect existing forms and colours where possible.

The management priority for each viewpoint is provided in Table 6-37.

Table 6-37 Visual landscape management priorities for representative viewpoints

ID	Receivers represented by this viewpoint	LCU	Management priority
V1	Murray's Crossing Road	Rural	C
V2	R3/ Murray's Crossing Road	Residential	B
V3	Mitchell Street	Rural	C
V4	R20 / Ramsay Road	Rural	B
V5	Murray's Crossing Road	Rural	C
V6	Murray's Crossing Road	Rural	C
V7	R32/ Byatt Street	Residential	B
V8	Byatt Street	Rural	C
V9	Tooma Road	Rural	C
V10	Tooma Road	Rural	C
V11	Tumbarumba Racecourse / Tooma Road	Commercial	C

6.11.2 Potential impacts

A VIA for the operational quarry has been prepared considering:

- The specific elements of the Proposal including the quarry face, haulage road and upgrade of the haul road intersection
- The potential for the quarry to be viewed from representative viewpoints

- The degree of contrast the proposed quarry would have within the identified LMZ. LMZs were assigned to viewpoints based on the results of the field work, and the contrast at that viewpoint was evaluated, as described below
- The potential impact from dust.

Evaluation criteria

The ratings for the degree of contrast created by the Proposal at each viewpoint have the following definitions (U.S. Department of the Interior, n.d.):

- High contrast: the Proposal would be dominant within the landscape and generally not overlooked by the observer; the visual change would not be absorbed
- Medium contrast: the Proposal would be moderately dominant and noticed; the visual change would be partially absorbed
- Low contrast: the Proposal would be seen but would not attract attention; the visual change would be well absorbed
- Indistinct: contrast would not be seen or would not attract attention; the visual change would be imperceptible.

To determine if the objectives for the LMZ are met, the contrast rating for the viewpoint is compared with the relevant management objectives to give a visual impact level. The visual impact level is consequently defined as:

- High impact: contrast is greater than what is acceptable
- Medium impact: contrast is acceptable
- Low impact: visual contrast is little or not perceived and is acceptable.

For high impact viewpoints, mitigation must be considered. Mitigation for moderately impacted receivers is considered on a case-by-case basis, generally in consultation with the affected individuals. No mitigation is warranted for low impacts.

Evaluation results

Table 6-38 evaluates the expected level of visual impact from 11 viewpoints, representing three residences, one commercial property and multiple public viewpoints surrounding the Development site.

Table 6-38 Visual impacts at representative viewpoints and their associated receivers

VIEWPOINT 1 (Murray's Crossing Road)		
Summary of viewpoint		Viewpoint description / impact
LCU	Rural	Viewpoint 1 is located approximately 800m southwest of the Development site on Murray's Crossing Road. Localised dust from the quarry is visible from the road; however, mature vegetation and undulating topography provides adequate screening of the Proposal. The development would not be visible from this viewpoint. **No mitigation is required, other than dust suppression.**
Scenic quality	Low	
Proximity	Foreground	
Sensitivity	Low	
LMZ objective	C	
Contrast	Indistinct	
Inherent visual impact	LOW	
Residual visual impact	LOW	

VIEWPOINT 2 (R2 / Murray's Crossing Road)		
Summary of viewpoint		Viewpoint description / impact
LCU	Residential	Viewpoint 2, representing views from R2 and Murray's Crossing Road, is located approximately 470m southwest of the Development site. Localised dust from the quarry is visible from the road; however,
Scenic quality	Moderate	
Proximity	Foreground	
Sensitivity	High	

LMZ objective	B	mature vegetation and undulating topography provides adequate screening of the Proposal. The development would not be visible from this viewpoint. **No mitigation is required, other than dust suppression.**
Contrast	Low	
Inherent visual impact	INDISCERNIBLE	
Residual visual impact	INDISCERNIBLE	

VIEWPOINT 3 (Mitchell Street)		
Summary of viewpoint		Viewpoint description / impact
LCU	Rural	Viewpoint 3 is located on Mitchell Street, approximately 420m northwest of the Development site. From this location, stockpiling within the TSR and evidence of quarrying are visible within the landscape. No changes to the existing use agreement of the TSR are proposed and as such, the stockpile site has not been included for assessment as part of this VIA. Given the mature vegetative screening and undulating nature of the topography, it is considered unlikely that views of the Proposal would become more visible, given that the pit footprint will continue southeast. **No mitigation is required.**
Scenic quality	Low	
Proximity	Foreground	
Sensitivity	Low	
LMZ objective	C	
Contrast	Low	
Inherent visual impact	LOW	
Residual visual impact	LOW	

VIEWPOINT 4 (R20 / Ramsay Road)		
Summary of viewpoint		Viewpoint description / impact
LCU	Rural	Viewpoint 4, representing views from Ramsay Road and R20, is located approximately 760m northwest of the Development site. Murray's Crossing Quarry is partially visible from both viewpoints. Mature vegetation provides partial screening of the Proposal. Given that the pit footprint would continue southeast, it is considered unlikely that views of the quarry would increase as a result of the Proposal. **No mitigation is required.**
Scenic quality	Low	
Proximity	Foreground	
Sensitivity	Low	
LMZ objective	B	
Contrast	Low	
Inherent visual impact	LOW	
Residual visual impact	LOW	

VIEWPOINT 5 (Murray's Crossing Road)		
Summary of viewpoint		Viewpoint description / impact
LCU	Rural	Viewpoint 5, representing views from Murray's Crossing Road, is located approximately 40m northwest of the Development site. Views from
Scenic quality	Low	
Proximity	Foreground	

Sensitivity	Low	the road have a direct line of site to the development. Views of the development are likely to increase as the pit footprint continues southeast. Given the undulating nature of the topography and the established nature of the vegetation along the majority of Murray's Crossing Road, it is estimated that road users would have views of the Proposal for approximately 800m. This is considered to be a short-term, low visual impact. As the quarry is already operation, mitigation is not considered necessary. **No mitigation is required.**
LMZ objective	C	
Contrast	Moderate	
Inherent visual impact	LOW	
Residual visual impact	LOW	

VIEWPOINT 6 (Murray's Crossing Road)		
Summary of viewpoint		Viewpoint description / impact
LCU	Rural	Viewpoint 5, representing views from Murray's Crossing Road, is located approximately 20m northwest of the Development site. Views from the road have a direct line of site to the quarry. Views of the quarry are likely to remain the same as the pit footprint continues southeast. Given the undulating nature of the topography and the established nature of the vegetation along the majority of Murray's Crossing Road, it is estimated that road users would have views of the Proposal for approximately 800m. The is considered to be a short-term, visual impact. As the quarry is already operation, mitigation is not considered necessary. **No mitigation is required.**
Scenic quality	Low	
Proximity	Foreground	
Sensitivity	Low	
LMZ objective	C	
Contrast	Medium	
Inherent visual impact	LOW	
Residual visual impact	LOW	

VIEWPOINT 7 (R32 / Byatt Street)		
Summary of viewpoint		Viewpoint description / impact
LCU	Residential	Viewpoint 7, representing views from R32 and Byatt Street, is located approximately 370m north of the Development site. The quarry is completely screened by vegetation and undulating topography. The Proposal would see the pit footprint continue to the southeast of its current location; therefore, no additional visual impacts would occur. **No mitigation is required.**
Scenic quality	Moderate	
Proximity	Foreground	
Sensitivity	High	
LMZ objective	B	
Contrast	Indistinct	
Inherent visual impact	INDISCERNIBLE	
Residual visual impact	INDISCERNIBLE	

VIEWPOINT 8 (Byatt Street)		
Summary of viewpoint		Viewpoint description / impact
LCU	Rural	Viewpoint 8, representing views from Byatt Street, is located approximately 570m northeast of the Development site. The development is well screened by vegetation and undulating topography. The Proposal would see the pit footprint continue to the southeast of its current location; therefore, no additional visual impacts would occur.
Scenic quality	Moderate	
Proximity	Foreground	
Sensitivity	Moderate	
LMZ objective	C	
Contrast	Indistinct	

Inherent visual impact	INDISCERNIBLE	**No mitigation is required.**
Residual visual impact	INDISCERNIBLE	

VIEWPOINT 9 (Tooma Road)		
Summary of viewpoint		Viewpoint description / impact
LCU	Rural	Viewpoint 9, representing views from Tooma Road, is located approximately 635m northeast of the Development site. Due to the topography of the landscape, existing vegetation and distance from the Proposal, the quarry would not be visible from this location. **No mitigation is required.**
Scenic quality	Moderate	
Proximity	Foreground	
Sensitivity	Moderate	
LMZ objective	C	
Contrast	Indistinct	
Inherent visual impact	INDISCERNIBLE	
Residual visual impact	INDISCERNIBLE	

VIEWPOINT 10 (Tooma Road)		
Summary of viewpoint		Viewpoint description / impact
LCU	Rural	Viewpoint 10, representing views from Tooma Road, is located approximately 590m east of the Development site. Due to the topography of the landscape, existing vegetation and distance from
Scenic quality	Moderate	
Proximity	Foreground	
Sensitivity	Moderate	

LMZ objective	C	the Proposal, the quarry would not be visible from this location. **No mitigation is required.**
Contrast	Indistinct	
Inherent visual impact	INDISCERNIBLE	
Residual visual impact	INDISCERNIBLE	

VIEWPOINT 11 (Tumbarumba Racecourse / Tooma Road)		
Summary of viewpoint		Viewpoint description / impact
LCU	Commercial	Viewpoint 11, representing views from Tumbarumba Racecourse and Tooma Road, is located approximately 20m east of the Development site. Due to the topography of the landscape, the Proposal would be partially visible from this location. Given that the existing development is already visible to V11, it is considered unlikely that the Proposal would result in further visual impact. **No mitigation is required.**
Scenic quality	Low	
Proximity	Foreground	
Sensitivity	Moderate	
LMZ objective	C	
Contrast	Low	
Inherent visual impact	LOW	
Residual visual impact	LOW	

6.11.3 Results summary

Low impact to indiscernible views – no mitigation required

All 11 viewpoints are assessed as having low visual impact from the existing and proposed quarry. The Development site is obstructed by topography and vegetation for 5 of these locations. No mitigation is required for the Proposal.

6.11.4 Potential cumulative impacts

Adverse cumulative impacts occur when the infrastructure or activities at the quarry site exacerbate the negative impacts of other infrastructure or activities occurring nearby. The visual impact of the Proposal is considered low, contributing only a very small portion of background views where the Proposal would be visible. It is unlikely that the Proposal would contribute to cumulative visual impacts for residences within 3km of the Development site. Views from all viewpoints would remain dominated by agricultural land use and remnant native woodland.

6.11.5 Safeguards and mitigation measures

Table 6-39 Safeguards and mitigation measures for visual impacts

No.	Safeguards and mitigation measures	C	O	R
VA1	Night lighting will be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations). Lighting to: • Be directed away from roads and residents so as not to cause light spill that may be hazardous to drivers. • Comply with all relevant standards, codes of practice and policies • Light spill is light that falls outside the area that is intended to be lit and can contribute to glare and waste energy. Spill light above the horizontal plane also contributes to artificial skyglow. All light fittings should be located, aimed or shielded to avoid spill. Measures to prevent spill include: o Installing light fittings with an opaque cover and flat glass, mounted horizontally on both axes o Mounting lights under part of a building (including awnings, verandas or roofs) so light is blocked above the horizontal plane o Design buildings to internalise lights • Wherever possible, light should be directed downwards. Mitigation measures include: o Installing direction fittings, such as floodlights or spotlights o Use higher mounting heights that allow lower main beam angles that are closer to the vertical o Lighting of all-night operations need to be downward facing of a peach colour and shielded • Operational light from the Proposal must be directed downwards, or inwards towards the work area • Light fittings that are specifically designed to minimise light shining near to or above the horizontal plane should be used • Energy efficient globes include LEDs and high-pressure sodium • Where floodlights are required, wherever possible use fittings with asymmetric beams that permit horizontal glazing. These are to be kept at or near parallel to the surface being lit, usually the ground and should prevent light spill. An asymmetric beam also allows the light fitting to be mounted on the edge of an area and avoids the need for fittings to be tilted upwards. Flat glass light fittings should be installed with the glass horizontal to make efficient use of the brightest part of the beam and to eliminate light spill	**C**	**O**	**R**

C: Construction; O: Operation; R: Rehabilitation

6.12 Land use impacts

6.12.1 Existing environment

Surrounding land uses within 2km of the Proposal include grazing agriculture, a racecourse and the town of Tumbarumba. Tumbarumba supports commercial businesses, residential dwellings and associated public services, such as hospitals, parks and schools (Figure 6-23).

The Development site, and surrounding land, is zoned RU1 Primary Production (refer to Figure 6-24). Key nearby features and land uses in the locale include:

- Current quarry activities within the Development site
- The Tumbarumba township, located approximately 2km to the north
- Numerous rural and commercial buildings
- Public road network consisting of both sealed and unsealed rural roads
- Electricity connection and transmission infrastructure
- Mannus State Forest, located approximately 2km to the west
- Bogandyera Nature Reserve, located approximately 2.3km to the south
- Tumbarumba racecourse, located immediately to the south east
- Tumbarumba Creek, located immediately to the north west.

The Development site does not hold any exploration applications, assessment lease applications, assessment leases, mining or production applications, or mining or production leases (NSW Government, 2021).

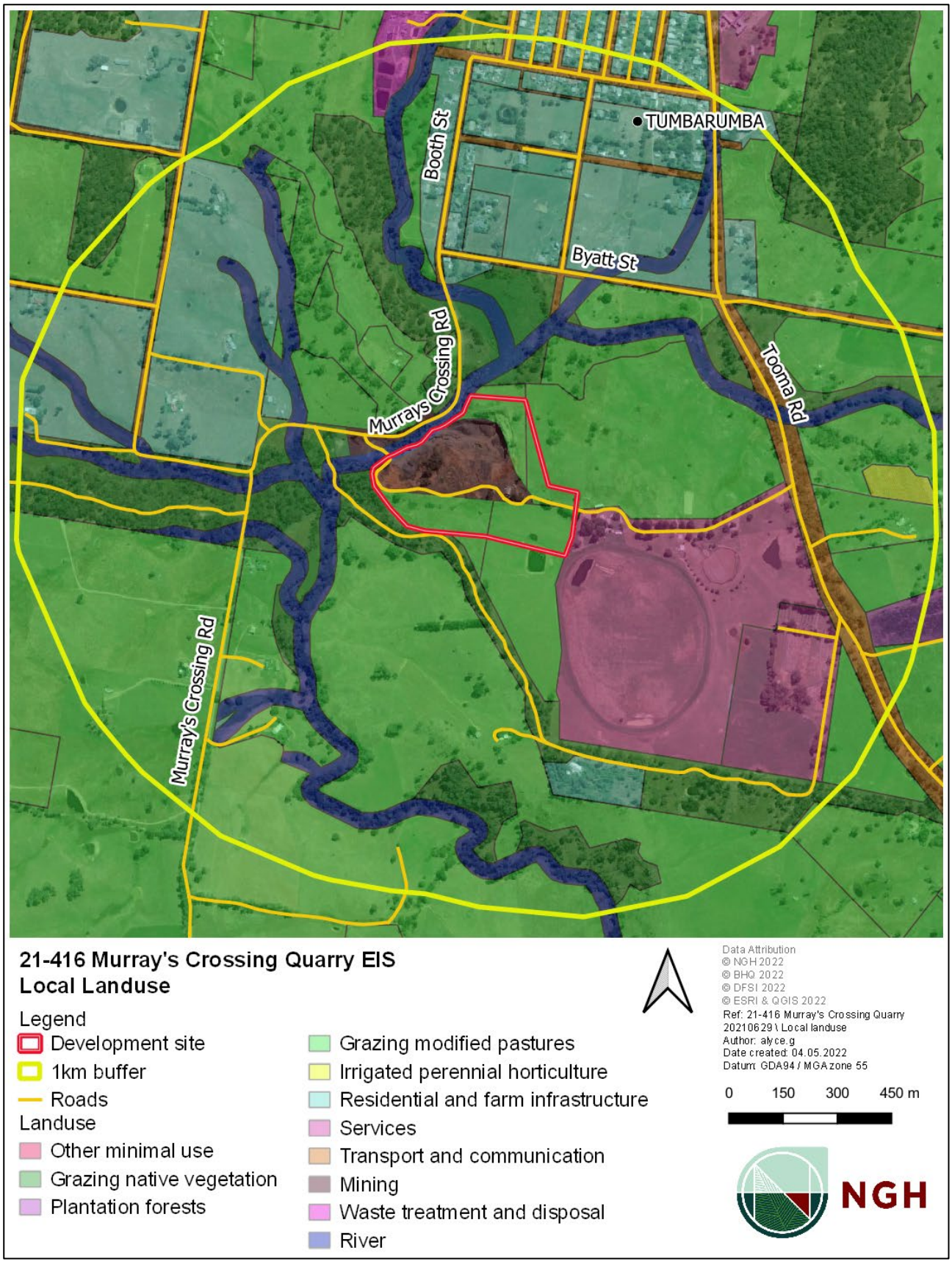

Figure 6-23 Local landuse within 1km of the Proposal

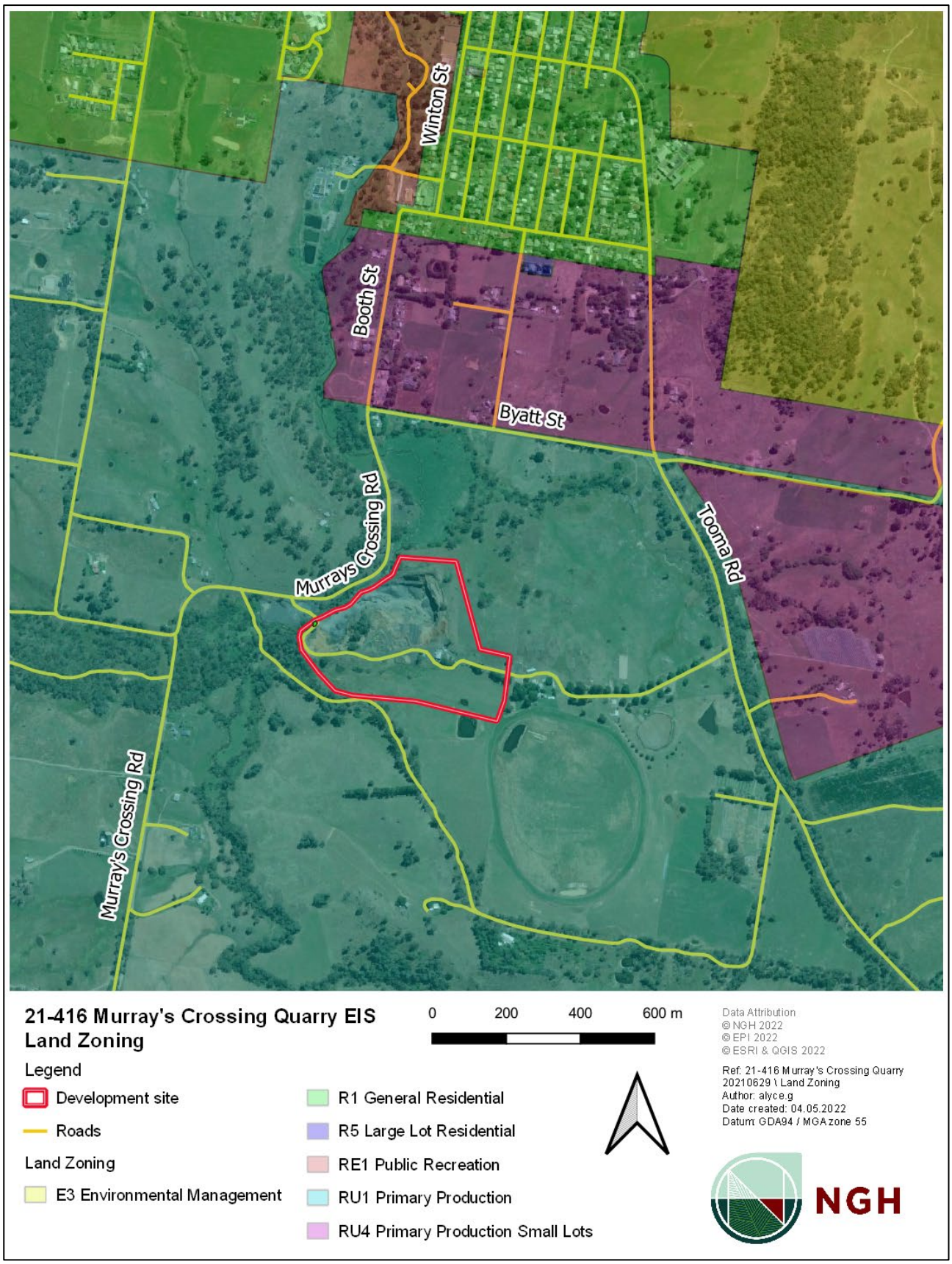

Figure 6-24 Land zoning within proximity to the Proposal

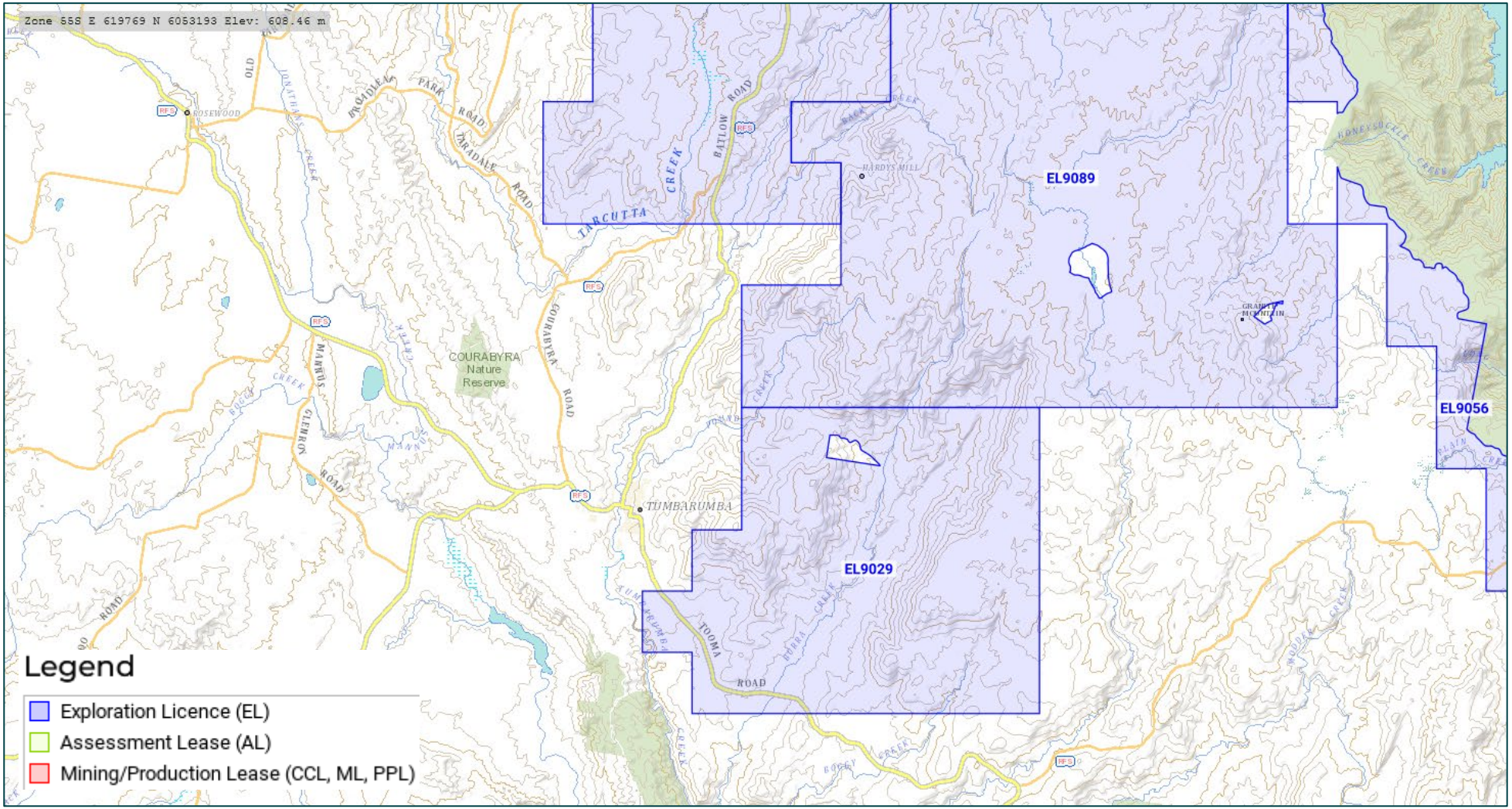

Figure 6-25 Exploration and mining titles within proximity to the Proposal (NSW Government, 2021)

Land capability and agricultural land

Land capability is the inherent physical capacity of the land to sustain a range of land uses and management practices in the long term without degradation to soil, land, air and water resources (OEH, 2012). The NSW land and soil capability assessment scheme (OEH, 2012) describes and maps eight land and soil capability classes. The classes range from 1 (best, highest capability land) to 8 (worst, lowest capability land). The classification is based on the biophysical features of the land and soil (including landform position, slope gradient, drainage, climate, soil type and soil characteristics) and susceptibility to hazards. Hazards include water erosion, wind erosion, soil structure decline, soil acidification, salinity, waterlogging, shallow soils and mass movement.

Land capability uses within the Development site are provided in Figure 6-26. The proposal is mostly located on land mapped as Capability Class 6 (low capability land). Table 6-40 provides an overview of Class 4, Class 5 and Class 6 land under the *Land and Soil Capability Assessment Scheme* (OEH, 2012).

No Biostrategic Agricultural Land (BSAL) occurs within the Development site.

Table 6-40 Land and soil capability classes (OEH, 2012)

Class	Broad category	Description
Class 4	Moderate capability land	Land has moderate to high limitations for high-impact land uses. Would restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.
Class 5	Moderate-low capability land	Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.
Class 6	Low capability land	Land has very high limitations for high-impact land uses. Land use is restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation

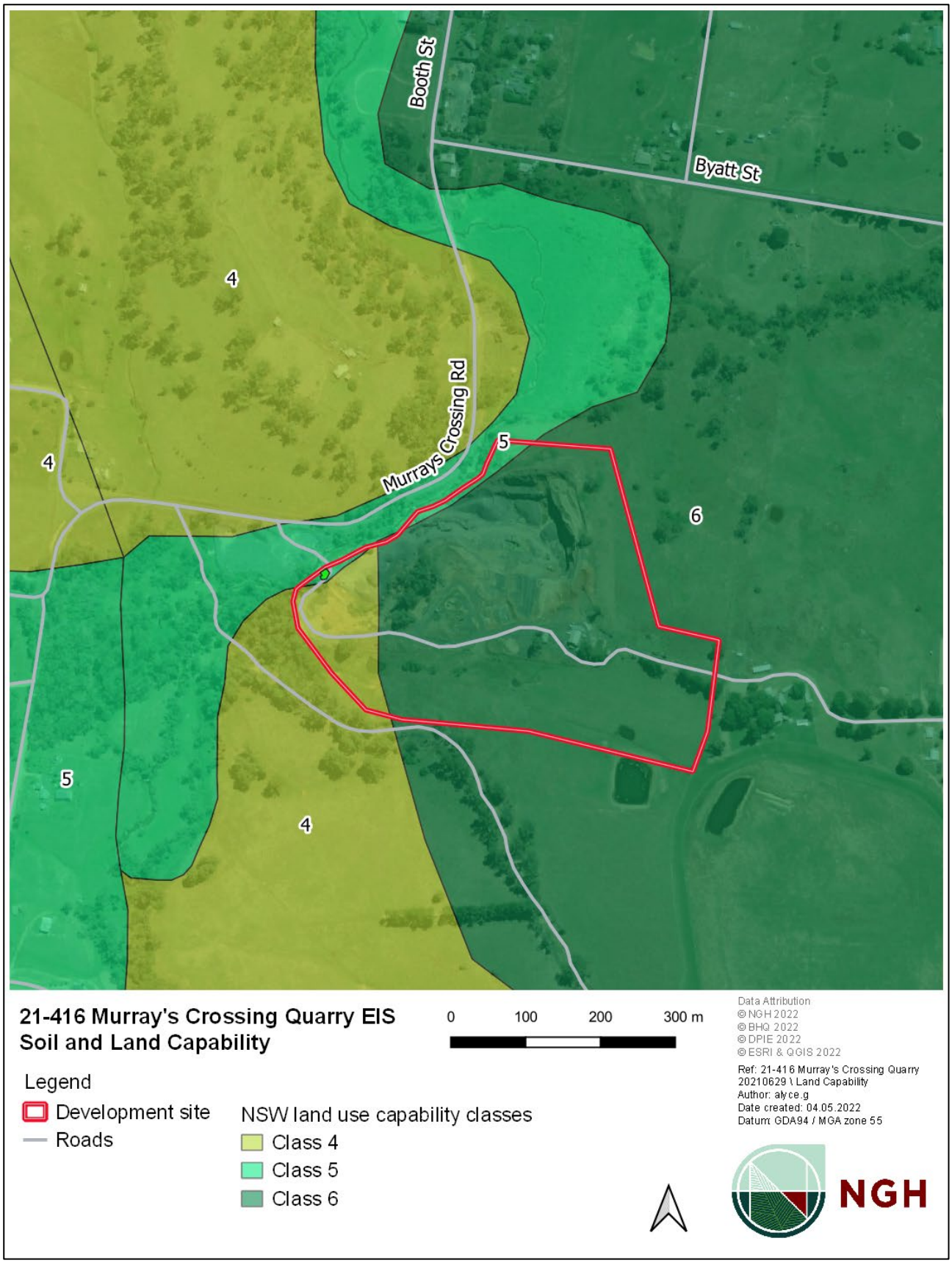

Figure 6-26 Soil and land capability for the Development site

6.12.2 Potential impacts

Land use conflict risk assessment

A land use conflict risk assessment (LUCRA) has been carried out in accordance with the Department of Primary Industries Land Use Conflict Risk Assessment Guide (DPI, 2011). Given that a quarry operation already exists within the Development site, this assessment aims to identify and rank potential land use conflicts with the proposed quarry extension. Where expected conflicts are adequately managed, the rights of the existing and proposed land uses can be protected.

The risk ranking in Table 6-42 has been determined using the risk ranking matrix shown in Table 6-41 and in accordance with the probability table and measure consequence table in Department of Primary Industries Land Use Conflict Risk Assessment Guide (DPI, 2011). This matrix ranks the risk of impacts according to the probability of occurrence and the consequence of the impact. Probability 'A' is described as 'almost certain' to probability 'E', which is described as 'rare'. The level of consequence starts at 1 – Severe to 5 – Negligible. The risk ranking from 1 to 25 is a result of the probability and consequence. For example, a risk ranking of 25 is the highest magnitude of risk (DPI, 2011).

Table 6-41 Risk ranking matrix (DPI, 2011).

PROBABILITY	A	B	C	D	E
Consequence					
1	25	24	22	19	15
2	23	21	18	14	10
3	20	17	13	9	6
4	16	12	8	5	3
5	11	7	4	2	1

Table 6-42 Land use conflict risk assessment summary.

Identified Potential Conflict	Risk Ranking		Management Strategy	Revised Risk Ranking	
Agricultural land use					
Increased erosion risk and contaminated surface water runoff	B3	17	Implementation of a Soil and Water Management Plan and an Erosion and Sediment Control Plan would minimise the potential impact.	D4	5
Dust	A3	20	Dust generated during the construction and operation stages to be managed. Water carts and road sealing to be utilised. Impact is non-serious. Drilling and blasting impacts are short term.	C5	4
Odour	B4	12	Vehicle emissions to comply with Australian standards.	D5	2

Identified Potential Conflict	Risk Ranking		Management Strategy	Revised Risk Ranking	
			Distance to receivers provides adequate buffer.		
Fire/Bushfire	D1	19	Implementation of a Bushfire Management Plan would significantly reduce the probability of a mining operation starting a fire.	D3	9
Emissions	A3	20	Best practice measures to be introduced under the Operational Environmental Management Plan. Engine emissions to be in accordance with Australian standards.	B5	7
Clearing of native vegetation	B1	24	Initial clearing to be appropriately managed. Mitigation measures within this report to be followed. Rehabilitation would re-establish native vegetation once the quarry is exhausted.	C4	8
Increased traffic flow	A3	20	Traffic flows would experience a minor increase as a result of the quarry extension.	B5	7
Visual amenity	A3	20	Dust generation management strategies and no night work would minimise visual amenity impacts.	B5	7
Noise	B3	17	Noise generated during construction and operation would be minimised through the implementation of mitigation measures. Where regular maintenance practices are incorporated into operation, noise is not expected to generate a land use conflict.	C4	8
Mining land use					
Resource extraction/exploration	D3	9	It is unlikely there would be an impact on existing resource extraction or exploration.	D5	2

Identified Potential Conflict	Risk Ranking		Management Strategy	Revised Risk Ranking	
			This proposal would be a progression of current quarry activities.		

Operation

The range of scores in the mitigated risk rating were all low, demonstrating that the proposed extension and operation of the quarry will have minimal impact to the area. The lifespan of the quarry is expected to be around 25 years or when 2.4 million tonnes of material has been extracted (200,000 tpa peak), as detailed in section 3.1.2.

The expected impact on surrounding land uses during construction is considered to be minimal. Given the temporary nature of the work and the implementation of mitigation strategies, the level of impact in relation to land use would be further reduced.

Once construction of the quarry extension commences, agricultural activities would cease in the areas involved in access and construction.

Due to the nature of construction and the location of the private haul road, disruption to local traffic during construction would be negligible. Any impact would be a temporary and could be managed in consultation with local landholders.

It is considered unlikely that traffic movements associated with Proposal activities would generate a land use conflict with movement of local livestock. The likelihood of conflict can be further minimised by consulting with local landholders.

The potential operational land use impact has been assessed in accordance with guidance provided in *Primefact 1063: Infrastructure Proposals on rural land* (DPI, 2013).

Agricultural impacts

The extension of the quarry would potentially result in the following agricultural impacts:

- A reduction in the agricultural uses of the Development site. Specifically, grazing agriculture would not be possible in the areas impacted by the pit footprint. Grazing could continue around the development footprint during construction and once the site is rehabilitated
- Soil and Land Capability of the development footprint is Class 4, Class 5 and Class 6, which includes land with moderate to severe limitations to agricultural activity
- Upon decommissioning, the quarry footprint would be rehabilitated.

Resource loss and fragmentation

The area impacted by the Proposal does not currently contain highly productive pastures due to its proximity to the existing quarry, the slope of the terrain and weed growth. The Proposal would not impact on land identified by the NSW Government as Biophysical Strategic Agricultural Land (BSAL). The Proposal would not result in rural land fragmentation or alienation of agricultural land. As such the loss of this agricultural landscape would not present a significant impact to local agriculture or the local economy.

The Proposal has been designed to minimise the development footprint. It is considered that the Proposal would not generate any land use conflicts or have an impact on the nature of existing surrounding agricultural holdings due to the nature of the constraints of this landscape.

Disturbance to farming operations and livestock

Adjacent farming and racecourse operations are compatible with the Proposal. Noise from nearby farming practices over the day would not impact on the proposed quarry or vice versa. The proposed construction of the quarry would occur in daylight hours and would not conflict with adjacent farming activity. Any noise impacts would be minor and temporary.

Noise is expected as part of general quarry processes and includes constant machinery operation, truck movements, and blasting five to six times a year. Blasting is considered the most significant noise impact on surrounding land users and has been further assessed in section 6.3.5 of this report. Due to the short-term and infrequent nature (5 - 6 times a year) of blasting, as well as proposed management measures (e.g., notifying nearby receivers), blasting is considered to present a negligible impact. Ongoing machinery is not expected to increase from what is experienced for the existing operation. A slight increase in truck movements is expected; however, no additional impacts are expected. Refer to section 6.7 of the EIS for the traffic assessment.

During construction and operation there may be slight disruption to local traffic, which would not present a significant impact to nearby land users. Traffic and on-site machinery movements have the capacity to generate dust and emissions. Dust generation would be the result of earthworks associated with removal of topsoil and overburden, and the creation of the haul road extension. The application of suitable erosion and sediment control measures is considered sufficient to mitigate impacts during construction and operation. Plant and vehicles would be maintained to ensure emissions are minimal and minimise impacts to local air quality.

Traffic impacts are discussed in detail in section 6.7 of this report.

Changes in biosecurity risks – pest, disease and weed risks

The Proposal would result in the increased movement of vehicles and people to the Development site. The primary risk to biosecurity is the spread of weeds that may result from increased vehicle movements in and out of the Development site. Weed seeds can be transported through and from the Development site on the tyres and undercarriages of vehicles and on the clothing of staff. The risk of weed dispersal would primarily be mitigated by confining vehicle and machinery movements to formed access tracks during all phases of the Proposal.

Vehicle movements would be limited to the single haul road access located at Murray's Crossing Road. To assist in the management of weeds, a Weed Management Plan would be prepared for the construction, operation and rehabilitation phases, and based on SVC and NSW DPI requirements. Management measures would focus on early identification of invasive weeds and effective management controls.

BHQ currently undertakes weed and pest management in conjunction with the existing development at Murray's Crossing, in partnership with adjacent and involved landholders. Grazing would continue to occur within the development following site rehabilitation.

Water quality

Run-off during construction has the potential to impact water quality of downgradient watercourses to the Proposal. Increased runoff from the site due to clearing of vegetation presents a significant erosion risk. Potential spills and leaks from onsite machinery and chemicals have the potential to run off site and contaminate surrounding areas. Mitigation measures such as appropriate erosion and sediment controls and spill response procedures would minimise potential impacts.

Two sediment dams would be utilised to collect and store dirty water runoff (refer to Figure 3-10). Due to the incremental depths and modified contours of the pit, once construction reaches a certain point, dirty water would flow into the pit or one of two sediment basins. Surface water that

flows into the pit / sediment dams would be reused onsite for dust suppression and for the rock crushing plant. Clean water would be redirected, via contouring, offsite as a clean water diversion.

Refer to section 6.5 of this EIS for the detailed surface and groundwater assessment.

Surrounding landholder visual impacts

The Development site already experiences visual impacts due to the presence of the existing quarry. Minor impacts are likely to visual amenity as a result of the Proposal. The removal of soil and rock at the hillcrest would be visible from Murray's Crossing Road due to the elevation of the Proposal. The retention of vegetation around the border of the Development site would help alleviate these visual impacts. Due to the rolling nature of the landscape, visual impacts to sensitive receivers would be limited.

Dust generation could impact visual amenity in the area. However, dust suppression measures would be implemented to minimise dust impacts to air quality and visual amenity.

The topography of the landscape would change dramatically as a result of removing quarry material. Topography would change from a hillcrest to an excavated void. Existing woodland vegetation surrounding the development footprint would be maintained to provide natural vegetation screening and break views of the Proposal.

Refer to section 6.11 of this EIS for the detailed visual impact assessment.

Mining impacts

There are no mineral titles and no mineral applications relevant to the Development site indicated in the Minview database (NSW Government, 2021).

Resource impacts

The proposal would require a sheet of aggregates for the vehicle access road extension to make it all weather access. The availability of this resource is not declining or limited in the region and would be supplied by BHQ from the existing Murray's Crossing quarry operation.

In view of the nature of the resources, all parts of the resource are used on site. Dust and overburden during the construction and operational phases would be used as part of the product (for blending), as well as during the rehabilitation process. The Proposal is unlikely to place significant pressure on the availability of local or regional resources for other land uses in the area.

It is estimated that a maximum approximately 5,000L – 8,000L of water could be utilised per day during high summer. This water is largely utilised for dust suppression. The precise amount of water used during construction would be heavily affected by prevailing weather conditions and the need for watering to suppress dust generation. Given that construction would occur incrementally and in response to demand, and that the water would be sourced from the two sediment dams onsite, it is considered unlikely that the Proposal would put significant pressure on local water resources.

Potable water for staff would be provided at the proposed workshop, which would be connected to town water (refer to Figure 3-10). Amenities are supplied with rainwater. Requirements for potable water would not place pressure on local drinking water supplies.

Summary of Impacts

The range of scores in the LUCRA revised risk rating were low to moderate, demonstrating that the proposed construction of the quarry would have minimal impact to surrounding land uses. The expected impact on surrounding land uses during construction is considered to be minimal given the temporary nature of the work and with the implementation of mitigation measures. The

expected impact on surrounding land uses during operation is considered to be minimal with the implementation of mitigation measures. Although the Proposal is not reversible, it would result in a small permanent loss (approximately 2.98ha or 35.5%) of agricultural land from within the Development site.

Rehabilitation

Once the operational phase of the Proposal is complete and the site is decommissioned, vegetation can be re-established around the Development site and where feasible, within the pit. It is likely that the landowner would wish to keep the access road for ongoing use. The slope of the landscape would be replicated to match the existing landscape slope. Any water captured within the pit following closure would be directed to the sediment dam and utilised if required for irrigation or stock. watering.

6.12.3 Safeguards and mitigation measures

Table 6-43 Safeguards and mitigation measures for land use impacts

No.	Safeguards and mitigation measures	C	O	R
LU1	Consultation with adjacent landholders will be ongoing to manage interactions between the quarry and other properties.	**C**	**O**	
LU2	A Soil and Water Management Plan (SWMP) and Erosion and Sediment Control Plan (ESCP) will be prepared as a subplan for the Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP), implemented and monitored during the construction and operation of the Proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. The SWMP and ESCP would include provisions such as: • At the commencement of the works, and progressively during construction, install the required erosion control and sediment capture measures. • Runoff which has been captured on site should be managed to avoid any overflow. Captured waters should be reused where possible, evaporated or extracted from the site and disposed of elsewhere. • Regularly inspect erosion and sediment controls, particularly following rainfall. • Maintain a register of inspection and maintenance of erosion control and sediment capture measures. • Ensure there are appropriate erosion and sediment control measures in place to prevent erosion and sedimentation occurring within stormwater paths and along roadsides during concentrated flows. • Ensure that machinery arrives and leaves site in a clean, washed condition, free of fluid leaks and not tracking soil to and from nearby areas. • Stockpile topsoil appropriately to minimise weed infestation, maintain soil organic matter, and maintain soil structure and microbial activity. • Manage works in consideration of heavy rainfall events. • Areas of unexpected/unintended soil disturbance to be rehabilitated promptly and progressively during construction.	**C**	**O**	
LU3	A Rehabilitation Management Plan is to be prepared in consultation with NSW Department of Primary Industries and the landowner prior to decommissioning. The Rehabilitation Management Plan is to include: • Removal of gravel from internal access tracks where required, in consultation with landowner. • Indicators and standards to indicate successful rehabilitation of disturbed areas. These indicators and standards should be applied to rehabilitation			**R**

No.	Safeguards and mitigation measures	C	O	R
	activities once the quarry is decommissioned.			
LU4	A Pest and Weed Management Plan would be prepared as part of the CEMP and OEMP to manage the occurrence of noxious weeds and pest species across the site during construction and operation. The plans must be prepared in accordance with Snowy Valleys Council and NSW DPI requirements. Where possible integrate weed and pest management with adjoining landowners.	**C**	**O**	
LU5	The Proponent would consult with GSNSW in relation to biodiversity offset areas or any supplementary biodiversity measures to ensure there is no consequent reduction in access to prospective land for mineral exploration, or potential for sterilisation of mineral resources.	**C**		
LU6	Construction and operations personnel will drive carefully and below the designated speed limit of the haul road to minimise dust generation and disturbance to nearby farming enterprises.	**C**	**O**	
LU8	The Proponent would provide annual production data for the subject site to the NSW Division of Resources and Geoscience for the collection of construction material production data.		**O**	

C: Construction; O: Operation; R: Rehabilitation

6.13 Socio-economic and community

6.13.1 Background

The Snowy Valleys LGA was established in May 2016 following the amalgamation of the former Tumbarumba and Tumut Shire Councils (SVC, 2021). The Snowy Valleys Council is located within the South West Slopes of New South Wales, about 30km west of Canberra and approximately 270km southwest of Sydney. The LGA has two main townships: Tumut and Tumbarumba.

The town of Tumbarumba is located within the central-west portion of the Snowy Valleys LGA, on Batlow Road, approximately 114km southwest of Canberra and 55km southwest of Tumut. The Wiradjuri, the traditional owners of the land, are an example of the rich indigenous history within the area (SVC, 2022). The Snowy Valleys LGA experienced European settlement during a period of gold exploration in the 1850s. Many people remained in Tumbarumba after mining activities declined and turned to farming instead, contributing to Tumbarumba's mountain cattleman heritage (SVC, 2022).

Tumbarumba has a population of 1862 people (SVC, 2018). The timber industry (14.1%) employs the most people within Tumbarumba, followed by local government (8.2%) and retail (3.4%). The *Snowy Valleys Local Strategic Planning Statement: Envisage 2040* sets out a number of Planning Priorities, to be actioned by SVC over the coming years.

Towns and Villages: Planning Priority 1 states that Council will:

Provide a range of accessible facilities and services to meet community needs within our towns and villages, and foster a culturally rich, creative, safe and socially connected Snowy Valleys community.

The Proposal is considered to be consistent with this Planning Priority. Murray's Crossing Quarry would provide a supply of hard rock materials for Tumbarumba and the wider LGA. The provision of road base would improve accessibility and drive growth within the area, increasing subsequent lifestyle appeal.

Bald Hill Quarry and Community

BHQ has supplied and continues to supply high quality construction material for local and state significant projects. The continued operation and increase in annual production would continue to provide security of supply during peak demands (future major projects) as well as meeting the local demand of material from local councils. Additional benefits of the Proposal include:

- Maximising the operating life of an existing facility, thereby avoiding / delaying the need to develop a greenfield site
- The Proposal is located nearby to Tooma Road and Batlow Road, which represent major regional road networks
- Continued employment of existing quarry personnel, plus additional employment associated with increased production
- Continued contribution to the commonwealth and state governments through taxes.

Benefits of the Proposal for local community include:

- Continued employment of existing BHQ staff
- If approved, the Proposal would provide 4-5 full time jobs
- Employment of subcontractors for haulage of material to projects.

Community Engagement

BHQ focuses on community and environmental concerns both during and after its quarrying operations. The company is committed to developing and maintaining long-term relationships with all stakeholders by communicating openly, honestly and in a transparent manner.

An information and complaints line for BHQ Murray's Crossing Quarry is provided at the front gate, website and in the yellow pages. The information line can be used for the community to lodge complaints or concerns about the operation. BHQ has a procedure in place to collect, monitor, evaluate and action any community feedback. Any complaints are recorded in the complaints register in order to be monitored and evaluated. Each complaint or information received from the community is followed up in a timely manner.

6.13.2 Potential impacts

Potential social issues primarily relate to visual amenity and the quality of life in the surrounding locality. Noise, air and visual assessments have been undertaken as part of this EIS to outline the potential issues to the surrounding sensitive receivers.

The Proposal is unlikely to cause negative impacts to the local economy. BHQ and its employees would benefit from a range of local and regional economies through direct spending of wages and employment of contactors, consultants, trades people, transport operators and other associated service providers.

The proposed extension of BHQ operations would result in considerable economic benefits at local, regional and even state level, including:

- The Proposal would result in employment retention. The site currently has four to five Fulltime Equivalent (FTE) staff
- Support local employment and regional development and economic opportunities, outside of the operations on the site
- Over the life of the Proposal, it would provide approximately $1.1million of capital investment value in the region
- The use of the extracted material would support the construction of additional roads and improve the quality of existing roads, thereby resulting in increased access to local towns, resulting in shared economic benefits
- The Proposal would meet local strategic and statutory provisions, endorsed by the local Council and community, that apply to the Proposal
- It would reduce the dependence on other developments in the region, and in turn potentially reduce greenhouse gas emissions that contribute to climate change, by providing a resource that can be locally sourced and is well located to access major roads and train lines minimising travel.

6.13.3 Safeguards and mitigation measures

Table 6-44 Safeguards and mitigation measures for socio-economic considerations

No.	Safeguards and mitigation measures	C	O	R
SE1	A Community and Stakeholder Engagement Plan (CSEP) will be developed as a subplan in the CEMP and OEMP, and will be implemented during construction to manage impacts to community stakeholders, including but not limited to:	**C**	**O**	

No.	Safeguards and mitigation measures	C	O	R
	• Protocols to keep the community updated about the progress of the project and project benefits • Protocols to inform relevant stakeholders of potential impacts (haulage, noise etc.) • Protocols to respond to any complaints received.			
SE2	Liaise with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.	**C**	**O**	

C: Construction; O: Operation; R: Rehabilitation

6.14 Resource use and waste generation

6.14.1 Policy position

Resource use

Key resources and estimated quantities (pending the completion of the detailed project design) required to construct the Proposal include those listed in section 3.2 of this report.

Waste generation

Legal requirements for the management of waste are established under the POEO Act and the Protection of the Environment Operations (Waste) Regulation 2005. Unlawful transportation and deposition of waste is an offence under Section 143 of the POEO Act. Littering is an offence under Section 145 of the POEO Act.

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The Proposal's resource management options would be considered against a hierarchy of the following order:

- Avoidance of unnecessary resource consumption
- Resource recovery (including reuse, reprocessing, recycling and energy recovery)
- Disposal.

Adopting the above principles would encourage the most efficient use of resources and reduce costs and environmental harm in accordance with the principles of ecologically sustainable development.

SVC – Draft Operational Plan

The SVC Draft Operational Plan 2021 – 2022 (SVC, 2021) sets out the following objectives in relation to waste management:

- Avoid and reduce waste generation
- Increase recycling
- Divert more waste from landfill
- Manage problem wastes better
- Reduce litter
- Reduce illegal dumping
- Develop regional collaboration and advocacy.

Waste management for the Proposal aligns with the themes and objectives of the Draft Operational Plan.

Waste generation

Waste generated by construction activities can be largely reused in the rehabilitation process. Construction and operation of the development would occur concurrently. However, each stage has been discussed separately below, to provide clarity on potential waste generation and management.

As the pit footprint increases, construction resources used would be associated with:

- Extension of the existing access road
- Relocation of the onsite workshop and amenities building
- Use of machinery and vehicles
- Maintenance activities.

Construction activities that would produce wastes include:

- Used oils and grease from plant and equipment maintenance

Topsoil would be used during rehabilitation activities. Overburden is used in the manufacture of products.

Water would be required during construction for activities including watering of roads, topsoil stockpiles and in the site office and amenities compound. Water use is considered in section 6.4 of this report.

In accordance with definitions in the POEO Act and associated waste classification guidelines, most waste generated during the construction phase would be classified as building and demolition waste within the class general solid waste (non-putrescible). Materials taken from the existing workshop and amenities building would be utilised for the replacement building (refer to Figure 3-9 and Figure 3-10 for the location of existing and proposed infrastructure).

Ancillary facilities in the site compound would also produce sanitary wastes classified as general solid waste (putrescible) in accordance with the POEO Act.

Waste management facilities near the Development site, including waste accepted at each location, are detailed in Table 6-45 below.

Table 6-45 Waste facilities located within proximity to the Development site

Waste facility	Waste accepted	Details
Tumbarumba Resource Recovery and Waste Transfer Centre	• Mixed recycling • Tyres • Batteries – single use and vehicular • Fire extinguishers • Fluorescent tubes and bulbs • Gas bottles • Green waste • Motor oils • Scrap metals – bulk loads	**Location:** 74 Saleyards Road, Tumbarumba **Opening hours:** Wednesday 8am – 2pm Friday 1pm – 5pm Saturday 12pm – 2pm Sunday 12pm – 5pm
Adelong Resource Recovery Centre	• Mixed recycling • Tyres • Batteries – vehicular • Green waste • Motor oils • Scrap metals – bulk loads	**Location:** 183 Grahamstown Rd, Adelong **Opening hours:** Tuesday 9am – 11am Thursday 3pm – 5om Saturday 8am – 12pm Sunday 1pm – 4pm

During operation, the solid waste streams would be associated with maintenance activities and presence of employees. Some materials, such as fuels, lubricants and metals may require replacement over the operational life of the Proposal.

Water would be required during operation for activities including watering of roads, topsoil stockpiles, operations and in the site office and amenities compound. Water use is considered in section 6.4 of this report.

Ongoing quarry operations are not expected to produce a significant amount of waste. The majority of the waste produced would result from staff on site (food waste, septic waste, etc).

Repair or replacement of infrastructure components at the processing plant would result in some waste generation. However, these activities would occur infrequently and there would be a high potential for recycling or reuse of any waste.

6.14.2 Potential impacts

While increasing scarcity of resources and environmental impacts are emerging from the use of non-renewable resources, the supply of the materials required for the Proposal are not currently limited or restricted. In the volumes required, the Proposal is unlikely to place significant pressure on the availability of local or regional resources. The use of the required resources is considered reasonable, given that the Proposal would extend the operating life of an existing development.

Water would be required during construction for activities including watering of roads and in the site office and amenities. Water use is considered in section 6.4 of this report.

Most of the Proposal components are reusable or recyclable and mitigation measures are in place to maximise reuse and recycling in accordance with resource management hierarchy principles.

Vegetation waste

Vegetation waste would be generated during construction activities. Trees with suitable timber would be used as large woody debris, creating habitat on adjoining land. Remaining vegetation would be mulched and reused on site.

Rehabilitation

Rehabilitation of the site would involve the recycling or reuse of materials including:

- Remaining topsoil
- Repurposing of buildings
- Scrap metal would be sent to a recycling facility.

Items that cannot be recycled or reused would be disposed of in accordance with applicable regulations and to appropriate facilities.

Rehabilitation of the site is described in section 7 of this report.

Overburden (spoil)

The majority of the material extracted from the quarry would be suitable for sale. It is anticipated that the available volume of overburden would remain constant with each stage of pit development. Excavated overburden would be separated and stockpiled on site with appropriate erosion and sediment controls implemented.

All overburden is assessed for suitability to be sold or blended with the product that is suitable for sale.

Given the previous activities that have occurred on the site, it is considered unlikely any spoil material would be contaminated. Any overburden with suspected contamination would be classified and disposed offsite at an appropriately licensed waste management facility.

Any contaminated material that required offsite disposal would be tracked via GPS from on-site loading to unloading at the licensed waste management facility. All material requiring offsite disposal would be transported via the proposed haulage routes (refer to Figure 6-13).

Hazardous materials

Explosives would not be stored on site, instead brought to site by the contractor on the day of the blasting. Fuel (diesel (not considered a flammable liquid) or petrol) would be stored in a bunded container within the quarry pit or within an above ground tank at the workshop. The above ground tank would be relocated when the workshop is moved to its proposed location.

Waste management

Where possible, recyclable materials would be sourced when required. Recycling bins are provided on site, along with general rubbish bins at the existing office building, workshop and staff amenities. General waste would be disposed of at the adjacent Tumbarumba waste transfer station. Recyclable material would be sent to an appropriate recycling facility.

Environmental balance

The inflow and outflow of materials during construction and operation is provided in Table 6-46.

Table 6-46 Environmental balance for quarry construction and operation

Activity	Material Inflow	Material Outflow	Timing		
Clearing vegetation	Fuel for plant.	Vegetation - Vegetation either used for habitat in adjacent areas or for mulching and reuse on site for rehabilitation or erosion controls. Plant emissions to air.	**C**	**O**	**R**
Removing topsoil and overburden	Fuel for plant.	Topsoil and overburden – stockpiled and reused for rehabilitation, bunding for erosion control and visual amenity mitigation, rehabilitation. Plant emission to air.	**C**	**O**	**R**
Material winning and crushing in pit	Fuel for plant and explosives.	All material crushed on-site. All material is used. Plant emission to air.		**O**	
Stormwater runoff capture	Water for dust suppression and processing.	Water captured in the dam or sediment dams would be reused for on-site dust suppression where required. It would also be used for material processing.	**C**	**O**	
Material processing	Water, fine material, crushed rock.	Dust is captured during the processing of material at the existing processing plant. Dust would be reused through blending with the product.		**O**	

Activity	Material Inflow	Material Outflow	Timing		
Material transport	Fuel for plant and heavy vehicles.	Transport of material from pit to processing plant, and processing plant to sale. Emissions to air.		**O**	

C: Construction; O: Operation; R: Rehabilitation

6.14.3 Safeguards and mitigation measures

Table 6-47 Safeguards and mitigation measures for resource use and waste generation

No.	Safeguards and mitigation measures	C	O	R
WM1	A Waste Management Plan (WMP) will be developed as a subplan in the CEMP and OEMP and implemented during construction, operation, and rehabilitation to minimise wastes. It will include but not be limited to: • Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy • Spoil would be blended with the product that is suitable for sale and/or used as backfill in the sediment dams during staging of the quarry pit. Dust generated during operation of the quarry would be captured and used as blending for the product. • Quantification and classification of all waste streams • Provision for recycling management onsite • Provision of toilet facilities for onsite workers and how sullage will be disposed. • Tracking of all waste leaving the site • Disposal of waste at facilities permitted to accept the waste • Requirements for hauling waste (such as covered loads)	**C**	**O**	**R**

C: Construction; O: Operation; R: Rehabilitation

6.15 Cumulative impacts

Cumulative impacts relate to the combined effect of similar or different impacts on a particular value or residence and may occur concurrently or sequentially. For these purposes, cumulative impacts are associated with other known or foreseeable developments occurring in proximity to the Proposal. The incremental effects of the Proposal on existing background conditions in the Development site have been taken into account in the preceding assessment sections.

6.15.1 Existing environment

The proposed extension to the Murray's Crossing Quarry would contribute to infrastructure development within the region.

A review of the State Significant Development (SSD) register for the Snowy Valleys Council LGA was conducted on 23 February 2022 to consider the potential for cumulative impacts locally and across the LGA.

The Snowy Valleys Council website was reviewed on 23 February 2022 for local projects with the potential to contribute to a cumulative impact with the Proposal. No Projects were identified.

Major projects listed on the Major Projects Register within the Snowy Valleys LGA are provided in Table 6-48.

Table 6-48 SSD projects within the Snowy Valleys LGA

Major Project	Status	Distance from Project
Tumbarumba Timber Mill (Mod 2 – Changes to Timber Treatment Chemicals)	Determination (02/06/2010)	~4.3km
Batlow Hospital – Multi-Purpose Health Facility	Determination (22/05/2007)	~30km
Snowy Hydro – Main Works (Mod 1 – Main Access Tunnel to Marica Services Connection)	Determination (28/01/2022)	~30km
Snowy Hydro 2.0 – Transmission Connection	Response to submissions	~30km
Snowy Hydro – Exploratory Works (Mod 2 – Tunnelling Methodology)	Determination (27/03/2020)	~30km
Kosciuszko National Park – Proposed Sewerage Treatment at Yarangobilly Caves	Determination (22/09/2003)	~30km
Visy Pulp and Paper Mill (Mod 3 – Truck Refuelling Facility)	Determination (05/10/2012)	~55km
Tumut Paper Mill (Mod 5 – Additional Storage)	Determination (18/02/2022)	~60km
HumeLink	Prepare SEARS	~200km

Cumulative impacts may have a minor impact to SSD Proposals occurring within the LGAs. Mechanisms to consult with local industry are, however, included in section 5 and Appendix C, and would assist to manage cumulative impacts should additional developments become relevant to the Proposal.

6.15.2 Potential impacts

During construction and operation, key cumulative impacts may include:

- Biodiversity impacts
- Community complaints regarding visual amenity impacts
- Pressure on local facilities, goods and services
- Accommodation impacts
- Noise impacts
- Local agricultural impacts
- Traffic.

Biodiversity impacts

The clearing of native vegetation, which is a key threatening process at both the State and Commonwealth level, is considered a major factor in the loss of biological diversity. At least 61% of native vegetation in NSW has been removed since European settlement and the removal of vegetation for the Proposal is contributing to this process. The cumulative impact of similar projects, particularly where EECs are involved, can be considerable given that many poorly conserved vegetation communities have a substantial portion of their extent represented on private land. Small losses of vegetative communities may be insignificant at a local level but may accumulate over time to cause a significant reduction in the extent of remnant patches. No EECs were identified in the BA (refer to Appendix D for the full report).

The Proposal has been designed to avoid and minimise impacts to biodiversity, where only 0.65ha of native vegetation and one HBT are proposed for removal. Mitigation measures have been provided in section 6.2.5 of this EIS. There are no other mitigation measures required to address cumulative biodiversity impacts.

Visual and landscape character impacts

The visibility of the facility (the operational view) may generate a cumulative impact with the existing quarry on the Development site. Murray's Crossing Quarry, as shown in Figure 3-2, is in an undulating landscape at an elevation ranging from 620m to 660m AHD. Variable topography and vegetation surrounding the Development site provides some screening for the development.

For the purpose of this VIA, visual elements of the Proposal include the quarry pit and the extended haulage road, which would connect the proposed workshop / amenities building with the existing operation. Moving heavy vehicles are also assessed in the VIA. The mitigation measures recommended in this report (section 6.11.5) would act to reduce the cumulative impacts.

Generally, it is unlikely that the Proposal would contribute to cumulative visual impacts for residences within 3km of the Development site. Views from all viewpoints would remain dominated by agricultural land use and remnant native woodland. Cumulative impacts are considered to be minimised due to the low number of similar developments and separation in the locality.

Pressure on local facilities, goods and services

There is potential that the possible concurrent construction of the Proposal with other SSD or local development would increase pressures on local community services, including accommodation. However, there is also a potential for positive cumulative economic effects from the construction of multiple developments in the area. Socio-economic benefits in relation to developments in the region would be a continuous ongoing benefit for the community with increased jobs and economic input into local business.

The Proposal would not result in significant impacts to local businesses, residents, and road users, subject to the range of identified mitigation measures. Due to the number of local communities in the area, any cumulative impacts on local services are likely to be spread between communities. There is sufficient residual capacity within the existing communities. It is unlikely that there would be negative cumulative impacts to local facilities, goods and services.

Accommodation impacts

Snowy Valleys LGA and the surrounding areas provide many visitor accommodations. It is possible that, in conjunction with other major projects, shortages of accommodation could occur during the

construction stage. The Proponent would engage with local accommodation providers and Snowy Valleys Council if necessary to provide additional short term and temporary accommodation at these businesses. The Proponent would also consult with Snowy Valleys Council to co-ordinate construction schedules to minimise conflict with any local festivals or activities. Scheduling staff 'rostered days off' could help alleviate accommodation pressures by allowing itinerant workers to return home.

It is considered that the demand for health care and other services would also be dispersed throughout the surrounding towns to coincide with where workers are staying.

Noise impacts

Noise impacts through the use of plant, machinery and vehicles and blasting would be heightened if the construction of other developments is undertaken concurrently with operations of the quarry and are located within close proximity to the quarry. This impact would be unavoidable to a certain extent due to the ongoing nature of quarry operations. As no other developments are located within close proximity to the quarry, cumulative impacts are therefore unlikely to occur (refer to Figure 6-23).

The noise report indicates that noise levels during quarry operations are predicted to exceed the NPfI PNTLs at several receptors, particularly for quarrying, processing and product despatch. Noise from the activities is not expected to contain any 'annoying' characteristics (described in Table 6-8), including a substantial low frequency component, when observed at the surrounding receptors, and therefore no modifying factor is required for the predicted noise levels.

It is important to note that the quarrying activities were assessed at the highest point on the site. As quarrying progresses, noise levels would be likely to decrease at several receptors as activities are shielded by the quarry benches that are formed.

Explosive use overblast sound levels at all receivers would be less than the maximum limit of 115 dB(A) for blasting.

It is expected that the Project would not noticeably increase the traffic volume on the local road network, so the RNP +2 dB criterion for the Proposal would not be exceeded.

The mitigation measures to minimise noise more generally are provided in section 6.3.6 of this report.

Local agriculture impacts

Approximately 8.4ha of grazing land would be repurposed for the Proposal. The Proposal would not permanently fragment primary production land, as rehabilitation would occur. Post-rehabilitation, it is estimated that approximately 5.42ha (64.5%) of the land could be returned to grazing pastures. The haul road would likely remain for landowner access following quarry closure. Benches and bunds would be revegetated, and the dams would be retained for stock watering.

The land would not be used for agricultural purposes for the life of the quarry and until rehabilitation is complete. This impact has been considered in section 6.12. Removal of agricultural land is considered to be reversible to an extent at the end of the life of the Proposal, with the exception of the change to the landform and geology.

The continued need for quarried material has the potential to increase the cumulative impacts affecting land use change and local agriculture in the region. However, mining and extraction land uses are supported in the region (refer to consideration of the NSW *Riverina Regional Plan 2036*

(the regional plan) (DPE, 2017) and *Snowy Valleys – Envisage 2040: Local Strategic Planning Statement* (LSPS) (SVC, 2021) in section 2.1). The Regional Plan and LSPS outlines the importance for growth within the region. The Proposal would facilitate the growth of agricultural, forestry and tourism sectors within the region, through the provision of valuable road base materials. The Snowy Mountains Highway is a major transport corridor and, as such, the region is reliant on an efficient transport network.

The removal of a minor portion (2.98ha or 35.5%) of agricultural land for the purposes of extractive industry in the Snowy Valleys LGA is not likely to significantly reduce the agricultural output of the locality.

PRODUCTIVE LAND PRESERVED FOR FUTURE GENERATIONS

The Proposal would result in a change to the landscape and reduction (2.98ha or 35.5%) in productive land. The quarry site would be returned to land with capability for agricultural use following rehabilitation, providing for a return of productive land for future generations.

6.15.3 Safeguards and mitigation measures

The cumulative impacts identified for the Proposal are considered to be best managed by dealing with each component individually. No additional safeguards are proposed.

7. Closure and Rehabilitation

BHQ is committed to the effective rehabilitation following closure of all quarry operations. This is achieved through progressive rehabilitation where practicable and managing the quarry throughout operations. The following section discusses BHQ's approach to rehabilitation of the site and approach to quarry closure including conceptual final land use.

7.1 Proposed final land use

At completion of extraction there are a range of options for proposed rehabilitation and final land use. The surrounding land use is small acreage farmland and recreation. The site could be stabilised and returned it to an agricultural landscape. There is potential for stock watering by diverting water captured in the pit to surrounding farm dams. All disturbed areas such as processing or laydown areas would be rehabilitated and handed back to the appropriate authority, with roads likely left as access for local landholders.

As part of the development of the detailed Quarry Closure Plan, BHQ will investigate and work with the appropriate authorities to identify other potential sustainable and economically productive post-closure land uses, in consideration with local and regional land use strategies, which may have further evolved towards the end of the development's life.

Annually, over the life of the quarry, an amount of money would be calculated to be set aside as a bond for the future rehabilitation. The bond would be deposited in a bond account to ensure there are sufficient financial resources available to implement the proposed rehabilitation strategy.

7.2 Closure and rehabilitation objectives

Rehabilitation of the proposed quarry pit would be undertaken in accordance with the following objectives:

- Provide a safe and stable landform compatible with the intended final land use
- Comply with relevant regulatory requirements and attain regulatory consensus on the successful closure and rehabilitation of the project area
- Reduce the need for long term monitoring and maintenance by achieving effective rehabilitation
- Provide a sustainable plant cover through rehabilitation of disturbed areas
- The area of exposed ground is minimised, reducing the potential for sediment-laden runoff
- Provide stock watering points were practicable.

7.3 Closure and rehabilitation criteria

Completion criteria will be utilised to demonstrate achievement of rehabilitation objectives. The preliminary closure and rehabilitation criteria for the project are outlined in Table 7-1.

Table 7-1 Preliminary closure and rehabilitation criteria

Aspect	Preliminary Closure Criteria
Decommissioning	• All surface infrastructure which does not have a potential future use associated with post mining land use will be removed

Aspect	Preliminary Closure Criteria
Landform	• Rehabilitated slopes are to be stable • No significant erosion is present that would constitute a safety hazard or compromise the capability of supporting the end land use • Contour banks are stable and there is no evidence of overtopping or significant scouring as a result of runoff • Surface layer is free of any hazardous materials • Any contamination will be appropriately remediated so that appropriate guidelines for land use are met
Soil	• Topsoil or a suitable alternative available at the time has been spread uniformly over the rehabilitated surface
Water	• Runoff water quality from the site does not pose a threat to downstream water quality
Native Vegetation	• Revegetation area will contain flora species assemblages characteristic of the desired native vegetation communities • There is no significant weed infestation within the quarry footprint
Bushfire Hazard	• Appropriate bushfire hazard controls have been implemented
Ongoing Public Safety	• Appropriate mechanisms are established to control access and manage public safety post closure

The preliminary closure criteria will be reviewed and revised throughout the Project life and used as the basis for further refinement following the commencement of rehabilitation activities and in consideration of any stakeholder feedback.

7.4 Final landform

7.4.1 Quarry wall

Wherever possible, rehabilitation would be completed progressively as part of ongoing development of the quarry. Due to the high rainfall, areas that are left undisturbed naturally regenerate which creates stability, reduces the potential for erosion and decreases dust.

The pit wall would be left as an open level area to the creek line and the wall would have 10m high near vertical batters separated by 5m wide berms, which would be progressively rehabilitated once they are available. It is noted that opportunities for progressive rehabilitation within the pit are limited as there are few berms shaped to final profile during the staged quarry development. As the final wall is left and the pit progresses, scattered wood would be left on the berms to create habitat. It is not practical to place soil and trees or shrubs on the berms.

The top of the pit wall will have a safety bund and fence to prevent native animals falling over the edge.

A schematic of the final landform has been provided in Figure 7-1. Further designs are provided in Appendix N.

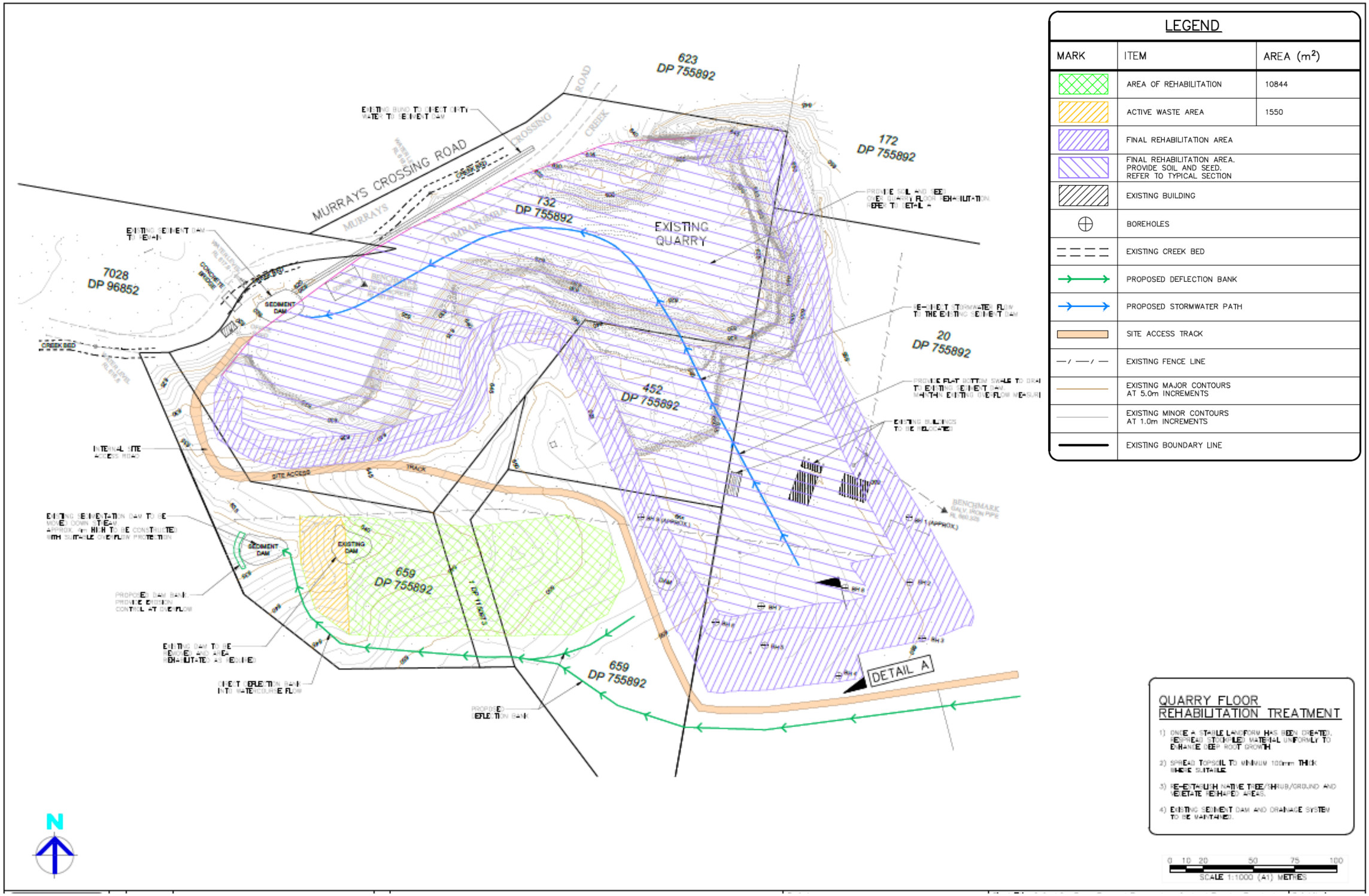
623
DP 755892
172
DP 755892
732
DP 755892
EXISTING
QUARRY
7028
DP 96852
20
DP 755892
452
DP 755892
659
DP 755892
659
DP 755892
MURRAYS CROSSING ROAD
SEDIMENT DAM
EXISTING DAM
DETAIL A
N
LEGEND
MARK
ITEM
AREA (m²)
AREA OF REHABILITATION
10844
ACTIVE WASTE AREA
1550
FINAL REHABILITATION AREA
FINAL REHABILITATION AREA. PROVIDE SOIL AND SEED. REFER TO TYPICAL SECTION
EXISTING BUILDING
BOREHOLES
EXISTING CREEK BED
PROPOSED DEFLECTION BANK
PROPOSED STORMWATER PATH
SITE ACCESS TRACK
EXISTING FENCE LINE
EXISTING MAJOR CONTOURS AT 5.0m INCREMENTS
EXISTING MINOR CONTOURS AT 1.0m INCREMENTS
EXISTING BOUNDARY LINE
QUARRY FLOOR REHABILITATION TREATMENT
1) ONCE A STABLE LANDFORM HAS BEEN CREATED, RESPREAD STOCKPILED MATERIAL UNIFORMLY TO ENHANCE DEEP ROOT GROWTH.
2) SPREAD TOPSOIL TO MINIMUM 100mm THICK WHERE SUITABLE.
3) RE-ESTABLISH NATIVE TREE/SHRUB/GROUND AND VEGETATE REHABILITATED AREAS.
4) EXISTING SEDIMENT DAM AND DRAINAGE SYSTEM TO BE MAINTAINED.
0 10 20 50 75 100
SCALE 1:1000 (A1) METRES

Figure 7-1 Schematic of the final landform of the pit following closure

7.4.2 Laydown and processing area

All infrastructure would be removed from the laydown and processing areas. If disturbed areas are not required by the landholder, they would be rehabilitated. Rehabilitation of the laydown, processing and pit floor areas would occur. These areas would be ripped, shaped, stabilised and covered with the use of organic material such as soil if available, crusher dust and scattered wood.

7.4.3 Internal access road

It is likely the access road will be left for access to the top of the quarry wall. If sections of the road are not required, they will be ripped, reshaped, stabilised and left to regenerate with fast growing grass species.

7.4.4 Surplus product stockpile

Material from this stockpile will either be spread onsite during the rehabilitation process or levelled and left in situ. The stockpile will be progressively covered with topsoil, mulch and/or a soil binder and left to naturally regenerate to increase the stability of the landform throughout the life of the quarry, and then returned to grazing land.

7.4.5 Sediment dams

Areas around the sediment dams would be stabilised and revegetated during the final stages of the rehabilitation process. Sediment dams would remain onsite, providing important erosion sediment control during the rehabilitation process. The dams will be left for watering stock. The maintenance of the dams would remain the responsibility of the landholder (BHQ) once the site is decommissioned and rehabilitated.

The Proponent would finalise a detailed Quarry Closure Plan three years prior to the cessation of quarrying activities and undertake whatever works are requested by the respective landholders to return the disturbed area to a standard that is commensurate with its ongoing use. Rehabilitation works may involve selected ripping, topsoiling and stabilisation with grasses.

7.4.6 Bunds

The bund near Tumbarumba creek will be retained and rehabilitated to prevent sediment entering the creek. The contour bank would also remain in place, to maintain water flow patterns once the development is rehabilitated.

7.4.7 Rehabilitation vegetation

Native trees and shrubs endemic to the area that would be used for revegetation are included in Table 7-2.

Table 7-2 Native trees / shrubs for use in quarry rehabilitation

Species Name	Common Name
Trees	
Eucalyptus bicostata	Eurabbie
Eucalyptus bridgesiana	Apple Box
Eucalyptus camphora subsp. humeana	Broad-leaved Sally
Eucalyptus radiata	Narrow-leaved Peppermint
Eucalyptus robertsonii	Robertson's Peppermint
Eucalyptus stellulata	Black Sally
Acacia dealbata	Silver Wattle
Acacia melanoxylon	Blackwood
Salix spp.	
Shrubs	
Acacia pravifolia	Coil-pod Wattle
Acacia kettlewelliae	Buffalo Wattle
Bursaria spinosa	Native Blackthorn
Cassinia longifolia	
Epacris breviflora	
Kunzea spp.	
Leptospermum continentale	Prickly Teatree

Disturbed areas would be progressively covered with topsoil, mulch and/or a soil binder and left to naturally regenerate to reduce erosion and increase the stability of the landform. In areas where natural regeneration is deemed unsuccessful, hydroseeding would be implemented. Indicative hydroseeding pasture mix is provided in

Table 7-3. Proposed fertiliser would include Starter 15 and Mo Super. The quantities required for both spring and summer would be 300kg/ha of Starter 15 and 200kg/ha of Mo Super.

Table 7-3 Proposed hydroseeding pasture mix

Seed Type	Spring Sowing (kg/ha)	Autumn Sowing (kg/ha)
Ryecorn	20	20
Victorian Perennial Ryegrass	6	6
Cocksfoot	8	8
Phalaris	6	6
White Clover*	2	2
Red Clover*	4	2
Sub Clover*	4	6

* All clover seed would be lime pelleted and inoculated.

7.5 Safeguards and mitigation measures

Table 7-4 Safeguards and mitigation measures for closure and rehabilitation

No.	Safeguards and mitigation measures	C	O	R
CR1	Consultation with adjacent landholders will be ongoing to determine the areas and degree of rehabilitation for aspects of the Proposal following closure.		**O**	

CR2	Development of the detailed Quarry Closure Plan, just prior to closure. The Quarry Closure Plan will include:
	• Purpose and objectives of the Plan
	• Rehabilitation Management Plan:
	  ○ Rehabilitation and revegetation
	  ○ Topsoil management
	  ○ Surface preparation
	  ○ Scheduling of works
	  ○ Final landform
	  ○ Weed control
	  ○ Rehabilitation maintenance
	  ○ Rehabilitation monitoring.
	• Final Void Management:
	  ○ Void design criteria and specifications
	  ○ Void slope stability
	  ○ Control of surface inflow
	  ○ Monitoring and management
			O	**R**

No.	Safeguards and mitigation measures	C	O	R
	○ Final void rehabilitation. • Quarry Closure and Decommissioning: ○ Closure methodology – decommissioning of infrastructure, plant, buildings, roadways and hardstands ○ Dams, diversions and surface water features ○ Post mine land use.			

C: Construction; O: Operation; R: Rehabilitation

8. Environmental Management

8.1 Environmental framework

The environmental risks associated with the Proposal would be managed by implementing a project-specific suite of mitigation measures detailed in sections 6.12 to 6.15 and summarised below.

All commitments and environmental safeguards would be managed through the implementation of a Construction Environmental Management Plan (CEMP), an Operation Environmental Management Plan (OEMP) and a detailed Quarry Closure Plan (QCP). These plans would be prepared sequentially, prior to each stage of works.

These plans would detail the environmental management responsibilities of specific staff roles, reporting requirements, monitoring requirements, environmental targets and objectives, auditing and review timetables, emergency responses, induction and training, complaint response procedures and adaptive management mechanisms to encourage continuous improvement.

8.2 Consolidated mitigation measures

The mitigation measures contained in this report comprise Proposal-specific safeguards, recommendations from specialist assessment reports and reference to a range of best practice guidelines and regulatory requirements. The measures are to be incorporated in Proposal plans and designs, contract specifications and the CEMP, OEMP and QCP as appropriate. The mitigation measures are consolidated below. Where measures are relevant to more than one environmental aspect, they are cited only once under the most relevant aspect, to avoid duplication.

A summary of the safeguards and mitigation measures contained within this EIS are listed collectively in Table 8-1.

Table 8-1 Safeguards and mitigation measures summary

No.	Safeguards and mitigation measures	C	O	R
Biodiversity				
BA1	• All weed material containing seed heads, weeds that contain toxins, and weeds that are able to reproduce vegetatively will be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth. • All herbicides will be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application should be trained to do so and have the proper certificate of completion/ competency or statement of attainment issued by a registered training organisation. Plant equipment and machinery will be cleaned of all biological matter prior to entering the site.	C	O	R
BA2	• The site induction will include measures to make employees aware of potential threatened flora and fauna during works and understand the procedures if threatened fauna are detected, this will be recorded as a part of the induction procedure and toolbox talks:	C	O	R

No.	Safeguards and mitigation measures	C	O	R
	○ Stop work Alert an Ecologist or suitably qualified person for assessment and possible re–location during works.			
BA3	Only one HBT will be removed during the proposed works. If the proposed design changes to include HBT removal further assessment would be required prior to commencement of work.	**C**	**O**	**R**
BA4	All fallen timber within the Development site is to be relocated from the development footprint to an adjacent area.	**C**	**O**	
BA5	• All woodland to be removed is to be surveyed by an ecologist or suitably qualified person to record the presence of any nesting fauna. • Vegetation to be retained within the study area is to be clearly marked. Exclusion zones at the extent of the works corridor to limit works encroaching outside the corridor should be used.	**C**	**O**	
BA6	• Impacts to aquatic habitat will be kept to the smallest possible extent. • An Erosion and Sediment Control Program (ESCP) will be implemented, prior to the commencement of work. • Erosion controls will be implemented prior to channel diversion. This would ensure that the natural flow regime of Tumbarumba Creek is not impacted and that downstream sedimentation does not occur. Erosion controls will remain in place until the site is revegetated and stabilised. • BHQ will restrict works within aquatic and riparian areas, to periods of low rainfall, to coincide with natural aquatic processes and reduce unnecessary sedimentation within waterways. • BHQ will divert the watercourse and provide sufficient time for the dam to dry out, allowing invertebrates and aquatic fauna sufficient time to relocate. • No herbicide use will occur within aquatic areas. Vehicle hygiene protocols should be in line with Roads and Maritime Biodiversity Guidelines - Guide 7 (Pathogen Management) for the control of Chytrid.	**C**	**O**	**R**
BA7	• All weed material containing seed heads, weeds that contain toxins, and weeds that are able to reproduce vegetatively will be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth. • All herbicides will be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application should be trained to do so and have the proper certificate of completion/ competency or statement of attainment issued by a registered training organisation. Plant equipment and machinery will be cleaned of all biological matter prior to entering the site.	**C**	**O**	**R**
Noise and vibration				
NV1	An Operational Environmental Management Plan (OEMP) will be developed. The OEMP will include the following, as necessary: • Noise monitoring requirements	**C**	**O**	**R**

No.	Safeguards and mitigation measures	C	O	R
	• Notification procedures for the sensitive receivers identified in this report • Complaints handling procedure and point of contact • Noise monitoring program and implementation procedure • Record of blasting dates, blast charges and locations • Complaints registered • Map of on-site noise barriers/berms			
NV2	An annual monitoring program will be undertaken to establish / confirm: • The noise level and characteristics of the current quarry activities • The sound emission of quarry plant/equipment items Actual ambient background noise levels (to be used as a basis for the PNTLs and update this assessment as appropriate)	**C**	**O**	
NV3	Blasting will be restricted to daytime hours (9.00am – 5.00pm, Monday to Saturday).	**C**	**O**	**R**
NV4	Product stockpiles will be located to the northwest of fixed plant, where possible.	**C**	**O**	**R**
NV5	Avoid dropping extracted material from excessive height into carry vehicles.	**C**	**O**	**R**
NV6	The Proponent would investigate reasonable measures to reduce noise, including: • Relocation of processing plant to afford screening due to quarry benches and local topography Purpose-built noise reduction bunds/barriers (where local topography allows)	**C**	**O**	
NV7	Keep noise generating equipment well maintained and lubricated.	**C**	**O**	**R**
NV8	Plant and equipment to be operated in a quiet and efficient manner, including: • Turning off plant and equipment that is not being used. • Ensuring plant is regularly maintained. Repairing or replacing equipment that becomes noisy.	**C**	**O**	**R**
NV9	All staff on-site to be informed, through toolbox meetings, training and education, of procedures to operate plant and equipment in a quiet and efficient manner.	**C**	**O**	**R**
NV10	Adjoining landowners to be notified of any blast 2-3 days prior to the blast event. Livestock to be relocated away from blasts as necessary.	**C**	**O**	**R**
NV11	It is estimated that blasting activities (excluding drilling and charging) will occur five to six times a year during the following hours: Monday to Saturday 9am to 5pm.	**C**	**O**	**R**
NV12	All blasts should be monitored in accordance with EPL requirements. Monitoring will confirm noise constants and compliance with blasting criteria.	**C**	**O**	
NV13	Blast monitoring will be in accordance with the monitoring requirements for blasting activities outlined in the Australian and New Zealand Environment Council Technical Basis for Guidelines to Minimise Annoyance Due to the Blasting Overpressure and Ground Vibration (1990).	**C**	**O**	**R**
NV14	The BMP will be updated, as required, to incorporate proposed operations of the quarry and detail the mitigation and management procedures for minimising	**C**	**O**	

No.	Safeguards and mitigation measures	C	O	R
	potential impacts.			
NV15	The quarry operator is to keep a record of all complaints made in relation to noise arising from quarry operations. The record must include the following detail: • The date and time of the complaint. • The method by which the complaint was made. • Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect. • The nature of the complaint. • The action taken by the quarry operator in relation to the complaint, including any follow-up contact with the complainant. If no action was taken by the licensee, the reasons why no action was taken.	**C**	**O**	**R**
Topography, geology & soils				
SO1	Clearly mark out areas of operation for construction and stripping purposes	**C**		
SO2	A Soil and Water Management Plan (SWMP) and Erosion and Sediment Control Plan (ESCP) would be prepared as part of the CEMP and OEMP. These plans would be implemented and monitored during the construction and operation of the Proposal, in accordance with Landcom (2004) and DPIE (2008) to minimise soil (and water) impacts. Refer to section 6.12.3 for details on what to include in the SWMP and ESCP.	**C**	**O**	
SO3	Best practice management measures to be employed where applicable to reduce the risk of erosion and sedimentation control: • Preserve and stabilise disturbed areas, drainageways and steep slopes. • Minimise the extent and duration of disturbance. • Install perimeter controls. • Employ the use of sediment control measures to prevent off- and on-site damage. Inspect and maintain sediment and erosion control measures regularly. • Control stormwater flows onto, through and from the site in stable drainage structures. Protect inlets, storm drain outlets and culverts. Provide access and general construction controls.	**C**	**O**	
SO4	Any area temporarily used during construction (laydown and trailer complex areas) will be restored to original condition or re-vegetated with native plants where possible.	**C**		
Water Quality				
WA1	Best practice management measures to be employed where applicable to reduce the risk of erosion and improve sediment control: • Preserve and stabilise disturbed areas, drainageways and steep slopes • Minimise the extent and duration of disturbance • Install perimeter controls • Employ the use of sediment control measures to prevent off- and on-site damage. Inspect and maintain sediment and erosion control measures	**C**	**O**	

No.	Safeguards and mitigation measures	C	O	R
	regularly • Control stormwater flows onto, through and from the site in stable drainage structures. Protect inlets, storm drain outlets and culverts Provide access and general construction controls.			
WA2	All chemicals and fuels used on-site must be stored and handled in accordance with: • The requirements of all relevant Australian Standards • The NSW EPA's *Storing and Handling of Liquids: Environmental Protection – Participants Handbook* if the chemicals are liquids In the event of an inconsistency, the most stringent requirement must prevail to the extent of the inconsistency.	**C**	**O**	
WA3	A protocol shall be developed in relation to discovering buried contaminants within the development site (e.g. pesticide containers, if any). It will include stop work, remediation and disposal requirements. If significant contamination is found on site during construction or operation activities, it must be reported in line with *Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites (OEH, 2011)*. Further action shall be undertaken when necessary in line with the *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (EPA, 2015).*	**C**	**O**	
WA4	Any area temporarily used during construction (laydown and trailer complex areas) to be restored to original condition or re-vegetated with native plants where possible.	**C**		
WA5	A Spill Response Management Plan will be prepared, implemented and monitored during the construction and operation of the Proposal.	**C**	**O**	
WA6	Vehicles, plant and equipment will be maintained to minimise leakages during construction and operation of the Proposal	**C**	**O**	
Climate and air quality				
AQ1	General transport controls include: • All loads leaving the site will be covered with a vehicle fitted tarpaulin system • A speed limit of 20km/hr will be adopted on all unsealed roads across the site • Water cart spraying will be utilised on all unsealed roads at a rate of >2L/m^2/hr, as required • Low silt aggregates will be used on unsealed roads Wheel washing bay will be considered at the meeting point of sealed and unsealed roads	**C**	**O**	
AQ2	Dust suppression controls at crusher, screening and dumping areas include: • Periodical water spraying • Minimising dust generating activities during periods of excessive wind Reduction of rate of activity in response to excessive dust generation		**O**	
AQ3	Dust suppression controls for quarry activities including blasting, drilling, stripping of overburden and on-site dumping to include: • Periodical water spraying. • Minimising dust generating activities during periods of excessive wind • Reduction of rate of activity in response to excessive dust generation		**O**	

No.	Safeguards and mitigation measures	C	O	R
	Locating and relocating high impact activities to less sensitive on-site areas where possible			
AQ4	Stockpiles and exposed areas of soil and rock will be contained through wetting or covering with an appropriate seal if left for periods of time.	**C**	**O**	
AQ5	Monitor local weather conditions and manage the site if any conditions will exacerbate air quality (e.g. wind). Minimise or cease activity in proximity to R28 when winds are blowing from the south-southeast at a windspeed of 2m/s or greater for 4 hours or longer.	**C**	**O**	
AQ6	Fires and material burning are prohibited on the Development site.	**C**	**O**	
AQ7	The single transportation route to the development will be utilised to maximise use of sealed roads.	**C**	**O**	
AQ8	Vegetation skirting the site to be retained. Exposed areas that are not part of active operational areas will be revegetated as soon as practically possible.	**C**	**O**	
AQ9	Using technologies to optimise blast patterns for consistent energy distribution and reducing the explosive overconsumption.	**C**	**O**	
AQ10	All pumps and machinery are to use appropriately sized and high energy efficient motors to reduce the carbon footprint.	**C**	**O**	**R**
AQ11	Time switches and sensor lights are to be used across the Development site to maximise energy efficiency to reduce the carbon footprint.	**C**	**O**	**R**
AQ12	Variable speed drivers (VSD) are to be used on electric motors to maximise energy efficiency to reduce the carbon footprint.	**C**	**O**	**R**
AQ13	Fuel economy and energy consumption of vehicles are to be considered before purchasing new vehicles and machinery; regular servicing is to be undertaken.	**C**	**O**	**R**
Traffic and transport				
TT1	A Traffic Management Plan (TMP) would be implemented, as part of the CEMP and OEMP, prior to construction commencing.	**Design**		
Hazards				
HA01	Update the BHQ Bushfire Emergency Response Plan as part of the Health Safety and Environment Management Plan (HSEMP) and Emergency Management Plan. The updated plan will be prepared in consultation with the local Rural Fire Service and details of the plan would be provided in the updated CEMP and OEMP for the project.	**C**	**O**	**R**
HA02	Dangerous or hazardous materials will be transported, stored, and handled in accordance with *AS1940-2004: The storage and handling of flammable and combustible liquids*, and the ADG Code where relevant. All potential pollutants kept on-site will be stored in accordance with relevant HAZMAT requirements and bunded.	**C**	**O**	**R**
HA03	All design and engineering will be undertaken by qualified competent persons with the support of specialists as required.	**Design**		

No.	Safeguards and mitigation measures	C	O	R
HA04	All electrical equipment will be designed in accordance with relevant codes and industry best practice standards in Australia.	**Design**		
HA05	All chemicals and fuels used on-site must be stored and handled in accordance with: • The requirements of all relevant Australian Standards • The NSW EPA's *Storing and Handling of Liquids: Environmental Protection – Participants Handbook* if the chemicals are liquids In the event of an inconsistency, the most stringent requirement must prevail to the extent of the inconsistency.	**C**	**O**	**R**
HA06	Water for use in firefighting will be provided by the site water management system, to ensure there is sufficient water available on site for bushfire fighting purposes.	**C**	**O**	**R**
HA07	The haul road on the site provides access across the site for fire fighting vehicles. Water for use in firefighting will be provided by an extraction groundwater bore onsite. Firefighting equipment including fire extinguishers and hose reel (landfill shed only) will continue to be provided at all infrastructure areas and mobile equipment will be maintained in accordance with Australian Standards and WH&S guidelines.	**C**	**O**	**R**
HA08	A Fire Management and Emergency Response will be developed and implemented during construction, operation and rehabilitation to prevent contaminants affecting adjacent surrounding environments. The FMER will include spill and contamination responses to: • Manage the storage of any potential contaminants onsite. Mitigate the effects of soil contamination by fuels or other chemicals (including emergency response and EPA notification procedures and remediation).	**C**	**O**	
HA09	A protocol will be developed in relation to discovering buried contaminants within the Development site (e.g., pesticide containers, if any). It would include stop work, remediation and disposal requirements. If significant contamination is found on site during construction or operation activities, it must be reported in line with *Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites (OEH 2011)*. Further action should be undertaken when necessary in line with the *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA 2015).	**C**	**O**	
Aboriginal Heritage				
AH1	Works must avoid the area of Potential Archaeological Deposit (PAD) with a minimum 10 m buffer to ensure there are no inadvertent impacts to potential Aboriginal objects.	**C**	**O**	**R**
AH2	BHQ is encouraged to not undertake activities within the TSR as identified in Figure 6-20 due to the significant cultural value placed on the area by the local Aboriginal community. Open and ongoing dialogue with local representatives of the Toomaroombah Kunama Namadgi Indigenous Corp (TKNIC) is recommended.	**C**	**O**	**R**
AH3	Prior to works proceeding near the two mature native trees identified in Figure 6-20, BHQ must undertake physical inspection of the trunk of the trees which were unable to be assessed at the time of inspection due to safety concerns. BHQ is to photograph the trunk of each tree with a scale and forward the	**C**	**O**	**R**

No.	Safeguards and mitigation measures	C	O	R
	photographs on to an NGH archaeologist. Works can only proceed with caution following written advice by an archaeologist to confirm the presence or absence of cultural modification. If deemed to be necessary, a physical inspection may be required.			
AH4	Works within the survey area that are outside the area of Potential Archaeological Deposit (PAD 01) and the two trees identified in Figure 6-20 can proceed with caution.	**C**	**O**	**R**
AH5	If the proposed works cannot avoid the PAD, then further assessment in the form of an Aboriginal Cultural Heritage Assessment (ACHA) must be undertaken, including a programme of subsurface testing to establish the true archaeological potential and extent of archaeological sites within the portion of the PAD proposed to be impacted. All subsurface testing must comply with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW. If Aboriginal objects are recovered during the testing programme an Aboriginal Heritage Impact Permit (AHIP) must be obtained from Heritage NSW before the proposed development can proceed.	**C**	**O**	**R**
AH6	Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment.	**C**	**O**	**R**
AH7	If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and Heritage NSW notified. The find will need to be assessed and if found to be an Aboriginal object an Aboriginal Heritage Impact Permit (AHIP) may be required.	**C**	**O**	**R**
AH8	In the unlikely event that human remains are identified during development works, all work must cease in the immediate vicinity and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, Heritage NSW must be notified by ringing the Enviroline (131 555).	**C**	**O**	**R**
Historic Heritage				
HH1	Should an item of historic heritage be identified, the Heritage Division (DPIE) shall be contacted prior to further work being carried out in the vicinity.	**C**	**O**	**R**
Visual amenity				
VA1	Night lighting will be minimised to the maximum extent possible (i.e. manually operated safety lighting at main component locations). Lighting to: • Be directed away from roads and residents so as not to cause light spill that may be hazardous to drivers. • Comply with all relevant standards, codes of practice and policies • Light spill is light that falls outside the area that is intended to be lit and can contribute to glare and waste energy. Spill light above the horizontal plane also contributes to artificial skyglow. All light fittings should be located, aimed or shielded to avoid spill. Measures to prevent spill include: o Installing light fittings with an opaque cover and flat glass, mounted horizontally on both axes o Mounting lights under part of a building (including awnings, verandas or roofs) so light is blocked above the horizontal plane	**C**	**O**	**R**

No.	Safeguards and mitigation measures	C	O	R
	○ Design buildings to internalise lights • Wherever possible, light should be directed downwards. Mitigation measures include: ○ Installing direction fittings, such as floodlights or spotlights ○ Use higher mounting heights that allow lower main beam angles that are closer to the vertical ○ Lighting of all-night operations need to be downward facing of a peach colour and shielded • Operational light from the Proposal must be directed downwards, or inwards towards the work area • Light fittings that are specifically designed to minimise light shining near to or above the horizontal plane should be used • Energy efficient globes include LEDs and high-pressure sodium Where floodlights are required, wherever possible use fittings with asymmetric beams that permit horizontal glazing. These are to be kept at or near parallel to the surface being lit, usually the ground and should prevent light spill. An asymmetric beam also allows the light fitting to be mounted on the edge of an area and avoids the need for fittings to be tilted upwards. Flat glass light fittings should be installed with the glass horizontal to make efficient use of the brightest part of the beam and to eliminate light spill			
Land use impacts				
LU1	Consultation with adjacent landholders will be ongoing to manage interactions between the quarry and other properties.	**C**	**O**	
LU2	A Soil and Water Management Plan (SWMP) and Erosion and Sediment Control Plan (ESCP) will be prepared as a subplan for the Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP), implemented and monitored during the construction and operation of the Proposal, in accordance with Landcom (2004), to minimise soil (and water) impacts. The SWMP and ESCP would include provisions such as: • At the commencement of the works, and progressively during construction, install the required erosion control and sediment capture measures. • Runoff which has been captured on site should be managed to avoid any overflow. Captured waters should be reused where possible, evaporated or extracted from the site and disposed of elsewhere. • Regularly inspect erosion and sediment controls, particularly following rainfall. • Maintain a register of inspection and maintenance of erosion control and sediment capture measures. • Ensure there are appropriate erosion and sediment control measures in place to prevent erosion and sedimentation occurring within stormwater paths and along roadsides during concentrated flows. • Ensure that machinery arrives and leaves site in a clean, washed condition, free of fluid leaks and not tracking soil to and from nearby areas. • Stockpile topsoil appropriately to minimise weed infestation, maintain soil organic matter, and maintain soil structure and microbial activity. • Manage works in consideration of heavy rainfall events. Areas of unexpected/unintended soil disturbance to be rehabilitated promptly and progressively during construction.	**C**	**O**	

No.	Safeguards and mitigation measures	C	O	R
LU3	A Rehabilitation Management Plan is to be prepared in consultation with NSW Department of Primary Industries and the landowner prior to decommissioning. The Rehabilitation Management Plan is to include: • Removal of gravel from internal access tracks where required, in consultation with landowner. Indicators and standards to indicate successful rehabilitation of disturbed areas. These indicators and standards should be applied to rehabilitation activities once the quarry is decommissioned.			**R**
LU4	A Pest and Weed Management Plan would be prepared as part of the CEMP and OEMP to manage the occurrence of noxious weeds and pest species across the site during construction and operation. The plans must be prepared in accordance with Snowy Valleys Council and NSW DPI requirements. Where possible integrate weed and pest management with adjoining landowners.	**C**	**O**	
LU5	The Proponent would consult with GSNSW in relation to biodiversity offset areas or any supplementary biodiversity measures to ensure there is no consequent reduction in access to prospective land for mineral exploration, or potential for sterilisation of mineral resources.	**C**		
LU6	Construction and operations personnel will drive carefully and below the designated speed limit of the haul road to minimise dust generation and disturbance to nearby farming enterprises.	**C**	**O**	
LU8	The Proponent would provide annual production data for the subject site to the NSW Division of Resources and Geoscience for the collection of construction material production data.		**O**	
LU1	Consultation with adjacent landholders will be ongoing to manage interactions between the quarry and other properties.	**C**	**O**	
Socio-economic and community impacts				
SE1	A Community and Stakeholder Engagement Plan (CSEP) will be developed as a subplan in the CEMP and OEMP, and will be implemented during construction to manage impacts to community stakeholders, including but not limited to: • Protocols to keep the community updated about the progress of the project and project benefits • Protocols to inform relevant stakeholders of potential impacts (haulage, noise etc.) Protocols to respond to any complaints received.	**C**	**O**	
SE2	Liaise with local industry representatives to maximise the use of local contractors, manufacturing facilities, materials.	**C**	**O**	
Resource use and waste generation				
WM1	A Waste Management Plan (WMP) will be developed as a subplan in the CEMP and OEMP and implemented during construction, operation, and rehabilitation to minimise wastes. It will include but not be limited to: • Identification of opportunities to avoid, reuse and recycle, in accordance with the waste hierarchy • Spoil would be blended with the product that is suitable for sale and/or used as backfill in the sediment dams during staging of the quarry pit.	**C**	**O**	**R**

No.	Safeguards and mitigation measures	C	O	R
	Dust generated during operation of the quarry would be captured and used as blending for the product. • Quantification and classification of all waste streams • Provision for recycling management onsite • Provision of toilet facilities for onsite workers and how sullage will be disposed. • Tracking of all waste leaving the site • Disposal of waste at facilities permitted to accept the waste Requirements for hauling waste (such as covered loads)			
Closure and rehabilitation				
CR1	Consultation with adjacent landholders will be ongoing to determine the areas and degree of rehabilitation for aspects of the Proposal following closure.		**O**	

CR2	Development of the detailed Quarry Closure Plan, just prior to closure. The Quarry Closure Plan will include:
	• Purpose and objectives of the Plan
	• Rehabilitation Management Plan:
	  ○ Rehabilitation and revegetation
	  ○ Topsoil management
	  ○ Surface preparation
	  ○ Scheduling of works
	  ○ Final landform
	  ○ Weed control
	  ○ Rehabilitation maintenance
	  ○ Rehabilitation monitoring.
	• Final Void Management:
	  ○ Void design criteria and specifications
	  ○ Void slope stability
	  ○ Control of surface inflow
	  ○ Monitoring and management
	  ○ Final void rehabilitation.
	• Quarry Closure and Decommissioning:
	  ○ Closure methodology – decommissioning of infrastructure, plant, buildings, roadways and hardstands
	  ○ Dams, diversions and surface water features
	Post mine land use.
			O	**R**

9. Conclusion

Secretary's Environmental Assessment Requirements

In particular, the EIS must include:

- *a conclusion justifying why the development should be approved, taking into consideration:*
  - *alternatives;*
  - *the suitability of the site;*
  - *the biophysical, economic and social impacts of the project, having regard to the principles of ecologically sustainable development; and*
  - *whether the project is consistent with the objects of the Environmental Planning and Assessment Act 1979;*

9.1.1 Needs and benefits

The proposed Murray's Crossing Quarry would involve the extension and operation of an existing quarry 2km south of Tumbarumba, in south eastern NSW. The Development site comprises freehold land and the Crown Quarry Reserve, which is approximately 15.41 ha of land. The development footprint of the Proposal is approximately 13.24ha, including a pit footprint of approximately 8.68ha.

The Proposal would contribute to the supply and use of the extracted material locally or within the region. The resource capacity of the existing Murray's Crossing Quarry is depleting, and the quarry boundary is at the limits of the Crown Quarry Reserve. The Proposal would ensure the continued supply of locally sourced hard rock, providing supply and certainty for the region.

Local social and economic benefits that would be associated with the Proposal include:

- The Proposal would result in employment retention. The site currently has four to five Fulltime Equivalent (FTE) staff
- Support local employment and regional development and economic opportunities, outside of the operations on the site
- Over the life of the Proposal, it would provide approximately $1.1 million of capital investment value in the region
- The use of the extracted material would support the construction of additional roads and improve the quality of existing roads, thereby resulting in increased access to local towns, resulting in shared economic benefits
- The Proposal would meet local strategic and statutory provisions, endorsed by the local Council and community, that apply to the Proposal
- It would reduce the dependence on other developments in the region, and in turn potentially reduce greenhouse gas emissions that contribute to climate change, by providing a resource that can be locally sourced and is well located to access major roads and train lines minimising travel.

Characteristics of the Proposal that make it suitable for a quarry are identified and justified, specifically for land use and compatibility with surrounding land uses, strategic need, the resource need, and the low environmental constraints and minimal impacts to the community and environment. The investigation and laboratory testing of the resource indicate there is approximately 2.4 million tonnes of resource. Material testing indicates a medium to high strength Olivine Basalt.

No alternative sites were investigated. The location of the quarry extension was influenced by the existing operation and underlying geology. Existing infrastructure such as the site office and mobile rock processing plant are already located within close proximity to the proposed quarry extension.

9.1.2 Environmental assessment and mitigation of impacts

NGH, with input from specialists as required, has prepared this EIS on behalf of the Proponent, Bald Hill Quarry Pty Ltd. This EIS has assessed the broader Proposal and Development site where infrastructure may be located. Overall, the proposed quarry would represent a further contribution of rock aggregate to the local region for use in the development of infrastructure and other projects. It is considered compatible with existing land uses and would be rehabilitated following closure and returned to agricultural use.

The precautionary principle has been adopted in the assessment of expected impacts. The aims, structure and content of this EIS have incorporated the principles of ESD. The mitigation measures described in this EIS set out an auditable environmental management commitment by the Proponent.

The key environmental risks have been investigated through detailed specialist investigations. These included:

- Biodiversity impacts – the BA concluded that that no significant impacts to threatened species and ecological communities would result from development of the Proposal. No referrals under the EPBC or BC Act are considered to be required. Mitigation measures have been provided (section 6.2.5) to manage impacts to Biodiversity.
- The noise report indicates that noise levels during quarry operations are predicted to exceed the NPfI PNTLs at several receptors, particularly for quarrying, processing and product despatch. It is important to note that the quarrying activities were assessed at the highest point on the site. As quarrying progresses, noise levels would be likely to decrease at several receptors as activities are shielded by the quarry benches that are formed. Mitigation measures would further manage noise impacts to sensitive receivers.
- Topography, geology and soils - The risk of erosion is considered low. With the implementation of safeguards and mitigations measures, runoff is considered to be readily manageable and unlikely to cause substantial erosion or lead to substantial sediment loads entering any natural waterways.
- Water use and water quality – Water would be sourced on-site from two sediment dams. During construction, water would be used primarily for dust suppression. During operation, quantities of water required would be for dust suppression and for material processing. Potable water for staff would be provided at the proposed workshop, which would be connected to town water (refer to Figure 3-10). Amenities are supplied with rainwater. Minimal impacts to water quality are expected with the correct use of erosion controls during construction and the maintenance of groundcover during operation. The pit is known to act as a flood storage area during high rainfall events. This would not change as a result of the Proposal.
- Climate and air quality – the AQIA predicts that the operational quarry is likely to cause no or minor additional exceedances of the 24-hour average $PM_{2.5}$ and PM_{10} criterion. PM_{10}, TSP and dust deposition criteria are predicted to be met at all receivers. Exceedances of the cumulative annual average $PM_{2.5}$ impact assessment criteria were predicted at each of the sensitive receivers due to the background concentrations already being above criteria. Incremental increases due to the proposed operations were less than 1% of the criteria in most cases. Mitigation measures to reduce dust during construction and operation include

the use of water carts for dust suppression, covering loads and stockpiles, and a stop works during adverse weather.

- Traffic, transport and road safety – the traffic assessment concluded that the existing road network would be able to accommodate the minor additional traffic during construction and operation. Mitigation measures have been provided (section 6.7.4) to help manage traffic resulting from the development.
- Hazards – A PHA was not considered necessary for the Proposal. With the implementation of the safeguards and mitigation measures provided in section 6.8.4 of this report, the Proposal would not be considered a potentially hazardous development with respect to the storage, use or transportation of hazardous substances.
- Aboriginal heritage impacts – the Aboriginal heritage survey and assessment found that no operational impact to Aboriginal cultural heritage would occur as a result of the Proposal, providing that works avoid PAD01 with a minimum 10m buffer. Prior to works proceeding, two mature native trees require further physical inspection to determine whether they have Aboriginal cultural value. A mitigation measure would be imposed that if any items suspected of being Aboriginal in origin are discovered during works, all work in the immediate vicinity must stop and Heritage NSW must be notified. The find will need to be assessed and if found to be an Aboriginal object an Aboriginal Heritage Impact Permit (AHIP) may be required.

Management measures have been developed to address environmental impacts and risks to these and other physical, social and environmental impact areas. Key management strategies centre on the development of management plans and protocols to minimise impacts and manage identified risks. The management measures account for uncertainty and are precautionary where required. The impacts and risks identified are considered highly manageable with the effective implementation of the measures stipulated in this EIS and are consistent with the objectives of the *Environmental Planning and Assessment Act 1979*.

The objects of the EP&A Act have been considered throughout this environmental assessment, including natural resources and competing land uses. The Proposal aims to support local industry and the regional economy through the extension of an existing quarry, benefiting from existing quarry infrastructure and reducing the overall net impact of the Proposal. The Proposal would provide for the considered management of an essential natural resource. The Proposal has been located and designed to avoid environmentally sensitive land and clearing of native vegetation as much as possible. For these reasons it is considered that the Proposal is consistent with the objectives of the EP&A Act.

9.1.3 Ability to be approved

- The Development site is appropriate for a quarry
- The Proposal is consistent with local, State and Federal planning provisions
- The Development site has been selected to avoid or minimise environmental impacts where possible through an iterative constraints' investigation/design process
- The development footprint has been designed to avoid or minimise impacts to vegetation and habitat
- The development footprint has been designed to avoid Aboriginal artefacts
- The development is well screened by existing vegetation and natural topography
- Land use conflicts and hazard risks are considered manageable and acceptable.

The residual impacts are considered justifiable and acceptable in the context of the Proposal's benefits.

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Appendix A Secretary's Environmental Assessment Requirements (SEARs)

Planning and Assessment
Energy, Industry & Compliance
Contact: Joel Herbert
Phone: 8289 6614
Email: Joel.herbert@planning.nsw.gov.au

Ms Belinda Fourie
Bald Hill Quarry Pty Ltd
5423 Hume Highway
Jugiong NSW 2726

Via email: safety@baldhillquarry.com.au

6 April 2021

Dear Ms Fourie

Planning Secretary's Environmental Assessment Requirements
Tumbarumba Quarry (EAR 1549)

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

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

In your request for SEARs, you have also indicated that the proposal is classified as integrated development under section 4.46 of the EP&A Act as it requires additional statutory authorisations. You are encouraged to consult with the relevant agencies with respect to licence/approval requirements. If further integrated approvals are required, you must undertake your own consultation with the relevant public authorities, and address their requirements in the EIS.

The Department wishes to emphasise the importance of effective and genuine community consultation during the preparation of the EIS. This process should provide the community with a clear understanding of the proposal and its potential impacts and include active engagement with the community regarding key issues of concern. The development application (DA) for the proposed development must be accompanied by clear evidence of the consent to the lodgement of the DA of all owners of land directly subject to the DA.

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

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

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

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

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

Yours sincerely,

Lauren Evans
A/Director
Resource Assessments
as delegate for the Planning Secretary

Planning Secretary's Environmental Assessment Requirements

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

Designated Development

EAR Number	EAR 1549
Proposal	Extraction and processing of up to 200,000 tonnes of hard rock per annum over a 25 year period from a total resource of up to 3,000,000 tonnes
Location	71 Murrays Crossing Road, Tumbarumba Lots 659, 663, 665, 452, 20, 172, 173, 174, 175, 176, 177, 178, DP 755892, Lot 179 DP 1100528, Lot 1 DP 1150973, Lot 1 DP 111861, Lot 732 and 623 DP 755892, Lot 7028 DP96852
Applicant	Bald Hill Quarry Pty Ltd
Date of Issue	6 April 2021
Date of Expiry	6 April 2023
General Requirements	The Environmental Impact Statement (EIS) for the development must comply with the requirements in Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* In particular, the EIS must include: • an executive summary; • a comprehensive description of the development, including: - a detailed site description and history of any previous quarrying on the site, including a current survey plan; - identification of the resource, including the amount, type, composition; - the layout of the proposed works and components (including any existing infrastructure that would be used for the development); - an assessment of the potential impacts of the development, as well as any cumulative impacts, including the measures that would be used to minimise, manage or offset these impacts; - a detailed rehabilitation plan for the site; - any likely interactions between the development and any existing/approved developments and land uses in the area, paying particular attention to potential land use conflicts with nearby residential development; - a list of any other approvals that must be obtained before the development may commence; - the permissibility of the development, including identification of the land use zoning of the site; - identification of sensitive receivers likely to be affected by the development using clear maps/plans, including key landform areas, such as conservation areas and waterways; • a suitable monitoring and reporting procedure to ensure that the total resource extracted by the development does not exceed 5 million tonnes; • a conclusion justifying why the development should be approved, taking into consideration: – alternatives; – the suitability of the site; – the biophysical, economic and social impacts of the project, having regard to the principles of ecologically sustainable development; and – whether the project is consistent with the objects of the Environmental Planning and Assessment Act 1979; and • a signed declaration from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.
Consultation	In preparing the EIS for the development, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers and any surrounding landowners that may be impacted by the development. The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.

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

	- a description of access roads, specifically in relation to nearby Crown roads and fire trails; • **Land Resources**– including an assessment of: - potential impacts on soils and land capability (including potential erosion and land contamination) and the proposed mitigation, management and remedial measures (as appropriate); - potential impacts on landforms (topography), paying particular attention to the long-term geotechnical stability of any new landforms (such as overburden dumps, bunds etc); and - the compatibility of the development with other land uses in the vicinity of the development, in accordance with the requirements of Clause 12 of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*; • **Waste** – including estimates of the quantity and nature of the waste streams that would be generated or received by the development and any measures that would be implemented to minimise, manage or dispose of these waste streams; • **Hazards** – including an assessment of the likely risks to public safety, paying particular attention to potential bushfire risks and the transport, storage, handling and use of any hazardous or dangerous goods; • **Visual** – including an assessment of the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, including with respect to any new landforms; • **Social & Economic** – an assessment of the likely social and economic impacts of the development, including consideration of both the significance of the resource and the costs and benefits of the project; and • **Rehabilitation** – including: - a detailed description of the proposed rehabilitation measures that would be undertaken throughout the development and during quarry closure; - a detailed rehabilitation strategy, including justification for the proposed final landform and consideration of the objectives of any relevant strategic land use plans or policies; and - the measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy, recognising that a rehabilitation bond will likely be required as a condition of any future development consent.
Environmental Planning Instruments	The EIS must take into account all relevant State Government environmental planning instruments, guidelines, policies, and plans. While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies and plans that may be relevant to the environmental assessment of this development. During the preparation of the EIS you must also consult the Department's EIS Guideline – Extractive Industries – Quarries. This guideline is available at http://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/extractive-industries-quarries-eis-guideline-1996-10.ashx. In addition, the EIS must assess the development against the *Tumbarumba Local Environmental Plan 2010* and any relevant development control plans/strategies.

ATTACHMENT 1

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

Many of these documents can be found on the following websites:
http://www.planning.nsw.gov.au
http://www.bookshop.nsw.gov.au
http://www.publications.gov.au

Environmental Planning Instruments, Policies, Guidelines & Plans

Environmental Planning Instruments - General	
	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
	State Environmental Planning Policy (State and Regional Development) 2011
	State Environmental Planning Policy (Infrastructure) 2007
	Tumbarumba Local Environmental Plan 2010
Risk Assessment	
	AS/NZS 4360:2004 Risk Management (Standards Australia)
	HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)
Land	
	State Environmental Planning Policy No. 55 – Remediation of Land
	Agricultural Land Classification (DPI)
	Rural Land Capability Mapping (OEH)
	Soil and Landscape Issues in Environmental Impact Assessment (NOW)
	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC)
	Guidelines for Consultants Reporting on Contaminated Sites (EPA)
	Agricultural Issues for Extractive Industry Development (DPI)
Water	
Groundwater	NSW Aquifer Interference Policy 2012 (NOW)
	NSW State Groundwater Policy Framework Document (NOW)
	NSW State Groundwater Quality Protection Policy (NOW)
	NSW State Groundwater Quantity Management Policy (NOW)
	Australian Groundwater Modelling Guidelines 2012 (Commonwealth)
	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	Guidelines for the Assessment & Management of Groundwater Contamination (EPA)
Surface Water	NSW State Rivers and Estuary Policy (NOW)
	NSW Government Water Quality and River Flow Objectives (EPA)
	Using the ANZECC Guideline and Water Quality Objectives in NSW (EPA)
	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (EPA)
	Managing Urban Stormwater: Soils & Construction (Landcom) and associated Volume 2E: Mines and Quarries (DECC)
	Managing Urban Stormwater: Treatment Techniques (EPA)
	Managing Urban Stormwater: Source Control (EPA)
	Technical Guidelines: Bunding & Spill Management (EPA)
	A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)
	NSW Guidelines for Controlled Activities (NOW)
	Guidelines for Controlled Activities on Waterfront Land 2018 (NRAR) (Waterfront land only)
Flooding	Floodplain Development Manual (OEH)
	Floodplain Risk Management Guideline (OEH)
Biodiversity	

	Biodiversity Assessment Method (OEH 2020)
	Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH 2017)
	Ancillary rules: Biodiversity conservation actions
	Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying variation rules
	NSW Guide to Surveying Threatened Plants (OEH 2016)
	Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECC 2009)
	Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004)
	Threatened Species Assessment Guideline – The Assessment of Significance (DECC 2007)
	OEH principles for the use of biodiversity offsets in NSW
	NSW State Groundwater Dependent Ecosystem Policy (NOW)
Heritage	
	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
	Guide to investigation, assessing and reporting on Aboriginal cultural heritage in NSW (OEH) 2011
	Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH)
	Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (OEH)
	Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (OEH)
	NSW Heritage Manual (OEH)
	Statements of Heritage Impact (OEH)
Noise & Blasting	
	NSW Noise Policy for Industry (EPA)
	Interim Construction Noise Guideline (EPA)
	NSW Road Noise Policy (EPA)
	Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC)
Air	
	Protection of the Environment Operations (Clean Air) Regulation 2002
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA)
	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (EPA)
	Assessment and Management of Odour from Stationary Sources in NSW (DEC)
	National Greenhouse Accounts Factors (Commonwealth)
Transport	
	Guide to Traffic Generating Development (RTA)
	Road Design Guide (RMS) & relevant Austroads Standards
Hazards	
	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
	Hazardous and Offensive Development Application Guidelines – Applying SEPP 33
	Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis
	Planning for Bushfire Protection 2006 (RFS)
Resource	
	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (JORC)
Waste	
	Waste Classification Guidelines (EPA)
	Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes 1999 (EPA)
Rehabilitation	
	Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth)
	Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth)
	Strategic Framework for Mine Closure (ANZMEC-MCA)

ATTACHMENT 2

AGENCIES' CORRESPONDENCE

Our ref: DOC21/86616
Senders ref: SEAR 1549

Joel Herbert
Environmental Assessment Officer – Resource Assessments
Energy, Industry and Compliance
Department of Planning, Industry & Environment

Via email: joel.herbert@planning.nsw.gov.au

24 February 2021

Dear Mr Herbert

Subject: Request for Secretary's Environmental Assessment Requirements – Tumbarumba Quarry (SEAR 1549)

Thank you for your email dated 9 February 2021 seeking input from the Biodiversity and Conservation Division (BCD) into the Department of Planning, Industry and Environment (the Department) Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement (EIS) for the Tumbarumba Quarry designated development application.

BCD has reviewed the documentation and provides SEARs for the proposed development in **Attachment A.** Guidance material is listed in **Attachment B**.

BCD recommends that the EIS appropriately address the following:

1. Biodiversity
2. Flooding

The EIS should fully describe the proposal, the existing environment, including threatened species habitat not associated with vegetation communities such as paddock trees and drainage lines, and impacts of the development including the location and extent of all proposed works that may impact on biodiversity. The scale and intensity of the proposed development should dictate the level of investigation. It is important that all conclusions are supported by adequate data. The assessment must include all ancillary infrastructure associated with the project, such as roads, sedimentation basins, material stockpiles, vehicle parking and hardstand areas, water and power supplies, and Rural Fire Service requirements for asset protection.

<u>Biodiversity</u>

The activity involves the clearing of remnant vegetation as described in your submission. Section 3.3 (page 10) of the Scoping Report indicates that an unnamed, natural drainage line would be used to stockpile topsoil and waste. We recommend that any native wetland plants or vegetation communities within the drainage line be identified and assessed for threatened species habitat.

The preferred approach under the *Biodiversity Conservation Act 2016* (BC Act) is to avoid impacting on biodiversity, including scattered trees that may provide habitat for hollow-dependent fauna. Unless the vegetation can be avoided, the exact nature of the impact should be confirmed by applying the Biodiversity Offset Scheme Threshold and a Test of Significance. Any determined impacts must be managed in a Biodiversity Development Assessment Report (BDAR).

The proposal site includes sections of a parcel of Crown land and adjacent Crown road, which form part of a Travelling Stock Reserve (TSR). Based on aerial imagery, this TSR provides a vegetated habitat corridor through the surrounding agricultural landscape and nearby records of Gang-gang Cockatoo (*Callocephalon fimbriatum*) indicate that nesting hollows may be present in mature trees. The BioNet database also includes nearby records of Varied Sittella (*Daphoenositta chrysoptera*), which relies on woodland habitat.

The Scoping Report states that the proponent is permitted by Local Land Services to stockpile material on the TSR. Stockpiling and other ancillary activities that impact on native vegetation, including ground cover, must be included in the assessment.

Flooding

An initial assessment of the location of the proposal site in relation to the Tumbarumba Creek floodplain is needed to determine potential flood liability. The Tumbarumba Creek floodplain is defined as the extent of the Probable Maximum Flood.

If any part of the site is within the mapped floodplain, then a detailed assessment of the flood impacts caused by the development (including all proposed site access roads) needs to be completed. If a detailed assessment is required, the EIS should specifically address the requirements for flooding listed in **Attachment A**, Section 3 “Flooding”.

If you have any questions about this advice, please contact Miranda Kerr, Senior Biodiversity Conservation Officer, via rog.southwest@environment.nsw.gov.au or 02 6022 0607.

Yours sincerely

Andrew Fisher
Senior Team Leader Planning
South West Branch
Biodiversity and Conservation Division
Department of Planning, Industry and Environment

ATTACHMENT A – Recommended Environmental Assessment Requirements for Tumbarumba Quarry (SEAR 1549)
ATTACHMENT B – Guidance material

Attachment A Recommended Environmental Assessment Requirements for Tumbarumba Quarry (SEAR 1549)

Sources of guidance material for terms in blue are in Attachment B.

The Proposal

The objectives of the proposal should be clearly stated and identify:

- the size, scale and type of the proposed activity / development;
- all anticipated environmental impacts including: direct and indirect; construction and operational; and extent of vegetation / habitat clearing or disturbance;
- threatened species, populations, ecological communities or habitats impacted upon;
- the staging and timing of the proposal; and
- the proposal's relationship to any other proposals and developments.

1. Environmental Impacts of the Proposal

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

- Biodiversity
- Flooding

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

2. Biodiversity

Negative impacts on native vegetation should be avoided where possible using prevention and mitigation measures. Where impacts cannot be avoided, the EIS should detail how they will be remedied through biodiversity offsetting, including quantification of impacts and assessment of the value of offset areas, protection mechanisms and associated management regimes for those areas.

We recommend that the applicant provide evidence that any clearing associated with or ancillary to the activity is not likely to significantly affect threatened species, threatened ecological communities or their habitats. At a minimum that evidence should take the form of a Test of Significance according to the Minister's Guidelines. Links to biodiversity assessment-related guidance and tools are in **Attachment B.**

The threatened species profile website and BioNet Atlas of NSW Wildlife can be used to generate a list of threatened species, populations and ecological communities predicted or known to occur in the area. Vegetation map datasets can be accessed via SEED.

Habitat preferences can then be used to determine the likelihood of these species occurring in the study area. Appropriate measures to avoid, minimise and mitigate any impacts on vegetation and threatened species habitat should be set out in the EIS. If impacts on biodiversity are likely to be significant, then the applicant must mitigate these impacts through the Biodiversity Offset Scheme according to the *Biodiversity Conservation Act 2016* (BC Act), namely a Biodiversity Development Assessment Report (BDAR).

The applicant should also apply the Biodiversity Offset Scheme Threshold test. The Biodiversity Values Map and Threshold (BMAT) Tool can help to determine whether the activity exceeds the entry thresholds and the Biodiversity Offset Scheme is triggered by providing the specific area clearing threshold and stating whether the development proposal occurs on land mapped on the Biodiversity Values Map. The report generated by the BMAT Tool should be submitted with the application.

Where the proposal is likely to significantly affect threatened species within the meaning of Section 7.2 of the BC Act, the application for development consent is to be accompanied by a Biodiversity Development Assessment Report, and the following requirements apply:

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

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

The BDAR must be prepared by a person accredited in accordance with the accreditation scheme under s6.10 of the BC Act.

Please note that because the Tumbarumba Quarry is a matter which requires consent under the *Environmental Planning and Assessment Act 1979*, the clearing provisions of the *Local Land Services Act 2013* and the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*, do not permit clearing associated with or ancillary to the activity regardless of zone.

Matters of National Environmental Significance

Regarding the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the EIS should identify any relevant Matters of National Environmental Significance, and whether the proposal has been referred to the Australian Government or whether it is already determined to be a controlled action.

3. Flooding

The EIS should specifically address the requirements listed below for flooding. Flood modelling should be conducted for the purposes of appropriately locating infrastructure and for assessing impacts, including impacts to waterway crossings for site access.

3.1 The EIS must map the following features relevant to flooding, as described in the Floodplain Development Manual 2005 (NSW Government 2005):

a. Flood prone land.

b. Flood planning area, the area below the flood planning level.

c. Hydraulic categorisation (floodways and flood storage areas).

d. Flood hazard.

3.2 The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 5% Annual Exceedance Probability (AEP), 1% AEP flood levels, and the probable maximum flood or an equivalent extreme event.

3.3 The EIS must model the effect of the proposed development (including fill) on the flood behaviour under the following scenarios:

a. Current flood behaviour for a range of design events as identified in 7 above. This includes the 0.5% and 0.2% AEP year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.

3.4 Modelling in the EIS must consider and document:

a. Existing council flood studies in the area and examine consistency to the flood behaviour documented in these studies.

b. The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood (PMF).

c. Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazards and hydraulic categories.

d. Relevant provisions of the NSW Floodplain Development Manual 2005.

3.5. The EIS must assess the impacts on the proposed development on flood behaviour, including:

a. Whether there will be detrimental increases in the potential flood affectation of other properties, assets and infrastructure.

b. Consistency with Council Floodplain Risk Management Plans.

c. Compatibility with the flood hazard of the land.

d. Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land.

e. Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site.

f. Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.

g. Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the SES and Council.

h. Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the SES and Council.

i. Emergency management, evacuation and access, and contingency measures for the development considering the full range or flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the SES.

j. Any impacts the development may have on the social and economic costs to the community as consequence of flooding.

Attachment B – Guidance material

Title	Web address
Relevant Legislation	
Biodiversity Conservation Act 2016	www.legislation.nsw.gov.au/#/view/act/2016/63/full
Commonwealth Environment Protection and Biodiversity Conservation Act 1999	www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
Environmental Planning and Assessment Act 1979	www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Biodiversity	
Biodiversity Assessment Method 2020 (DPIE 2020)	www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-2020
Biodiversity Offsets Scheme Threshold	www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/biodiversity-offsets-scheme/entry-requirements
Biodiversity Values Map and Threshold (BMAT) Tool	www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap
BAM Assessor Resources (including links to Survey Guidelines, Registers and Databases)	www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/accredited-assessors/assessor-resources
BAM Assessor FAQ	www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/accredited-assessors/assessor-questions-and-answers
Biodiversity Values Map	www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap
Guidance to assist a decision maker to determine a serious and irreversible impact (DPIE 2019)	www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/guidance-decision-makers-determine-serious-irreversible-impact-190511.pdf
Ancillary rules: biodiversity conservation actions	www.environment.nsw.gov.au/resources/bcact/ancillary-rules-biodiversity-actions-170496.pdf
Ancillary rules: reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules	www.environment.nsw.gov.au/resources/bcact/ancillary-rules-reasonable-steps-170498.pdf
DPIE Threatened Species Profiles	www.environment.nsw.gov.au/threatenedspeciesapp/
BioNet Atlas	www.environment.nsw.gov.au/wildlifeatlas/about.htm
BioNet Vegetation Classification – see **NSW Plant Community Type (PCT) classification** link for PCT database login page.	www.environment.nsw.gov.au/research/Visclassification.htm
NSW SEED Data Portal (access to online spatial data)	www.seed.nsw.gov.au/

Title	Web address
Fisheries NSW policies and guidelines	www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals/fish-habitat-conservation
Water	
Flooding	
Floodplain development manual	www.environment.nsw.gov.au/floodplains/manual.htm
Australian Rainfall and Runoff: A Guide to Flood Estimation (Geoscience Australia 2019).	arr.ga.gov.au/
Floodplain Risk Management Guide: Incorporating 2016 Australian Rainfall and Runoff in studies.	www.environment.nsw.gov.au/research-and-publications/publications-search/floodplain-risk-management-guide
NSW Climate Impact Profile	climatechange.environment.nsw.gov.au/
Climate Change Impacts and Risk Management	www.environment.gov.au/climate-change/adaptation/publications/climate-change-impact-risk-management

Joel Herbert

From: Lands Ministerials Mailbox
Sent: Monday, 1 March 2021 1:12 PM
To: Joel Herbert
Subject: Re: Request for Requirements - EARs 1549 - Tumbarumba Quarry
Attachments: Tumbarumba Quarry Map.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Joel

Apologies for the late response.

Crown Lands has the following comments for this proposal:-

The SEARS proposal is over several parcels of Crown land managed by several Crown Land Managers and some parcels have Aboriginal Land Claims. Additionally, the proposed development is not consistent with all of the reserve purposes and native title will be impacted.

The Department would like to work with the Tumbarumba Quarry proponent to discuss the issues. A Land Owners Consent will be required by the Department. Please see the attached map.

The proposal is over the following Crown Land parcels -
Reserve 81837 for Quarry Gazette 7 August 1959, managed by Snowy Valleys Council
Reserve 84248 for Future Public Requirements Gazette 28 June 1963
Reserve 81837 for Quarry Gazette 7 August 1959, managed by Snowy Valleys Council
Reserve 51191 for Camping and Travelling Stock Gazette 8 December 1915, managed by Riverina Local Lands Services
Crown Waterway Tumbarumba Creek.

The quarry proposal may also impact on an adjoining reserve, the Tumbarumba Racecourse.

Thanks
Kirstyn

Lands Stakeholder Relations

Team telephone numbers: Rebecca Johnson, Principal Project Officer, 4920 5040; Kirstyn Goulding, Administration Officer - Customer Liaison, 4920 5058; Kim Fitzpatrick, Senior Project Officer, 4920 5015, Deb Alterator, Project Support Officer 4920 5172

Crown Lands | Department of Planning, Industry and Environment
E lands.ministerials@dpie.nsw.gov.au
Level 4, 437 Hunter Street Newcastle NSW 2295
www.dpie.nsw.gov.au

Our Vision: Together, we create thriving environments, communities and economies.

The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

From: Joel Herbert <Joel.Herbert@planning.nsw.gov.au>
Sent: Tuesday, 9 February 2021 5:36 PM
To: info@svc.nsw.gov.au <info@svc.nsw.gov.au>; DPI Landuse Enquiries Mailbox <landuse.enquiries@dpi.nsw.gov.au>; DPI Landuse Ag Mailbox <landuse.ag@dpi.nsw.gov.au>; development.southern <development.southern@rms.nsw.gov.au>; 'records@rfs.nsw.gov.au' <records@rfs.nsw.gov.au>; EPA Planning Matters Mailbox <planning.matters@epa.nsw.gov.au>; Planning Matters Mailbox <planning.matters@environment.nsw.gov.au>; Environmental Assessments <environmental.assessments@waternsw.com.au>; DPI AHP Central Mailbox <ahp.central@dpi.nsw.gov.au>; DRG RO Assessment Coordination Mailbox <assessment.coordination@planning.nsw.gov.au>; Lands Ministerials <lands.ministerials@industry.nsw.gov.au>; RRD EO Executive Director Resources Regulator Mailbox <ED.ResourcesRegulator@planning.nsw.gov.au>
Subject: Request for Requirements - EARs 1549 - Tumbarumba Quarry

Good afternoon,

Proposal – Tumbarumba Quarry
EAR ID No. 1549

Bald Hill Quarry Pty Ltd have requested the requirements of the Secretary of the Department of Planning and Environment for the preparation of an Environmental Impact Statement (EIS) for the above local designated development located in the Snowy Valleys local government area.

I have attached a copy of the Applicant's request for your reference.

Under Schedule 2 of the *Environmental Planning and Assessment Regulation 2000,* the Secretary is requesting your requirements for the EIS.

It would be greatly appreciated if we could receive your advice by **Wednesday 24 February 2021.**

Please note that the proposal seeks to amalgamate the operations of the existing Murray's Crossing Quarry under the approval. This would result in extending the life of the quarry for a further 25 years, to continue extracting Basalt at a rate of 200,000 tonnes per annum from a total resource of approximately 3 million tonnes.

If you have any queries, please contact me on the details below.

Joel Herbert
Environmental Assessment Officer - Resource Assessments
Energy, Industry and Compliance
4 Parramatta Square, 12 Darcy Street Parramatta NSW 2150
Locked Bag 5022, Parramatta NSW 2124

T 02 8289 6614 | E Joel.Herbert@planning.nsw.gov.au


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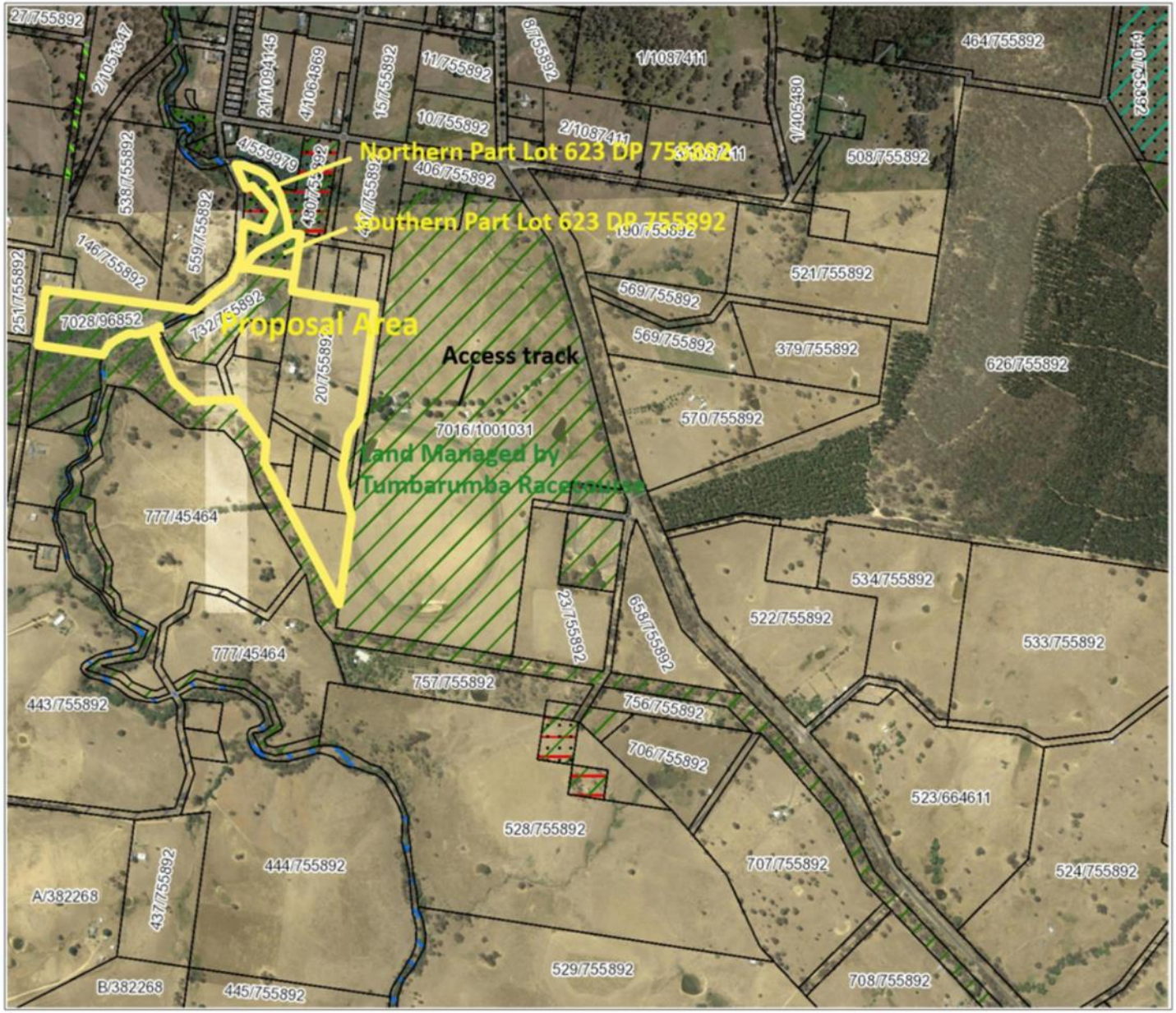

Bald Hill Quarry - EARs 1549

Legend

- Aboriginal Land Claim Boundary
- Licence (Structure Point)
- Licence (Structure Line)
- Licence (Structure Polygon)
- Licence (Land Area)
- Crown Lease
- Enclosure Permit
- Crown Reserve
- Crown Land (Other)
- Crown Land
- Crown Land - Status Unknown
- Non Crown Land
- Crown Land - Undefined Status
- Crown Road
- Shared Crown / Council Road
- Crown Road - Undefined Status
- Crown Waterway
- All Crown (Land, Road & Water)
- Local Government Area
- Suburb
- National Parks Reserve
- State Forest

Crown Account Details

Parish: TUMBARUMBA
County: SELWYN
LGA: SNOWY VALLEYS
Suburb: TUMBARUMBA

Author: DPI\fitzgs01
Map Created: 16/02/2021 9:32:12 AM

NSW GOVERNMENT | Planning, Industry & Environment

N

0 183 367 550 734 m

Scale 1: 18056

Projection: WGS_1984_Web_Mercator_Auxiliary_Sphere

Disclaimer: Scale is not accurate. Crown Lands must not be liable for any loss or damage (including loss of profits, business, revenue or data) whether in contract, tort (including negligence) or otherwise arising from or in connection with any defect, error or inaccuracy of information or any part thereof or any products or services.

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OUT21/1886

Joel Herbert
Environmental Assessment Officer
Resource Assessments
Energy, Industry and Compliance
Parramatta NSW 2124
joel.herbert@dpie.nsw.gov.au

Dear Joel

Environmental Assessment Requirements – EARs 1549 - Tumbarumba Quarry

Thank you for your correspondence requesting Environmental Assessment Requirements (EARs) for the above proposal.

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

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

Should you require clarification on any of the information contained in this response, please contact Lilian Parker, Agricultural Land Use Planning Officer, on 0427812508 or by email at landuse.ag@dpi.nsw.gov.au

Yours sincerely

Lilian Parker

Lilian Parker
Agricultural Land Use Planning Officer
Esigned 17-2-2021

Attachment 1: Environmental Assessment Requirements

Issue	Environmental Assessment Requirements for the Environmental Impact Statement
Site Suitability	• Include a Land Use Conflict Risk Assessment (LUCRA) to identify potential land use conflict with sensitive receptors including surrounding agricultural land uses. The LUCRA is to address separation distances and management practices to minimise odour, dust and noise impacts on sensitive receptors including surrounding agricultural land uses. A LUCRA is described in the DPI Land Use Conflict Risk Assessment Guide. • Include a map, to scale, showing the above operational and infrastructure details including separation distances from sensitive receptors including surrounding agricultural land uses.
Consideration of impacts on agricultural resources and land	**Characteristics of Agricultural Land** • Describe the soil, slope, land capability, agricultural productivity, land characteristics and the history of agricultural land uses on the proposed development site. • Describe the current and historical agricultural land uses on surrounding land in the locality including the land capability and agricultural productivity of the surrounding land. **Impacts on Agricultural Land, Resources and Land Uses** • Detail the potential impacts from the proposed extractive industry on agricultural land and agricultural land uses on the site and in the locality. • Consider possible cumulative impacts on surrounding agricultural enterprises and landholders. **Measures to Mitigate Impacts on Agricultural Land** • Demonstrate that all significant impacts on current and potential agricultural developments and resources can be reasonably avoided or adequately mitigated. • Detail the expected life span of the proposed development.
Suitable and secure water supply	• Detail the estimated water demand and water availability and the source of water and any sanitisation methods proposed. • Outline any impacts to water use for agriculture and measures to mitigate against these impacts.
Biosecurity	• Include a biosecurity (pests, weeds and disease) risk assessment outlining the likely plant, animal and community risks. The relevant weed or pest animals for a region are addressed in the regional plans or strategies issued by NSW Local Lands Services. • Include details of how the proposal will deal with identified biosecurity risks as well as contingency plans for any failures. Include monitoring and mitigation measures for weed and pest management.
Traffic movements	• Detail the volume and route of traffic movements for the proposed development and how potential impacts on surrounding agricultural land uses are proposed to be mitigated (eg noise, dust, volume of traffic). This should include consideration of Travelling Stock Reserves (TSR) and the movement of livestock or farm vehicles along / across the affected roads.

Land stewardship	• Describe the final proposed land use and land form. • Detail the proposed rehabilitation and decommissioning/closure measures to achieve this land use including the expected timeline for the rehabilitation program. • Outline the monitoring and mitigation measures to be adopted for rehabilitation remedial actions.
Community Consultation	• Consult with the owners / managers of affected and adjoining agricultural operations in a timely and appropriate manner about: the proposal, the likely impacts and suitable mitigation measures or compensation.
Emergency Management	• The proposal is to detail contingency plans to enable the operation to deal with emergency situations. The proposal is to detail Emergency Management procedures and responsibilities for responding to bushfire threats, extreme climatic conditions, and animal disease outbreaks.

Attachment 2: Guidelines for assessment

Title	Location
Land Use Conflict Risk Assessment Guide	https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment2/lucra
Agricultural Issues for Extractive Industry Development	https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment2/extractive-industries

Joel Herbert

From: Luke Pearce
Sent: Monday, 8 March 2021 11:23 AM
To: Joel Herbert
Subject: Tumbarumba Quarry EAR ID No. 1549

Hi Joel,

Can you please incorporated the following comments into your response regarding the amalgamation and increased production from the Murray's Crossing Quarry at Tumbarumba.

- Tumbarumba Creek is an important Class 1 Key Fish Habitat, having known and potential habitats for threatened species including Murray Crayfish
- The proposal needs to incorporate riparian buffers along Tumbarumba Creek as per DPI's Policy and guidelines for fish habitat conservation and management
- Avoid or mitigate potential direct and indirect impacts to aquatic habitats
- Avoid or mitigate impacts to water quality
- Any waterway crossing need to comply with DPI's current waterway crossing policy's and guidelines to allow fish passage

Regards

Luke

Luke Pearce | Fisheries Manager – Murray-Darling Unit
Freshwater Environment
NSW Department of Primary Industries | Fisheries
Unit 5/620 Macauley Street| Albury | NSW 2640
T: 02 6051 7768 | M: 0428 227 464 | E: luke.pearce@dpi.nsw.gov.au

DOC21/91732

The Director
Resource Assessments
Department of Planning, Industry and Environment

By email: Joel.Herbert@planning.nsw.gov.au

Attention: Joel Herbert

Dear Mr Ritchie

Re SEAR 1549

I refer to the electronic mail on 9 February 2021 to the Environment Protection Authority (EPA) requesting our requirements for the preparation of an Environmental Impact Statement (EIS) for the proposed expansion of Murray's Crossing Quarry, located 2km south of Tumbarumba.

The EPA have considered the details of the proposal and have identified the information required for the EIS as outlined in Attachment A. In summary, the EPA's key information requirements for the proposal include an adequate assessment of:

- Noise and Vibration – proximity to sensitive receptors and impacts of any sources associated with the project, including operational noise and blasting;
- Air – dust generation and management of potential impacts on adjacent landscape and/or communities;
- Water and Soils – water management system and the implementation of adequate erosion and sedimentation controls to control runoff from the quarry.

In carrying out the environmental assessment, the guidelines in Attachment B should be referred to.

It is important that all assumptions and conclusions made in the EIS are supported by adequate data. The proponent should also be aware that any commitments made in the EIS may be formalised as approval conditions and/or environment protection licence conditions.

If you have any further enquiries about this matter please contact Briohny Seaman by telephoning 0269 690 700 or by electronic mail at riverina.farwest@epa.nsw.gov.au.

Yours sincerely

JESSICA CREED
Unit Head Regional West Operations
Regulatory Operations Regional

19 February 2021

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ATTACHMENT A

The EPA's assessment of the proposal has identified the following areas that require further information.

Environmental impacts of the proposal

The Environmental Impact Statement (EIS) must address the requirements of Section 45 of the *Protection of the Environment Operations Act 1997* (POEO Act) by determining the extent of each impact and provide sufficient information to enable the EPA to determine appropriate conditions, limits and monitoring requirements for an Environment Protection Licence (EPL).

The following potential environmental impacts of the project need to be assessed, quantified and reported on:

- Air
- Noise
- Water
- Land
- Waste and chemicals.

The EIS should address how the required environmental goals will be met for each potential impact.

The EIS should describe mitigation and management options that will be used to prevent, control, abate or mitigate identified potential environmental impacts associated with the project and to reduce risks to human health and prevent the degradation of the environment.

This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

Air Quality impacts

The goal of the proposal in relation to air quality should be to ensure sensitive receptors are protected from any adverse impacts from odour and dust.

For a proposal of this scope we would expect an air quality impacts assessment (AQIA) to be undertaken in accordance with the *Approved Methods and Guidance for the Modelling and Assessment of Air Pollution in New South Wales* (DECC, 2016).

The EIS needs to identify any other existing impacts on air quality within the area, and if necessary, provide an assessment and commentary on the predicted cumulative impacts that may arise.

Emissions from any plant must meet the design criteria detailed in the Protection of the Environment Operations (Clean Air).

Surface and Groundwater impacts

The EIS must demonstrate how the proposed development will meet the requirements of section 120 of the POEO Act.

The goals of the project should include the following:

- No pollution of waters (including surface and groundwater), except to the extent authorised by the EPA (ie in accordance with an Environment Protection Licence);
- Polluted water (including process waters, wash down waters or polluted stormwater) captured on the site and collected, treated and beneficially reused, where this is safe and practicable to do so; and

- It is acceptable in terms of the achievement or protection of the River Flow Objectives and Water Quality Objectives.

The EIS should document the measures that will achieve the above goals.

The EIS should provide details of any water management systems for the site to ensure surface and ground waters are protected from contaminants. This should include an assessment of the following:

- Surface and groundwater conditions that may potentially be impacted by operations on site and any proposed environmental monitoring measures that the proponent will implement to monitor the receiving environment.

Land impacts

The goals of the project should include the following:

- No pollution of land, except to the extent authorised by the EPA (ie in accordance with an Environment Protection Licence); and
- The potential impact of land erosion from the development is mitigated.

The EIS should document the measures that will achieve the above goals.

Noise, blasting and vibration impacts

The EIS should include design, construction and operation of the premises in accordance with relevant EPA policy, guidelines and criteria, and in order to minimise potential impacts from noise.

The EPA expects that potential noise sources are assessed in accordance with the *Noise Policy for Industry* (EPA 2017), and where required mitigation measures are proposed (eg appropriate equipment chose to minimise noise levels). All residential or noise sensitive premises likely to be impacted by the development must be identified and included in the assessment.

An assessment of potential blast impacts must be undertaken, and this should be assessed against the guidelines contained in the document *Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990).

An assessment of vibration from all activities (including construction and operation) must be undertaken on the premises and this should be assessed using the guidelines contained in the document *Assessing Vibration: a technical guideline (DEC, 2006)*.

The proposed development may result in an increase in traffic movements associated with the proposal. The number of traffic movements associated with the proposal should be quantified and the potential noise impacts associated with these traffic movements need to be assessed in accordance with the *NSW Road Noise Policy* (DECCW, 2011).

Waste and chemical impacts

The EIS must assess all aspects of waste generation, management and disposal associated with the proposed development. The EIS should include the following:

- It is in accordance with the principles of the waste hierarchy and cleaner production;
- Where potential impacts associated with the handling, processing and storage of all waste materials generated at the premises are identified, these be satisfactorily mitigated;
- The beneficial reuse of all waste generated at the premises are maximised where it is safe and practical to do so;

- No waste disposal occurs on site except in accordance with an Environment Protection Licence; and
- Ensure that the environmental risks from hazardous chemicals and chemical waste are minimised.

Spill management measures, including items such as bunding, and emergency procedures should be clearly outlined.

Monitoring

The EIS must outline the proposed monitoring regime to be implemented in relation to the following potential impacts, where relevant:

- Air quality monitoring;
- Water quality monitoring;
- Noise monitoring; and
- Blast and vibration monitoring.

ATTACHMENT B

Title	Web address
Relevant Legislation	
Environmental Planning and Assessment Act 1979	https://www.legislation.nsw.gov.au/#/view/act/1979/203
Protection of the Environment Operations Act 1997	https://www.legislation.nsw.gov.au/#/view/act/1997/156/full
Licensing	
Guide to Licensing	http://www.epa.nsw.gov.au/licensing/licenceguide.htm
Air Issues	
POEO (Clean Air) Regulation 2010	https://www.legislation.nsw.gov.au/#/view/regulation/2010/428/historical2016-11-01/full
Approved methods for modelling and assessment of air pollutants in NSW (2016)	http://www.environment.nsw.gov.au/resources/air/ammodelling05361.pdf
Assessment and management of odour from stationary sources in NSW (DEC, 2006)	Technical framework: https://www.environment.nsw.gov.au/resources/air/20060440framework.pdf Technical notes: https://www.environment.nsw.gov.au/resources/air/20060441notes.pdf
Noise and Vibration	
Interim Construction Noise Guidelines (EPA, 2017)	https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/interim-construction-noise-guideline
Noise Policy for Industry (EPA, 2017)	https://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/noise-policy-for-industry-(2017)
NSW Road Noise Policy (EPA, 2011)	https://www.epa.nsw.gov.au/publications/noise/2011236-nsw-road-noise-policy
Assessing Vibration: a technical guideline (DEC 2006)	https://www.epa.nsw.gov.au/noise/vibrationguide.htm
Australian and New Zealand Environment Council: Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC 1990)	https://www.epa.nsw.gov.au/resources/noise/ANZECBlasting.pdf

Soils	
Managing Urban Stormwater: Soils and Construction (Landcom, 2004)	https://www.environment.nsw.gov.au/stormwater/publications.htm
Waste	
Waste Classification Guidelines (EPA, 2014)	https://www.epa.nsw.gov.au/your-environment/waste/classifying-waste/waste-classification-guidelines
Protection of the Environment Operations (Waste) Regulation 2014	https://www.legislation.nsw.gov.au/regulations/2014-666.pdf
Environmental Guidelines: Solid Waste Landfills, Second edition (EPA, 2016)	https://www.epa.nsw.gov.au/~/media/EPA/Corporate%20Site/resources/waste/solid-waste-landfill-guidelines-160259.ashx
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
National Water Quality Management Strategy: Australia and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000)	http://www.waterquality.gov.au/anz-guidelines/Documents/ANZECC-ARMCANZ-2000-guidelines-vol2.pdf
National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ, 2000)	http://www.waterquality.gov.au/anz-guidelines/Documents/ANZECC-ARMCANZ-monitoring-reporting.pdf
Using the ANZECC Guidelines and Water Quality Objectives in NSW (EPA, 2006)	https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/water/anzeccandwqos06290.pdf
Environmental Guidelines: Storage and Handling of Liquids (EPA, 2007)	https://www.epa.nsw.gov.au/licensing-and-regulation/licensing/environment-protection-licences/compliance-audit-program/chemical-storage-handling-and-spill-management/storing-and-handling-liquids-trainers-manual
The NSW State Groundwater Policy Framework Document (DLWC, 1997)	http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/547550/avail_ground_nsw_state_groundwater_policy_framework_document.pdf
The NSW State Groundwater Quality Protection Policy (DLWC, 1998)	http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/548286/nsw_state_groundwater_quality_policy.pdf

National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC, 1995)	https://www.water.wa.gov.au/__data/assets/pdf_file/0020/4925/8728.pdf

Joel Herbert
Environmental Assessment Officer
Resource Assessments
Energy, Industry and Compliance
Department of Planning, Industry & Environment

Your reference: SEARs 1549
Our reference: DOC21/87982

By email: joel.herbert@planning.nsw.gov.au

Dear Joel

Request for Input – Amalgamation of Murrays Crossing Quarry operations, 71 Murrays Crossing Road, Tumbarumba – SEAR 1549

Thank you for requesting our input on the draft Planning Secretary's Environmental Assessment Requirements (SEARs) for the above designated development in Snowy Valleys local government area.

Heritage NSW has reviewed the information supplied (BHQ Scoping Report - Tumbarumba Project, dated 21 January 2021) and provide SEARs for the proposed development in relation to Aboriginal cultural heritage matters in **Attachment A**. Guidance material for an Aboriginal cultural heritage assessment is provided in **Attachment B**.

Project specific matters:

- We note that the subject area has not been previously surveyed for Aboriginal cultural heritage values.
- A number of known Aboriginal sites registered with the Aboriginal Heritage Information Management System (AHIMS) including stone artefact deposits occur within approximately 650m of the proposal.
- The subject site contains landscape features (including Tumbarumba Creek) considered indictive for the occurrence of Aboriginal cultural heritage.

If you have any questions regarding these comments, please contact me on (02) 6229 7089 or via email: jackie.taylor@environment.nsw.gov.au.

Yours sincerely

Jackie Taylor
Senior Team Leader, Aboriginal Cultural Heritage Regulation - South
Heritage NSW
24 February 2021

Enclosure – Attachment A: HERITAGE NSW – Aboriginal Cultural Heritage SEARs;
Attachment B: Guidance material for Aboriginal Cultural Heritage SEARs

ATTACHMENT A: HERITAGE NSW – Aboriginal Cultural Heritage SEARs

Project Name: Tumbarumba Quarry (amalgamation of the existing Murrays Crossing Quarry operations), 71 Murrays Crossing Road, Tumbarumba
SEARs no: 1549

1. The EIS must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the proposal. This may include the need for surface survey and test excavation. The identification of cultural heritage values must be conducted in accordance with the Code of Practice for Archaeological Investigation of Aboriginal objects in NSW (DECCW 2010), and be guided by the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales (OEH 2011) and consultation with Heritage NSW.

   Note: Please note these are the standard requirements for designated development proposals. The Due Diligence Process is not appropriate to use as an Aboriginal Cultural Heritage Assessment.

2. Where Aboriginal cultural heritage values or potential values are present, these are to be assessed and documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR). The ACHAR must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the ACHAR must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to Heritage NSW.

3. Consultation with Aboriginal people must be undertaken and documented in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010) where an ACHAR is required. The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the ACHAR.

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

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

5. The ACHAR must outline procedures to be followed if Aboriginal objects are found at any stage of the life of the project to formulate appropriate measures to manage unforeseen impacts.

6. The ACHAR must outline procedures to be followed in the event Aboriginal burials or skeletal material is uncovered during construction to formulate appropriate measures to manage the impacts to this material in accordance with the Code of Practice for Archaeological Investigation of Aboriginal objects in NSW (DECCW 2010).

ATTACHMENT B: Guidance material for Aboriginal Cultural Heritage SEARs

Title	Web address
Relevant Legislation	
National Parks and Wildlife Act 1974	https://www.legislation.nsw.gov.au/view/html/inforce/current/act-1974-080
Environmental Planning and Assessment Act 1979	https://www.legislation.nsw.gov.au/view/html/inforce/current/act-1979-203
Aboriginal Cultural Heritage	
Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011)	https://www.heritage.nsw.gov.au/assets/Uploads/files/Guide-to-Investigating-Assessing-and-Reporting-on-Aboriginal-Cultural-Heritage-in-New-South-Wales.pdf
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)	https://www.heritage.nsw.gov.au/assets/Code-of-Practice-for-Archaeological-Investigation-in-NSW.pdf
Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)	https://www.heritage.nsw.gov.au/assets/Uploads/publications/524/aboriginal-cultural-heritage-consultation-requirements-for-proponents-2010-090781.pdf
Aboriginal Site Recording Form	https://www.heritage.nsw.gov.au/assets/Aboriginal-Site-Recording-Form.pdf
Aboriginal Site Impact Recording Form	https://www.heritage.nsw.gov.au/assets/Uploads/files/aboriginal-site-impact-recording-form.pdf
Aboriginal Heritage Information Management System (AHIMS) Registrar	https://www.heritage.nsw.gov.au/search-for-heritage/aboriginal-heritage-information-management-system/
Care Agreement Application form	https://www.heritage.nsw.gov.au/assets/Uploads/files/Aboriginal-Heritage-Impact-Permit-Application-to-Transfer-Objects.pdf
The Burra Charter (The Australia ICOMOS charter for places of cultural significance)	http://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf

Natural Resources Access Regulator

Contact: Tim Baker
Phone: 0428 162097
Email : Tim.Baker@dpie.nsw.gov.au

Our ref: V15/2812-5#63
File No:
Your Ref:

15 February 2021

Joel Herbert
Department of Planning, Industry and Environment
GPO Box 39
SYDNEY NSW 2001

email: Joel.Herbert@planning.nsw.gov.au

Dear Joel

Re: Tumbarumba Quarry– Environmental Assessment Requirements ID No. 1549 - Designated Development

Thank you for your email of 9 February 2021 seeking input to Secretary Environmental Assessment Requirements (SEARs) for the above development. The Natural Resources Access Regulator (NRAR) has reviewed the supporting documentation accompanying the request for SEARs and recommends the EIS be required to include the following.

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

- Consideration of relevant policies and guidelines eg. "*Guideline for Controlled Activities on Waterfront Land*" for watercourse crossings and works within waterfront land. Identification of relevant buffers for works within waterfront land will be required. This is particularly relevant to Tumbarumba Creek which is a 5th order watercourse and a number of 1st order watercourses within the project site.
- A statement of where each element of the SEARs is addressed in the EIS in the form of a table.
- Full technical details and data of all surface and groundwater modelling.
- Where groundwater may be intercepted or impacted a detailed assessment against the NSW Aquifer Interference Policy (2012) using DPIE Water's assessment framework. Justification is required to support a statement that groundwater is not to be intercepted
- Details of the final landform of the site, including final void management (where relevant), rehabilitation measures, and where any ongoing approval or licence requirements will be necessary under the *Water Management Act 2000*.

For further information please contact me on 0428 162097 or
Tim.Baker@dpie.nsw.gov.au

Yours sincerely

Tim Baker
Senior Water Regulation Officer
Natural Resources Access Regulator
Department of Planning, Industry and Environment

NSW RURAL FIRE SERVICE

Department of Planning and Environment (Sydney Offices)
GPO Box 39
Sydney NSW 2001

Your reference: EARs 1549
Our reference: DA20210211000559-SEARS-1

ATTENTION: Joel Herbert

Date: Wednesday 17 March 2021

Dear Sir/Madam,

Development Application
State Significant – SEARS – Extractive Industry
71 MURRAYS CROSSING RD TUMBARUMBA NSW 2653, 7028//DP96852, 1//DP111861, 20//DP755892, 173//DP755892, 177//DP755892, 20//DP755892, 623//DP755892, 452//DP755892, 732//DP755892, 663//DP755892, 659//DP755892, 172//DP755892, 176//DP755892, 175//DP755892, 174//DP755892, 178//DP755892

I refer to your correspondence regarding the above proposal which was received by the NSW Rural Fire Service on 09/02/2021.

The New South Wales Rural Fire Service (NSW RFS) has considered the information submitted and notes that the proposed development has the potential to increase the level of bush fire risk within the landscape and, the development may be impacted upon during a bush fire event. As such, the environmental assessment for the proposed resource recovery facility should address the following bush fire criteria:

- The aim and objectives of *Planning for Bush Fire Protection 2019*;
- Identification of potential ignition sources during construction and operation of the development;
- Storage of fuels and other hazardous materials;
- Proposed bush fire protection measures for the development, including vegetation management and fire suppression capabilities;
- Operational access for fire fighting appliance to the site; and
- Emergency and evacuation planning.

For any queries regarding this correspondence, please contact Peter Dowse on 1300 NSW RFS.

Yours sincerely,

Bradley Bourke
Team Leader, Dev. Assessment & Planning
Planning and Environment Services

Postal address

NSW Rural Fire Service
Locked Bag 17
GRANVILLE NSW 2142

Street address

NSW Rural Fire Service
4 Murray Rose Ave
SYDNEY OLYMPIC PARK NSW 2127

T (02) 8741 5555
F (02) 8741 5550
www.rfs.nsw.gov.au

DOC21/100298
MAAG0009907

Joel Herbert
Environmental Assessment Officer
Energy, Industry and Compliance

Via: Major Projects Portal

Dear Mr Herbert

Re. Request for EIS Requirements – EARs 1549 – Tumbarumba Quarry

I refer to your request of 9 February 2021 for advice regarding Tumbarumba Quarry EIS Request for Requirements. The Resources Regulator has reviewed the request.

Assessment
Based on the review of the request for EARs and supporting documents, the Resources Regulator advises that, as the quarry proposes the extraction of blue metal (basalt) for use as road base (which is not a mineral under the Mining Act) its rehabilitation is not regulated by the NSW Resources Regulator.

In regards to Mine Safety it should be noted that as the proposed activity is considered a mine under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* (the "WHS (MPS) Act") with the mine operator required to conduct its operations in accordance with the provisions of both the *Work Health and Safety Act 2011* and the WHS (MPS) Act.

Regulatory requirements if approved
The Resources Regulator may undertake assessments of the mine operators' proposed mining activities under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and Regulation as well as other WHS regulatory obligations.

Background
The Mining Act Inspectorate within the Resources Regulator undertake risk-based compliance and enforcement activities in relation to obligations under the *Mining Act 1992*. This includes undertaking assessment and compliance activities in relation to mine rehabilitation activities and determination of security deposits.

The Mine Safety Inspectorate within the Resources Regulator is responsible for ensuring the mine operators' compliance with the Work Health and Safety (WHS) legislation, in particular the effective management of risks associated with the principal hazards as specified in the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Contact
Should you require any further information or clarification, please contact the Office of the Executive Director (ED.ResourcesRegulator@planning.nsw.gov.au)

Yours sincerely,

Alex Tutt-Branco
Executive Officer
Office of the Executive Director, Resources Regulator

19 February 2021

SWT21/00018
SF2021/021867
CO

23 February 2021

Manager - Resource Assessments
Department of Planning, Industry & Environment
12 Darcy Street
PARRAMATTA NSW 2124

Attention: Joel Herbert

SEARS 1549 – PROPOSED TUMBARUMBA QUARRY, LOT 732 DP755892, MURRAYS CROSSING ROAD, TUMBARUMBA

I refer to correspondence forwarded to Transport for NSW (TfNSW) requesting the provision of key issues and assessment requirements to be included in the Secretary's Environmental Assessment Requirements.

From the scoping report provided, it is understood that the proposed development is for the expansion of the current extractive operations on the subject site which is located to the south of Tumbarumba. Access will remain through Murrays Crossing Road and an internal access road will be developed to allow for truck movement on site. The subject site is remote from the classified road network.

It is understood that the proponent wishes to amalgamate the current operations at Murray's Crossing Quarry in Tumbarumba and combine all disturbance areas under one approval. Currently the site extracts and transports approximately 80,000 tonnes per annum (tpa). The project plans to extract and transport approximately 100,000 tpa with peak period and project specific requirements of up to 200,000 tpa from the site. The degree of traffic assessment required to support the proposal will depend on the level of impact resulting from traffic generated by the proposed quarry and the further expansion, the rate of extraction of material and the standard of construction of, and current usage characteristics of, the public roads servicing the proposed quarry sites.

TfNSW is interested in the characteristics of the traffic generated by the development and in the impact of the development on the safety and efficiency of the classified road network. A traffic impact assessment should outline measures to address and manage traffic related issues generated by the development. The documentation submitted should address

- the potential impacts on the road network associated with the development during the lifetime of the project,
- works required to the existing road infrastructure supported by detailed concept plans,
- the measures to be implemented to maintain the standard and safety of the road network,
- the procedures to monitor and ensure compliance,
- and a transport management plan may be required to outline measures to manage traffic related issues generated by the development.

For guidance in the preparation of the TIA the applicant is referred to section 2 of the "Guide to Traffic Generating Developments" prepared by the RTA and the Austroads publications, particularly the Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development and Part 3:

Traffic Studies and Analysis. As a minimum the TIA is to address the existing and anticipated additional traffic generation on the surrounding road network, peak traffic volumes, vehicle types, travel routes for vehicles accessing the site and provide recommendations for any mitigation measures, such as intersection upgrades, considered necessary to address traffic related impacts.

TfNSW emphasises the need to appropriately consider and minimise the impacts of the development on the existing road network and maintain the level of safety, efficiency and maintenance along the existing road network. Any Traffic Impact Assessment needs to address the impacts of traffic generated by this development upon the nearby road network, particularly intersections.

Any enquiries regarding this correspondence may be referred to Cam O'Kane - TfNSW (South Region), phone (02) 6923 6582.

Yours faithfully

Maurice Morgan
A/Manager Development Services South

Joel Herbert

From: Justine Clarke <Justine.Clarke@waternsw.com.au>
Sent: Wednesday, 17 February 2021 2:27 PM
To: Joel Herbert
Subject: WaterNSW response - Request for Requirements - EARs 1549 - Tumbarumba Quarry

Dear Joel

Thank you for your email regarding the EAR request for Tumbarumba Quarry (EAR 1549).

The proposal is not located near any WaterNSW land, assets or infrastructure, therefore we have no particular comments or requirements regarding the proposal.

WaterNSW requests the Department continues to consult with WaterNSW for any development that may impact on our assets, infrastructure or land, using the email address Environmental.Assessments@waternsw.com.au

If you have any questions regarding this email, please contact me.

Regards

Justine Clarke
Catchment and Asset Protection Adviser

Please note: *I am currently working from home. I can be reached via email or 0457 535 955*

Level 14, 169 Macquarie Street
PO Box 398
Parramatta NSW 2150
M: 0457 535 955
justine.clarke@waternsw.com.au
www.waternsw.com.au

From: Joel Herbert <Joel.Herbert@planning.nsw.gov.au>
Sent: Tuesday, 9 February 2021 5:37 PM
To: info@svc.nsw.gov.au; DPI Landuse Enquiries Mailbox <landuse.enquiries@dpi.nsw.gov.au>; DPI Landuse Ag Mailbox <landuse.ag@dpi.nsw.gov.au>; development.southern <development.southern@rms.nsw.gov.au>; 'records@rfs.nsw.gov.au' <records@rfs.nsw.gov.au>; EPA Planning Matters Mailbox <planning.matters@epa.nsw.gov.au>; Planning Matters Mailbox <planning.matters@environment.nsw.gov.au>; Environmental Assessments <Environmental.Assessments@waternsw.com.au>; DPI AHP Central Mailbox <ahp.central@dpi.nsw.gov.au>; DRG RO Assessment Coordination Mailbox <assessment.coordination@planning.nsw.gov.au>; Lands Ministerials <lands.ministerials@industry.nsw.gov.au>; RRD EO Executive Director Resources Regulator Mailbox <ED.ResourcesRegulator@planning.nsw.gov.au>
Subject: Request for Requirements - EARs 1549 - Tumbarumba Quarry

Good afternoon,

Proposal – Tumbarumba Quarry
EAR ID No. 1549

Bald Hill Quarry Pty Ltd have requested the requirements of the Secretary of the Department of Planning and Environment for the preparation of an Environmental Impact Statement (EIS) for the above local designated development located in the Snowy Valleys local government area.

I have attached a copy of the Applicant's request for your reference.

Under Schedule 2 of the *Environmental Planning and Assessment Regulation 2000,* the Secretary is requesting your requirements for the EIS.

It would be greatly appreciated if we could receive your advice by **Wednesday 24 February 2021.**

Please note that the proposal seeks to amalgamate the operations of the existing Murray's Crossing Quarry under the approval. This would result in extending the life of the quarry for a further 25 years, to continue extracting Basalt at a rate of 200,000 tonnes per annum from a total resource of approximately 3 million tonnes.

If you have any queries, please contact me on the details below.

Joel Herbert
Environmental Assessment Officer - Resource Assessments
Energy, Industry and Compliance
4 Parramatta Square, 12 Darcy Street Parramatta NSW 2150
Locked Bag 5022, Parramatta NSW 2124

T 02 8289 6614 | E Joel.Herbert@planning.nsw.gov.au

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Appendix B Permits

BALD HILL QUARRY

Bald Hill Quarry Pty Ltd (ABN 19 003 764 725)
5423 Hume Highway, Jugiong, NSW, 2726
02 6227 7817

16 December 2021

Re: Existing land rights use

Bald Hill Quarry Pty Ltd confirm they have the right to clear land on the active Crown Quarry Reserve on Lot 732 and lot 623 DP 755892 (Crown Quarry Reserve no. 81837) under 'existing use' as defined under section 4.65 of the Environmental Planning and Assessment Act 1979.

This reserve is Crownland, managed by Snowy Valley Council by way of an agreement, see section 5 – Quarry Licence (attached but confidential). As the regeneration lies within lot 732 DP755892 and is not classed as an increase to outside the defined area approved it is therefore not limited by section 4.66 of the EP&A Act. There are also no changes for a different use or purpose therefore is not impacted by section 45 of the EP&A Regulation 2000.

An existing use is a use that is lawfully commenced but subsequently become a prohibited use under the local environmental plan (LEP) or other environmental planning instrument. The LEP further outlines the use under the section 10 of the Crown Land Regulation 1990.

Hope this clears up and confirms that BHQ have the right to clear the regeneration.

If there are any further questions, please do not hesitate to contact me.

Kind Regards,

Belinda Fourie
Work Health Safety and Environment Manager
safety@baldhillquarry.com.au
Ph: 0490 552 596

5. Quarry Licence

5.1 The Licensor grants to the Licensee the following non exclusive rights:

(a) to enter upon the Land and remain thereon to search for, dig, work and obtain by open cut excavations all Materials and carry away (without the payment of wayleave rent) and dispose of the Materials for the Licensee's own benefit;

(b) subject to the provisions of this Licence Agreement to erect any buildings or structures and to erect and place such engines, plant and machinery and to open, sink and make such excavations, levels, water courses and other works upon below the surface of the Land as may be necessary or convenient for the purpose of winning and carrying away the Materials;

(c) to construct properly formed roads where necessary, with such roads to take the shortest practicable route to the boundary of the Land and then traverse to the nearest public road;

(d) to place and stack upon the Land any Materials got hereunder or from outside the Land and to heap waste and over burden; and

generally to do all things which shall be convenient or reasonably necessary for working, getting, milling, making merchantable and disposing of Material.

5.2 In consideration of the granting of the Quarry Licence the Licensee shall pay to the Licensor Royalties computed in accordance with Item 6.

0188

RESERVE USE APPLICATION & PERMIT

Local Land Services

Local Land Services Act 2013, Part 6, Section 77

Phone: 1300 795 299
Email: land.murray@lls.nsw.gov.au

Murray
PO Box ~~885~~ 61
DENILIQUIN NSW 2710

This Permit authorises:

Name of Applicant: Belinda Fourie

On behalf of Organisation: Bald Hill Quarry Pty Ltd

Address: 5423 Hume Hwy, Ingiong

Phone: Mobile: 0407 552 596 Fax:

Proposed Activity: Stockpile of quarry materials for loading

Date(s) of proposed activity: 1 July 2022 - 31 December 2023

Reserve No/Name: R51991

Location of Reserve: Murrays Crossing Tumbarumba

CONDITIONS (See over Page)

Fee: $. 6 months x $120 month = $720

Insurance Details:

Insurance Company: Allianz Australia

Policy No: 960972561CD Amount of Cover: $ 20 million

Commencement & Expiry Dates: 31/3/2022 - 31/3/2023

I hereby agree to abide by the relevant provisions of the Local Land Services Act 2013 and the fees and conditions relating to this permit.

Signature of Applicant B. Fourie (email) Date: 1/7/2022

Signature of Authorised Officer of Murray LLS Date: 1/7/2022

Office Use Only

Date Received:

Receipt Number:

Amount Received:

Invoice No:

Customer No:

Appendix C Consultation

Alyce Gill

From: David Ward <david.ward@dpi.nsw.gov.au>
Sent: Monday, 7 March 2022 2:01 PM
To: Alyce Gill
Cc: Nicola Smith; Sue Mahon; Julie Gooding; Alison Mclean
Subject: RE: 21-416 - Murrays Crossing Quarry Tumbarumba EIS - Fisheries Consultation
Attachments: Threatened-Species-Guidelines.pdf

Hi Alyce,

Thank you for your consultation.

There are no legislative requirements triggered regarding the footprint of the proposed quarry extension as it is not located within *Key Fish Habitat* (Third order or larger (Strahler stream order)).

DPI Fisheries do however suggest that the proposal should include a threatened aquatic species assessment (as per part 7A *Fisheries Management Act* 1994) to address whether there are likely to be any significant impacts downstream on listed threatened species, populations or ecological communities listed under the *Fisheries Management Act 1994*, particularly the Murray Crayfish (*Euastacus armatus*) as per the attached guidelines.

Cheers
David

David Ward | Fisheries Manager
DPI Fisheries - Freshwater Environment
Department of Primary Industries
4 Marsden Park Road | Calala NSW 2340
T: +61 2 6763 1255 | M: +61 (0) 0429 908 856
E: david.ward@dpi.nsw.gov.au
W: www.dpi.nsw.gov.au

From: DPI AHP Central Mailbox
Sent: Thursday, 3 March 2022 8:28 AM
To: Alyce Gill <alyce.g@nghconsulting.com.au>
Cc: Nicola Smith <nicola.s@nghconsulting.com.au>; Sue Mahon <sue.m@nghconsulting.com.au>; Julie Gooding <julie.g@nghconsulting.com.au>
Subject: RE: 21-416 - Murrays Crossing Quarry Tumbarumba EIS - Fisheries Consultation

Good morning Alyce

Your application has been received.

C22/134 - Consultation - Proposed quarry extension - 21-416-Murrays Crossing Quarry Tumbarumba

The application has been work flowed to Alison McLean, the Assessing Officer for this area – please don't hesitate to contact Alison on 0484 907 343 or E: alison.mclean@dpi.nsw.gov.au

Kind regards

Jane Gordois | Administration

NSW Department of Primary Industries | Fisheries

DPI Fisheries acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

From: Alyce Gill <alyce.g@nghconsulting.com.au>
Sent: Wednesday, 2 March 2022 1:58 PM
To: DPI AHP Central Mailbox <ahp.central@dpi.nsw.gov.au>
Cc: Nicola Smith <nicola.s@nghconsulting.com.au>; Sue Mahon <sue.m@nghconsulting.com.au>; Julie Gooding <julie.g@nghconsulting.com.au>
Subject: 21-416 - Murrays Crossing Quarry Tumbarumba EIS - Fisheries Consultation

Good afternoon,

Bald Hill Quarry (BHQ) are proposing to amalgamate and extend their current hard rock quarry operation, located on Murrays Crossing Road, approximately 2km south of Tumbarumba (please see attached locality map).
As part of their Proposal, BHQ intend to:

- Divert a 1st order ephemeral watercourse south of its current location.
- Remove an existing farm dam, through which this watercourse runs.
- Construct a new sediment dam to the west of the farm dam that would be removed.
- Construction of a waste stockpile immediately north of the diverted watercourse.

The proposed diversion would flow into Tumbarumba Creek, which is mapped as Key Fish Habitat (KFH). Indicative mapping also suggests that the Murray Crayfish (*Euastacus armatus*) occurs within Tumbarumba Creek.

NGH Consulting are preparing a Biodiversity Assessment (BA), which would support an EIS, for the Proposal. NGH would assess and mitigate any impacts on aquatic species as a result of the works. Mitigation measures would include:

- Impacts to aquatic habitat would be kept to the smallest possible extent.
- An Erosion and Sediment Control Program (ESCP) would be implemented, prior to the commencement of work.
- Erosion controls would be implemented prior to channel diversion. This would ensure that the natural flow regime of Tumbarumba Creek is not impacted and that downstream sedimentation doesn't occur.
- BHQ would restrict works within aquatic and riparian areas, to periods of low rainfall, to coincide with natural aquatic processes and reduce unnecessary sedimentation within waterways.
- BHQ would divert the watercourse and provide sufficient time for the dam to dry out, which would allow invertebrates and aquatic fauna sufficient time to relocate.
- No herbicide use would occur within aquatic areas.
- Vehicle hygiene protocols should be in line with Roads and Maritime Biodiversity Guidelines - Guide 7 (Pathogen Management) for the control of Chytrid.

NGH would like to give Fisheries the option to review and add comments to the BA if required/desired.

If you need any more information, please let me know via return email or via my contact details below.

Thank you,

ALYCE GILL
ENVIRONMENTAL MANAGEMENT
B. Env Science (Management)

M. 0431 131 564 **D.** 02 6923 1564
E. alyce.g@nghconsulting.com.au
35 Kincaid St
(PO Box 5464) Wagga Wagga NSW 2650

NSW · ACT · QLD · VIC
WWW.NGHCONSULTING.COM.AU

We pay our respects to elders, past present and emerging. *people across Australia and recognises the enduring connection to the land.*

Alyce Gill

From: Alyce Gill
Sent: Monday, 14 March 2022 10:51 AM
To: info@svc.nsw.gov.au
Subject: 21-416 - Murrays Crossing Quarry Tumbarumba EIS
Attachments: 21-416 Involved lots 20220225.png

Good morning,

My name is Alyce Gill and I am working on an EIS for a development approximately 2km south of Tumbarumba.
I just wanted to confirm whether or not the development is located on flood prone land?
I have included a map showing the involved Lots.

Cheers

ALYCE GILL
ENVIRONMENTAL MANAGEMENT
B. Env Science (Management)

M. 0431 131 564 **D.** 02 6923 1564
E. alyce.g@nghconsulting.com.au
35 Kincaid St
(PO Box 5464) Wagga Wagga NSW 2650

NSW · ACT · QLD · VIC
WWW.NGHCONSULTING.COM.AU

NGH acknowledges that we work on the traditional lands of First Nations people across Australia and recognises the enduring connection to the land. We pay our respects to elders, past present and emerging.

From: Sally Fitzgerald <sally.fitzgerald@crownland.nsw.gov.au>
Sent: Wednesday, 28 April 2021 12:53 PM
To: Shona Cowley <shona.cowley@crownland.nsw.gov.au>; Grant Maginness <grant.maginness@crownland.nsw.gov.au>; Belinda Fourie <safety@baldhillquarry.com.au>
Subject: Tumbarumba/Bald Hill Meeting - Tuesday 27 April 2021

Good morning all,

Firstly, thank you to everyone for taking the time to meet yesterday, it was beneficial to meet and discuss the proposal, and lovely to meet you Belinda & John.

Following on from our meeting yesterday, I would like to summarise key discussion points & outcomes, as well as follow up actions.

Key discussion points:

- The proposal area involving Crown Land for quarrying operations is limited to Lot 732 DP 755892, even though Reserve 81837 does encompass part of lot 623 DP 755892. Lot 732 DP 755892 does not currently have an Aboriginal land Claim over the area.
- There has been an initial DA lodged involving this proposal, and a second DA is to be lodged in relation to expanding the area of operations to include adjoining privately owned land
- Lot 623 DP 755892 is not intended to be part of the quarrying operations proposal area
- The Crown waterway (Tumbarumba Creek) located to the west of the proposal area is not expected to be impacted by, or involved in the proposal
- Lot 7028 DP 96852 is a Travelling Stock Reserve (TSR), Reserve 51191, reserved for the purpose of Travelling Stock & gazetted 8 December 1915 and currently managed by Riverina Local Land Services. This TSR currently has an agreement in place with Riverina Local Land Services to use the eastern most portion of the reserve for access & stockpiling in relation to quarrying operations.
- Part of the proposal will be to increase the size of the TSR required for access and stockpiling in relation to quarrying operations - from the easternmost point of the TSR, up to and including the access track which enters from Murrays Crossing Road. Quarrying operations are not proposed to be undertaken within this TSR. The area has been highlighted on the attached map
- There will be no access requirements, additional to what is already in place, coming from Lot 7016 DP 1001031 (Land Managed by Tumbarumba Racecourse

Actions for follow up:

- Grant to further investigate best way forward to facilitate and formalise the proposal requirements involving the TSR

Please let me know if anything has been missed, or you believe there is anything to be added

Belinda, would you mind ensuring John receives a copy of this email, as I was not sure of john's email address

Kind Regards, Sally

BALD HILL QUARRY

Bald Hill Quarry Pty Ltd (ABN 19 003 764 725)
71 Murrays Crossing Rd, Tumbarumba, NSW 2653
02 6227 7817

Re: Community Consultation

To our neighbors and near neighbors,

Our company Bald Hill Quarry Pty Ltd (BHQ) has been operating the Tumbarumba quarry for over 20 years on behalf of Snowy Valley Council. This joint arrangement has provided a reliable source of construction materials for the local region and employment opportunities within the local community.

As a close neighbour to our operations, we wish to consult with you regarding a proposal to upgrade the quarry to provide for its continuation and to support the Snowy 2.0 project now underway.

We wish to notify you that the company will be making application to upgrade our operations within our property. This move is necessary to expand the life expectancy and provide for a modest increase in the extraction necessary to supply project specific requirements within the local region.

Once the Development Application and associated Environmental Impact Statement are submitted to Council, a public notification will be advertised where the documents can be viewed for comment. The proposed project has been assessed to not have any major additional impact compared to that of the current operations.

We are pleased to be available to answer any questions you may have, any time, so please feel free to contact:

Belinda Fourie on 0490 552 596 or safety@baldhillquarry.com.au.

John Wilkinson 0418 679 291 email john@baldhillquarry.com.au

We would appreciate if you could complete the attached contact form to facilitate future contact or if you prefer email Belinda with your details.

Kind Regards,

Belinda Fourie
Work Health Safety and Environment Manager
4th April 2022

Contact detail form

Name	
Street Address	
Phone Number	
Email Address	

Appendix D Biodiversity Assessment (BA)

Biodiversity Assessment

Murrays Crossing Quarry Tumbarumba

April 2022

Project Number: 21-416

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Document verification

Project Title:	Murrays Crossing Quarry Tumbarumba
Project Number:	21-416
Project File Name:	21-416 Murrays Crossing Quarry BA Final 20220413

Revision	Date	Prepared by	Reviewed by	Approved by
Draft v.1	30/03/2022	Z. Renner A. Gill	J. Gooding	J. Gooding
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Table of contents

Figures

Tables

Appendices

Acronyms and abbreviations

AOBV	Area of Outstanding Biodiversity Value
BV	Biodiversity Values (As Mapped on the BV Map viewer)
BA	Biodiversity Assessment
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BHQ	Bald Hill Quarry Pty Ltd
Biosecurity Act	*Biosecurity Act 2015* (NSW)
BOM	Australian Bureau of Meteorology
Cwth	Commonwealth
DAWE	Department of Agriculture, Water and the Environment (Cwth) (formerly DoEE)
DECCW	(Former) Department of Environment, Climate Change and Water (NSW) (now DPE)
DoEE	(Former) Department of the Environment and Energy (Cwth) (now DAWE)
DPE	(Former) Department of Planning and Environment (NSW) (formerly DPIE)
DPIE	Department of Planning, Industry and Environment (NSW) (now DPE)
EEC	Endangered ecological community – as defined under relevant law applying to the Proposal
EES	Environment, Energy and Science (NSW), Division of DPIE (formerly OEH, and, prior, DECCW)
EIA	Environmental impact assessment
EIS	Environmental impact statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
FM Act	*Fisheries Management Act 1994* (NSW)
ha	hectares
HBT	Hollow-bearing tree
SEPP	State Environmental Planning Policy (NSW)
KFH	Key Fish Habitat
km	kilometres
LEP	Local Environment Plan
m	metres
NES	Matters of National Environmental Significance under the EPBC Act (*c.f.*)

NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NV Act	*Native Vegetation Act 2003* (NSW)
OEH	(Former) Office of Environment and Heritage (NSW) (now DPE)
SVC	Snowy Valleys Council
tpa	Tonnes per annum
TSR	Travelling Stock Reserve

1. Introduction

This Biodiversity Assessment (BA) has been prepared for Bald Hill Quarry Pty Ltd (BHQ) to consider the potential biodiversity impacts associated with the proposed extension of current operations at Murrays Crossing Quarry in Tumbarumba. The Proposal would include the construction, operation and rehabilitation of a quarry extension to existing quarry operations. Bald Hill Quarry Pty Ltd is approved to extract and process up to 15,000 tonnes per annum (tpa). The Proposal aims to extract 100,00 tpa with peak volumes of 200,00 tpa over approximately 25 years.

This Biodiversity Assessment (BA) identifies and assesses the potential biodiversity impacts associated with the construction and operation of the proposed Murray's Crossing Quarry (the Proposal). NGH has prepared this BA on behalf of the Proponent, Bald Hill Quarry Pty Ltd (the Proponent).

The Proposal is classified as integrated development under section 4.46 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) as it requires additional statutory authorisations.

The Proposal (extractive industries) is Designated Development under section 4.10 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 3 of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation).

This BA has been prepared in accordance with Part 4 of the EP&A Act to support a Development Application (DA) to be lodged with Snowy Valleys Council. This BA addresses the flora and fauna assessment requirements of the Proposal.

1.1 Purpose of this report

NGH was engaged by BHQ to undertake a BA for the proposed works to support an Environmental Impact Statement (EIS). This report assesses the impacts of the proposed development on biodiversity values in the Subject Land. The report identifies and describes biodiversity values in terms of vegetation structure, composition, type and condition, and fauna habitats, sightings and signs.

The potential for, and significance of, impacts to threatened species and communities listed under the *NSW Biodiversity Conservation Act 2016* (BC Act) Act, *Fisheries Management Act 1994* (FM Act) and *Commonwealth Environmental Protection and Biodiversity Conservation Act* (EPBC Act) have been evaluated.

The report addresses the flora and fauna assessment requirements under Part 4 of the EP&A Act and the Biodiversity Offset Scheme thresholds under Section 7.2 of the BC Act. Where relevant, recommendations are provided to avoid and minimise flora and fauna impacts.

The following definitions are used in this BA:

Proposal: All works involved in the implementation and operation of the development as described in this EIS.

Subject Land: All land within the affected lot boundaries. The Subject Land comprises Freehold Land and the Crown Quarry Reserve, which amounts to approximately 15.41 ha of land.

Development footprint: The development footprint is approximately 13.24ha, including a total pit footprint of 8.68ha, and involves:

- Land directly impacted by the quarry

- Areas where vehicle and plant will cause ground disturbance
- Land proposed for stockpiling and/or ancillary use.

Study area: The Subject Land.

Locality: The Subject Land plus a 10km buffer.

1.2 The Proposal

1.2.1 Site Location and Description

The location of the development site is provided in (Figure 1-1). The existing pit and proposed quarry extension would be located across the following Lot and DP numbers (Table 1-1):

Table 1-1 Existing operations at Murray's Crossing Quarry.

Land Description	Zoning	Owner	Components
Lot 659, 663, 665, 452, 20, 172, 173, 174, 175, 176, 177, 178, DP755892 Lot 179 DP1100528 Lot 1 DP1150973 Lot 1 DP111861	RU1 Primary Production.	Bald Hill Quarry Pty Ltd.	Quarry, sediment dam, topsoil stockpiles, waste dumps, workshop, office.
Lot 732 DP755892 Crown Reserve (81837)	RU1 Primary Production.	Crown Lands and Snowy Valley Council.	Quarry, processing plant, sediment dam and office.
Lot 7028 DP96852 Travelling Stock Reserve (51191)	RU1 Primary Production.	Crown Lands and Snowy Valley Council.	Material stockpiles and sediment dam.

In 2009, BHQ entered into an existing land use rights agreement for the Crown Quarry Reserve with Snowy SVC. BHQ also have a permit from Murray Local Land Services to use the TSR (R51191). Operational activities conducted on the TSR include stockpiling of material, water capture in a sediment dam, loading of trucks and site access. As such, the TSR (Figure 1-3) has not been included in this development application.

The Proposal would involve a quarry extension to the south of the existing operation. The proposed extension would involve the extension of the quarry onto approximately 5 hectares (ha) of freehold land owned by BHQ, and involve the following Lot and DP numbers:

- Lot 1 DP1150973
- Lot 20 DP755892
- Lot 172 DP755892
- Lot 452 DP755892
- Lot 659 DP755892

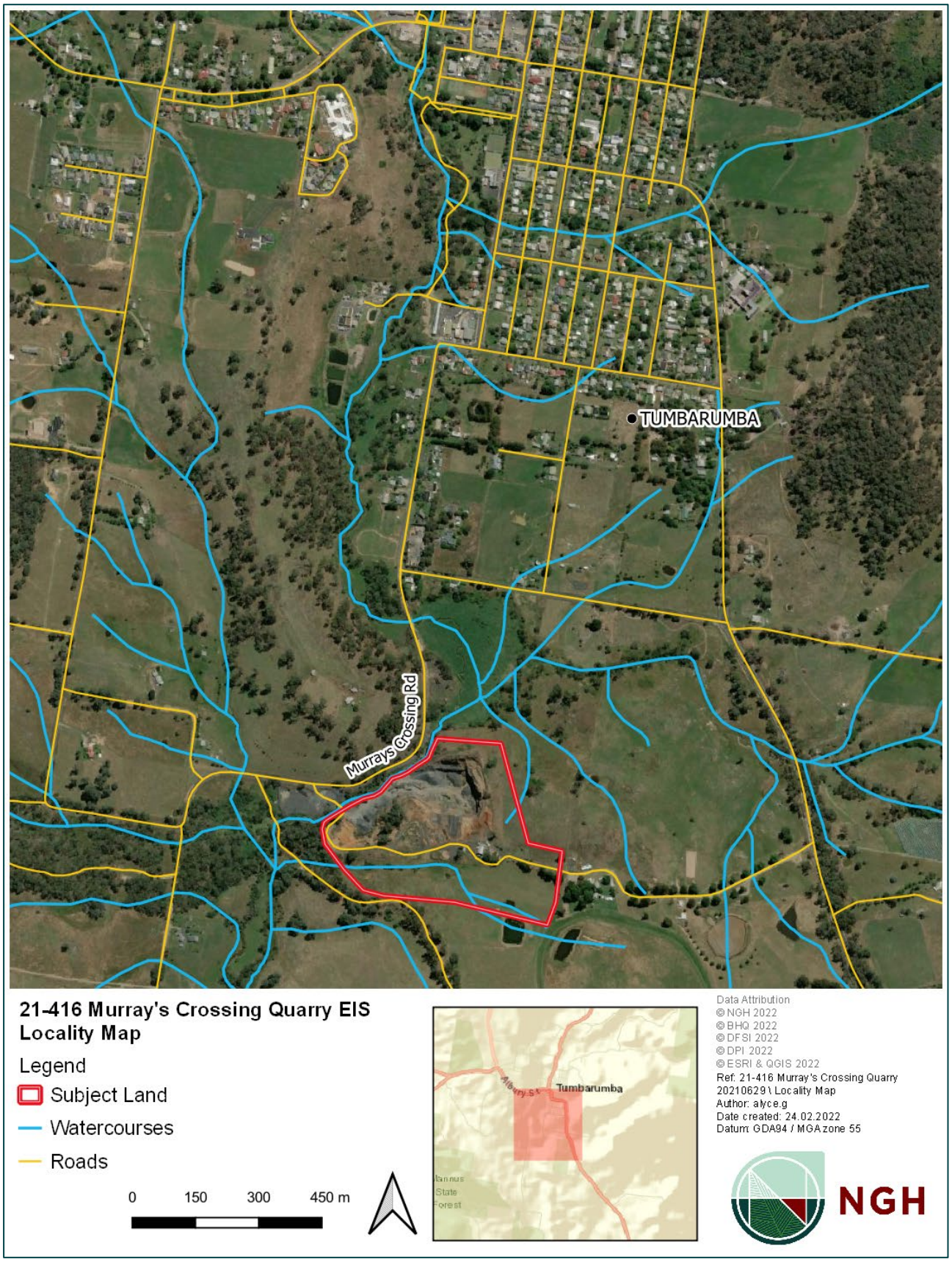


Figure 1-1 Locality Map

The site is located approximately 2km south of Tumbarumba in the Snowy Valleys Council (SVC) Local Government Area (LGA). The existing operation is accessible via Murrays Crossing Road, to the north of the site. The proposed quarry extension is located immediately south-southeast of the existing quarry operation (Figure 1-2) and would be accessed via an internal haulage route.

The development site falls within a gently sloping to undulating landscape. Large portions of land within the surrounding landscape have been cleared for agricultural purposes, namely broadacre cropping and grazing. Forested areas, associated with the Travelling Stock Route (TSR), occur to the west of the Proposal. Farm dams are located along drainage lines. Tumbarumba Creek, located immediately northwest of the Subject Land, is the receiving waterbody. Vehicles, existing quarry operations and stockpiling sites are the main land disturbances within the Subject Land. A racecourse, cemetery and agricultural activities are the other disturbing land uses in proximity to the Proposal.

Figure 1-2 Existing development

1.2.2 Proposal Description

BHQ received Development Consent for the Murrays Crossing Quarry in 1992; however, quarrying activities within the Crown Quarry Reserve have been evident since the 1940s. In 2009, BHQ entered into an existing land use rights agreement for the Crown Quarry Reserve with Snowy Valley Council (SVC). BHQ also have a permit from Local Land Services to stockpile material and load trucks on the TSR. As such, the existing stockpile location (refer to Figure 1-2) has not been included in this assessment.

The Proposal involves a quarry extension south to southeast of the current Murray's Crossing operation.

The Proposal (refer to Figure 1-3) would include:

- A new quarry footprint of approximately 8.68ha, which would include:
  - The existing quarry (2.88ha)
  - The proposed quarry extension (5.8ha)
- Drill and blasting for extraction up to five to six times a year
- Use of existing quarrying equipment for road construction and quarry operations
- Relocation of the existing workshop and amenities building
- Construction of a waste stockpile
- Construction of a sediment dam
- The diversion of an ephemeral watercourse within the southern portion of the Subject Land
- The removal of an existing farm dam
- Haulage of extracted rock via the proposed internal haul roads, to an existing processing plant, located within the Subject Land
- An increase in truck movements, from 24 per day to:
  - 30 per day during extraction periods of up to 100,000 tonnes per annum (tpa)
  - 60 per day during extraction periods of up to 200,000 tpa

The Proposal would include the current operating conditions of the Murray's Crossing Quarry, including:

- Four to five full time staff
- No additional permanent buildings
- No additional water usage
- No new accesses to the local and regional road network
- Use of the on-site rock processing plant located within the Subject Land

The Proposal seeks approval for extraction of 100,000 tpa with peak periods of 200,000 tpa over a period of 25 years. Total extraction would not exceed 3 million tonnes of hard rock (basalt) for the life of the project.

Figure 1-3 Proposed development

2. Statutory Considerations

2.1 NSW Biodiversity Conservation Act 2016

The BC Act aims 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. The BC Act contains lists of critically endangered, endangered, and vulnerable species, populations and ecological communities, as well as a list of key threatening processes in NSW.

The primary requirement under the BC Act, is to determine whether a development is likely to significantly affect threatened species. According to clause 7.7(2) of the BC Act, if a proposed development is likely to significantly affect threatened species, the development application is to be accompanied by a biodiversity development assessment report (BDAR). According to this clause, development is considered likely to significantly affect threatened species if:

> *(a) it is likely to significantly affect threatened species or ecological communities, or their habitats, according to the BC Act 5-part Test, or*
>
> *(b) the development exceeds the biodiversity offsets scheme threshold if the biodiversity offsets scheme applies to the impacts of the development on biodiversity values, or*
>
> *(c) it is carried out in a declared area of outstanding biodiversity value.*

This assessment considers the potential impacts to biodiversity for the proposed amalgamation of current operations at Murrays Crossing Quarry in Tumbarumba and disturbance areas.

2.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance. Matters of national environmental significance relevant to biodiversity are:

- Wetlands of international importance
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas

Significance of impacts is determined in accordance with the Significance impact guidelines 1.1 – Matters of National Environmental Significance (DoE 2013). Where a Proposal is likely to have a significant impact on a matter of national environmental significance, the Proposal is referred to the Commonwealth Environment Minister via the Department of Agriculture, Water and Environment (DAWE). The Minister then determines whether the Proposal is a 'controlled action'. If a Proposal is declared a controlled action, an assessment of the action is carried out and the Minister makes a decision to approve, approve with conditions, or not approve the proposed action.

This assessment considers the potential for the Proposal to impact on matters of national environmental significance relevant to biodiversity.

2.3 Environmental Planning and Assessment Act 1979

The EP&A Act encourages proper management, development and conservation of natural and artificial resources, protection and conservation of the environment including native plants and animals, threatened species, populations, ecological communities and their habitats and ecologically sustainable development.

This BA has been completed under Part 4 of the EP&A Act and aims to address BHQ's duty in respect to considering the environmental impact of the Proposal under Clause 5.5 of the EP&A Act and Section 228 of the EP&A Regulation.

2.4 Fisheries Management Act 1998 No 38

This Act provides conservation for fish and fish habitats and outlines approval processes for the activities that may impact on threatened species and habitats.

The Proposal involves:

- The diversion of an ephemeral watercourse within the southern portion of the Subject Land
- The removal of a farm dam, through which the ephemeral watercourse flows
- The construction of a new sediment directly west of the farm dam to be removed

Refer to section 5.1.2 for details and indicative mapping.

The proposed diversion would flow into Tumbarumba Creek, which is mapped as Key Fish Habitat (KFH). Indicative mapping also suggests that the Murray Crayfish (*Euastacus armatus*) occurs within Tumbarumba Creek (DPI, 2022).
Consultation with Fisheries was conducted via email on 2 March 2022 (refer to Appendix H). Fisheries responded via email on 7 March 2022, requesting that the BA include a threatened aquatic species assessment to address whether there are likely to be any significant impacts downstream on listed threatened species, populations or ecological communities listed under the FM Act, particularly the Murray Crayfish (*Euastacus armatus*). An assessment of significance under the FM Act was conducted (Appendix F). A significant impact on threatened species was considered unlikely.

2.5 NSW Biodiversity Act 2015

The Biosecurity Act guides the management of weeds at the regional level throughout NSW. Under the Act, all priority weeds are regulated with a *general biosecurity duty* to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any priority weed who knows or ought to know of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. Individual landholders and managers are required under the Act to control priority weeds for their area according to the relevant biosecurity toolset (Table 2-1).

One priority weed, Blackberry *(Rubus fruticosus species aggregate*) was identified at the site. This is discussed further in Section 4.3.4.

Table 2-1 Biosecurity Act 2015 toolset for weed management (DPI, 2022)

Outcome category	*Biosecurity toolset*
Weeds excluded from entering state	Prohibited Matter: Declaration and management of significant weeds not present in NSW or part of NSW.
Weeds to be eradicated	Control Order: Management of weeds that are the targets of approved eradication programs. Although a Control Order is for a five–year period, this can be renewed for longer eradication programs.
Weeds to be effectively managed to reduce spread on regional basis	Biosecurity Zone: Weeds subject to ongoing 'strategic' regional management.
All Weeds	General Biosecurity Duty: Requires any person dealing with biosecurity matter or a carrier of biosecurity matter and who knows or ought to know of the biosecurity risks associated with that activity to take measures to prevent, minimise or eliminate the risk as far as is reasonably practicable. Specific measures to reduce the risk will be detailed in regional weeds plans for priority weeds. Note however, that the General Biosecurity Duty exists for all weeds that present a biosecurity risk.
Other Biosecurity tools	Mandatory Measures Regulation: May require persons to take specific actions with respect to weeds or carriers of weeds. Emergency Order: To respond to a current or imminent biosecurity risk that may have a significant impact. Biosecurity Direction: An enforceable instruction to a person or class of persons to take action to: Prevent, eliminate or minimise a biosecurity risk Prevent, manage or control a biosecurity impact Enforce any instrument under the Act. Biosecurity Undertaking: An authorised officer may accept in writing an undertaking by a person that sets out the measures a person has agreed to implement to remedy a contravention, a likely contravention, or suspected contravention of the Act.

2.6 Crown Land Management Act 2016 No 58

The objects of this Act are:

a) *To provide for the ownership, use and management of the Crown land of NSW and,*
b) *To provide clarity concerning the law applicable to Crown land, and*
c) *To require environmental, social, cultural heritage and economic considerations to be taken into account in decision making about Crown land, and*

d) *To provide for the consistent, efficient, far and transparent management of Crown land for the benefit of New South Wales, and*
e) *To facilitate the use of Crown land by the Aboriginal people of New South Wales because of the spiritual, social, cultural and economic importance of land to aboriginal people and, where appropriate, to enable the co-management of dedicated or reserved Crown land, and*
f) *To provide for the management of Crown land having regard to the principles of Crown land management.*

BHQ received Development Consent for the Murrays Crossing Quarry in 1992; however, quarrying activities within the Crown Quarry Reserve (Lot 732 and 623 DP755892) have been evident since the 1940s. In 2009, BHQ entered into an existing land use rights agreement for the Crown Quarry Reserve with Snowy Valley Council (SVC). BHQ also have a permit from Local Land Services to stockpile material and load trucks on the TSR (Lot 7028 DP96852). The Proposal is considered to be consistent with the objectives of the *Crown Land Management Act* whereby:

- The use and management of the land have been clearly established
- Environmental, social, economic and cultural heritage considerations have been taken into consideration
- The use of Crown land by Aboriginal people has been acknowledged.

2.7 State Environmental Planning Policy (Biodiversity and Conservation) 2021

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

Conservation SEPP) was gazetted on 1 March 2022 repealing the Koala Habitat Protection 2021 and Koala Habitat Protection 2020 SEPPS. No policy changes have been made. The following chapters are relevant to the proposed development:

Chapter 4: Koala Habitat Protection 2021

The Subject Land is located within the Snowy Valleys LGA, which is listed in Schedule 1, Chapter 4, of the Biodiversity and Conservation SEPP. The Subject Land occurs on land zoned RU1 Primary Production. According to Clause 6, Chapter 4 does not apply to land zoned RU1 Primary Production within the Snowy Valleys LGA.

Chapter 3: Koala Habitat Protection 2020

Koala Habitat Protection 2020 applies to all RU1, RU2 and RU3 zoned land outside of the Sydney Metropolitan Area and the Central Coast.

The Subject Land is located on land zoned RU1 Primary Production within the Snowy Valleys LGA, which is listed on Schedule 2, of the Biodiversity and Conservation SEPP. The provisions of Chapter 3 apply to the Proposal.

Assessment of koala habitat is undertaken in section 4.4.3.

2.8 Tumbarumba Local Environmental Plan 2010

1) This Plan aims to make local environmental planning provisions for land in Tumbarumba in accordance with the relevant standard environmental planning instrument under section 3.20 of the Act.

(2) The particular aims of this Plan are as follows—

(aa) to protect and promote the use and development of land for arts and cultural activity, including music and other performance arts,

(a) to develop local planning controls that manage human settlement, rural activities and the natural environment in a manner that contributes to the unique quality of Tumbarumba,

(b) to encourage development that supports the long term economic viability of the local community,

(c) to ensure development is undertaken in a manner that mitigates impacts on the natural environment,

(d) to encourage development that promotes positive social outcomes for the local community.

It is considered that the Proposal is compatible with the aims of the Tumbarumba LEP. The Proposal would be undertaken in a manner that mitigates impacts on the natural environment, while supporting long term employment and economic growth within the region.

3. Methodology

3.1.1 Database Searches and Literature Review

Background searches were undertaken prior to carrying out field investigations to determine whether any threatened flora or fauna species, communities or populations were likely to occur in the study area. These background searches are listed in (Table 3-1).

Table 3-1 Background searches undertaken for the Proposal

Resource	Target	Search date NGH	Search area
NSW Department of Planning, Industry and Environment (DPE) BioNet Atlas	Threatened flora and fauna, populations and endangered ecological communities	29/06/2021	10 km buffer around the Subject Land
EPBC Act Protected Matters Search	Threatened flora and fauna, endangered populations and ecological communities and migratory species	11/09/2021	10 km buffer around the Subject Land
NSW Biodiversity Values Map and Threshold Spatial Data	Areas of Outstanding Biodiversity Value and BV (high Biodiversity Value) mapped land.	11/09/2021	Subject Land
Department of Primary Industries (DPI) threatened freshwater indicative distributions	Indicative distributions of threatened freshwater species.	11/09/2021	10 km buffer around the Subject Land
DPI Key Fish Habitat	Key Fish Habitat	11/09/2021	Subject Land
Bureau of Meteorology (BOM) Groundwater Dependent Ecosystems Spatial Data	Groundwater Dependent Ecosystems	11/09/2021	Subject Land
DPE Vegetation Information System, State Vegetation Mapping	Plant Community Type (PCT) Descriptions	11/09/2021	Subject Land
National Flying Fox Viewer	Flying fox camps.	11/09/2021	10 km buffer around the Subject Land
Tumbarumba LEP	Minimum lot size	11/09/2021	Subject Land

3.1.2 Threatened Species Evaluation

Information was compiled on threatened species, populations, and communities which have the potential to be present in the Subject Land from current scientific publications including national recovery plans, approved recovery advice, interim management plans and state (DPIE, BCS and DPI) and federal (SPRAT) species profiles.

The results of the database searches and literature review have been used to evaluate the potential for threatened species, ecological communities and endangered populations to be present in the study area, and to be adversely affected by the works. The threatened species evaluation also considers field survey results in relation to habitat type and quality, and on–site records. The approach is consistent with the NSW Threatened Species Test of Significance Guidelines (OEH, 2018). The Threatened Species Evaluation (Appendix C) was utilised to determine the likelihood of threatened entities within the Subject Land, and then, the potential impact to those entities based on the impact assessment within this BA.

3.2 Field Surveys

An initial site survey was undertaken by two NGH ecologists on 17 September 2021. The Subject Land was surveyed via foot to determine the PCTs and zones present. Additional surveys were undertaken on 20 October 2021, in response to changes to the Subject Land boundary.

3.2.1 Flora

The aims of the flora surveys were to:

- Determine the vegetation communities present within the study area, their condition and extent
- Identify potential Threatened Ecological Communities (TECs) within the study area and determine their condition and extent
- Identify potential habitat for threatened flora species within the study area

The random meander method (Cropper, 1993) was used to survey vegetation within the study area. These methods provide good coverage in terms of area and microhabitats and maximises opportunities for detecting rare or sparsely distributed species. Species were recorded progressively with abundance recorded within Subject Land. Any priority weeds were recorded opportunistically.
Plant Community Types (PCTs) were identified according to the DPE BioNet Vegetation Classification (DPE, 2022). Where relevant, Threatened Ecological Communities (TEC) were confirmed based on the relevant Scientific Committee – final determinations for each TEC. Botanical nomenclature follows Harden (1990-2002) and the PlantNet website (PlantNET, 2022).

3.2.2 Fauna and Habitat

The terrestrial fauna survey was undertaken to record and assess the habitat value of the site for fauna, particularly threatened species with potential to occur at the site. Fauna signs and key habitat features were recorded, including:

- Hollows and fissures in standing trees and stags
- Fallen timber and litter
- Fauna signs such as nests, scratches, scats and latrine sites

- Food tree species (for gliders, possums and koala etc)
- Microhabitats such as soaks, rock outcrops and dense understorey vegetation
- Habitat type (Woodland, grassland, aquatic etc) and quality

All trees were individually inspected for trunk or limb hollows and any signs of occupation or use. Any disturbances and active threats to fauna or habitats were also recorded during the survey.

3.3 Assumptions and Limitations

The survey undertaken involved a site assessment to determine Plant Community Types (PCTs) and key habitats present on site for the purpose of preparing this BA, as outlined in (Section 1.1) of this report.

There is potential for some flora species to have not been recorded during the survey due to the timing of the survey. Some ephemeral or short-lived species such as grasses, orchids and lilies, have a limited growing season and tend to grow during spring and early summer during favourable conditions.

Site surveys were conducted during the mid-morning to early afternoon time period and some fauna species may not have been present during this time of the day. Opportunistic fauna surveys were undertaken. No targeted fauna surveys were conducted, and assessment of fauna is based on habitat features present.

4. Results

4.1 General

The Proposal falls within the Bondo subregion of the South Eastern Highlands Bioregion. This Bioregion is dominated by a temperate climate, characterised by warm summers and no dry season (DPE, 2021).

The Proposal is located approximately 2km south southwest of the Tumbarumba township. The Subject Land slopes gently west, down towards Tumbarumba Creek. The Subject Land is largely cleared and disturbed from existing quarry use and agricultural activities. Some small fragmented pockets of remnant woodland and isolated remnant trees occur throughout the site. Remaining vegetated areas are dominated by exotic vegetation such as Blackberry (**Rubus fruticosus*) and exotic pasture grasses such as Phalaris (**Phalaris aquatica*) and **Dactylis glomerata.* Two ephemeral streams/drainage lines pass through the Subject Land and feed into Tumbarumba Creek, located immediately northwest of the Subject Land. The drainage lines lack a native overstory but contain a mix of native sedges and rushes. The surrounding landscape consists of an undulating topography and relatively large portions of remnant, contiguous vegetation, especially to the west within the TSR.

Key biodiversity features identified within the Subject Land include:

- Remnant Riverina Dry Sclerophyll Forest
- Isolated Mature Trees
- One hollow-bearing tree (HBT)
- Two farm dams
- Two ephemeral streams, which feed into Tumbarumba Creek

PCTs recorded within the Subject Land has been described within section 4.3.2. Flora and fauna species recorded within the Subject Land have been detailed within section 4.3 and section 4.4. Biodiversity features within the Subject Land are described further within this chapter.

4.2 Background Searches

4.2.1 Threatened Species

The results of the desktop study identified 26 flora species, 6 Threatened Ecological Communities (TECs), as well as 70 fauna species and/or populations with the potential to occur within the locality.

4.2.2 Biodiversity Values

The Proposal does not fall within an Area of Outstanding Biodiversity Value (AOBV). Tumbarumba Creek is mapped under the NSW Biodiversity Values Map as Biodiversity Values (BV) Land (Figure 4-1). Tumbarumba Creek is identified under the NSW BV Map as an area of 'Protected Riparian Land'. BV Mapped land is identified as land with '*high biodiversity value that is particularly sensitive to impacts from development and clearing'* (DPIE, 2021).

The Subject Land occurs within mapped areas of BV land. The Proposal would not involve further development on BV land. Some of this land is already cleared from historic quarry operations. No clearing of native vegetation would occur within the BV land.

Consideration of prescribed impacts under cl6.1 of the BC Regulation on BV mapped land is undertaken in Section 5.1.3.

4.2.3 Groundwater Dependant Ecosystems

Groundwater dependent ecosystems are vulnerable to pressures such as agriculture, mining, urban and commercial development (BOM, 2017). Doody et al. (2019) define Groundwater Dependent Ecosystems (GDEs) as ecosystems *whose species and ecological processes rely on groundwater, either entirely or intermittently*. GDEs are roughly grouped into subterranean, aquatic and terrestrial ecosystems. For the purpose of this report aquatic and terrestrial GDEs are mapped. Subterranean mapping has not been conducted outside of QLD under the Bureau of Meteorology GDE atlas.

Both terrestrial and aquatic GDEs are present within the site. Moderate potential aquatic GDEs are present in the form of Tumbarumba Creek, while high potential terrestrial GDEs are present as woodlands.

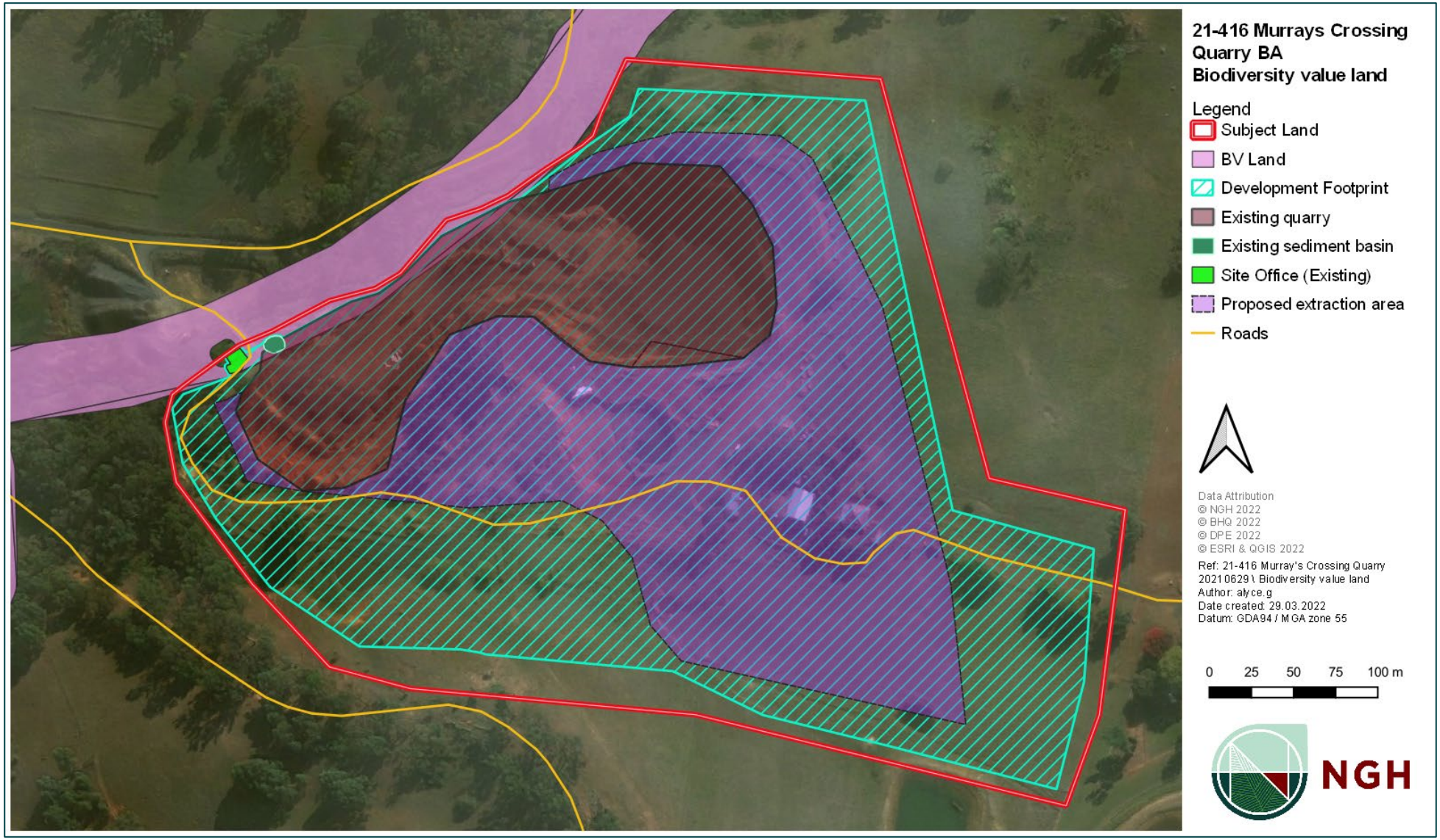


Figure 4-1 Biodiversity value land

Figure 4-2 Groundwater Dependent Ecosystems

4.3 Flora

4.3.1 Threatened Flora

No threatened flora species were identified during the site survey.

A search of the NSW BioNet Atlas and EPBC Protected Matters Search Tool identified 26 threatened flora species with the potential to occur within the Subject Land.

One historic record of the Crimson Spider Orchid from 1899 was identified within the 10km locality using the NSW BioNet Atlas (DPE, 2022).

The Crimson Spider Orchid (*C. concolor*) is listed as Endangered under the BC Act and Vulnerable under the EPBC Act. There are no known populations or individuals previously recorded within the Subject Land. Habitat for this species is defined on the DPE (2022) Threatened Species Profile as '*regrowth woodland on granite ridge country that has retained a high diversity of plant species, including other orchids'.* No habitat suitable for this species was present within or directly adjacent to the Subject Land. No further assessment was considered necessary.

A review of threatened flora known to occur within the Bondo subregion of the Eastern Highlands Bioregion was made to determine potential occurrence of threatened species within the Subject Land. A habitat evaluation was completed for all of these species.

Based on this the assessment, habitat within the Subject Land is considered suitable for the following species due to the presence of a patch of Kangaroo Grass (*Themeda triandra*):

- Austral Toadflax (*Thesium australe*) BC – V, EPBC - V

4.3.2 Plant Community Types

One PCT was identified in the study area:

- PCT 285 Broad-leaved Sally grass – sedge woodland on valley flats and swamps in the NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion.

This PCT occurred in four separate forms, including woodland, isolated paddock trees, creek lines devoid of overstory vegetation and derived grasslands. This PCT has been detailed in Table 4-1 and the proportion occurring within the development footprint has been provided in Figure 4-6.

Table 4-1 PCT 285 description

PCT 285 *Broad-leaved Sally grass- sedge woodland on valley flats and swamps in the NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion*	
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation Class	Upper Riverina Dry Sclerophyll Forests
Description	**Woodland**

<table>
<tr><td></td><td colspan="2">Mid-high woodland dominated by a mix of Broad-leaved Sally (Eucalyptus camphora subsp. humeana) ,Apple Box (Eucalyptus bridgesiana) Robertson's Peppermint (Eucalyptus robertsonii) and Black Sally (Eucalyptus steullata).

Shrubs were sparse to dense and included Coil-pod Wattle (Acacia pravifolia), Buffalo Wattle (Acacia kettlewelliae), Native Blackthorn (Bursaria spinosa) and Cassinia longifolia.

The ground cover was mostly disturbed but contained some native understory species such as Oxalis perennans, Native Geranium (Geranium solanderi), Cotton Woodruff (Asperula conferta) and Austral Bear's Ears (Cymbonotus preissianus). Blackberry (Rubus fruticosus) was common along the edges of the woodland patches.

Isolated paddock trees were comprised of the same overstory species and were considered to be part of the same PCT.

This zone occurred in the ephemeral drainage line within the exotic grazing paddocks. No native overstory was present however some scattered Willow (Salix sp.) occurred. Groundcover within the drainage line was dominated by native rushes such as Juncus usitatus, Carex appressa and Eleocharis sp. Exotic pasture grasses such as Phalaris (*Phalaris aquatica) and Brome (*Bromus catharticus) were also common.

Derived Grassland

Derived Grassland comprised of a small stand of Kangaroo Grass (Themeda australis) within exotic pasture of Phalaris (Phalaris sp.) and Cocksfoot (Dactylis glomerata).</td></tr>
<tr><td>Condition</td><td>PCT Zone

PCT 285 Woodland

PCT 285 Creek line</td><td>Condition

Moderate condition. The PCT contained a native remnant overstory with a predominately native understory. Highly fragmented from quarry operations with high disturbance on the edges.

Low condition. Contained a predominately exotic understory with some native rushes within the drainage line. No overstorey present. Natural regeneration not present.</td></tr>
</table>

	PCT 285 Grassland	Low condition, dominated by exotic grasses with low density of native grasses. No regeneration of canopy species present.
	PCT 285 Paddock Trees	Low condition. Isolated trees within exotic understory. Trees suffering dieback.
Approximate extent within study area	PCT 285 Creek line	0.21 ha
	PCT 285 Grassland	0.04 ha
	PCT 285 Paddock Trees	0.07 ha
	PCT 285 Woodland	0.33 ha
Conservation Status	No associated TEC	
Image	 Figure 4-3 PCT 285_woodland	

Figure 4-4 PCT 285_paddock tree

Figure 4-5 PCT 285_creekline

Figure 4-6 Vegetation mapping within the development footprint

4.3.3 Threatened Ecological Communities

PCT 285 does not form part of a TEC.

One aquatic TEC was present within the Subject Land:

- The aquatic ecological community in the natural drainage system of the lower Murray River catchment (Murray River EEC) – FM Act Listed EEC.

The Murray River EEC occurs within the Subject Land in the form of ephemeral drainage lines, that feed into Tumbarumba Creek. This EEC includes *'all native fish and aquatic invertebrates within all natural creeks, rivers, and associated lagoons, billabongs and lakes of the regulated portions of the Murray River (also known as the River Murray) downstream of Hume Weir, the Murrumbidgee River downstream of Burrinjuck Dam, the Tumut River downstream of Blowering Dam and all their tributaries anabranches and effluents'* (DPE, 2007).

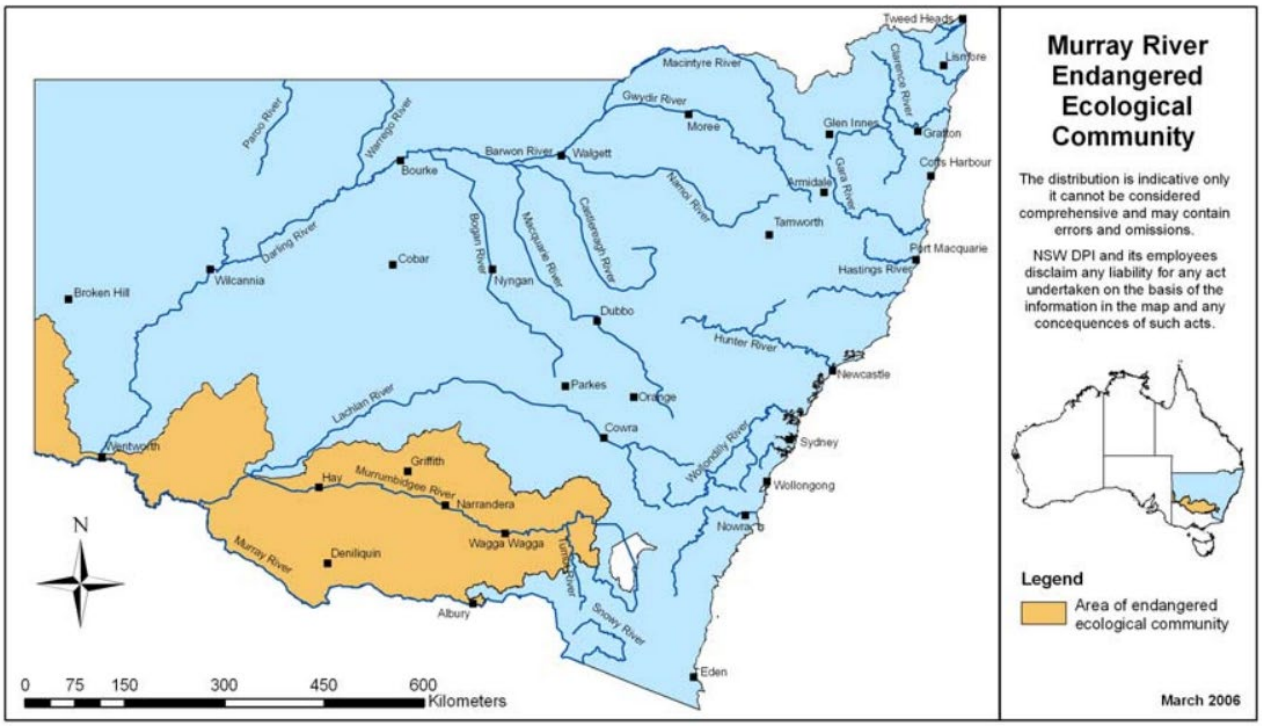


Figure 4-7 Distribution of the Murray River EEC (DPE, 2007)

4.3.4 Priority Weeds

One priority weed was detected within the Subject Land - Blackberry (*Rubus fruticosus* species aggregate). This weed is regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk it may pose and any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable (DPI, 2019) This has a prohibition on certain dealings. It must not be imported into the state, sold, bartered exchanged or offered for sale.

In NSW, reasonable steps must be undertaken to prevent, eliminate or minimise any biosecurity risk or threat from priority weeds.

4.4 Fauna

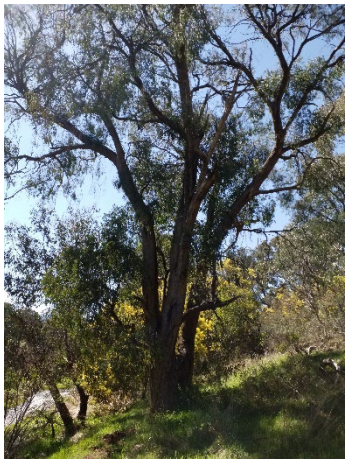
4.4.1 Terrestrial Fauna Habitat

During the field surveys 9 terrestrial species were observed, or evidence of their presence was found. No threatened fauna species were identified within the Subject Land. A species list has been provided within Appendix B.

Terrestrial fauna habitat identified within the Subject Land is detailed in Table 4-2.

Table 4-2 Terrestrial fauna habitat identified within the Subject Land

Habitat features	Description	
Eucalypt Forest PCT 285	Remnant and isolated forest and grassland within the Subject Land provides valuable foraging and breeding habitat for native species. Habitat within PCT 285 was diverse, containing a number of eucalyptus and shrub species. Although the ground cover was dominated by exotic perennial grasses, the mature and regenerating structure of this PCT provides a value resource for local fauna species.	
Groundcover	Native grasses occurred in very low densities. Native grasses provide foraging resources for native species. Most of the site was dominated by exotic perennial grasses; however, these grasses also provide a low value resource for foraging and refuge.	

Habitat features	Description	
Fallen timber	Fallen timber has collected in a few locations throughout the Subject Land. Areas with fallen timber generally occurred where previous disturbance was present. Fallen timber provides shelter and foraging resources for several native fauna species including small reptiles and ground-foraging birds.	
Hollow-bearing trees	One hollow-bearing tree occurred within the Subject Land, containing two small hollows HBTs provide nesting and/or roosting habitat for native fauna including microbats, birds and mammals.	
Aquatic habitat	Ephemeral creeks occur within the Subject Land. Aquatic habitat provides a valuable resource for native fauna.	

4.4.2 Threatened Fauna

No threatened species were identified during the site inspection, however due to the extent, variability, and quality of habitat within the Subject Land, the presence of threatened fauna may not be ruled out.

A search of the NSW BioNet Atlas found the following fauna species were recorded within 10 km of the Subject Land:

- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)
- Flame Robin (*Petroica phoenicea*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Greater Glider (*Petauroides volans*)
- Koala (*Phascolarctos cinereus*)
- Large Bent-winged bat (Miniop*terus orianae oceanensis*)
- Powerful Owl (*Ninox strenua*)
- Scarlet Robin (*Petroica boodang*)
- Speckled Warbler (*Pyrrholaemus sagittatus)*
- Spotted-tailed Quoll (*Dasyurus maculatus*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Yellow-bellied Glider (*Petaurus australis*)

A search of the NSW DPI Threatened Freshwater Species Indicative Distributions (TFSID) found the following threatened species may occur within the Murray River and associated tributaries:

- Murray Crayfish (*Euastacus armatus*)

A search pf the EPBC Protected Matters Search Tool (PMST) an additional 57 threatened (and/or migratory) species.

A habitat evaluation was completed for all of these species (Appendix C).

Based on this assessment, the following species have been determined to potentially occur within the Subject Land and have the potential to be impacted by the proposed works:

Amphibians

- Booroolong Frog (*Litoria booroolongensis*) BC – E, EPBC - E
- Spotted Tree Frog (*Litoria spenceri*) BC – CE, EPBC - E

Birds

- Woodland Birds:
    - Regent Honeyeater (*Anthochaera phrygia*) BC – CE, EPBC - CE
    - Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) BC - V
    - Gang-gang Cockatoo (*Callocephalon fimbriatum*) BC - V
    - Speckled Warbler (*Chthonicola sagittata*) BC - V
    - Brown Tree Creeper (eastern subspecies) (*Climacteris picumnus victoriae*) BC - V
    - Varied Sittella (*Daphoenositta chrysoptera*) BC - V
    - Painted Honeyeater (*Grantiella picta*) BC – V, EPBC - V
    - Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*) BC - V
    - Turquoise Parrot (*Neophema pulchella*) BC - V
    - Barking Owl (*Ninox connivens*) BC - V
    - Powerful Owl (*Ninox strenua*) BC - V

  - Scarlet Robin (*Petroica boodang*) BC - V
  - Flame Robin (*Petroica phoenicea*) BC - V
  - Superb Parrot (*Polytelis swainsonii*) BC – V, EPBC - V
  - Diamon Firetail (*Stagonopleura guttata*) BC - V
  - Masked Owl (*Tyto novaehollandiae*) BC - V
- Raptors:
  - Spotted Harrier (*Circus assimilis*) BC - V
  - Black Falcon (*Falco subniger*) BC - V
  - Little Eagle (*Hieraaetus morphnoides*) BC - V
  - Square-tailed Kite (*Lophoictinia isura*) BC - V

Mammals

- Woodland Mammals:
  - Eastern Pygmy Possum (*Cercartetus nanus*) BC - V
  - Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) BC – V, EPBC - E
- Bats:
  - Large Bent-winged Bat (*Miniopterus orianae oceanensis*) BC - V
  - Southern Myotis (*Myotis macropus*) BC - V
  - Corben's Long-eared Bat (*Nyctophilus corbeni*) BC – V, EPBC - V
  - Grey-headed Fly-fox (*Pteropus poliocephalus*) BC – V, EPBC – V

An Assessment of Significance (AoS) and Test of Significance (ToS) have been completed for these species (Appendix D and Appendix E). A significant impact was considered unlikely, given that:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- No substantial contribution to any Key Threatening Process are expected
- Mitigation measures have been recommended to further reduce impacts to biodiversity
- No impact on an important population of this species is expected by the proposed works.

4.4.3 Koala Habitat Assessment

Part 3.2 of Chapter 3 of the Biodiversity and Conservation SEPP, determines development consent may be granted if the applicant provides to the Council evidence, prepared by a suitably qualified and experienced person, that the land subject to the development application:

- is not potential koala habitat; or,
- if it is potential koala habitat, it is not core koala habitat; or,
- if it is core koala habitat, a Koala Plan of Management (Koala PoM) must be either be in place or be prepared, and Council's determination of the DA cannot be inconsistent with the Koala PoM.

Under section 3.2 of Chapter of the Biodiversity and Conservation SEPP, the following definitions apply:"

- Potential koala habitat: means areas of native vegetation where trees of the types listed in Schedule 1 of the Biodiversity and Conservation SEPP 2021 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.
- Core koala habitat: means an area of land with a resident population of koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population.

Does the proposed development area contain trees listed under Schedule 1 of the Biodiversity and Conservation SEPP 2021?

No, The Subject Land does not contain any of the Koala feed trees listed in Schedule 1

Is the land potential Koala habitat?

No, The Subject Land does not contain any of the Koala feed trees listed in Schedule 1

Is the land core Koala habitat?

There was no detection of Koala or evidence of their presence during site visit undertaken by an NGH ecologist. No trees were found to have scratches and no Koalas were observed within any of the trees in the development site. No NSW Bionet Atlas records for Koala occur within the Subject Land. One historic record pre 1970 of the Koala occurs in Tumbarumba township but it is believed to be a vagrant record.

NGH ecologists therefore do not consider the land to be potential or core Koala habitat, as defined under the Biodiversity and Conservation SEPP 2021, and a Koala Management Plan is not required for this proposed development.

4.4.4 Aquatic Habitat

No threatened aquatic species were observed or heard during the site survey. However, due to the timing of the survey some aquatic species, such as amphibians, may not have been calling. Other species, such as fish, may not have been present or not identified due to the presence of water. The occurrence of threatened aquatic species may not be ruled out.

Under the NSW DPI Strahler Stream Order spatial data Tumbarumba Creek is mapped as a 5th order stream. A search of the DPI Fisheries NSW Spatial Data Portal found that Tumbarumba Creek, located immediately northwest of the Subject Land is mapped as Key Fish Habitat (KFH) and 'very poor' Freshwater Fish Community status. It contains mapping for one Threatened Freshwater Fish Species, the Murray Crayfish.

Tumbarumba Creek connects and flows into Tooma River around 30 km south of the Subject Land. Tooma river is mapped as Key Fish Habitat with sections of 'very poor' and 'poor' Freshwater Fish Community status. It contains mapping for three threatened Freshwater Fish Species, being the Murray Crayfish, Flathead Galaxias and Macquarie Perch.

Subject Land.

Under the FM Act, the Endangered Ecological Community (EEC), '*The aquatic ecological community in the natural drainage system of the lower Murray River catchment'* (Murray River EEC) occurs within the 10km locality. The Murray River EEC DPI Primefact (2007) states *'The lower Murray aquatic ecological community includes all native fish and aquatic invertebrates within all natural creeks, rivers and associated lagoons, billabongs and lakes of the regulated portions of*

the Murray, Murrumbidgee and Tumut rivers, as well as all their tributaries and branches.' Tumbarumba Creek falls within the area mapped as the 'Area of endangered ecological community' under the DPI Primefact and may be considered a branch of tributaries associated with the Murray River. A precautionary approach has been taken to assume this EEC occurs within the Subject Land.

Observations of Tumbarumba Creek within the Subject Land are detailed below:

- Fast flowing, no areas of pooled water.
- Native dominated aquatic vegetation
- Algae was not noted as present within the Subject Land
- Meandering creek formation
- Shallow banks (roughly level with stream)
- Native riparian vegetation present
- Minimal roughness present, minor presence of instream snags, logs and branches
- Water colour was light brown and very turbid due to recent rain
- Minimal pollution was observed (rubbish)

Aquatic habitat features have been detailed further in Table 4-3 and Figure 4-7.

A search of NSW BioNet Atlas and NSW DPI TFSID found the following threatened aquatic species has the potential to occur within the Subject Land:

Fish

- Murray Crayfish (*Euastacus armatus*) FM – V

Amphibians

- Booroolong Frog (*Litoria booroolongensis*) BC – E, EPBC – E
- Spotted Tree Frog (*Litoria spenceri)* BC – CE, EPBC - E

Refer to section 4.4.2 for details on the assessment of threatened fauna under the BC Act and EPBC Act.

Table 4-3 Aquatic Habitat Features

Aquatic habitat feature	Image
Deep water creek with shallow banks and native vegetation. Tumbarumba Creek is located directly north northwest of the Subject Land. KFH associated with Tumbarumba Creek is mapped as occurring within the Subject Land. It is possible that aquatic species, such as amphibians, utilise riparian habitat on either side of the creek. Tumbarumba creek falls outside the development footprint but indirect impacts may occur from sedimentation or change in water flow.	
Two deep water farm dams are located within the Subject Land. Native flora species, such as sedges and rushes were observed, which are utilised by amphibians.	
Ephemeral drainage line An ephemeral drainage line runs East West direction into Tumbarumba Creek in the southern half of the Subject Land. Native sedges and rushes were observed within the drainage lines.	

Figure 4-8 Aquatic habitat occurring within and adjacent to the Subject Land

4.5 EPBC Matters of National Environmental Significance

4.5.1 Wetlands

No wetlands of national importance occur within the Subject Land, or 200km upstream or downstream of the Subject Land.

4.5.2 Threatened Species

9 EPBC Act listed species were considered to have the potential to occur within the Subject Land and be impacted by the proposed works:

Flora:

- Austral Toadflax (*Thesium austral*) BC – V, EPBC - V

Fauna:

- Woodland Birds:
  - Regent Honeyeater (*Anthochaera phrygia*) BC – CE, EPBC - CE
  - Painted Honeyeater (*Grantiella picta*) BC – V, EPBC - V
  - Superb Parrot (*Polytelis swainsonii*) BC – V, EPBC - V
- Woodland Mammals:
  - Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) BC – V, EPBC - E
- Bats:
  - Corben's Long-eared Bat (*Nyctophilus corbeni*) BC – V, EPBC - V
  - Grey-headed Fly-fox *(Pteropus poliocephalus*) BC – V, EPBC - V
- Frogs
  - Booroolong Frog (*Litoria booroolongensis*) BC – E, EPBC - E
  - Spotted Tree Frog (L*itoria spenceri*) BC – CE, EPBC – E

A significant impact is not considered likely. Rrefer to section 4.3 and section 4.4 of this report for details on the assessment of threatened fauna under the BC Act and EPBC Act.

4.5.3 Migratory Species

Migratory species are protected under the EPBC Act. 11 species listed as Migratory under the EPBC Act were determined by the EPBC PMST as having potential habitat or occurrence within the area. Based on the habitat assessment, no habitat is present that would indicate the likely occurrence of these species. As such, no tests of significance would need to be conducted for these species under the EPBC Act.

4.5.4 Threatened Ecological Communities

No area of TEC listed under the EPBC Act were identified within the Subject Land.

5. Assessment of Impacts

5.1 Assessment of Impacts

It has been assumed that all areas within the development footprint would be impacted by the proposed works through:

- Excavation and modification (quarrying)
- Ground disturbance (vehicle and plant movement)
- Ancillary facilities (stockpile, workshop)

Direct impacts from the proposed works, relevant to the BA, include:

- Native vegetation removal
- Disturbance to aquatic habitat
- In-stream impacts
- Excavation
- Erosion, sedimentation and pollution runoff into waterways
- Ground disturbance
- Increases to Key Threatening Processes.

Indirect impacts within the Subject Land include noise and dust from the proposed works. These indirect impacts would be minimal and temporary and occur during daylight hours only.

Areas of vegetation and aquatic habitat that may incur impact from the proposed works are detailed below within Table 5-1 and Table 5-2.

Table 5-1 Vegetation impacts

Vegetation	Zone	Development footprint (ha)
PCT 285	Creek line	0.21
PCT 2285	Grassland	0.04
PCT 285	Paddock Tree	0.07
PCT 285	Woodland	0.33
Total		**0.65**

Table 5-2 Aquatic habitat impacts

Vegetation	Development footprint (ha)
Aquatic Habitat (Existing Dams) and streams	0.21

5.1.1 Vegetation loss

The proposed works would predominately incur impacts on PCT 285: *Broad-leaved Sally grass – sedge woodland on valley flats and swamps in the NSW South Western Slope Bioregion and adjoining South Eastern Highlands Bioregion*. This would occur on isolated paddock trees, creek line, grassland and woodland. Approximately 0.65ha of native vegetation and 9.35ha of exotic vegetation would be impacted by the Proposal.

The development would also involve the removal of approximately 0.3ha of regenerating vegetation (PCT 285) from within the existing quarry footprint (refer to Figure 4-6). BHQ have an existing land rights agreement with SVC (refer to Appendix G). As a part of this agreement, BHQ are permitted to periodically clear vegetation from the existing pit. As such, regeneration vegetation observed within and immediately surrounding the pit was not included in the impact assessment.

5.1.2 Threatened species and ecological communities

AoS and ToS were conducted for selected species listed under the BC Act, EPBC Act and FM Act (Appendix D, Appendix E and Appendix F) to characterise the effect of habitat loss and clearing and these are summarised briefly below. Both construction and operation impacts were assessed.

Terrestrial flora

Construction

Construction of the Proposal has the potential to incur the following impacts to native flora species:

- Disturb mature flora plants and associated seedbank and therefore inhibit potential regeneration
- Incur the invasion and spread of weeds, pathogens and disease

Approximately 0.65ha of native vegetation would be removed for the Proposal. The proposed development would largely extend into areas of exotic pasture grasses and, as such, impacts to native flora species are considered minor.

Ground disturbance from the movement of plant machinery and vehicles is expected to occur throughout the development footprint. Post-construction, plant and machinery would utilise the internal haul roads, allowing for the regeneration of native species onsite.

Edge effects are not expected to increase as a result of the development, as vegetation within the Subject Land was observed to already be heavily fragmented. Weed encroachment and establishment is currently being experienced throughout the site, reducing the quality of habitat.

Operation

During operation of the development, ongoing dust impacts could occur to terrestrial vegetation. Given that the mitigation measures relating to dust within the BA and EIS are adhered to, it is considered unlikely that dust would have a significant impact on native flora species within the Subject Land.

Conclusion

An AoS and ToS was conducted for Austral Toadflax (*Thesium australe*). A significant impact for this species was considered unlikely, based on the following conclusions:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur

- No substantial contribution to any Key Threatening Process are expected
- Mitigation measures have been recommended to further reduce impacts to biodiversity
- No impact an important population of this species is expected by the proposed works.

Terrestrial fauna

Construction

Construction of the Proposal has the potential to incur the following impacts to threatened fauna species:

- Disrupt breeding fauna
- Disturb mature flora plants and associated seedbank and therefore inhibit potential regeneration of foraging and breeding habitat for fauna species
- Incur the invasion and spread of pathogens and disease
- Temporary indirect disturbance to wildlife (noise, dust, light, spill, vibration).

Approximately 0.65ha of native terrestrial habitat would be removed for the Proposal. The proposed development would largely extend into areas of exotic pasture grasses and, as such, impacts resulting from the removal of native habitat are considered minor.

One HBT would be removed by the proposed works. Given the trees location to the existing quarry operation (refer to Figure 4-6), it is unlikely that the tree supports threatened species and, therefore, the impacts of its removal are also considered to be minor.

Operation

During operation of the development, ongoing dust impacts could occur to terrestrial fauna. Given that the mitigation measures relating to dust within the BA and EIS are adhered to, it is considered unlikely that dust would have a significant impact on native fauna species within the Subject Land.

Conclusion

An AoS and ToS was conducted for threatened terrestrial fauna species. A significant impact for this species was considered unlikely, based on the following conclusions:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- Only one HBT is proposed for removal
- No substantial contribution to any Key Threatening Process are expected
- Mitigation measures have been recommended to further reduce impacts to biodiversity
- No impact to any important population is expected by the proposed works.

Threatened ecological community

One TEC was identified within the Subject Land. This was:

- *The aquatic ecological community in the natural drainage system of the lower Murray River catchment* (Murray River EEC) – FM Act Listed EEC.

Construction

The Proposal involves the diversion of an ephemeral creek and the removal of two existing farm dam from within the southern portion of the Subject Land (refer to Figure 5-1). Re-directing the creek has the potential to incur the following impacts:

- The disturbance/removal of approximately 0.21ha of aquatic habitat
- Sedimentation of nearby waterways, such as Tumbarumba Creek
- Removal of mature aquatic vegetation and their associated seedbanks from within the EEC
- Changes to the natural flow regime and degradation of natural waterways
- Introduction of pollutants into the waterway
- Erosion

Operation

During operation of the development, ongoing dust and sedimentation impacts could occur within this EEC. Given that the mitigation measures relating to dust and sedimentation control, provided within the BA and EIS are adhered to, it is considered unlikely that dust or sedimentation would have a significant impact on an EEC occurring within or adjacent to the Subject Land.

Conclusion

An assessment under the FM Act was conducted for the Murray River EEC. A significant impact for this EEC was considered unlikely, based on the following conclusions:

- The amount of aquatic habitat to be removed or disturbed by the Proposal is very small
- Aquatic habitat to be impacted largely consists of highly modified pastureland
- No substantial contribution to any Key Threatening Process are expected
- Mitigation measures have been recommended to further reduce impacts to biodiversity

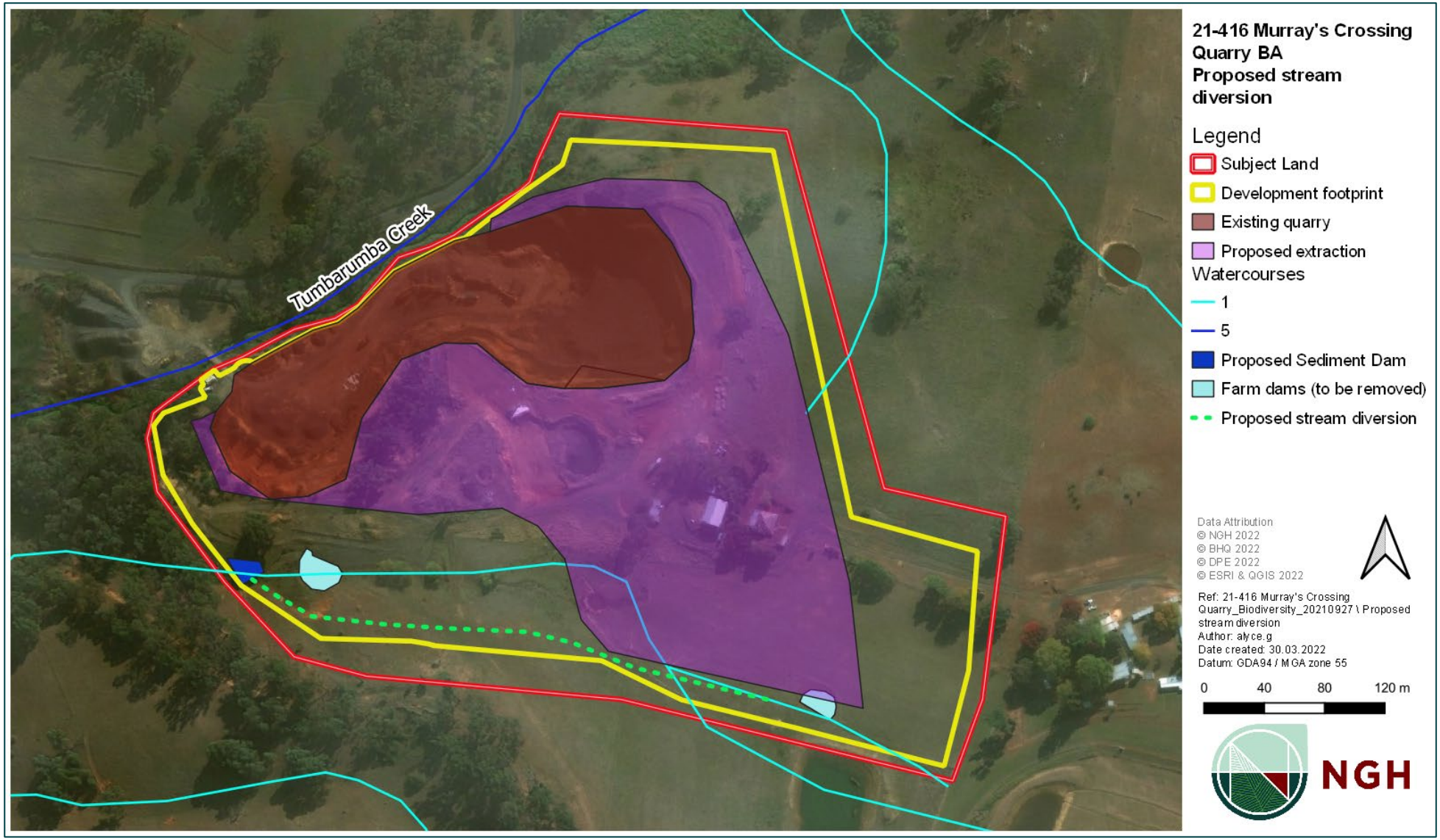


Figure 5-1 Proposed stream diversion and farm dam removal within Murray River EEC

Aquatic fauna

Construction

Three aquatic species have the potential to occur within the Subject Land (Booroolong Frog, Spotted Tree Frog and Murray's Crayfish). Potential impacts to these species include:

- The disturbance/removal of approximately 0.21ha of aquatic habitat, suitable to these species
- Sedimentation and increased turbidity of nearby waterways, such as Tumbarumba Creek
- Changes to the natural flow regime and degradation of natural waterways
- Introduction of pollutants into the waterway
- Erosion

Operation

During operation of the development, ongoing dust and sedimentation impacts could occur. Given that the mitigation measures relating to dust and sedimentation control, provided within the BA and EIS are adhered to, it is considered unlikely that dust or sedimentation would have a significant impact on aquatic species occurring within or adjacent to the Subject Land.

Conclusion

An AoS and ToS was conducted for threatened aquatic fauna under the BC Act and EPBC Act. A significant impact for these species was considered unlikely, based on the following conclusions:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- No substantial contribution to any Key Threatening Process are expected
- Mitigation measures have been recommended to further reduce impacts to biodiversity
- No impact to any important population is expected by the proposed works.

5.1.3 Prescribed Impacts on BV Mapped Land

Tumbarumba Creek is identified as BV mapped land - no native vegetation would be cleared within this area. However Prescribed biodiversity impacts (listed under clause 6.1 of the Biodiversity Conservation Regulations) on BV mapped land must be assessed to determine if the BOS threshold would be exceeded.

Prescribed biodiversity impacts relevant to this Proposal include impacts on;

- Human made structures that sustain threatened entities
- Non-native vegetation that sustains threatened entities
- Water quality, waterbodies and hydrological processes that sustain threatened entities

Based on the habitat assessment (Appendix C), no threatened entities were considered to be associated with the man-made structures or non-native vegetation associated with the Quarry operations within the BV mapped land.

Tumbarumba creek provides habitat for threatened species such as the Murray Crayfish, Booroolong Frog and Spotted Tree Frog. Assessments of impacts to aquatic species have been undertaken in Section 4.4.4 and no significant impact is considered to occur to these species.

No prescribed impacts on threatened entities are considered likely to occur and the BOS threshold is not exceeded for this criteria.

5.1.4 Priority weeds

The proposed works have the potential to result in further spread of priority weeds and other exotic weed species within and outside of the Subject Land.

One priority weed, Blackberry (*Rubus frutcosus* species aggregate), was recorded within the Subject Land. There is a prohibition on certain dealings for this species under the *Biosecurity Act 2015.* This species must not be imported into the state, sold, bartered exchanged or offered for sale.

The Biosecurity Act dictates that all priority weeds are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any land managers or authorities who deal with any priority has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. Other exotic flora that were identified within the study area are common within the region and are often encountered within disturbed areas.

Mitigation measures have been recommended in section 6 of this report, to control the spread of weed seed species by the Proposal.

5.1.5 Key threatening processes

The Proposal has the potential to increase Key Threatening Processes (KTPs) listed under the BC Act, EPBC Act and FM Act. KTPs relevant to the proposed work are described within Table 5-4 below.

5.1.6 Assessment of BOS Thresholds

As outlined in Section 2.1, the requirement under the BC Act, is to determine whether a development is likely to significantly affect threatened species.

A summary of the potential impacts from the Proposal against the BC Act thresholds is provided in Table 5-3.

Table 5-3 Impact assessment against the BC Act Thresholds.

Threshold	Application to the Proposal	Section of this report	Threshold Exceeded?
The development is likely to significantly affect threatened species, populations or ecological communities (clause 7.2(1)(a))	No significant effects on threatened species, populations or ecological communities is considered likely.	Section 4.2.1, 4.3.1, 4.4.2, 5.1.2 and Appendix D (DAWE, 2021) (DAWE, 2021)	No
The clearing of native vegetation exceeds the area clearing threshold ***Minimum lot size associated with the property*** / ***Threshold for clearing of native vegetation*** **40 ha** / **1 ha or more**	The clearing threshold for the Proposal is 0.67 ha of native vegetation across the site. Therefore, this is below the BOS threshold.	Section 5.1.1	No

Threshold	Application to the Proposal	Section of this report	Threshold Exceeded?
(40ha to 1000ha)			
The clearing of native vegetation, or other action prescribed by clause 6.1, on land identified on the Biodiversity Values (BV) map;	The Subject Land occurs in area of BV mapped land but no further clearing of native vegetation would occur in areas mapped as BV land. No prescribed impacts to threatened species are considered to occur.	Section 4.2.2, Figure 4-1, Section 5.1.3 and Appendix D	No
The development is in an area of Outstanding Biodiversity Value (clause 7.2(1)(c))	None occur in the Proposal area.	Section 4.2.2	No

Based on the assessment in this report, no BOS thresholds are considered to be exceeded and a BDAR is not required to be submitted with the DA.

Table 5-4 Key threatening processes

Key Threatening Processes (KTPs)			
BC Act	**EPBC Act**	**FM Act**	**Relevance**
Clearing of native vegetation	Land clearance		The clearing of native vegetation is considered a major contributor to the loss of biodiversity. In the determination, the NSW Scientific Committee found that 'clearing of any area of native vegetation, including areas less than two hectares in extent, may have significant impacts on biological diversity'. Clearing can lead to direct habitat loss, habitat fragmentation and associated genetic impacts, habitat degradation and off–site impacts such as downstream sedimentation. Approximately 0.65ha of native vegetation and one HBT (an isolated paddock tree) would be removed by the Proposal. Given the extent of the disturbance already experienced within the Subject Land, it is considered that the Proposal would only contribute to a minor increase in the KTP.
Invasion and establishment of exotic vines and scramblers			The Proposal has the potential to spread exotic species from the Subject Land to other parts of the study area through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site.
Invasion of native plant communities by exotic perennial grasses			The understorey in the Subject Land is already dominated by exotic perennial grasses; however, weed spread would be minimised off-site by following the provided mitigation measures.
Removal of dead wood and trees			Dead wood and dead trees provide essential habitat for a wide variety of native animals and are important to the functioning of many ecosystems. The removal of dead wood can have a range of environmental consequences, including the loss of habitat (as they often contain hollows used for shelter by animals), disruption of ecosystem process and soil erosion. The Proposal is unlikely to increase this KTP. Dead wood and trees would be placed outside of the development footprint and within the surrounding environment.
Infection of frogs by amphibian chytrid causing the	Infection of amphibians with chytrid fungus resulting in		Chytridiomycosis is a fatal disease of amphibians and is caused by the chytrid *Batrachochytrium dendrobatidis* (Longcore *et al.* 1999). Chytridiomycosis is a global epidemic.

Key Threatening Processes (KTPs)			
disease *chytridomycosis.*	chytridiomycosis		Chytridiomycosis is potentially fatal to all native species of amphibian. As such, all frog species that are listed under the schedules of the Act may be affected by the disease. Fifty species of Australian frogs have been found infected with the chytrid fungus. In NSW, 22 species, more than one quarter of the total NSW amphibian fauna, have been diagnosed with the disease. The Proposal has the potential to spread this disease from other sites containing aquatic habitat. The Proposal is not expected to increase this KTP due to safeguards included in section 6 of this report.
Alternation of natural flow regimes of rivers, streams, floodplains & wetlands.		Degradation of native riparian vegetation along New South Wales water courses.	Alteration to natural flow regimes refers to reducing or increasing flows, altering seasonality of flows, changing the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and subsurface water levels and changing the rate of rise or fall of water levels. Riparian vegetation forms an important part of a healthy functioning ecosystem and has numerous important ecological benefits. Studies show that species diversity and abundance are greater in areas with good riparian vegetation. Riparian vegetation is degraded by the complete removal or modification of native plants. A major cause of degradation is the introduction of, or invasion by, non-native species. In some areas the only vegetation present along streams may be exotic species such as willows. Due to the safeguards provided in section 6 of this report, the Proposal is not expected to increase this KTP.

6. Safeguards and Mitigation Measures

These safeguards are a tool to assist with minimising the impacts on biodiversity during construction of the Proposal.

Table 6-1 Safeguards and mitigation measures

Impact	Environmental safeguards	Responsibility	Timing
Spread of weeds	• All weed material containing seed heads, weeds that contain toxins, and weeds that are able to reproduce vegetatively will be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth. • All herbicides will be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application should be trained to do so and have the proper certificate of completion/ competency or statement of attainment issued by a registered training organisation. • Plant equipment and machinery will be cleaned of all biological matter prior to entering the site.	Contractor	Construction Operation Construction Prior to construction
Unexpected threatened species finds	• The site induction will include measures to make employees aware of potential threatened flora and fauna during works and understand the procedures if threatened fauna are detected, this will be recorded as a part of the induction procedure and toolbox talks: o Stop work o Alert an Ecologist or suitably qualified person for assessment and possible re–location during works.	Contractor	Construction
Removal of hollow-bearing trees	• Only one HBT will be removed during the proposed works. If the proposed design changes to include HBT removal further assessment would be required prior to commencement of work.	Contractor	Prior to construction
Fallen timber removal	• All fallen timber within the Subject Land is to be relocated from the development footprint to an adjacent area.	Contractor	Construction

Vegetation clearing	• All woodland to be removed is to be surveyed by an ecologist or suitably qualified person to record the presence of any nesting fauna. • Vegetation to be retained within the study area is to be clearly marked. • Exclusion zones at the extent of the works corridor to limit works encroaching outside the corridor should be used.	Contractor Contractor Contractor	Prior to construction Prior to construction Prior to construction
Aquatic habitat	• Impacts to aquatic habitat will be kept to the smallest possible extent. • An Erosion and Sediment Control Program (ESCP) will be implemented, prior to the commencement of work. • Erosion controls will be implemented prior to channel diversion. This would ensure that the natural flow regime of Tumbarumba Creek is not impacted and that downstream sedimentation doesn't occur. Erosion controls will remain in place until the site is revegetated and stabilised. • BHQ will restrict works within aquatic and riparian areas, to periods of low rainfall, to coincide with natural aquatic processes and reduce unnecessary sedimentation within waterways. • BHQ will divert the watercourse and provide sufficient time for the dam to dry out, allowing invertebrates and aquatic fauna sufficient time to relocate. • No herbicide use will occur within aquatic areas. • Vehicle hygiene protocols should be in line with Roads and Maritime Biodiversity Guidelines - Guide 7 (Pathogen Management) for the control of Chytrid.	Contractor Contractor Contractor Contractor	Construction Construction Construction Construction

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Appendix A Background Research

A.1 EPBC PMST

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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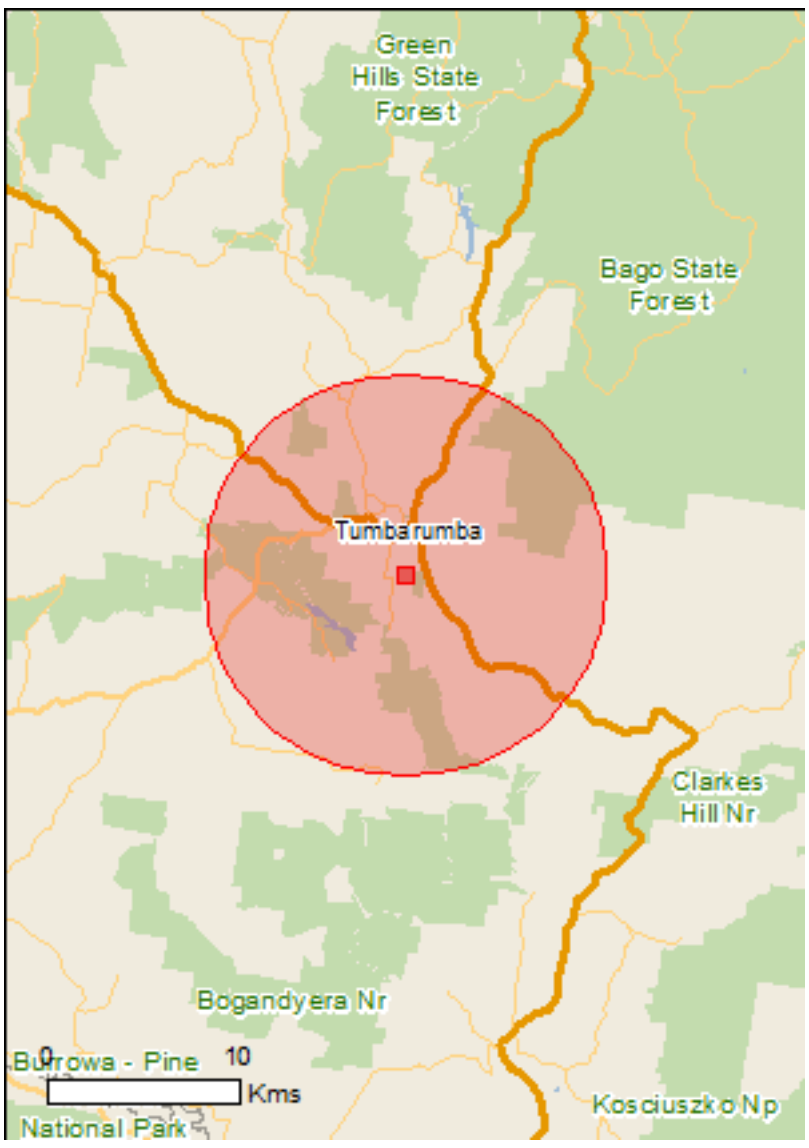

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

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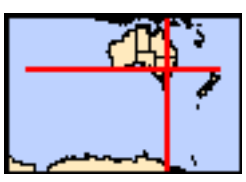

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	7
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	38
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	32
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	700 - 800km upstream
Barmah forest	200 - 300km upstream
Gunbower forest	300 - 400km upstream
Hattah-kulkyne lakes	500 - 600km upstream
Nsw central murray state forests	200 - 300km upstream
Riverland	600 - 700km upstream
The coorong, and lakes alexandrina and albert wetland	700 - 800km upstream

Listed Threatened Ecological Communities		[Resource Information]
For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.		
Name	Status	Type of Presence
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community likely to occur within area
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
[Rostratula australis](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		
[Galaxias rostratus](#) Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat likely to occur within area
[Maccullochella macquariensis](#) Trout Cod [26171]	Endangered	Species or species habitat may occur within area
[Maccullochella peelii](#) Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
[Macquaria australasica](#) Macquarie Perch [66632]	Endangered	Translocated population known to occur within area
Frogs		
[Crinia sloanei](#) Sloane's Froglet [59151]	Endangered	Species or species habitat may occur within area
[Litoria booroolongensis](#) Booroolong Frog [1844]	Endangered	Species or species habitat likely to occur within area
[Litoria verreauxii alpina](#) Alpine Tree Frog, Verreaux's Alpine Tree Frog [66669]	Vulnerable	Species or species habitat may occur within area
Insects		
[Synemon plana](#) Golden Sun Moth [25234]	Critically Endangered	Species or species habitat may occur within area
Mammals		
[Dasyurus maculatus maculatus (SE mainland population)](#) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
[Mastacomys fuscus mordicus](#) Broad-toothed Rat (mainland), Tooarrana [87617]	Vulnerable	Species or species habitat likely to occur within area
[Nyctophilus corbeni](#) Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
[Petauroides volans](#) Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
[Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)](#) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat likely to occur within area
[Pseudomys fumeus](#) Smoky Mouse, Konoom [88]	Endangered	Species or species habitat may occur within area
[Pteropus poliocephalus](#) Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Plants		

Name	Status	Type of Presence
Ammobium craspedioides Yass Daisy [20758]	Vulnerable	Species or species habitat likely to occur within area
Amphibromus fluitans River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area
Calotis glandulosa Mauve Burr-daisy [7842]	Vulnerable	Species or species habitat may occur within area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat may occur within area
Prasophyllum bagoense Bago Leek-orchid [84276]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum innubum Brandy Marys Leek-orchid [83603]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum keltonii Kelton's Leek-orchid [83604]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
Pterostylis oreophila Blue-tongued Orchid, Kiandra Greenhood [22903]	Critically Endangered	Species or species habitat likely to occur within area
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Bogandyera	NSW
Courabyra	NSW
Eurabbie	NSW
Forestry Management Areas in Tumut (FMZ2)	NSW
Tumut Subregion of Southern Region	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Southern RFA	New South Wales

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-35.78958 148.00454,-35.78958 148.01239,-35.79511 148.01239,-35.79511 148.00454,-35.78958 148.00454

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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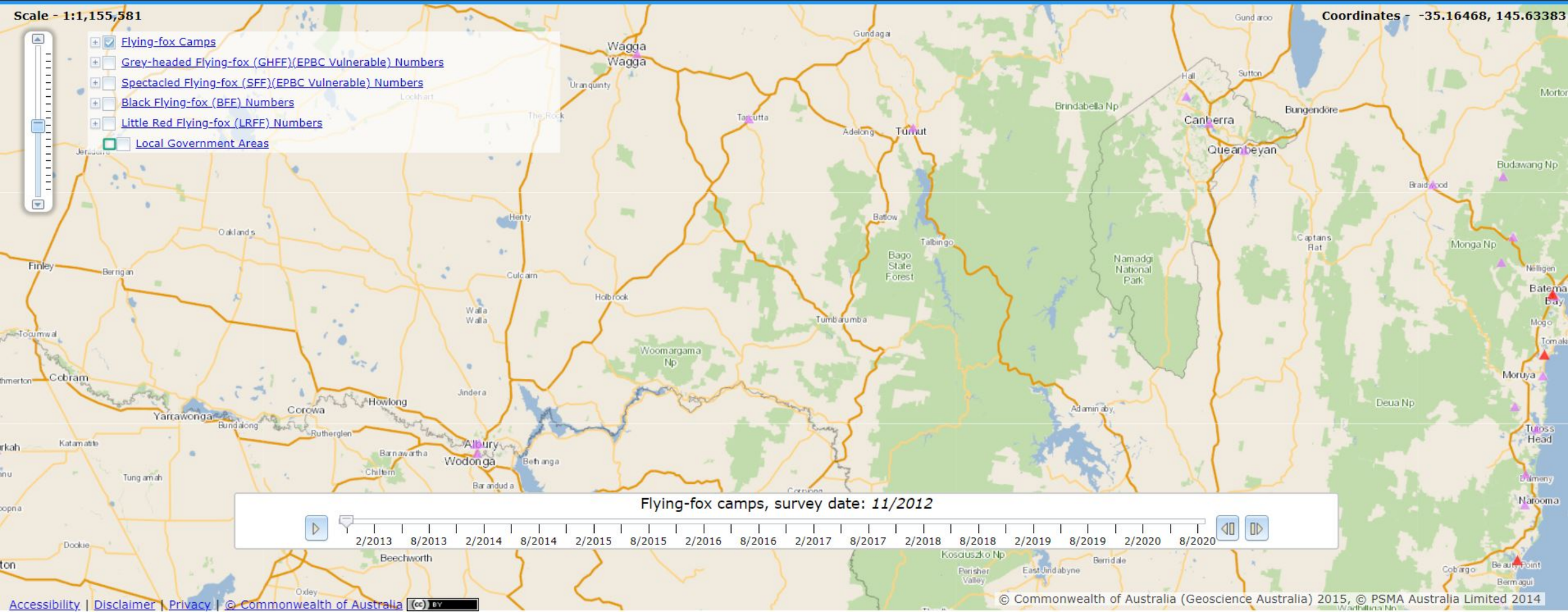
A.2 Bionet Search Results

Scientific name	Common name
Caladenia concolor	Crimson Spider Orchid
Artamus cyanopterus cyanopterus	Dusky Woodswallow
Petroica phoenicea	Flame Robin
Callocephalon fimbriatum	Gang-gang Cockatoo
Petauroides volans	Greater Glider
Phascolarctos cinereus	Koala
Miniopterus orianae oceanensis	Large Bent-winged Bat
Ninox strenua	Powerful Owl
Petroica boodang	Scarlet Robin
Chthonicola sagittata	Speckled Warbler
Dasyurus maculatus	Spotted-tailed Quoll
Daphoenositta chrysoptera	Varied Sittella
Hirundapus caudacutus	White-throated Needletail
Petaurus australis	Yellow-bellied Glider



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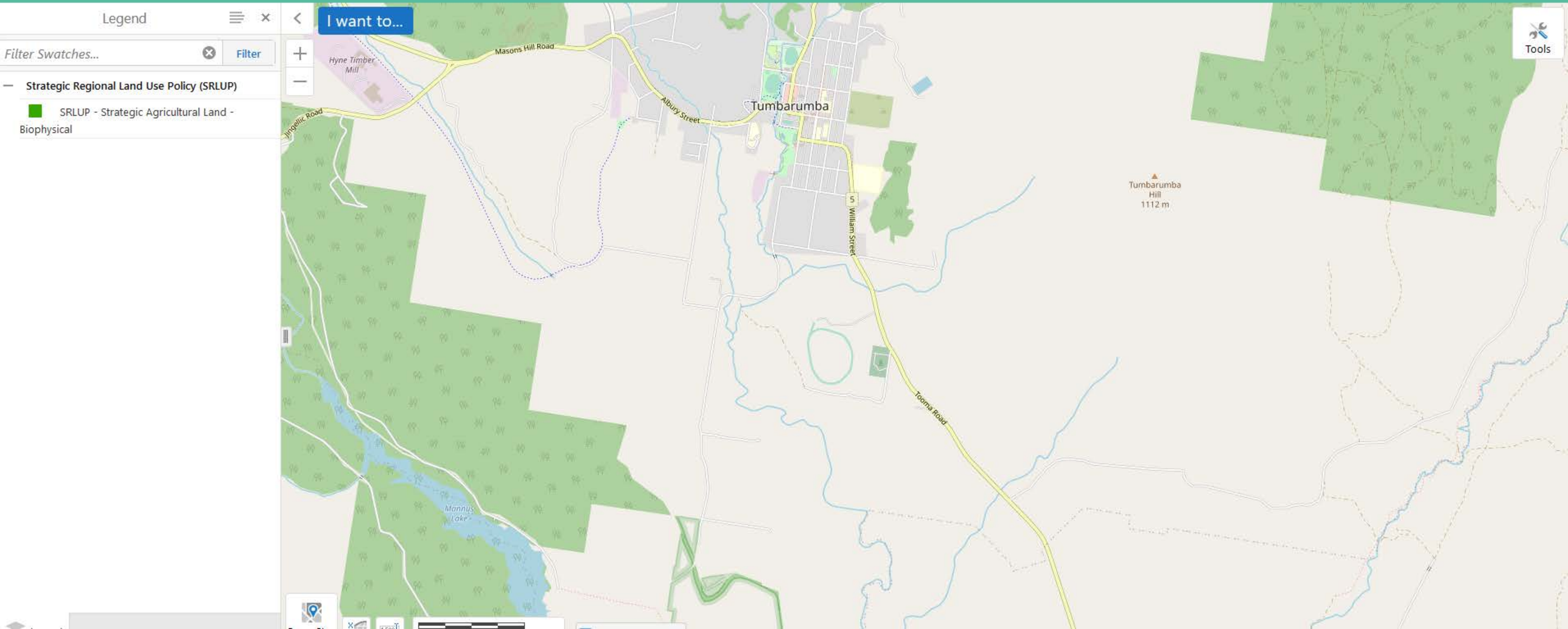
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Strategic Regional Land Use Policy (SRLUP)
SRLUP - Strategic Agricultural Land - Biophysical
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Tools
Masons Hill Road
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Albury Street
Tumbarumba
Jingellic Road
Tumbarumba Hill
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William Street
Tooma Road
Mannus Lake

Appendix B Flora and fauna species list

B.1 Fauna species list

Common Name	Latin Name
Australian White Ibis	*Threskiornis molucca*
Australian Wood Duck	*Chenonetta jubata*
Nankeen Kestrel	*Falco cenchroides*
Pacific Black Duck	*Anas superciliosa*
Pied Currawong	*Strepera graculina*
Superb Fairywren	*Malurus cyaneus*
Welcome Swallow	*Hirundo neoxena*
Short-beaked Echidna	*Tachyglossus aculeatus*
Common Wombat	*Vombatus ursinus*
Eastern Sign-bearing Froglet	*Crinia parinsignifera*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*

B.2 Flora species recorded during site visit

Species Name	Common Name	Family	Exotic
TREES			
Eucalyptus bicostata	Eurabbie	Myrtaceae	
Eucalyptus bridgesiana	Apple Box	Myrtaceae	
Eucalyptus camphora subsp. humeana	Broad-leaved Sally	Myrtaceae	

Eucalyptus radiata	Narrow-leaved Peppermint	Myrtaceae	
Eucalyptus robertsonii	Robertson's Peppermint	Myrtaceae	
Eucalyptus stellulata	Black Sally	Myrtaceae	
Pinus radiata	Radiata Pine	Pinaceae	*
Acacia dealbata	Silver Wattle	Fabaceae (Mimosoideae)	
Acacia melanoxylon	Blackwood	Fabaceae (Mimosoideae)	
Salix spp.		Salicaceae	*
SHRUBS			
Acacia pravifolia	Coil-pod Wattle	Fabaceae (Mimosoideae)	
Acacia kettlewelliae	Buffalo Wattle	Fabaceae	
Bursaria spinosa	Native Blackthorn	Pittosporaceae	
Cassinia longifolia		Asteraceae	
Epacris breviflora		Ericaceae	
Kunzea spp.		Myrtaceae	
Leptospermum continentale	Prickly Teatree	Myrtaceae	
Ligustrum sinense	Small-leaved Privet	Oleaceae	*
FORBS			
Acaena novae-zalandiae	Bidgee-Widgee		
Arctotheca calendula	Capeweed	Asteraceae	*
Asperula conferta	Common Woodruff	Rubiaceae	
Conium maculatum	Hemlock	Apiaceae	*
Carthamus lanatus	Saffron Thistle	Asteraceae	*
Cirsium vulgare	Spear Thistle	Asteraceae	*
Conyza spp.	A Fleabane	Asteraceae	*
Cymbonotus preissianus	Austral Bear's Ear	Asteraceae	

Hypochaeris radicata	Catsear	Asteraceae	*
Senecio quadridentatus	Cotton Fireweed	Asteraceae	
Silybum marianum	Variegated Thistle	Asteraceae	*
Sonchus oleraceus	Common Sowthistle	Asteraceae	*
Hypericum perforatum	St. Johns Wort	Clusiaceae	*
Chamaesyce drummondii	Caustic Weed	Euphorbiaceae	
Trifolium arvense	Haresfoot Clover	Fabaceae (Faboideae)	*
Trifolium subterraneum	Subterranean Clover	Fabaceae (Faboideae)	*
Geranium solanderi	Native Geranium	Geraniaceae	
Gonocarpus tetragynus	Poverty Raspwort	Haloragaceae	
Romulea rosea var. australis	Onion Grass	Iridaceae	*
Epilobium billardierianum		Onagraceae	
Oxalis perennans		Oxalidaceae	
Dianella spp.		Phormiaceae	
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	*
Pontentilla recta		Rosaceae	*
Rubus fruticosus sp. agg.	Blackberry complex	Rosaceae	*
Galium aparine	Goosegrass	Rubiaceae	*
Verbascum thapsus subsp. thapsus	Great Mullein	Scrophulariaceae	*
GRASSES			
Avena fatua	Wild Oats	Poaceae	*
Bromus catharticus	Praire Grass	Poaceae	*
Cynodon dactylon	Common Couch	Poaceae	
Dactylis glomerata	Cocksfoot	Poaceae	*
Lolium spp.	A Ryegrass	Poaceae	*

Phalaris aquatica	Phalaris	Poaceae	*
Phragmites australis	Common Reed	Poaceae	
Themeda triandra	Kangaroo Grass	Poaceae	
SEDGES & RUSHES			
Juncus usitatus		Juncaceae	
Lomandra spp.	Mat-rush	Lomandraceae	
Carex appressa	Tall Sedge	Cyperaceae	

Appendix C Threatened Species Evaluation

The habitat evaluation for threatened species, ecological communities and endangered populations listed within 10km of the Subject Land under the *NSW BioNet* [1], those listed under the DPE threatened species IBRA Bondo subregion of the South-Eastern Highlands Bioregion[2] and those identified as potentially occurring in the area according to the Commonwealth EPBC *Protected Matters Search Tool*[3].

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the Proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

Presence of habitat:

Present: Potential or known habitat is present within the study area

Marginal: Habitat onsite meets some basic habitat descriptions, without microhabitat or preferred needs being met

Absent: No potential or known habitat is present within the study area

Likelihood of occurrence

Unlikely: Species known or predicted within the locality but unlikely to occur in the study area

Possible: Species could occur in the study area

Present: Species was recorded during the field investigations

Possible to be impacted

No: The Proposal would not impact this species or its habitats. No Assessment of Significance (AoS) under the BC Act and/or FM Act and/or Test of Significance (ToS) under the EPBC Act is necessary for this species.

[1] The *NSW BioNet* is administered by the NSW Office of Environment and Heritage (DPE) and is an online database of fauna and flora records that contains over four million recorded sightings.
[2] This online tool is designed for the public to search for threatened entities by occurrence of IBRA-Subregions (DPIE).
[3] This online tool is designed for the public to search for matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is managed by the Commonwealth Department of the Environment, Water, Heritage and the Arts.

C.1 Flora

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Flora									
Ammobium craspediodes	Yass Daisy	V		V	Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. Grows in association with a large range of eucalypts (*Eucalyptus blakelyi*, *E. bridgesiana*, *E. dives*, *E. goniocalyx*, *E. macrorhyncha*, *E. mannifera*, *E. melliodora*, *E. polyanthemos*, *E. rubida*). Apparently unaffected by light grazing, as populations persist in some grazed sites. Found in a number of TSRs, Crown reserves, cemeteries and roadside reserves within the region		**Present** Dry forest present with associated Eucalyptus species present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species not likely to occur.
Amphibromus fluitans	Floating Swamp Wallaby-grass	V		V	Grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. Habitats in south-western NSW include swamp margins in mud, dam and tank beds in hard clay and in semi-dry mud of lagoons with *Potamogeton* and *Chamaeraphis* species. The species is virtually aquatic, often with only the flower heads above the water. It has been recorded recently in lagoons beside the Murray River near Cooks Lagoon (Shire of Greater Hume), Mungabarina Reserve, East Albury, at Ettamogah, Thurgoona (Charles Sturt University Campus), near Narranderra, and also further west along the Murray River (near Mathoura) and in Victoria. There is a recent record of this species near Laggan in Upper Lachlan Shire. It is also found in Victoria and in Tasmania.		**Absent** No wetlands present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species not likely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Caladenia concolor	Crimson Spider Orchid	E		V	Habitat is regrowth woodland on granite ridge country that has retained a high diversity of plant species, including other orchids. The dominant trees are Blakely's Red Gum (*Eucalyptus blakelyi*), Red Stringybark (*E. macrorhyncha*), Red Box (*E. polyanthemos*) and White Box (*E. albens*); the diverse understorey includes Silver Wattle (*Acacia dealbata*), Hop Bitter-pea (*Daviesia latifolia*), Common Beard-heath (*Leucopogon virgatus*), Spreading Flax-lily (*Dianella revoluta*) and Poa Tussock (*Poa sieberiana*). In the area where this species occurs, only the Rosella Spider Orchid *C. rosella* is similar, but it is musk-scented and has paler pink-streaked flower-parts. The current NSW Scientific Committee listing incorporates two populations which have each been described as separate species. Other occurrences of the Crimson Spider Orchid in NSW are from the Nail Can Hill Crown Reserve near Albury. The species also occurs at two localities in Victoria near Beechworth and Chiltern.	1 record within locality (historic from 1899)	**Absent** Granite ridge country not present.	**Unlikely** Species not associated with PCT.	**No** Species unlikely to occur.
Caladenia montana	Mountain Spider Orchid	V			Caladenia montana is restricted to high montane areas 700–1000 m a.s.l. where it grows in well-drained loam on slopes and ridges of montane forest among an understorey of shrubs. The species occurs in mainly in the east alps section of the Alpine National Park in Victoria. There are records in the ACT and adjacent areas in NSW, but these are now referred to Caladenia fitzgeraldii. Caladenia montana may occur in southern Kosciuszko National Park adjacent to Victoria.		**Absent** Elevation below 700 m and loam not present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Calotis glandulosa	Mauve Burr-daisy	V		V	Found in montane and subalpine grasslands in the Australian Alps. Found in subalpine grassland (dominated by *Poa* spp.), and montane or natural temperate grassland dominated by Kangaroo Grass		**Absent** Grasslands not present, Kangaroo Grass and	**Unlikely** Species not associated with PCT. No records within	**No** Species unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					(*Themeda australis*) and Snow Gum (*Eucalyptus pauciflora*) Woodlands on the Monaro and Shoalhaven area. Appears to be a coloniser of bare patches, which explains why it often occurs on roadsides. Apparently common on roadsides in parts of the Monaro, though it does not persist for long in such sites. Does not persist in heavily-grazed pastures of the Monaro or the Shoalhaven area.		*Poa sp.* Not present.	locality.	
Discaria nitida	Leafy Anchor Plant	V		V	Generally occurs on or close to stream banks and on rocky areas near small waterfalls. The species occurs in both woodland with heathy riparian vegetation and on treeless grassy sub-alpine plains. Most population survive in sites that appear to be rarely burnt "fire refugia". The species is known to be highly fire sensitive and most plants that have been observed to have been burnt, even lightly, have died and there has been very little post fire recruitment.		**Present** Stream bank and riparian vegetation present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Euphrasia scabra	Rough Eyebright	E			Occurs in or at the margins of swampy grassland or in sphagnum bogs, often in wet, peaty soil. Presumed extinct in NSW,		**Absent** No swampy grasslands or sphagnum bogs present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Geneoplsium vernale	East Lynne Midge Orchid	V		V	The East Lynne Midge Orchid grows in dry sclerophyll woodland and forest extending from close to the coast to the adjoining coastal ranges. Confined to areas with well-drained shallow soils of low fertility, often occurring near the crests of ridges and on low rises where the ground cover is more open and sedge dominated rather then being shrubby. Has some limited ability to re-colonize previously disturbed sites.		**Absent** Site is frequently and heavily disturbed. Has a shrub layer and lack of sedge dominated landscape.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Grevillea iaspicula	Wee Jasper Grevillea	CE		E	Grows on rocky limestone outcrops and around sink holes and cave entrances. Vegetation is open woodland dominated by White Box (Eucalyptus albens) and Apple Box (E. bridgesiana) trees Often occurs as a co-dominant species within the shrubby understorey of its open woodland habitat.		**Absent** Rocky limestone outcrop not present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Irenepharus magicus	Elusive Cress	E			Habitat preference for the species is unclear, although two collections in Victoria have been made in or on the edge of recently logged Messmate Stringybark (*Eucalyptus obliqua*) forest. One of these sites had been burnt. The record of the species in NSW includes the habitat note "growing on mineral soil of embankment". The species was recently found in a rocky limestone area in eastern Victoria after the 2003 fires.		**Absent** Messmate Stringybark not present and rocky limestone areas not present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Leucochrysum albicans subsp. Tricolor	Hoary Sunray			E	Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils. Can occur in modified habitats such as semi-urban areas and roadsides. Highly dependent on the presence of bare ground for germination. In some areas, disturbance is required for successful establishment.		**Absent** Lack of heavy soils present on site.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Pilularia novae-hollandiae	Austral Pillwort	E			Grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. Most records in the Albury-Urana area were from table drains on the sides of roads. The ACT record was from a subalpine grassy plain. This species is probably ephemeral		**Absent** No shallow swamp or shallow waterway present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					(especially in the drier parts of its range), appearing when soils are moistened by rain. In NSW, it's been recorded from suburban Sydney, Khancoban, the Riverina. The species has also been recorded in the ACT, Victoria, Tasmania, South Australia and Western Australia.				
Pimelea bracteate	Rice Flower	CE			Pimelea bracteata occurs in wetlands and along waterways and stream edges in high altitude treeless subalpine valleys. It can also occur in wet heathland and closed heath.		**Absent** No high altitude treeless subalpine valley present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Pomaderris cotoneaster	Cotoneaster Pomaderris	E		E	Cotoneaster Pomaderris has been recorded in a range of habitats in predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.		**Present** Forest present on site with creek present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Prasophyllum bagoense	Bago Leek-orchid	CE		CE	Found in grassy, low heathland dominated by *Poa clivicola, Epacris gunnii* and *E. celata* on a subalpine plain bordered by Snow Gum and Mountain Gum.		**Absent** Low heathland not present with lack of associated species present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Prasophyllum innubum	Brandy Marys Leek-orchid	CE		CE	The species is known only from a highly restricted streamside habitat and *Sphagnum* hummocks, and rarely on adjacent grassy flats, at altitudes of 1150-1180 m.		**Absent** No Sphagnum hummocks or grassy flats present.	**Unlikely** No records within locality.	**No** Species unlikely to occur.
Prasophyllum keltonii	Kelton's Leek-orchid	CE		CE	The species is known only from a highly restricted habitat on the treeless McPhersons Plain, an area that includes sub-alpine grassland, sphagnum bogs, and open heathland, at an elevation of 1,100 m. The species has a		**Absent** Treeless McPhersons plain is not present. As	**Unlikely** Species not associated with PCT. No records within	**No** Species unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					preference for grassland. The species apparently has a preference for moderately boggy ground, though not sphagnum-dominated areas, but also occurs on some drier patches.		well as no heathland, grassland or sphagnum bogs around 1100 m of elevation.	locality.	
Prasophyllum petilum	Tarengo Leek Orchid	E		E	Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with *Poa labillardieri, Eucalyptus aggregata* and *Leptospermum* spp. near Queanbeyan and within the grassy groundlayer dominated by *Themeda* under Box-Gum Woodland at Ilford (and Hall, ACT). Natural populations are known in NSW, near Boorowa, Queanbeyan area, at Hall in the ACT, Ilford, Delegate and a new population c.10 km west of Muswellbrook. This species has also been recorded at Bowning Cemetery where it was experimentally introduced, though it is not known whether this population has persisted.		**Absent** No temperate natural grassland within the Subject Land.	**Unlikely** Species not associated with PCT. No records within locality	**No** Species unlikely to occur.
Pterostylis alpina	Alpine Greenhood	V			The Alpine greenhood grows in moist forests on foothills and ranges, extending to montane areas in New South Wales, the Australian Capital Territory and Victoria. In NSW the species occurs in the Southern Tablelands south from Bondo State Forest. The Alpine Greenhood is often found on sheltered southern slopes near streams in rich loam.		**Absent** No moist forest present within Subject Land.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Pterostylis foliata	Slender Greenhood	V			In NSW, Pterostylis foliata grows in eucalypt forest amongst an understorey of shrubs, ferns and grasses. It grows on loam or clay loam soils found on sheltered sloping to steep ground and populations may be found in localised open seepage areas. Flowering occurs from August to January.		**Present** Eucalypt forest with understorey of shrubs present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Pterostylis oreophila	Blue-tongued Orchid	CE		CE	Grows along sub-alpine watercourses under more open thickets of Mountain Tea-tree in muddy ground very close to water. Less commonly grows in peaty soils and sphagnum mounds. While more frequently found in low-light conditions it appears to also be able to tolerate full sun.		**Absent** No Mountain Tea-tree thickets and a lack of muddy ground present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Senecio garlandii	Woolly Ragwort	V			The species occurs in dry sclerophyll forest and open woodland in association with Eucalyptus macrorhyncha, E. goniocalyx, Acacia doratoxylon, A. implexa and Brachychiton populneus. It is found on the upper parts of south to east-facing slopes of rocky outcrops (Burrows, 2001). This species occurs within the Lachlan, Murray and Murrumbidgee (NSW) Natural Resource Management Region		**Absent** Lack of rocky outcrops and no associated species present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Senecio macrocarpus	Large-fruit Fireweed	P		V	In NSW, Large-fruit Fireweed occurs in partly cleared dry forests and box-gum woodlands which transition to Brittle Gum Forest with a relatively undisturbed understorey of native grasses, forbs and subshrubs.		**Present** Partly cleared dry forest present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Swainsona recta	Small Purple-pea	E		E	Before European settlement it occurred in the grassy understorey of woodlands and open-forests dominated by *Eucalyptus blakelyi, E. melliodora, E. rubida* and *E. goniocalyx*. Grows in association with understorey dominants that include *Themeda triandra, Poa* spp. and *Austrostipa* spp. Recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Populations still exist in the Queanbeyan and Wellington-Mudgee areas. Also known from the ACT and a single population of four plants near Chiltern in Victoria.		**Absent** No associated species present.	**Unlikely** Species not associated with PCT. No records within locality.	**No** Species unlikely to occur.
Thelymitra alpicola	Alpine Sun-orchid	V			In Kosciuszko National Park and the Bago plateau the species occurs in wet heaths and		**Absent** No adjacent	**Unlikely** Species not	**No** Species unlikely

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					adjacent to Sphagnum bogs between 1000-1500 metres. Associated species include Hakea microcarpa, Leptospermum myrtifolium, Baeckea utilis, Baeckia gunniana, Epacris breviflora, Epacris paludosa, Baloskion australe and Empodisma minus. Apparently the species does not occur in Sphagnum where Thelymitra cyanea is more likely to occur. Near Clyde Mountain the species has been found in wet heaths with Banksia paludosa and Baeckea utilis near a creek. The habitat described on the collection notes at Kanangra-Boyd NP were swamp/heath, and swamp. The only other information was "under Leptospermum" and open sites "between sedges".		sphagnum bogs present, below 1000 meters elevation and lack of associated species present.	associated with PCT. No records within locality.	to occur.
Thesium australe	Austral Toadflax	V		V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass		**Present** Grassy woodland present.	**Possible** Habitat present and is associated with mapped PCT.	**Yes** AoS undertaken.
Threatened Ecological Communities (TECs)									
Alpine Sphagnum Bogs and Associated Fens				E	The Alpine Sphagnum Bogs and Associated Fens ecological community generally has sharp boundaries and is easily delineated from other alpine vegetation communities. Many of its plant species rarely occur in other vegetation assemblages. Although it is not always the dominant genus, the Alpine Sphagnum Bogs and Associated Fens ecological community can usually be defined by the presence or absence of Sphagnum spp., the most common of which is Sphagnum cristatum.		**Absent** No associated PCT present within Subject Land.	**Unlikely** Does not occur.	**No** TEC is not present.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions		E		E	Montane Peatlands and Swamps comprises a dense, open or sparse layer of shrubs with soft-leaved sedges, grasses and forbs. It is the only type of wetland that may contain more than trace amounts of *Sphagnum* spp., the hummock peat-forming mosses. Small trees may be present as scattered emergents or absent. The community typically has an open to very sparse layer of shrubs, 1-5 m tall, (eg. *Baeckea gunniana, B. utilis, Callistemon pityoides, Leptospermum juniperinum, L. lanigerum, L. myrtifolium, L. obovatum, L. polygalifolium*). Species of *Epacris* (eg. *E. breviflora, E. microphylla, E. paludosa*) and *Hakea microcarpa* are also common shrubs. In some peatlands and swamps, particularly those with a history of disturbance to vegetation, soils or hydrology, the shrub layer comprises dense thickets of *Leptospermum* species. In other peatlands and swamps with a history of grazing by domestic livestock, the shrub layer may be very sparse or absent. Montane Peatlands typically have a dense groundcover of sedges, grasses and forbs, except where a dense cover of tall shrubs casts deep shade. Soft-leaved species of *Carex* (eg. *C. appressa, C. fascicularis, C. gaudichaudiana*) and *Poa* (eg. *P. costiniana, P. labillardieri*) typically make up most of the groundcover biomass, while other common sedges include *Baloskion* spp., *Baumea rubiginosa, Empodisma minus, Juncus* spp. and *Schoenus apogon*. Forbs growing amongst the sedges include *Drosera* spp., *Geranium neglectum, Gratiola* spp., *Mitrasacme serpyllifolia, Ranunculus* spp. and *Viola* spp. Hummocks of *Sphagnum* moss may occur amongst other components of the ground layer.		**Absent** No associated PCT present within Subject Land.	**Unlikely** Does not occur.	**No** TEC is not present.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Natural Temperate Grassland of the South Eastern Highlands				CE	Natural Temperate Grassland is a natural grassland community dominated by a a range of perennial grass species and, in highly intact sites, containing a large range of herbaceous species in many plant families, including daisies, peas, lilies, orchids and plants in many other families, all collectively known as forbs, or "wildflowers" in the case of the more showy species. A number of distinct associations have been described in Armstrong et al. (2013), identified by combinations of the co-occurring grasses and forbs, and each found in particular regions and/or landscape positions. The community is often treeless, though trees of a range of species may occur in low densities, either as isolated individuals or in clumps. Seasonally wet areas within a site may also contain a range of wetland flora species, including rushes, sedges and a variety of wetland specialist forbs. A limited range of shrub species may occur at some sites, but these too occur in low densities.		**Absent** No associated PCT present within Subject Land.	**Unlikely** Does not occur.	**No** TEC is not present.
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions		CE			Characterised by the presence or prior occurrence of White Box, Yellow Box and/or Blakely's Red Gum and a generally grassy understorey. The trees may occur as pure stands, mixtures of the three species or in mixtures with other trees, including wattles. Commonly co-occurring eucalypts include Apple Box (E. bridgesiana), Red Box (E. polyanthemos), E. macrorhyncha), Coastal Grey Box (E. moluccana), Candlebark (E. rubida), Bundy (E. goniocalyx), Broad-leaved Stringybark (E. goniocalyx), Youman's Stringybark (E. youmanii) and others. The understorey in intact sites is characterised by native grasses and a high diversity of herbs; the most commonly encountered include Kangaroo Grass (Themeda australis), Poa Tussock (Poa sieberiana),		**Absent** No associated PCT present within Subject Land.	**Unlikely** Does not occur.	**No** TEC is not present.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					wallaby grasses (Rytidosperma spp.), spear-grasses (Austrostipa spp.), Common Everlasting (Chrysocephalum apiculatum), Scrambled Eggs (Goodenia pinnatifida), Small St John's Wort (Hypericum gramineum), Narrow-leafed New Holland Daisy (Vittadinia muelleri) and blue-bells (Wahlenbergia spp.). Shrubs are generally sparse or absent, though they may be locally common. Remnants generally occur on fertile lower parts of the landscape where soil fertility is relatively high compared to the surrounding landscape. Sites with particular characteristics, including varying age classes in the trees, patches of regrowth, old trees with hollows and fallen timber on the ground are very important as wildlife habitat.				
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland				CE	The ecological community can occur either as woodland or derived native grassland (i.e. grassy woodland where the tree overstorey has been removed). It is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs (where shrub cover comprises less than 30% cover), and a dominance or prior dominance of White Box (Eucalyptus albens) and/or Yellow Box (E. melliodora) and/or Blakely's Red Gum (E. blakelyi) trees.		**Absent** No associated PCT present within Subject Land.	**Unlikely** Does not occur.	**No** TEC is not present.
The aquatic ecological community in the natural drainage system of the lower Murray River catchment.			E		The lower Murray River endangered ecological community includes all native fish and aquatic invertebrates within all natural creeks, rivers, and associated lagoons, billabongs and lakes of the regulated portions of the Murray River (also known as the River Murray) downstream of Hume Weir, the Murrumbidgee River downstream of Burrinjuck Dam, the Tumut River downstream of Blowering Dam and all their tributaries anabranches and effluents including Billabong Creek, Yanco Creek, Colombo Creek, and their tributaries, the Edward River and the Wakool River and their tributaries, anabranches		**Present** Within area identified as EEC occurring under DPI Primefact. Tumbarumba Creek within Subject Land.	**Present** Within area identified as EEC occurring under DPI Primefact. Tumbarumba Creek.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC ACT	Habitat	No of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					and effluents, Frenchmans Creek, the Rufus River and Lake Victoria. Excluded from this recommendation are the Lachlan River and the Darling River and their tributaries, and artificial canals, water distribution and drainage works, farm dams and off-stream reservoirs.				

C.2 Fauna

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Aves									
Actitis hypoleucos	Common Sandpiper			M	Found along all coastlines of Australia and in many areas inland. The population that migrates to Australia breeds in the Russian far east. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks.		**Absent** No aquatic habitat present that would support this species.	**Unlikely** No suitable habitat present that would support this species. No records within the locality.	**No** Species not likely to occur.
Anthochaera phrygia	Regent Honeyeater	CE		CE	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak, that inhabit woodlands that support a significantly high abundance and species richness of bird species, and have large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Recently recorded in urban areas around Albury where woodlands tree species such as Mugga Ironbark and Yellow Box were planted 20 years ago. A generalist forager, although mainly feeds on the nectar from a relatively small		**Present** Eucalyptus woodland.	**Possible** Dry open forest present.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					number of eucalypts that produce high volumes of nectar eg. Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important eg. Lower Hunter Spotted Gum forests support regular breeding events. Flowering of associated species such as *Eucalyptus eugenioides* and other Stringybark species, and *E. fibrosa* can also contribute important nectar flows at times. Nectar and fruit from *Amyema miquelii, A. pendula* and *A. cambagei* are also utilised. When nectar is scarce, lerp and honeydew can comprise a large proportion of the diet. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Nests in horizontal branches or forks in tall mature eucalypts, mistletoes and Sheoaks. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands.				
Apus pacificus	Fork-tailed Swift			M	The Fork-tailed Swift is almost exclusively aerial, flying from less then 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (Higgins 1999). They forage aerially, up to hundreds of metres above ground, but also less then 1 m above open areas or over water. They		**Present** Species is mostly aerial and dry open habitat present.	**Possible** Species not recorded within the locality however suitable habitat.	**No** Species spends most time in the air and habitat is not likely relied upon by species.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					often occur in areas of updraughts, especially around cliffs. They are said to search along edges of low-pressure systems, which assist flight. Low-flying Swifts are said to be precursors of unsettled weather, possibly because insect prey fly at a lower altitude when the air is humid and when the air density is low (Cameron 1952). They sometimes feed aerially among tree-tops in open forest (Higgins 1999). They probably roost aerially, but are occasionally observed to land (Higgins 1999). They were once recorded roosting in trees, using a bare exposed branch emergent above the foliage (Newell 1930). Sometimes they loaf in the air, by allowing strong winds to support them (Boehm 1939). There have been rare records of loafing elsewhere including Swifts briefly resting on ground (Campbell 1900) and alighting on wire netting of a tennis court (Wheeler 1959). Once, one was seen attempting to land on the wall of a lighthouse (Scarff 1990).				
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V			Widespread in eastern, southern and south western Australia. Occurs throughout most of New South Wales, but sparsely scattered in, or largely absent from, much of the upper western region. Most breeding occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	2 records within locality	**Present** Eucalyptus woodland.	**Possible** Habitat present and recorded within locality.	**Yes** AoS undertaken.
Calidris acuminata	Sharp-tailed Sandpiper			M	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore		**Absent** No aquatic habitat present that would support this species.	**Unlikely** No suitable habitat present that would support this species.	**No** Species not likely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves				
Calidris ferruginea	Curlew Sandpiper	CE		CE	Generally occupies littoral and estuarine habitats, and in NSW is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. Roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores. Feeds on worms, molluscs, crustaceans, insects and some seeds. Distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration.		**Absent** No aquatic habitat present that would support this species.	**Unlikely** No suitable habitat present that would support this species. No records within the locality.	**No** Species not likely to occur.
Calidris melanotos	Pectoral Sandpiper			M	In NSW, it is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum.		**Absent** No aquatic habitat present that would support this species.	**Unlikely** No suitable habitat present that would support this species. No records within the locality.	**No** Species not likely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Callocephalon fimbriatum	Gang-gang Cockatoo	V			In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (*Eucalyptus pauciflora)* woodland and occasionally in temperate rainforests. In NSW, it is distributed from the south-east coast to the Hunter region, inland to the Central Tablelands and south-west slopes, and regularly in the ACT. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.	8 records within locality	**Marginal** Eucalypt woodland present.	**Possible** Marginal habitat and 8 records within locality.	**Yes** AoS undertaken.
Calyptorhynchus lathami	Glossy Black-cockatoo	V			Uncommon, but widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Dependent on large hollow-bearing eucalypts for nest sites. Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur. In the Riverina area, inhabits open woodlands dominated by Belah (*Casuarina cristata*). Feeds almost exclusively on the seeds of several species of she-oak *(Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill.		**Absent** No woodland present with stands of She-oak.	**Unlikely** No suitable habitat present. No records within locality.	**No** Unlikely to occur.
Chthonicola sagittata	Speckled Warbler	V			Has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills	1 record within locality	**Marginal** Habitat present but no large	**Possible** Species recorded within locality	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					and tablelands of the Great Dividing Range, and rarely from the coast. Lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.		undisturbed remnant vegetation present within Subject Land.	and marginal habitat present.	
Circus assimilis	Spotted Harrier	V			Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn). Preys on terrestrial mammals (eg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion. Occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania.		**Present** Suitable habitat present in the form of eucalypt woodland and open grassy habitat or woodland present.	**Possible** Habitat present but no records within locality.	**Yes** AoS undertaken.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V			Found in eucalypt woodlands (including Box-Gum, stringybarks or other rough-barked eucalypts) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and *Eucalyptus camaldulensis* Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses. Usually not found in woodlands with a dense shrub layer. Fallen timber is an important habitat component for foraging. Terrestrial and arboreal in about equal proportions; active, noisy and conspicuous while foraging on trunks and branches of trees and amongst fallen timber; spend much more time foraging on the ground and fallen logs than other treecreepers.		**Present** Eucalypt woodland present.	**Possible** Suitable habitat present but no records within locality.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					Western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell.				
Daphoenositta chrysoptera	Varied Sittella	V			Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. Sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west.	4 records within locality	**Present** Eucalypt woodland present.	**Possible** Suitable habitat and numerous records within locality.	**Yes** AoS undertaken.
Epthianura albifrons	White-fronted Chat	V			Found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation and mangroves but also in open grasslands and sometimes in low shrubs bordering wetland areas. Nests are usually built about 23 cm above the ground (but have been found up to 2.5 m above the ground).		**Marginal** Species known to use woodland occasionally when adjacent to suitable habitat. No other suitable habitat identified.	**Unlikely** Habitat is not likely to be preferred by or support this species. No records within locality.	**No** Species not likely to occur.
Falco hypoleucos	Grey Falcon	E		V	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.		**Absent** No arid or semi-arid grassland,	**Unlikely** Marginal habitat present and	No Species unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken.		shrbland or woodland present.	no records within locality.	
Falco subniger	Black Falcon	V			Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993). Occurs as solitary individuals, in pairs, or in family groups of parents and offspring.		**Marginal** Some marginally suitable habitat present in the form of eucalypt woodland, grassy habitat or woodland.	**Possible** Some marginal habitat present	**Yes** AoS undertaken.
Gallinago hardwickii	Latham's Snipe			M	Usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). Known to occur in the upland wetlands of the New England Tablelands and Monaro Plateau.		**Absent** No aquatic habitat present that would support this species.	**Unlikely** No suitable habitat present that would support this species. No records within locality.	**No** Species not likely to occur.
Grantiella picta	Painted Honeyeater	V		V	Nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema.* Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe		**Present** Eucalypt woodland present.	**Possible** Suitable habitat present. No records within locality.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					branches.				
Haliaeetus leucogaster	White-bellied Sea Eagle	V		M	Distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Also occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'		**Absent** No aquatic habitat present that would support this species.	**Unlikely** No suitable habitat present that would support this species. No records within the locality.	**No** Species not likely to occur.
Hieraaetus morphnoides	Little Eagle	V			The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. Occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland, Sheoak or Acacia woodlands, and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.		**Present** Eucalypt woodland present.	**Possible** Suitable habitat present.	**Yes** AoS undertaken.
Hirundapus caudacutus	White-throated Needletail			V, M	In Australia, it is almost exclusively aerial, from heights of 1 m to 1000m. Conventional habitat descriptions are in applicable however, certain preferences are exhibited by the species. Recorded most often over wooded areas and known to fly between trees in the canopy.	1 record within locality	**Present** Woodland present.	**Possible** Habitat present and 1 record within locality.	**No** Species is almost exclusively aerial.
Lathamus discolor	Swift Parrot	CE		CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the		**Marginal** Eucalypt woodland	**Unlikely** Marginal habitat	**No** Species unlikely to

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between March and October. No breeding in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*.		present, however not preferred Eucalypts.	present. No records within locality.	occur.
Lophoictinia isura	Square-tailed Kite	V			The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, it is a regular resident in the north, north-east and along the major west-flowing river systems. Found in a variety of timbered habitats including dry woodlands and open forests. Preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Appears to occupy large hunting ranges of more than 100km2. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.		**Present** Eucalypt woodland present.	**Possible** Suitable habitat present but no records within locality.	**Yes** AoS undertaken.
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V			Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Perches on low dead stumps and fallen timber or on low-hanging branches. Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season. Nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1-5 m above the ground. Widespread across Australia, except for the driest deserts and the wetter coastal areas -		**Present** Eucalypt woodland present adjacent to open areas.	**Possible** Suitable habitat present but no records within locality.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					northern and eastern coastal Queensland and Tasmania. Considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies *picata*.				
Motacilla flava	Yellow Wagtail			M	Occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. In the north of its range, it is also found in large forest clearings. Breeds from April to August, although this varies with latitude.		**Present** Damp, wet habitat present.	**Possible** Suitable habitat present. No records within the locality.	**No** Species is highly mobile migrating far distances. It is unlikely to rely on present habitat to be impacted.
Myiagra cyanoleuca	Satin Flycatcher			M	Found along the east coast of Australia in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. Nests in loose colonies of two to five pairs nesting at intervals of about 20-50 m apart. It builds a broad-based, cup-shaped nest of shredded bark and grass, coated with spider webs and decorated with lichen. The nest is placed on a bare, horizontal branch, with overhanging foliage, about 3-25 m above the ground.		**Absent** No tall moist eucalypt forest present.	**Unlikely** No records within the locality, and no suitable habitat present.	**No** Species is highly mobile migrating far distances. It is unlikely to rely on present habitat to be impacted.
Neophema pulchella	Turquoise Parrot	V			Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. Range extends from southern Queensland through to northern Victoria, from the		**Present** Eucalypt woodland present adjoining clearing.	**Possible** Suitable habitat present. Not recorded within locality.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					coastal plains to the western slopes of the Great Dividing Range.				
Ninox connivens	Barking Owl	V			Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Breeds along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. Roosts in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. Hunts small arboreal mammals such as Squirrel Gliders and Common Ringtail Possums, but becomes more reliant on birds, invertebrates, bats and terrestrial mammals such as rodents and rabbits when key food is sparse. Requires very large permanent territories in most habitats due to sparse prey densities, over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats. 2-3 eggs are laid in hollows of large, old living or dead trees. Nest sites are used repeatedly over years by a pair, but may switch sites if disturbed by predators. Nesting occurs mid-winter and spring. Common in parts of northern Australia, but now sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests.		**Present** Eucalypt woodland present.	**Possible** Suitable habitat present but no records within the locality.	**Yes** AoS undertaken.
Ninox strenua	Powerful Owl	V			The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia*	2 records within locality	**Present** Eucalypt woodland present.	**Possible** Suitable habitat present with two records within locality.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					melanoxylon, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species.				
Numenius madagascariensis	Eastern Curlew	CE		CE	In NSW, occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. Generally occupies coastal lakes, inlets, bays and estuarine habitats, and in NSW is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. Forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. Roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. May also roost on wooden oyster leases or other similar structures. Is carnivorous, mainly eating crustaceans.		**Absent** No aquatic habitat present that would support this species.	**Unlikely** No suitable habitat present that would support this species. No records within the locality.	**No** Species not likely to occur.
Oxyura australis	Blue-billed Duck	V			Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. Completely aquatic, swimming low in the water along the edge of dense cover. Feeds by day far from the shore, particularly if dense cover is available in the central parts of the wetland. They feed on the bottom of swamps eating seeds, buds, stems, leaves, fruit and small aquatic insects such as the larvae of midges, caddisflies and dragonflies. Partly migratory, with short-distance movements between breeding swamps and overwintering lakes with some long-distance dispersal to breed during spring and early summer. Nest solitarily in Cumbungi over deep water between September and February, and in trampled vegetation in Lignum, sedges or Spike-rushes, where a bowl-shaped nest is constructed.		**Absent** No aquatic habitat present that would support this species.	**Unlikely** No suitable habitat present that would support this species. No records within locality.	**No** Species not likely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					Young birds disperse in April-May from their breeding swamps in inland NSW to non-breeding areas on the Murray River system and coastal lakes. Endemic to south-eastern and south-western Australia. Widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas.				
Pachycephala olivacea	Olive Whistler	V			Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes. Forage in trees and shrubs and on the ground, feeding on berries and insects. Make nests of twigs and grass in low forks of shrubs.		**Absent** Wet forest not present.	**Unlikely** Suitable habitat not present.	**No** Species is unlikely to occur.
Petroica boodang	Scarlet Robin	V			Lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. Lives in both mature and regrowth vegetation. Occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber, which are important components of its habitat. Breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; and occasionally found up to 1000m in altitude. Primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. In autumn and winter, many live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. Found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding they disperse to the lower valleys and plains of the	5 records within locality	**Present** Eucalypt woodland present.	**Possible** Suitable habitat present and recorded within locality.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter.				
Petroica phoenicea	Flame Robin	V			Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understorey. Ground layer of breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. In winter birds migrate to drier more open habitats in the lowlands. Often occurs in recently burnt areas. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees.	3 records within locality	**Present** Eucalypt woodland present.	**Possible** Suitable habitat present and recorded within locality.	**Yes** AoS undertaken.
Petroica rodinogaster	Pink Robin	V			Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies		**Marginal** Rainforest not present. Open eucalypt forest present though.	**Unlikely** Marginal habitat present. No records within locality.	**No** Species unlikely to occur.
Polytelis swainsonii	Superb Parrot	V		V	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. Breed September-January. May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feeds in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds, herbaceous plants, fruits, berries, nectar, buds, flowers, insects and grain. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly		**Present** Eucalypt woodland present.	**Possible** Suitable habitat present. No records within locality.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild.				
Rhipidura rufifrons	Rufous Fantail			M	In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (*Eucalyptus microcorys*), Mountain Grey Gum (*E. cypellocarpa*), Narrow-leaved Peppermint (*E. radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (*E. pilularis*) or Red Mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns.		**Absent** No wet sclerophyll forest present.	**Unlikely** No suitable habitat present and no records within locality.	**No** Species is unlikely to occur.
Rostratula australis	Australian Painted Snipe	E		E	A small freshwater wader restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella and wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves.		**Absent** No aquatic habitat present that would support this species.	**Unlikely** No suitable habitat present that would support this species. No records within the locality.	**No** Species not likely to occur.
Stagonopleura guttata	Diamond Firetail	V			Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other		**Present** Eucalypt woodland present.	**Possible** Suitable habitat present. No records within	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Usually encountered in flocks of between 5-40 birds, occasionally more. Groups separate into small colonies to breed, between August and January. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Appears to be sedentary, though some populations move locally, especially those in the south. Has been recorded in some towns and near farm houses. Endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Cental and South Western Slopes and the North West Plains and Riverina.			locality.	
Tyto novaehollandiae	Masked Owl	V			Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.		**Present** Eucalypt woodland present.	**Possible** Suitable habitat present but not recorded within locality.	**Yes** AoS undertaken.
Tyto tenebricosa	Sooty Owl	V			Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*). Nests in very large tree-hollows.		**Absent** No rainforest or moist eucalypt forest present.	**Unlikely** No suitable habitat present and not recorded within locality.	**No** Species unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Mammals									
Cercartetus nanus	Eastern Pygmy Possum	V			Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, except in north-eastern NSW where they are encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.;		**Present** Sclerophyll forest present.	**Possible** Suitable habitat present but not recorded within locality.	**Yes** AoS undertaken.
Dasyurus maculatus maculatus	Spotted-Tailed Quoll (South-Eastern Mainland Population)	V		E	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Mostly nocturnal, although will hunt during the day; spend most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting	2 records within locality	**Present** Eucalypt woodland.	**Possible** Species not recorded within the locality however some suitable habitat present.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					birds. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals.				
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V			Found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer.		**Present** No moist tall eucalypt forest present.	**Unlikely** Species not recorded within the locality and no suitable habitat present.	**No** Species unlikely to occur.
Mastacomys fuscus	Broad-toothed Rat	V		V	The Broad-toothed Rat lives in a complex of runways through the dense vegetation of its wet grass, sedge or heath environment, and under the snow in winter. The Broad-toothed rat inhabits high rainfall areas. They prefer a moderate-to-dense ground cover of grasses or sedges, with shrubs usually present, particularly along valley floors near to streams. Although the Broad-toothed Rat is found from coastal environments to high altitude areas its main strongholds are mostly in subalpine and alpine regions.		**Marginal** Grass and sedge environment present but not a wet high rainfall area.	**Unlikely** Marginal habitat present. No records within locality.	**No** Species unlikely to occur.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V			Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very	2 records within locality	**Present** Eucalypt woodland present.	**Possible** Species not recorded within the locality however	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops.			some suitable habitat present.	
Myotis macropus	Southern Myotis	V			Found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.;2|In NSW females have one young each year usually in November or December.		**Present** Eucalypt woodland present.	**Possible** Species not recorded within the locality however some suitable habitat present.	**Yes** AoS undertaken.
Nyctophilus corbeni	Corben's Long-eared Bat	V		V	Overall, the distribution coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark. Mating takes place in autumn with one or two young born in late spring to early summer.		**Present** Eucalypt woodland present.	**Possible** Species not recorded within the locality however some suitable habitat present.	**No Yes** AoS undertaken.
Petauroides volans	Greater Glider			V	The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands Greater Gliders are forest dependent and prefer older tree age classes in moist forest types. They use hollow-bearing trees for shelter and nesting, with each family group using multiple den trees within its home range. They eat mainly	4 records within locality	**Absent** No old growth forest or moist forest with minimal hollows present.	**unlikely** No suitable habitat present..	**Nos** Species unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					young eucalypt leaves, with a preference for certain species.				
Petaurus australis	Yellow-bellied Glider	V			Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	3 records within locality	**Absent** No tall moist forest present.	**Unlikely** No suitable habitat present.	**No** Species unlikely to occur.
Petaurus australis - endangered population	Yellow-bellied Glider population on the Bago Plateau	E			Den, often in family groups, in hollows of large trees. The habitat on the Bago Plateau consists of tall wet sclerophyll forest dominated by *Eucalyptus delegatensis* (Alpine Ash), *E. dalrympleana* (Mountain Gum), *E. radiata* (Narrow-leaved Peppermint) and *E. rubida* (Candlebark).		**Absent** No tall wet sclerophyll forest present.	**Unlikely** No suitable habitat present.	**No** Species unlikely to occur.
Petaurus norfolcensis	Squirrel Glider	V			Widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.		**Marginal** Eucalypt woodland present with a midstorey of scrub acacia present. However, habitat is highly fragmented and has minimal hollows. Species relies on hollows and a non-fragmented patch of woodlan.	**Unlikely** Marginalhabit at present. No recorded within the locality.	**No** Habitat is highly fragmented and with minimum hollows.
Phascogale	Brush-tailed	V			Prefer dry sclerophyll open forest with sparse		**Marginal**	**Unlikely**	**No**

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
tapoatafa	Phascogale				groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater.. Nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span.		Dry sclerophyll forest present, however no hollow bearing trees present.	Marginal habitat present but lack of hollows. Not recorded within the locality.	Species unlikely to occur.
Phascolarctos cinereus	Koala	V		E	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery.	1 record within locality	**Marginal** Eucalypt woodland present, however not preferred foraging tree species.	**Unlikely** Marginal habitat present. One record within locality but is from 1970.	**No** Species unlikely to occur.
Pseudomys fumeus	Smoky Mouse	CE		E	The Smoky Mouse appears to prefer heath habitat on ridge tops and slopes in sclerophyll forest, heathland and open-forest from the coast (in Victoria) to sub-alpine regions of up to 1800 metres, but sometimes occurs in ferny gullies. Nesting burrows have been found in rocky localities among tree roots and under the skirts of Grass Trees *Xanthorrhoea* spp.		**Marginal** Sclerophyll forest present but highly degraded.	**Unlikely** Marginal habitat present. No records within locality.	**No** Species unlikely to occur.
Pteropus poliocephalus	Grey-headed Flying-fox	V		V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located		**Present** Eucalypt woodland present.	**Possible** Species not recorded within the	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					65within 20 km of a regular food source and commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, giving birth and rearing young. Annual mating commences in January and a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50km from the camp to forage; commuting distances are more often <20 km. Feed on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia,* and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops.			locality however some suitable habitat present. No breeding camps within Subject Land.	
Amphibians									
Crinia sloanei	Sloane's Froglet	V			It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. Recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. At a number of sites where records are verified by museum specimens, the species has not been subsequently detected during more recent frog surveys in the vicinity (e.g. Holbrook, Nyngan, Wagga Wagga and Tocumwal).		**Marginal** Potential for periodic inundated areas to occur.	**Unlikely** Marginal habitat present. No records within locality.	**No** Species not likely to occur.
Litoria booroolongensis	Booroolong Frog	E		E	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Shelter under rocks or amongst vegetation near the ground on the stream edge. Sometimes bask in the sun on exposed rocks near flowing water during summer. Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing connected or isolated pools.		**Present** Tumbarumba Creek present with native vegetation with sedges and grasses.	**Possible** Suitable habitat present within Subject Land.	**Yes** AoS undertaken.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Litoria spenceri	Spotted Tree Frog	CE		E	Occur among boulders or debris along naturally vegetated, rocky fast flowing upland streams and rivers. In summer, during the breeding season, adults bask on large in-stream boulders while juveniles occupy shingle banks. In winter animals are thought to hibernate in vegetation outside of the main stream environment. Eggs are deposited under large instream boulders.		**Present** Tumbarumba Creek present with native vegetation with sedges and grasses.	**Possible** Suitable habitat present within Subject Land.	**Yes** AoS undertaken.
Litoria verreauxii alpina	Alpine Tree Frog	E		V	Found in a wide variety of habitats including woodland, heath, grassland and herb fields. Breed in natural and artificial wetlands including ponds, bogs, fens, streamside pools, stock dams and drainage channels that are still or slow flowing. It does not climb well, and spends most of its time on the ground. Males call from the water at the edges of the pools, and eggs are attached to submerged vegetation. Non-breeding habitat and overwintering refuges are poorly known but are likely to include flat rocks, fallen logs, leaf litter and other ground debris.		**Marginal** Habitat present but in NSW species is found at altitudes around 1200-150 meters above sea level. The Subject Land is only 622-657 meters about sea level.	**Unlikely** Marginal habitat present but too low of elevation. No records within locality.	**No** Species not likely to occur.
Pseudophryne pengilleyi	Northern Corroboree Frog	CE		CE	Summer breeding habitat is pools and seepages in sphagnum bogs, wet heath, wet tussock grasslands and herbfields in low-lying depressions. Tadpoles overwinter in the pools, feed and grow slowly through spring as the water warms and metamorphose in early summer. Outside the breeding season adults move away from the bogs into the surrounding heath, woodland and forest to overwinter under litter, logs and dense groundcover.		**Absent** Sphagnum bogs not present within Subject Land.	**Unlikely** No suitable habitat present. No records within locality.	**No** Species not likely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
Retiles									
Aprasia parapulchella	Pink-tailed Worm-lizard	V		V	Known from the Central and Southern Tablelands, and the South Western Slopes. A concentration of populations in the Canberra/Queanbeyan Region, Cooma, Yass, Bathurst, Albury and West Wyalong. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda triandra*). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites. Feeds on the larvae and eggs of the ants with which it shares its burrows.		**Absent** Rocky outcrops and partially buried rocks absent throughout Proposal.	**Unlikely** Unsuitable habitat and no records within locality.	**No** Species unlikely to occur.
Delma impar	Striped Legless Lizard	V		V	The Striped Legless Lizard is a grassland specialist. Potential habitat for the Striped Legless Lizard includes all areas which have, or once had, native grasslands or grassy woodlands (including derived grasslands) across the historical range of the species, provided that area retains suitable tussock structure, the soil is of appropriate type and structure, and the site has not had major disturbance such as ploughing. All occupied sites have a grassy ground cover, often with a mixture of native and exotic perennial and annual species of tussock-forming grasses (often >20–50% cover). the species is now known to occur in some areas dominated by introduced species such as *Phalaris aquatica*, Serated Tussock (*Nasella trichotoma*) and *Hypocharis radicata*.		**Absent** Tussock grasses not present within Subject Land.	**Unlikely** No suitable habitat present.	**No** Species unlikely to occur.
Suta flagellum	Little Whip Snake	V			Occurs in Natural Temperate Grasslands and grassy woodlands, including those dominated by Snow Gum *Eucalyptus pauciflora* or Yellow Box *E. melliodora*. Also occurs in secondary grasslands derived from clearing of woodlands.		**Marginal** Grasslands present. However, scattered rocks not	**Unlikely** Marginal habitat present. No records within locality.	**No** Species is unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					Found on well drained hillsides, mostly associated with scattered loose rocks. Most specimens have been found under rocks or logs lying on, or partially embedded in the soil.		present within Subject Land.		
Varanus rosenbergi	Rosenberg's Goanna	V			Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.		**Marginal** Open forest present. However, lack of termite mounds present.	**Unlikely** Marginal habitat present. No records within locality.	**No** Species unlikely to occur.
Fish									
Euastacus armatus	Murray Crayfish		V		Murray Crayfish can be found in a variety of habitats ranging from pasture-lands to sclerophyll forest. They prefer cool, flowing water that is well oxygenated. The species is tolerant of water temperatures up to 27°C and moderate salinities, but are intolerant to low dissolved oxygen concentrations. They are most active between May to October when water temperatures are below 20°C and when the water warms in summer they tend to become less active. They create burrows that vary in complexity, from deep burrows with multiple entrances to simple burrows under a rock or log.		**Present** Tumbarumba Creek is present within the Subject Land and is mapped as present in Tumbarumaba Creek on DPIE Fishiers Portal	**Likely** Suitable habitat present and mapped as occurring within Tumbarumba Creek.	**Yes** AoS undertaken.
Galaxias rostratus	Flathead Galaxias		CE	CE	Below 150 m in altitude. Billabongs, lakes, swamps, and rivers, with preference for still or slow-flowing waters.		**Absent** Drainage lines and streams within the Subject Land would not support this species.	**Unlikely** No habitat present within the Subject Land would support this species.	**No** Species would not occur.
Maccullochella macquariensis	Trout Cod	E	E	E	Trout Cod tend to occupy areas which have lots of large in-stream woody debris or 'snags', which		**Absent** No large in-	**Unlikely** Suitable habit	**No** Species

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					provide complex habitats for each stage of the species' life cycle. They tend to remain at the one site with limited home ranges.		stream woody debris or snags present.	at not present. No records within locality.	unlikely to occur.
Maccullochella peelii	Murray Cod			V	Murray Cod generally prefer slow flowing, turbid water in streams and rivers, favouring deeper water around boulders, undercut banks, overhanging vegetation and logs.		**Absent** Fast moving creek present with no undercut banks, boulders or overhanging vegetation.	**Unlikely** No suitable habitat present. No records within locality.	**No** Species unlikely to occur.
Macquaria australasica	Macquarie Perch		E	E	A riverine, schooling species, they are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury/Nepean and Shoalhaven catchments. Has been long-term declines in their abundance. Inhabit cool, shaded pristine streams and rivers. Prefers clear water and deep rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks.		**Absent** Creek present is very murky and turbid and lack of cover present.	**Unlikely** No habitat present within the Subject Land would support this species.	**No** Species unlikely to occur.
Insects									
Synemon plana	Golden Sun Moth	E		CE	Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses *Austrodanthonia* spp. Grasslands dominated by wallaby grasses are typically low and open - the bare ground between the tussocks is thought to be an important microhabitat feature for the Golden Sun Moth, as it is typically these areas on which the females are observed displaying to attract males. Habitat may contain several wallaby grass species, which are typically associated with other grasses particularly spear-grasses *Austrostipa* spp. or		**Absent** Groundlayer lacked Wallaby Grasses.	**Unlikely** No suitable habitat present.	**No** Species unlikely to occur.

Scientific Name	Common Name	NSW BC Act	NSW FM Act	Federal EPBC Act	Habitat	Number of Records	Presence of habitat	Likelihood of Occurrence	Possible Impact
					Kangaroo Grass *Themeda australis*.				

Appendix D BC Act Assessment of Significant Impact (AoS)

Section 7.3 of the *Biodiversity Conservation Act 2016* specifies five factors to be taken into account in deciding whether a development is likely to significantly affect threatened species, populations or ecological communities, or their habitats, listed at the state level under the Act.

This *Five–part Test* characterises the significance of likely impacts associated with the Proposal on the following threatened entities:

- Flora:
  - Austral Toadflax (Thesium australe) BC – V
- Woodland Birds:
  - Regent Honeyeater (*Anthochaera phrygia*) BC – CE
  - Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) BC - V
  - Speckled Warbler (*Chthonicola sagittata*) BC - V
  - Brown Tree Creeper (eastern subspecies) (*Climacteris picumnus victoriae*) BC - V
  - Varied Sittella (*Daphoenositta chrysoptera*) BC - V
  - Painted Honeyeater (*Grantiella picta*) BC – V
  - Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*) BC - V
  - Scarlet Robin (*Petroica boodang*) BC - V
  - Flame Robin (*Petroica phoenicea*) BC - V
  - Diamond Firetail (*Stagonopleura guttata*) BC - V
- Hollow-dependent birds:
  - Masked Owl (Tyto novaehollandiae) BC - V
  - Barking Owl (Ninox connivens) BC - V
  - Powerful Owl (Ninox strenua) BC - V
  - Gang-gang Cockatoo (Callocephalon fimbriatum) BC - V
  - Turquoise Parrot (Neophema pulchella) BC - V
  - Superb Parrot (Polytelis swainsonii) BC – V
- Raptors:
  - Spotted Harrier (*Circus assimilis*) BC - V
  - Black Falcon (*Falco subniger*) BC - V
  - Little Eagle (*Hieraaetus morphnoides*) BC - V
  - Square-tailed Kite (*Lophoictinia isura*) BC - V
- Amphibians
  - Booroolong Frog (Litoria booroolongensis) BC – E
  - Spotted Tree Frog (Litoria spenceri) BC – CE
- Mammals
  - Eastern Pygmy Possum (Cercartetus nanus) BC - V
  - Spotted-tailed Quoll (Dasyurus maculatus maculatus) BC – V
- Bats:
  - Large Bent-winged Bat (Miniopterus orianae oceanensis) BC - V

- Southern Myotis (Myotis macropus) BC - V
- Corben's Long-eared Bat (Nyctophilus corbeni) BC – V
- Grey-headed Flying-fox (Pteropus poliocephalus) BC – V

a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Flora

Potential habitat for the Austral Toadlflax (*Thesium austral*) occurs within the Subject Land as grassy woodland. Austral Toadflax was not recorded during the site visit; however, as this species is a root parasite, often found in association with Kangaroo Grass (*Themeda australis*) (recorded within the site), the presence of this species within the Subject Land cannot be ruled out.

Up to 0.04ha of native vegetation, potentially suitable for this species, would be removed by the proposed development. Vegetation to be removed represents approximately less than 0.05% of PCT 285 habitat within the wider locality **(DPE, 2022)**. Given the pre-disturbed and highly exotic nature of the Subject Land, it is considered unlikely that the Proposal would have an adverse effect on the life cycle of this species such that a local viable population would be placed at risk of extinction.

Mitigation measures have been proposed to protect this species from excessive clearing and further spread of weeds.

An unexpected threatened species find procedure has been recommended.

Woodland Birds

Potential habitat, in the form of dry sclerophyll forests, occurs within the Subject Land for:

- Regent Honeyeater (*Anthochaera phrygia*)
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)
- Speckled Warbler (*Chthonicola sagittata*)
- Brown Tree Creeper (eastern subspecies) (*Climacteris picumnus victoriae*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Painted Honeyeater (*Grantiella picta*)
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*)
- Scarlet Robin (*Petroica boodang*)
- Flame Robin (*Petroica phoenicea*)
- Diamond Firetail (*Stagonopleura guttata*)

These species were not recorded during the site visit; however, suitable habitat occurs within the Subject Land. Up to 0.40ha of forest vegetation, potentially suitable for these species, would be removed by the proposed development. Vegetation to be removed represents less than 0.05% of PCT 285 habitat within the wider locality based on state vegetation mapping **(DPE, 2022)**. Given the pre-disturbed and highly exotic nature of the Subject Land, it is considered that these species would be more likely to occur within vegetation associated with Tumbarumba Creek and the nearby TSR. Considering that the Subject Land already contains an operational quarry, it is unlikely that the Proposal would have an adverse effect on the life cycle of these species, such that a local viable population would be placed at risk of extinction.

Mitigation measures have been proposed to protect these species from excessive clearing. An unexpected threatened species find procedure has been recommended.

Hollow-dependent Birds

Potential habitat, in the form of dry sclerophyll forests and one HBT, occurs within the Subject Land for:

- Masked Owl (*Tyto novaehollandiae*)
- Barking Owl (*Ninox connivens*)
- Powerful Owl (*Ninox strenua*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Turquoise Parrot (*Neophema pulchella*)
- Superb Parrot (*Polytelis swainsonii*)

These species were not recorded during the site visit; however, suitable habitat occurs within the Subject Land. Up to 0.40ha of forest vegetation including one HBT potentially suitable for these species would be removed by the proposed development. Vegetation to be removed represents approximately 0.05% of PCT 285 habitat within the wider locality based on state vegetation mapping **(DPE, 2022)**. Given the pre-disturbed and highly exotic nature of the Subject Land, it is considered that these species would be more likely to occur and nest within vegetation located along Tumbarumba Creek and the nearby TSR. It is considered that the removal of one HBT from within the Subject Land would not have an adverse impact on these species. Given that the Subject Land already contains an operational quarry, it is unlikely that the Proposal would have an adverse effect on the life cycle of these species, such that a local viable population would be placed at risk of extinction.

Mitigation measures have been proposed to protect these species from excessive clearing. An unexpected threatened species find procedure has been recommended.

Raptors

Potential habitat, in the form of dry sclerophyll forests , occurs within the Subject Land for:

- Spotted Harrier (*Circus assimilis*)
- Black Falcon (*Falco subniger*)
- Little Eagle (*Hieraaetus morphnoides*)
- Square-tailed Kite (*Lophoictinia isura*)

These species were not recorded during the site visit; however, suitable habitat occurs within the Subject Land. Up to 0.65ha of native vegetation, potentially suitable for these species, would be removed by the proposed development. Vegetation to be removed represents less than 0.05% of PCT 285 habitat within the wider locality **(DPE, 2022)**. Given the pre-disturbed and highly exotic nature of the Subject Land, it is considered that these species would be more likely to occur within vegetation located along Tumbarumba Creek and the nearby TSR. Considering that the Subject Land already contains an operational quarry, it is unlikely that the Proposal would have an adverse effect on the life cycle of these species, such that a local viable population would be placed at risk of extinction.

Mitigation measures have been proposed to protect these species from excessive clearing. An unexpected threatened species find procedure has been recommended.

Amphibians

Potential habitat, in the form of an ephemeral stream passing through two farm dams, occurs within the Subject Land for:

- Booroolong Frog (*Litoria booroolongensis*)
- Spotted Tree Frog (*Litoria spenceri*)

These species were not recorded during the site visit; however, suitable habitat occurs within the Subject Land. Up to 0.21ha of aquatic habitat, potentially suitable for these species, would be removed by the proposed development. Habitat to be removed represents approximately 0.08% of aquatic habitat within the wider locality **(DPE, 2022)**. Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams were observed to have low shallow flows, it is likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek. Considering that the Subject Land already contains an operational quarry, it is unlikely that the Proposal would have an adverse effect on the life cycle of these species, such that a local viable population would be placed at risk of extinction.

Mitigation measures have been proposed to protect aquatic habitat occurring within and adjacent to the Subject Land. An unexpected threatened species find procedure has been recommended.

Mammals

Potential habitat, in the form of dry sclerophyll forest and one HBT, occurs within the Subject Land for:

- Eastern Pygmy Possum (*Cercartetus nanus*)
- Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)

These species were not recorded during the site visit; however, suitable habitat occurs within the Subject Land. Up to 0.65ha of native vegetation including one HBT potentially suitable for these species would be removed by the proposed development. Vegetation to be removed represents approximately 0.05% of PCT 285 habitat within the wider locality based on state vegetation mapping **(DPE, 2022)**. Given the pre-disturbed and highly exotic nature of the Subject Land, it is considered that these species would be more likely to occur and breed within vegetation located along Tumbarumba Creek and the nearby TSR. It is considered that the removal of one HBT from within the Subject Land would not have an adverse impact on these species. Given that the Subject Land already contains an operational quarry, it is unlikely that the Proposal would have an adverse effect on the life cycle of these species, such that a local viable population would be placed at risk of extinction.

Mitigation measures have been proposed to protect these species from excessive clearing. An unexpected threatened species find procedure has been recommended.

Bats

Potential habitat, in the form of dry schlerophyll forests and one HBT, occurs within the Subject Land for:

- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*)
- Corben's Long-eared Bat (*Nyctophilus corbeni*)
- Grey-headed Fly-fox (*Pteropus poliocephalus*)

These species were not recorded during the site visit; however, suitable habitat occurs within the Subject Land. Up to 0.65ha of forest vegetation including one HBT potentially suitable for these species would be removed by the proposed development. Vegetation to be removed represents approximately 0.05% of PCT 285 habitat within the wider locality **(DPE, 2022)**. Given the pre-disturbed and highly exotic nature of the Subject Land, it is considered that these species would be more likely to occur and breed within vegetation located along Tumbarumba Creek and the nearby TSR. No caves or manmade structures, suitable for breeding, were observed within the Subject Land. It is considered that the removal of one HBT from within the Subject Land would not have an adverse impact on these species. Given that the Subject Land already contains an operational quarry, it is unlikely that the Proposal would have an adverse effect on the life cycle of these species, such that a local viable population would be placed at risk of extinction.

Mitigation measures have been proposed to protect these species from excessive clearing. An unexpected threatened species find procedure has been recommended.

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: ***a. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*** *b.* ***Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***
Not applicable.
c) In relation to the habitat of a threatened species or ecological community: ***i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*** ***ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*** *iii.* ***the importance of the habitat to be removed, modified, fragmented or isolated to the long–term survival of the species or ecological community in the locality.***
Flora
i. Around 0.04 ha of native vegetation suitable for this species would be removed by the Proposal. ii. The Subject Land is already fragmented as a result of the existing quarry. The Proposal would not cause further fragmentation of the Subject Land. iii. The area of habitat to be disturbed/removed is small (0.05%) given the local context. This habitat is not likely to be important for this species, given the previous disturbance associated with the existing quarry and accompanying infrastructure.
Woodland Birds
i. Around 0.40ha of suitable vegetation would be removed by the Proposal. ii. The Subject Land is already fragmented as a result of the existing quarry. The Proposal would not cause further fragmentation of the Subject Land. iii. The area of habitat to be disturbed/removed is small (0.05%) given the local context. This habitat is not likely to be important for this species, given the previous disturbance associated with the existing quarry and accompanying infrastructure.
Hollow-dependent Birds
i. Around 0.40ha of suitable vegetation including one HBT would be removed by the Proposal. ii. The Subject Land is already fragmented as a result of the existing quarry. The Proposal would not cause further fragmentation of the Subject Land. iii. The area of habitat to be disturbed/removed is small (0.05%) given the local context. This habitat is not likely to be important for this species, given the previous disturbance associated with the existing quarry and accompanying infrastructure.
Raptors
i. Around 0.65ha of suitable vegetation including one HBT would be removed by the Proposal. ii. The Subject Land is already fragmented as a result of the existing quarry. The Proposal would not cause further fragmentation of the Subject Land.

iii. The area of habitat to be disturbed/removed is small (0.05%) given the local context. This habitat is not likely to be important for this species, given the previous disturbance associated with the existing quarry and accompanying infrastructure.

Amphibians

i. Around 0.21ha of aquatic habitat would be removed by the Proposal.
ii. The Subject Land is already fragmented as a result of the existing quarry. The Proposal would not cause further fragmentation of the Subject Land.
iii. The area of habitat to be disturbed/removed is small (0.08%) given the local context. This habitat is not likely to be important for this species, given the previous disturbance associated with the existing quarry and accompanying infrastructure.

Mammals

i. Around 0.65ha of native vegetation including one HBT would be removed by the Proposal.
ii. The Subject Land is already fragmented as a result of the existing quarry. The Proposal would not cause further fragmentation of the Subject Land.
iii. The area of habitat to be disturbed/removed is small (0.05%) given the local context. This habitat is not likely to be important for this species, given the previous disturbance associated with the existing quarry and accompanying infrastructure.

Bats

i. Around 0.40ha of native vegetation and one HBT would be removed by the Proposal.
ii. The Subject Land is already fragmented as a result of the existing quarry. The Proposal would not cause further fragmentation of the Subject Land.
iii. The area of habitat to be disturbed/removed is small (0.05%) given the local context. This habitat is not likely to be important for this species, given the previous disturbance associated with the existing quarry and accompanying infrastructure.

d) Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

No areas of outstanding biodiversity value would be impacted directly or indirectly by the proposed works.

e) Whether the action proposed constitutes or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Refer to Table 5-4.

Conclusion

The impacts of the Proposal on the assessed threatened species listed under the BC Act are manageable. A significant impact is considered unlikely, based on the following conclusions:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- No substantial contribution to any Key Threatening Process are expected

- Mitigation measures have been recommended to further reduce impacts to biodiversity
- No impact on an important population of this species is expected by the proposed works.

Appendix E EPBC Test of Significant Impact (ToS)

Vulnerable Species

The *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) specifies factors to be taken into account in deciding whether a development is likely to significantly affect Endangered Ecological Communities, threatened species and migratory species, listed at the Commonwealth level. These assessments characterise the significance of likely impacts associated with the Proposal on the following **Vulnerable** species:

- Flora:
  - Austral Toadflax (*Thesium australe*) EPBC - V
- Woodland Birds:
  - Painted Honeyeater (*Grantiella picta*) EPBC - V
  - Superb Parrot (*Polytelis swainsonii*) EPBC - V
- Bats:
  - Corben's Long-eared Bat (*Nyctophilus corbeni*) EPBC - V
  - Grey-headed Flying-fox (*Pteropus poliocephalus*) EPBC – V

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
a) Will the action lead to a long-term decrease in the size of an important population of a species?
Austral Toadflax (*Thesium australe*)
Austral Toadflax was not recorded during the site survey; however, habitat suitable to this species occurs within the Subject Land as grassy woodland. There is no national recovery plan for this species; however, it has been listed under a Priorities Action Statement (PAS) (DPE, 2018). An important population is defined as, a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal. • populations that are necessary for maintaining genetic diversity, and/or, • populations that are near the limit of the species range. Under the PAS, no key management sites are mapped for this species. Fifteen priority actions have been identified to help recover the Austral Toadflax within NSW (DPE, 2018): • Undertake monitoring of populations to assess habitat quality, threats and ameliorative actions • Encourage community participation in implementation of recovery actions for the species • Consult with Aboriginal communities when undertaking actions on sites of cultural significance • Finalise completion of the recovery plan by 2007 • Implement Bitou bush control as described in the approved TAP • Control feral animals in key habitat • Control weeds in known habitat for this species • Determine if and/or where an ecological burn is required • Liaise with public agencies and private landowners over the implementation of management actions for the species • Prepare and distribute a species profile to landholders, land managers and consent authorities

- Develop and distribute standard survey and impact assessment guidelines
- Support funding for management work in habitat for the species and carry out habitat maintenance and protection at known locations for the species
- Implement control programs for rabbits and reduce impact of cattle through strategic grazing or exclusion
- Undertake and support research into key aspects of the biology and ecology of Austral Toadflax that are likely to provide information that assists with management of the species
- Undertake annual monitoring of populations to provide information on the lifecycle of the species

The Proposal would result in the disturbance and removal of up to 0.04ha of derived grassland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land, it is considered unlikely that the Proposal would have an adverse effect on the life cycle of this species such that a local viable population would be placed at risk of extinction.

Mitigation measures have been proposed to protect this species from excessive clearing and further spread of weeds.

An unexpected threatened species find procedure has been recommended.

Painted Honeyeater (*Grantiella picta*)

The Painted Honeyeater was not recorded during the site survey; however, habitat suitable to this species occurs within the Subject Land as grassy woodland. The Draft National Recovery Plan (NRP) for the Superb Parrot (DAWE, 2020) details Tumbarumba to be a place where the species is likely to occur. The Draft NRP for the Painted Honeyeater (DAWE, 2020) lists habitat critical to the survival of the species that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- To maintain genetic diversity and long-term evolutionary development
- For the reintroduction of populations or recovery of the species or ecological community.

This species prefers to breed within proximity to a source of Mistletoe, which is a preferred nesting substrate. Mistletoe was not recorded within the Subject Land; therefore, impacts to this species would occur to foraging habitat only. The Proposal would result in the disturbance and removal of up to 0.40ha of foraging woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land and considering that this species is unlikely to breed here, it is considered unlikely that the Proposal would have an adverse effect on the life cycle of this species such that a local viable population would be placed at risk of extinction.

Mitigation measures have been proposed to protect this species from excessive clearing.

An unexpected threatened species find procedure has been recommended.

Superb Parrot (*Polytelis Swainsonii*)

The Superb Parrot was not recorded during the site survey; however, habitat suitable to this species occurs within the Subject Land as grassy woodland. The National Recovery Plan for the Superb Parrot (DAWE, 2021) indicates that Tumbarumba is not an area where this species is likely to occur. This species shows a preference for nesting on major waterways. The Subject Land is located approximately 30km west of Talbingo Reservoir. In addition to this, Tumbarumba Creek occurs immediately to the north of the site. While the Subject Land is not considered an area where the species is likely to breed or occur, it is possible that the Proposal could impact on opportunistic foraging habitat suitable for this species.

The Proposal would result in the disturbance and removal of up to 0.44ha of foraging forest habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land and considering that this species is unlikely to breed here, it is considered unlikely that the Proposal would have an adverse effect on the life cycle of this species such that a local viable population would be placed at risk of extinction. The vegetation proposed for removal does not form part of any important or large wildlife movement corridor. Removal of woodland vegetation would not disrupt any connectivity of potential threatened species populations. The Proposal is not considered an action that would lead to a long-term decrease in the size of an important population of this species. It has been recommended that a suitably qualified person is present to survey woodland vegetation for removal prior to the commencement of works to rescue and/or relocate any fauna, including breeding fauna.

Mitigation measures have been proposed to protect this species from excessive clearing.

An unexpected threatened species find procedure has been recommended.

Corben's Long-eared Bat (*Nyctophilus corbeni*)

Corben's Long-eared Bat was not recorded during the site survey; however, habitat suitable to this species occurs within the Subject Land as grassy woodland. There is no National Recovery Plan for this species. The Corben's Long-eared Bat has been assigned to the "Landscape" species management stream under the Saving Our Species (SoS) Strategy (DPE, 2017). The Subject Land is not mapped as a priority management site (DPE, 2017).Corben's Long-eared bat roosts in tree hollows, crevices and under loose bark. Potential foraging and roosting habitat for Corben's Long-eared Bat occurs within the Subject Land in the form of woodland and one HBT.

The Proposal would result in the disturbance and removal of up to 0.40ha of foraging woodland habitat including one HBT suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land and considering that this species has not been mapped as occurring nearby to the Proposal (DPE, 2017), it is considered unlikely that the Proposal would have an adverse effect on the life cycle of this species such that a local viable population would be placed at risk of extinction. The vegetation proposed for removal does not form part of any important or large wildlife movement corridor. Removal of woodland vegetation would not disrupt any connectivity of potential threatened species populations. The Proposal is not considered an action that would lead to a long-term decrease in the size of an important population of this species. It has been recommended that a suitably qualified person is present to survey woodland vegetation for removal prior to the commencement of works to rescue and/or relocate any fauna, including breeding fauna.

Mitigation measures have been proposed to protect this species from excessive clearing.

An unexpected threatened species find procedure has been recommended.

Grey-headed Fly-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox was not recorded during the site survey; however, habitat suitable to this species occurs within the Subject Land as grassy woodland. The National Recovery Plan for the Grey-headed Flying-fox (DEW, 2021) states that Grey-headed Flying-foxes roost in large aggregations, known as camps, in the exposed branches of trees. The locations of camps have in the past generally been stable through time, and several sites have documented histories that exceed 100 years. The Subject Land is located approximately 63km south east of the nearest recorded Flying-fox camp (DAWE, 2014). Therefore, it is unlikely that this species breeds within or nearby to the Subject Land. Foraging habitat critical to the survival of this species is described as areas containing native species that occur within 20km of a nationally important camp (DAWE, 2014). Nationally important camps occur along the coastline of Australia and, as such, it is considered that foraging habitat within the Subject Land is not critical to this species survival.

The Proposal would result in the disturbance and removal of up to 0.65ha of foraging woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land and considering that this species has not been mapped as occurring nearby to the Proposal (DPE, 2017), it is considered unlikely that the Proposal would have an adverse effect on the life cycle of this species such that a local viable population would be placed at risk of extinction. The vegetation proposed for removal does not form part of any important or large wildlife movement corridor. Removal of woodland vegetation would not disrupt any connectivity of potential threatened species populations. The Proposal is not considered an action that would lead to a long-term decrease in the size of an important population of this species. It has been recommended that a suitably qualified person is present to survey woodland vegetation for removal prior to the commencement of works to rescue and/or relocate any fauna, including breeding fauna.

Mitigation measures have been proposed to protect this species from excessive clearing.

An unexpected threatened species find procedure has been recommended.

b) Will the action reduce the area of occupancy of an important population of a species?

Austral Toadflax (*Thesium australe)*

This species is not known to occur within the locality. Under the PAS, no key management sites are mapped for this species (DPE, 2018). Therefore, an important population is unlikely to occur within the Subject Land. The Proposal would result in the disturbance and removal of up to 0.40ha of derived grassland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land, the Proposal is not considered an action that would reduce the area of occupancy of any important population of this species.

Painted Honeyeater (*Grantiella picta*)

As stated above, the Subject Land is not considered to be an area where breeding is likely to occur. The Subject Land does not occur within a Key Biodiversity Area, as identified in the Draft National Recovery Plan (DAWE, 2020). Therefore, an important population is unlikely to occur within the Subject Land. The Proposal would result in the disturbance and removal of up to 0.40ha of foraging habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land, the Proposal is not considered an action that would reduce the area of occupancy of any important population of this species.

Superb Parrot (*Polytelis Swainsonii*)

As noted above, an important population is not likely to occur within the Subject Land, because important breeding sites for this species coincide with major rivers. The Proposal would result in the disturbance and removal of up to 0.44ha of foraging habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land, the Proposal is not considered an action that would reduce the area of occupancy of any important population of this species.

Corben's Long-eared Bat (*Nyctophilus corbeni*)

The Subject Land is not mapped as a priority management site for this species (DPE, 2017). Therefore, an important population is unlikely to occur within the Subject Land. The Proposal would result in the disturbance and removal of up to 0.40ha of woodland habitat and one HBT suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land, the Proposal is not considered an action that would reduce the area of occupancy of any important population of this species.

Grey-headed Fly-fox (*Pteropus poliocephalus*)

The Subject Land is located approximately 63km south east of the nearest recorded Flying-fox camp (DAWE, 2014). Therefore, it is unlikely that this species breeds within or nearby to the Subject Land. Therefore, an important population is unlikely to occur within the Subject Land. The Proposal would result in the disturbance and removal of up to 0.65ha of foraging habitat suitable for these species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land, the Proposal is not considered an action that would reduce the area of occupancy of any important population of this species.

c) Will the action fragment an existing important population into two or more populations?

Austral Toadflax (*Thesium australe)*

As noted above, an important population of this species is not likely to occur within the Subject Land. No priority management sites have been mapped for this species (DPE, 2018). The Proposal would result in the disturbance and removal of up to 0.04ha of derived grassland habitat suitable for these species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land, the Proposal is not considered an action that would fragment an existing population into two or more populations.

Painted Honeyeater (*Grantiella picta*)

As noted above, an important population of this species is not likely to occur within the Subject Land. The Proposal would result in the disturbance and removal of up to 0.40ha of foraging habitat suitable for these species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land and considering that the species is unlikely to breed here, the Proposal is not considered an action that would fragment an existing population into two or more populations.

Superb Parrot (*Polytelis Swainsonii*)

As noted above, an important population of this species is not likely to occur within the Subject Land, because important breeding sites for this species coincide with major rivers. The Proposal would result in the disturbance and removal of up to 0.44ha of foraging habitat suitable for these species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land and considering that the species is unlikely to breed here, the Proposal is not considered an action that would fragment an existing population into two or more populations.

Corben's Long-eared Bat (*Nyctophilus corbeni*)

As noted above, an important population of this species is not likely to occur within the Subject Land. No priority management areas for this species occur within or adjacent to the Proposal. The Proposal would result in the disturbance and removal of up to 0.40ha of habitat suitable for these species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land and considering that the species is unlikely to breed here, the Proposal is not considered an action that would fragment an existing population into two or more populations.

Grey-headed Fly-fox (*Pteropus poliocephalus*)

As noted above, this species is unlikely to breed within the Subject Land. Foraging habitat occurring within the Subject Land is not critical to this species survival and is likely used opportunistically. As such, an important population of this species is not likely to occur within the Subject Land. The Proposal would result in the disturbance and removal of up to 0.65ha of foraging habitat suitable for these species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of

the Subject Land and considering that the species is unlikely to breed here, the Proposal is not considered an action that would fragment an existing population into two or more populations.

d) Will the action adversely affect habitat critical to the survival of a species?

Austral Toadflax (*Thesium australe)*

No National Recovery Plan has been adopted for this species and no critical habitat has been identified. Therefore, all habitat for this species is considered important. The Proposal would result in the disturbance and removal of up to 0.04ha of derived grassland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed and highly exotic nature of the Subject Land, it is considered unlikely that the Proposal would have an adverse effect on habitat critical to the survival of this species.

Painted Honeyeater (*Grantiella picta*)

The Draft NRP for the Painted Honeyeater states that habitat critical to the survival of this species are necessary:

- For activities such as foraging, breeding, roosting, or dispersal
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- To maintain genetic diversity and long-term evolutionary development
- For the reintroduction of populations or recovery of the species or ecological community.

As stated above, it is considered unlikely that this species would breed within the Subject Land, given that no Mistletoe (a preferred nesting material) was recorded during the site visit. The Proposal would result in the disturbance and removal of up to 0.40ha of foraging woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land and considering that this species is unlikely to breed here, it is considered unlikely that the Proposal would have an adverse effect on habitat critical to the survival of this species.

Superb Parrot (*Polytelis Swainsonii*)

The National Recovery Plan for the Superb Parrot, states that habitat critical to the survival of the Superb Parrot can be divided into breeding and foraging habitat (DAWE, 2021). Breeding is unlikely to occur within the Subject Land, as the Proposal is not located within proximity to a major waterway. The Proposal would result in the disturbance and removal of up to 0.44ha of foraging woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land and considering that this species is unlikely to breed here, it is considered unlikely that the Proposal would have an adverse effect on habitat critical to the survival of this species.

Corben's Long-eared Bat (*Nyctophilus corbeni*)

As noted above, an important population of this species is not likely to occur within the Subject Land. No priority management areas are mapped as occurring within or nearby to the Subject Land (DPE, 2017). The Proposal would result in the disturbance and removal of up to 0.40ha of foraging woodland habitat and one HBT suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land, it is considered unlikely that the Proposal would have an adverse effect on habitat critical to the survival of this species.

Grey-headed Fly-fox (*Pteropus poliocephalus*)

Habitat critical to this species is defined as areas that (DPE, 2017):

- Contain native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May)
- Contain native species used for foraging and occur within 20 km of a nationally important camp as identified on the Department's interactive flying-fox web viewer
- Contain native and or exotic species used for roosting at the site of a nationally important Grey-Headed Flying-Fox camp as identified on the Department's interactive flying-fox web viewer.

The Subject Land is located approximately 63km south east of the nearest recorded Flying-fox camp (DAWE, 2014). Therefore, it is unlikely that this species breeds within or nearby to the Subject Land. Nationally important camps occur along the coastline of Australia and, as such, it is considered that foraging habitat within the Subject Land is not critical to this species survival. The Proposal would result in the disturbance and removal of up to 0.65ha of foraging woodland habitat and one HBT suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land, it is considered unlikely that the Proposal would have an adverse effect on habitat critical to the survival of this species.

e) Will the action disrupt the breeding cycle of an important population?

Austral Toadflax (*Thesium australe)*

As noted above, an important population of this species is not likely to occur within the Subject Land. This species has not been recorded within the locality and no priority management sites have been mapped for this species (DPE, 2018). Therefore, the Proposal is not considered likely to occur within an important population for this species. The Proposal would result in the disturbance and removal of up to 0.04ha of derived grassland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land, the Proposal is not considered an action that would disrupt the breeding cycle of this species.

Painted Honeyeater (*Grantiella picta*)

As stated above, it is considered unlikely that this species would breed within the Subject Land, given that no Mistletoe (a preferred nesting material) was recorded during the site visit. The Proposal would result in the disturbance and removal of up to 0.40ha of grassy woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land, the Proposal is not considered an action that would disrupt the breeding cycle of this species.

Superb Parrot (*Polytelis Swainsonii*)

As noted above, an important population of this species is not likely to occur within the Subject Land, because important breeding sites for this species coincide with major rivers. The Proposal would result in the disturbance and removal of up to 0.44ha of grassy woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land, the Proposal is not considered an action that would disrupt the breeding cycle of this species.

Corben's Long-eared Bat (*Nyctophilus corbeni*)

As noted above, an important population of this species is not likely to occur within the Subject Land, whereby no priority management areas are mapped as occurring within or nearby to the Subject Land (DPE, 2017). The Proposal would result in the disturbance and removal of up to 0.40ha of woodland habitat and one HBT suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land, the Proposal is not considered an action that would disrupt the breeding cycle of this species.

Grey-headed Fly-fox (*Pteropus poliocephalus*)

As noted above, an important population of this species is not likely to occur within the Subject Land, given that the nearest camp is located approximately 63km north west of the Subject Land (DEW, 2021). The Proposal would result in the disturbance and removal of up to 0.65ha of woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, highly exotic nature of the Subject Land, the Proposal is not considered an action that would disrupt the breeding cycle of this species.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Austral Toadflax (*Thesium australe)*

The Proposal would result in the disturbance and removal of up to 0.04ha of derived grassland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, largely cleared and exotic nature of the Subject Land, the Proposal is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species such that it is likely to decline.

Painted Honeyeater (*Grantiella picta*)

The Proposal would result in the disturbance and removal of up to 0.40ha of woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, largely cleared and exotic nature of the Subject Land, the Proposal is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species such that it is likely to decline.

Superb Parrot (*Polytelis Swainsonii*)

The Proposal would result in the disturbance and removal of up to 0.44ha of woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, largely cleared and exotic nature of the Subject Land, the Proposal is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species such that it is likely to decline.

Corben's Long-eared Bat (*Nyctophilus corbeni*)

The Proposal would result in the disturbance and removal of up to 0.40ha of woodland habitat and one HBT suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, largely cleared and exotic nature of the Subject Land, the Proposal is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species such that it is likely to decline.

Grey-headed Fly-fox (*Pteropus poliocephalus*)

The Proposal would result in the disturbance and removal of up to 0.65ha of woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the pre-disturbed, largely cleared and exotic nature of the Subject Land, the Proposal is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species such that it is likely to decline.

g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The Proposal has the potential to contribute to the spread of invasive species, mainly through the clearing of vegetation and transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site. The Proposal is not likely to lead to an increase in

invasive fauna species. The Proposal would therefore be unlikely to result in invasive species that are harmful to vulnerable species becoming established in their potential habitat.

h) Will the action introduce disease that may cause the species to decline?

The Proposal has the potential to contribute to the spread of disease through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of disease on site. The Proposal would therefore be unlikely to result in disease which may cause the species to decline.

i) Will the action interfere substantially with the recovery of the species?

Austral Toadflax (*Thesium australe)*

There is no national recovery plan for this species; however, it has been listed under a Priorities Action Statement (PAS) (DPE, 2018). Under the PAS, no key management sites are mapped for this species. Fifteen priority actions have been identified to help recover the Austral Toadflax within NSW (DPE, 2018):

- Undertake monitoring of populations to assess habitat quality, threats and ameliorative actions
- Encourage community participation in implementation of recovery actions for the species
- Consult with Aboriginal communities when undertaking actions on sites of cultural significance
- Finalise completion of the recovery plan by 2007
- Implement Bitou bush control as described in the approved TAP
- Control feral animals in key habitat
- Control weeds in known habitat for this species
- Determine if and/or where an ecological burn is required
- Liaise with public agencies and private landowners over the implementation of management actions for the species
- Prepare and distribute a species profile to landholders, land managers and consent authorities
- Develop and distribute standard survey and impact assessment guidelines
- Support funding for management work in habitat for the species and carry out habitat maintenance and protection at known locations for the species
- Implement control programs for rabbits and reduce impact of cattle through strategic grazing or exclusion
- Undertake and support research into key aspects of the biology and ecology of Austral Toadflax that are likely to provide information that assists with management of the species
- Undertake annual monitoring of populations to provide information on the lifecycle of the species

The Proposal would not interfere with these priority actions.

Painted Honeyeater (*Grantiella picta*)

The Draft NRP for the Painted Honeyeater (DAWE, 2020) lists the following objectives:

- Measure and sustain a positive population trend (compared to 2020 baseline counts) in the number of mature individuals of the Painted Honeyeater
- Maintain or improve the extent, condition and connectivity of habitat of the Painted Honeyeater.

The Proposal would not interfere with these objectives.

Superb Parrot (*Polytelis Swainsonii*)

The NRP for the Superb Parrot (DAWE, 2021) lists the following specific objectives:

- Determine population trends in the Superb Parrot.
- Increase the level of knowledge of the Superb Parrot's ecological requirements.
- Develop and implement threat abatement strategies.

- Increase community involvement in and awareness of the Superb Parrot recovery program.

The Proposal would not interfere with these objectives.

Corben's Long-eared Bat (*Nyctophilus corbeni*)

Corben's Long-eared Bat does not have a Recovery Plan but it is listed under the 'Saving our Species' conservation strategy. Given that it is unlikely that this species breeds within the Subject Land, the works are not predicted to substantially interfere with the recovery of the species. Mitigation measures have been recommended.

Grey-headed Fly-fox (*Pteropus poliocephalus*)

The NRP for the Grey-headed Flying-fox (DEW, 2021) lists the following objectives:

- Improve the national population trend
- Identify, protect and increase key foraging and roosting habitat
- Improve the community's capacity to coexist with flying-foxes
- Increase awareness about flying-foxes, the threats they face and the important ecosystem services they provide as seed dispersers and pollinators

The Proposal would not interfere with these objectives.

Conclusion

The impacts of the Proposal on the assessed threatened species listed under the EPBC Act are manageable. A significant impact is considered unlikely, based on the following conclusions:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- No substantial contribution to any Key Threatening Process are expected
- Mitigation measures have been recommended to further reduce impacts to biodiversity
- No impact on an important population of this species is expected by the proposed works.

Endangered Species

The *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) specifies factors to be taken into account in deciding whether a development is likely to significantly affect Endangered Ecological Communities, threatened species and migratory species, listed at the Commonwealth level. These assessments characterise the significance of likely impacts associated with the Proposal on the following **Endangered** or **Critically Endangered** species:

- Woodland Birds:
  - Regent Honeyeater (*Anthochaera phrygia*) EPBC - CE
- Amphibians
  - Booroolong Frog (*Litoria booroolongensis*) EPBC - E
  - Spotted Tree Frog (*Litoria spenceri*) EPBC - E
- Mammals
  - Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) EPBC - E

An action is likely to have a significant impact on an Endangered or Critically Endangered species if there is a real chance or possibility that it will:
a) lead to a long-term decrease in the size of a population
Regent Honeyeater (*Anthochaera phrygia*)
This species was not detected during the site visit; however, the National Recovery Plan (NRP) for the Regent Honeyeater (DoE, 2016) lists Tumbarumba as a place where this species is likely to occur. Potential habitat for the Regent Honeyeater occurs within the Subject Land as grassy woodland. The Proposal would result in the disturbance and removal of up to 0.40ha of foraging woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). The NRP states that the Regent Honeyeater prefers foraging areas containing Mistletoe, which were not recorded during the site survey. Given this and the pre-disturbed, highly exotic nature of the Subject Land, it is considered that this species would be more likely to occur along Tumbarumba Creek and the adjoining TSR. The Proposal is not considered an action that would lead to a long-term decrease in the size of a population of this species. Mitigation measures have been proposed to protect this species from excessive clearing. An unexpected threatened species find procedure has been recommended.
Booroolong Frog (*Litoria booroolongensis*)
This species was not detected during the site visit; however, the threatened species profile for the Booroolong Frog (DPE, 2017) lists Tumbarumba as a place where this species is known to occur. Potential habitat for this species occurs within the Subject Land as an ephemeral stream, which passes through two farm dams. Up to 0.21ha of aquatic habitat, potentially suitable for this species, would be removed by the proposed development. Habitat to be removed represents approximately 0.08% of aquatic habitat within the wider locality (DPE, 2022). Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek. Considering that the Subject Land already contains an operational quarry, it is unlikely that the Proposal would have an adverse effect on the life cycle of these species, such that a local viable population would be placed at risk of extinction. Mitigation measures have been proposed to protect aquatic habitat occurring within and adjacent to the

Subject Land. An unexpected threatened species find procedure has been recommended.
Spotted Tree Frog (*Litoria spenceri*)
This species was not detected during the site visit; however, the threatened species profile for the Spotted Tree Frog (DPE, 2019) lists Tumbarumba as a place where this species is known to occur. Potential habitat for this species occurs within the Subject Land as an ephemeral stream, which passes through two farm dams. Up to 0.21ha of aquatic habitat, potentially suitable for this species, would be removed by the proposed development. Habitat to be removed represents approximately 0.08% of aquatic habitat within the wider locality (DPE, 2022). Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek. Considering that the Subject Land already contains an operational quarry, it is unlikely that the Proposal would have an adverse effect on the life cycle of these species, such that a local viable population would be placed at risk of extinction. Mitigation measures have been proposed to protect aquatic habitat occurring within and adjacent to the Subject Land. An unexpected threatened species find procedure has been recommended.
Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)
This species was not detected during the site visit; however, the threatened species profile for the Spotted-tailed Quoll (DPE, 2020) lists Tumbarumba as a place where this species is likely to occur. Potential habitat for this species occurs within the Subject Land as grassy woodland. The NRP for this species (DELWP, 2016) states that this species utilises multiple dens within home ranges up to several thousand hectares in size. The Proposal would result in the disturbance and removal of up to 0.40ha of woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the large home range occupied by this species and the pre-disturbed, highly exotic nature of the Subject Land, it is considered that this species would be more likely to occur within the large patches of remnant vegetation occurring within Bago State Forest (1.6km east) and Mannus State Forest (2km south west). The Proposal is not considered an action that would lead to a long-term decrease in the size of a population of this species. Mitigation measures have been proposed to protect this species from excessive clearing. An unexpected threatened species find procedure has been recommended.
b) reduce the area of occupancy of the species
Regent Honeyeater (*Anthochaera phrygia*)
The Proposal would result in the disturbance and removal of up to 0.40ha of foraging woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the lack of Mistletoe recorded and the pre-disturbed, highly exotic nature of the Subject Land, it is considered that this species would be more likely to occur along Tumbarumba Creek and the adjoining TSR. The Proposal is not considered an action that would reduce the area of occupancy of this species.
Booroolong Frog (*Litoria booroolongensis*)
Up to 0.21ha of aquatic habitat, potentially suitable for this species, would be removed by the proposed development. Habitat to be removed represents approximately 0.08% of aquatic habitat within the wider locality (DPE, 2022). Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek.

The Proposal is not considered an action that would reduce the area of occupancy of this species.
Spotted Tree Frog (*Litoria spenceri*)
Up to 0.21ha of aquatic habitat, potentially suitable for this species, would be removed by the proposed development. Habitat to be removed represents approximately 0.08% of aquatic habitat within the wider locality (DPE, 2022). Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek. The Proposal is not considered an action that would reduce the area of occupancy of this species.
Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)
The Proposal would result in the disturbance and removal of up to 0.65ha of woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Noting the large home range occupied by this species and the pre-disturbed, highly exotic nature of the Subject Land, it is considered that this species would be more likely to occur within the large patches of remnant vegetation occurring within Bago State Forest (1.6km east) and Mannus State Forest (2km south west). The Proposal is not considered an action that would reduce the area of occupancy of this species.
c) Will the action fragment an existing population into two or more populations?
Regent Honeyeater (*Anthochaera phrygia*)
The Proposal would result in the disturbance and removal of up to 0.40ha of woodland habitat suitable for this species. Vegetation proposed for removal would not impact on any important wildlife movement corridors. Given the highly mobile nature of this species, the Proposal is not considered an action that would fragment a population of this species into two or more populations.
Booroolong Frog (*Litoria booroolongensis*)
Up to 0.21ha of aquatic habitat, potentially suitable for this species, would be removed by the Proposal. The habitat proposed for removal would not impact on any important wildlife movement corridors. The Proposal would involve the diversion of a watercourse that occurs at the top of a catchment. Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek. Therefore, the Proposal is not considered an action that would fragment a population of this species into two or more populations.
Spotted Tree Frog (*Litoria spenceri*)
Up to 0.21ha of aquatic habitat, potentially suitable for this species, would be removed by the Proposal. The habitat proposed for removal would not impact on any important wildlife movement corridors. The Proposal would involve the diversion of a watercourse that occurs at the top of a catchment. Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek. Therefore, the Proposal is not considered an action that would fragment a population of this species into two or more populations.
Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)
The Proposal would result in the disturbance and removal of up to 0.65ha of woodland habitat suitable for this species. Vegetation proposed for removal would not impact on any important wildlife movement

corridors. Given the highly mobile nature of this species, the Proposal is not considered an action that would fragment a population of this species into two or more populations.

d) Will the action adversely affect habitat critical to the survival of a species?

Regent Honeyeater (*Anthochaera phrygia*)

The NRP for the Regent Honeyeater (DoE, 2016), states that habitat critical to the survival of this species includes any breeding or foraging areas where the species is likely to occur, as well as any newly discovered breeding or foraging locations.
The Proposal would result in the disturbance and removal of up to 0.40ha of foraging woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). The NRP states that the Regent Honeyeater prefers foraging areas containing Mistletoe, which were not recorded during the site survey. Given this and the pre-disturbed, highly exotic nature of the Subject Land, it is considered that this species would be more likely to occur along Tumbarumba Creek and the adjoining TSR.

The Proposal is not considered an action that would adversely affect habitat critical to the survival of this species.

Booroolong Frog (*Litoria booroolongensis*)

The Proposal would result in the disturbance and removal of up to 0.21ha of aquatic habitat, potentially suitable for this species. Habitat to be removed represents approximately 0.08% of aquatic habitat within the wider locality (DPE, 2022). Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek.

The Proposal is not considered an action that would adversely affect habitat critical to the survival of this species.

Spotted Tree Frog (*Litoria spenceri*)

The Proposal would result in the disturbance and removal of up to 0.21ha of aquatic habitat, potentially suitable for this species. Habitat to be removed represents approximately 0.08% of aquatic habitat within the wider locality (DPE, 2022). Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek.

The Proposal is not considered an action that would adversely affect habitat critical to the survival of this species.

Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)

The Proposal would result in the disturbance and removal of up to 0.65ha of woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). Given the large home range occupied by this species and the pre-disturbed, highly exotic nature of the Subject Land, it is considered that this species would be more likely to occur within the large patches of remnant vegetation occurring within Bago State Forest (1.6km east) and Mannus State Forest (2km south west).

The Proposal is not considered an action that would adversely affect habitat critical to the survival of this species.

e) Will the action disrupt the breeding cycle of a population?

Regent Honeyeater (*Anthochaera phrygia*)

The NRP for this species lists three key breeding areas for this species in NSW, including the Bundarra-Barraba, Capertee Valley and Hunter Valley districts (DoE, 2016). The Subject Land does not occur within proximity to these districts. The NRP states that the Regent Honeyeater prefers foraging areas containing Mistletoe, which were not recorded during the site survey. Given this and the pre-disturbed, highly exotic nature of the Subject Land, it is considered that this species would be more likely to breed along Tumbarumba Creek, the adjoining TSR and surrounding woodland areas.

The Proposal is not considered an action that would disrupt the breeding cycle of a population.

Booroolong Frog (*Litoria booroolongensis*)

The Booroolong Frog prefers to breed in rocky crevices, near shallow pools or runs (DPE, 2017). Rocky crevices/habitat was not observed on either side of the ephemeral watercourses occurring within the Subject Land. Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek.

The Proposal is not considered an action that would disrupt the breeding cycle of a population.

Spotted Tree Frog (*Litoria spenceri*)

The Spotted Tree Frog prefers to breed under large, instream boulders (DPE, 2017). Rocky boulders/habitat was not observed on either side of the ephemeral watercourses occurring within the Subject Land. Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams within the Subject Land were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek.

The Proposal is not considered an action that would disrupt the breeding cycle of a population.

Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)

According to the NRP for the Spotted-tailed Quoll (DELWP, 2016), this species uses multiple dens (possibly in excess of 20), moving between them every 3-4 days. Recorded den sites include rock crevices, hollow logs, hollow tree buttresses, tree hollows, windrows, clumps of vegetation, caves and boulder tumbles, under buildings and underground burrows, including those of rabbits and wombats (DELWP, 2016). Hollow logs, clumps of vegetation and wombat burrows were recorded within the Subject Land.

This species has home ranges up to several thousand hectares in size. The Proposal would result in the disturbance and removal of up to 0.65ha of woodland habitat suitable for this species. Given the large home range occupied by this species and the pre-disturbed, highly exotic nature of the Subject Land, it is considered that this species would be more likely to breed within the large patches of remnant vegetation occurring within Bago State Forest (1.6km east) and Mannus State Forest (2km south west).

The Proposal is not considered an action that would disrupt the breeding cycle of a population.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Regent Honeyeater (*Anthochaera phrygia*)

The Proposal would result in the disturbance and removal of up to 0.40ha of woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). The Proposal would not contribute to an increase in edge effects or impact on any important wildlife movement corridors. The Subject Land does not represent an important breeding location for this species. Therefore, the Proposal is not considered an action that would modify, destroy, remove, isolate or decrease the availability or quality of

habitat to the extent that the species is likely to decline.
Booroolong Frog (*Litoria booroolongensis*)
Up to 0.21ha of aquatic habitat, potentially suitable for this species, would be removed by the Proposal. The habitat proposed for removal would not impact on any important wildlife movement corridors. The Subject Land does not represent an important breeding location for this species. The Proposal would involve the diversion of a watercourse that occurs at the top of a catchment; therefore, potential habitat would not become permanently isolated or fragmented by the Proposal. The Proposal is not considered an action that would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Spotted Tree Frog (*Litoria spenceri*)
Up to 0.21ha of aquatic habitat, potentially suitable for this species, would be removed by the Proposal. The habitat proposed for removal would not impact on any important wildlife movement corridors. The Subject Land does not represent an important breeding location for this species. The Proposal would involve the diversion of a watercourse that occurs at the top of a catchment; therefore, potential habitat would not become permanently isolated or fragmented by the Proposal. The Proposal is not considered an action that would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)
The Proposal would result in the disturbance and removal of up to 0.65ha of woodland habitat suitable for this species. Native vegetation to be removed represents approximately 0.05% of the vegetation occurring within the locality, based on indicative vegetation mapping (DPE, 2022). The Proposal would not contribute to an increase in edge effects or impact on any important wildlife movement corridors. The Subject Land does not represent an important breeding location for this species. Therefore, the Proposal is not considered an action that would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
g) Will the action result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Critically Endangered or Endangered species' habitat?
The Proposal has the potential to contribute to the spread of invasive species, mainly through the clearing of vegetation and transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site. The Proposal would therefore be unlikely to result in invasive species that are harmful to these species becoming established in their potential habitat.
h) Will the action introduce disease that may cause the species to decline?
The Proposal has the potential to contribute to the spread of disease through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of disease on site. The Proposal would therefore be unlikely to result in disease which may cause the species to decline.
i) Will the action interfere substantially with the recovery of the species?
Regent Honeyeater (*Anthochaera phrygia*)
The NRP for the Regent Honeyeater (DoE, 2016) lists the following objectives: • Reverse the long-term population trend of decline and increase the numbers of Regent Honeyeaters to a level where there is a viable, wild breeding population, even in poor breeding

years

- Enhance the condition of habitat across the Regent Honeyeater range to maximise survival and reproductive success, and provide refugia during periods of extreme environmental fluctuation.

The strategies to achieve the plans' objectives are:

- Improve the extent and quality of regent honeyeater habitat
- Bolster the wild population with captive-bred birds until the wild population becomes self sustaining
- Increase understanding of the size, structure, trajectory and viability of the wild population
- Maintain and increase community awareness, understanding and involvement in the recovery program

The Proposal would not interfere with these objectives.

Booroolong Frog (*Litoria booroolongensis*)

The NRP for the Booroolong Frog (DPE, 2017) states that the overall objective of recovery is to minimise the probability of extinction of the Booroolong Frog in the wild, and to increase the probability of populations becoming self-sustaining and viable in the longer term. Within the duration of this Recovery Plan, the specific objectives are to:

- Determine the species distribution in areas that have not been the focus of targeted surveys
- Determine the taxonomic status of northern and southern Booroolong Frog populations, and identify further genetic sub-division within these populations
- Reduce the impact of known or perceived threats contributing to the ongoing decline of the Booroolong Frog
- Determine population trends across the species range, and in areas subject to different management regimes
- Identify the potential impacts of climate change, and determine management responses to reduce these impacts
- Identify other potentially threatening processes
- Increase community awareness and involvement in the Booroolong Frog recovery program
- Achieve the effective implementation of the recovery plan

The Proposal would not interfere with these objectives.

Spotted Tree Frog (*Litoria spenceri*)

The NRP for the Spotted Tree Frog (DPE, 2019) states that the overall objective is to prevent the extinction of the Spotted Tree Frog in New South Wales by re-establishing a viable breeding population of the species at Bogong Creek.

The Proposal would not interfere with these objectives.

Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)

The overall objective of the NRP for the Spotted-tailed Quoll (DELWP, 2016) is to reduce the rate of decline of the Spotted-tailed Quoll, and ensure that viable populations remain throughout its current range in eastern Australia. To facilitate this, the following specific recovery objectives have been specified:

- Determine the distribution and status of Spotted-tailed Quoll populations throughout the range, and identify key threats and implement threat abatement management practices
- Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery
- Reduce the rate of habitat loss and fragmentation on private land. 4. Evaluate and manage the risk posed by silvicultural practices
- Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations
- Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations
- Reduce deliberate killings of Spotted-tailed Quolls

- Reduce the frequency of Spotted-tailed Quoll road mortality
- Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary
- Determine the likely impact of climate change on Spotted-tailed Quoll populations
- Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program.

Conclusion

The impacts of the Proposal on the assessed threatened species listed under the EPBC Act are manageable. A significant impact is considered unlikely, based on the following conclusions:

- The amount of habitat to be removed or disturbed by the Proposal is very small
- No increases to fragmentation, edge effects or isolation would occur
- No substantial contribution to any Key Threatening Process are expected
- Mitigation measures have been recommended to further reduce impacts to biodiversity
- No impact on an important population of this species is expected by the proposed works.

Appendix F FM Act Seven-Part Test

Section 221ZV of the *Fisheries Management Act 1994* (NSW) (FM Act) specifies seven factors to be taken into account in deciding whether a development is likely to significantly affect threatened species, populations or ecological communities, or their habitats, listed at the state level under the FM Act.

This seven-part test characterises the significance of likely impacts associated with the Proposal on the following:

- Crustacean:
  - Murray Crayfish (*Euastacus armatus*) – V
- Aquatic EEC:
  - *Lower Murray River aquatic ecological community* - E

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Murray Crayfish (*Euastacus armatus*)
The Murray's Crayfish was not observed during the site visit; however, indicate mapping suggests that this species occurs along Tumbarumba Creek (DPI, 2022). Habitat suitable to this species occurs within the Subject Land as pastureland and riparian habitat adjoining Tumbarumba Creek. Up to 0.27ha of aquatic and riparian habitat, potentially suited to this species, would be impacted by the Proposal. The Proposal involves the diversion of a stream and the removal of two farm dams to the south west of the Subject Land. Habitat to be removed represents approximately 0.08% of aquatic habitat within the wider locality (DPE, 2022). Given that the Subject Land is pre-disturbed and highly exotic in nature and that the streams were observed to have low shallow flows, it is more likely that these species would utilise aquatic habitat to the north and northwest of the site, including Tumbarumba Creek. Considering that the Subject Land already contains an operational quarry, it is unlikely that the Proposal would have an adverse effect on the life cycle of these species, such that a local viable population would be placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.
Not applicable.
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** ii. **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Lower Murray River aquatic ecological community
Ephemeral streams within the Subject Land are consistent with the *Lower Murray River* endangered ecological community. i. The Subject Land will impact on up to 0.27haof aquatic habitat within the Subject Land. Aquatic habitat occurring within the Subject Land was observed to consist of two ephemeral drainage lines. The Proposal includes the diversion of the ephemeral watercourse within the southern portion of the

Subject Land and the removal of an existing farm dam. Stabilisation work would be completed following construction, to manage impacts associated with sedimentation and turbidity. BHQ would divert the watercourse and provide sufficient time for the dam to dry out before filling it in, which would allow invertebrates and aquatic fauna sufficient time to relocate. Providing that the appropriate mitigation measures are followed; the proposed works are not likely to have an adverse effect on the extent of this EEC such that its local occurrence is likely to be placed at risk of extinction.
ii. The Proposal would involve temporary disturbances to this EEC. The Proposal would involve the diversion of a stream and the removal of a farm dam that occurs towards the top of a catchment. Once the works are complete and the existing stream has been diverted, the watercourse would continue to feed into Tumbarumba Creek. Therefore, the Proposal would not cause this EEC to become permanently isolated or fragmented. Given the location of the stream and the low flows observed during the site visit, it is considered that the composition of this EEC would not be adversely modified, such that its local occurrence would be placed at risk of extinction.
d) In relation to the habitat of a threatened species, population or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and** **ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and** **iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**
Lower Murray River aquatic ecological community
i. Up to 0.27ha of aquatic EEC, consistent with Lower Murray River EEC, would be impacted by the proposed works. The Proposal involves the diversion of an ephemeral stream and one farm dam within the southern portion of the Subject Land. BHQ would divert the watercourse and provide sufficient time for the dam to dry out before filling it in, which would allow invertebrates and aquatic fauna sufficient time to relocate. Stream flow would be reinstated, post-completion of works.
ii. The Proposal would involve the diversion of an ephemeral stream that occurs towards the top of a catchment. Once the diversion is completed, stream flows would return to normal. As the stream was observed to have low, shallow flows, it is considered that the temporary cessation of downstream flows would have a negligible impact on Tumbarumba Creek. BHQ would restrict works within aquatic and riparian areas, to periods of low rainfall, to coincide with natural aquatic processes and reduce unnecessary sedimentation within waterways. With the implementation of appropriate mitigation measures, it is considered unlikely that an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.
iii. The proportion of aquatic habitat (0.27ha) to be impacted is small given (0.08%) the local context (DPE, 2022). A large proportion of the aquatic habitat within the Subject Land is ephemeral. Given the pre-disturbed and highly modified nature of the pastureland within which the stream and farm dam occurs, this aquatic habitat is not considered to be important to the long-term survival of this EEC.
Murray Crayfish (*Eustacus armatus*)
i. Up to 0.27ha of aquatic habitat, potentially suitable for this species, would be impacted by the proposed works. The Proposal involves the diversion of an ephemeral stream and one farm dam within the southern portion of the Subject Land. BHQ would divert the watercourse and provide sufficient time for the dam to dry out before filling it in, which would allow invertebrates and aquatic fauna sufficient time to relocate. Stream flow would be reinstated, post-completion of works.
ii. The Proposal would involve the diversion of an ephemeral stream that occurs towards the top of a catchment. Once the diversion is completed, stream flows would return to normal. As the stream was observed to have low, shallow flows, it is considered that the temporary cessation of downstream flows would have a negligible impact on Tumbarumba Creek. BHQ would restrict works within aquatic and riparian areas, to periods of low rainfall, to coincide with natural aquatic processes and reduce unnecessary sedimentation within waterways. With the implementation of appropriate mitigation measures, it is considered unlikely that an area of habitat is likely to

become fragmented or isolated from other areas of habitat as a result of the proposed action.

iii. The proportion of aquatic habitat (0.27ha) to be impacted is small given (0.08%) the local context (DPE, 2022). A large proportion of the aquatic habitat within the Subject Land is ephemeral. Given the pre-disturbed and highly modified nature of the pastureland within which the stream and farm dam occurs, this aquatic habitat is not considered to be important to the long-term survival of this EEC.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Up to 0.27ha of aquatic habitat would be impacted by the proposed works. This is a very small proportion (0.08%) of habitat, given the proportion of aquatic habitat within the locality (DPE, 2022). Aquatic habitat occurring within the Subject Land was observed to consist of ephemeral drainage lines and farm dams. During the site survey these drainage lines were observed to contain low, shallow flows and, as such, it is unlikely that works within these areas would impact on Tumbarumba Creek, which is mapped as containing KFH. Stabilisation work would be completed following construction. BHQ would divert the watercourse and provide sufficient time for the dam to dry out before filling it in, which would allow invertebrates and aquatic fauna sufficient time to relocate.

Heavy metals and hydrocarbon-based contaminants have the potential to cause serious harm to the ecology of a creek system, including fish kills, harm to other fauna, and damage to vegetation. The Proposal is not likely to use substantial quantities of chemicals or fuels. Likely chemicals and fuels include minor amounts of diesel, unleaded petrol, lubricating oils, and hydraulic oils and fluids for maintenance. Refuelling and storing of chemicals pollutants would occur away from waterways and sensitive environmental areas.

Indirect impacts to the waterway could occur from sedimentation or stormwater run-off carrying pollutants downstream from the work site. An Erosion and Sediment Control Plan (ESCP) would be developed prior to the commencement of construction.

The implementation of the mitigation measures and safeguards, including erosion controls, are outlined below and would reduce potential impacts to aquatic habitat within the Subject Land. Sedimentation controls would remain in place until the diverted creek was revegetated and stabilised.

f) Whether the action proposed is consistent with the objectives or actions of a Recovery Plan or Threat Abatement Plan.

Murray Crayfish (*Eustacus armatus*)

Recovery actions for the Murray Crayfish (DPI, 2022) include:

- Providing advice to consent and determining authorities to ensure appropriate consideration during development assessment processes
- Collate and review existing information on the species
- Community and stakeholder liaison, awareness and education
- Maximise compliance activities at identified important sites
- Enhance, modify or implement NRM planning processes to minimize adverse impacts on threatened species
- Habitat rehabilitation
- Pest eradication and control
- Research and monitoring
- Stocking/translocation
- Survey/mapping

The Proposal will not interfere with these recovery objectives.

Lower Murray River EEC

The recovery actions underway listed for this EEC include:

- Allocate and manage environmental water flows in regulated rivers, to lessen the impacts of

unseasonal flow and temperature patterns.

- Mitigate the impact of cold water pollution from major regulating structures.
- Prevent sedimentation and poor water quality by improving land management practices, conserving and restoring riparian vegetation and using effective erosion control measures. The proposed works will not interfere with these recovery actions.
- Develop and implement control programs for introduced species.
- Reinstate large woody debris where appropriate.
- Continue to assess and manage the impacts of fishing.
- Provide fish passage by removing barriers or installing fishways in consultation with affected stakeholders.

With the implementation of the appropriate safeguards and mitigation measures, the Proposal would not interfere with these objectives.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Degradation of native riparian vegetation along New South Wales water courses

The proposed works would result in the disturbance of up to 0.27ha of aquatic and riparian habitat within the Subject Land. Given the pre-disturbed and highly modified nature of the pastureland within which the proposed stream and farm dam occurs, the Proposal would result in a minor increase in this KTP.

Conclusion

The impacts of the Proposal on the assessed threatened species listed under the FM Act are manageable. A significant impact is considered unlikely, based on the following conclusions:

- The amount of aquatic habitat to be removed or disturbed by the Proposal is very small
- Aquatic habitat to be impacted largely consists of highly modified pastureland
- No substantial contribution to any Key Threatening Process are expected
- Mitigation measures have been recommended to further reduce impacts to biodiversity

Appendix E Due Diligence Assessment

Aboriginal Heritage Due Diligence Assessment

Tumbarumba Quarry, Murrays Crossing Rd

March 2022

Project Number: 21-416

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Document verification

Project Title:	Tumbarumba Quarry, Murrays Crossing Rd
Project Number:	21-416
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Revision	Date	Prepared by	Reviewed by	Approved by
Draft	20/10/2021	Douglass Rovinsky and Jill Taylor	Dr Rhiannon Stammers	Dr Rhiannon Stammers
	[Enter the date]			
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	[Enter the date]			

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Table of contents

Figures

Tables

Plates

Appendices

Acronyms and abbreviations

ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
BHQ	Bald Hill Quarry
Corp	Toomaroombah Kunama Namadgi Aboriginal Corp
DP	Deposited Plan
EP&A Act	Environmental Planning and Assessment Act 1979
ha	hectares
Heritage Act	*Heritage Act 1977* (NSW)
Heritage NSW	Heritage NSW, within the Department of Premier and Cabinet
km	kilometres
LEP	Local Environmental Plan
LGA	Local Government Area
NGH	NGH Pty Ltd
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NPW Regulation	National Parks and Wildlife Regulation 2019 (NSW)
NSW	New South Wales
PAD	Potential Archaeological Deposit
TSR	Travelling Stock Reserve

Executive summary

NGH Pty Ltd was commissioned by Bald Hill Quarry Pty Ltd to undertake an Aboriginal Heritage Due Diligence assessment in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010) for the proposed amalgamation and expansion of the Murrays Crossing Quarry operations. The subject land at 71 Murrays Crossing Road, Tumbarumba NSW comprises Lots 659, 663, 665, 452, 20, 172, 173, 174, 175, 176, 177, 178, DP 755892, Lot 179 DP 1100528, Lot 1 DP 1150973, Lot 1 DP 111861, Lot 732 and is located within the Snowy Valleys Council Local Government Agency in the western slopes of the Snowy Mountains of NSW. The survey area included sections of Crown land and adjacent Crown road, which form part of a Travelling Stock Reserve incorporated into Lots and 623 DP 755892 and Lot 7028 DP 96852. These areas have since been removed from the SEARS but are included in this report as areas that have been subject to field survey. The currently quarried land is zoned for mining purposes, with the expansion of the survey area into the adjoining lots of general grazing land.

Background and desktop assessment

An extensive search of the Aboriginal Heritage Information Management System database was undertaken that covered an area of approximately 50 kilometres centred on the survey area. There were 98 Aboriginal sites recorded within this search area and no declared Aboriginal Places. None of the archaeological sites currently recorded on Aboriginal Heritage Information Management System are located within or directly adjacent to the survey area.

The survey area is characterised as a gentle to steep east west and south north tending slope leading down to Tumbarumba Creek in the western and northern boundary. A large quarry has been cut into the slope consuming approximately 75% of the survey area. A natural line of springs forming an unnamed non perennial drainage runs east to west in the southern portion of the survey area joining up with Tumbarumba Creek approximately 150 meters west of the survey area.

Although the area has been subject to high levels of disturbance the survey area lies within a well-watered landscape that may have supported a diverse range of resources for Aboriginal people to utilise. Additionally, any old growth mature native trees within the survey area have the potential to have been culturally modified. While the potential for Aboriginal objects is generally noted to have been removed in areas of significant prior disturbance the desktop assessment indicated that there are landscapes present within the survey area that have the potential to contain Aboriginal objects and/or sites.

Field results

A visual inspection of the survey area was carried out on the 23rd of September and again on the 13th of December 2021 after an amendment to the development footprint (Figure 1-1). Present at the September 23rd visit was a qualified NGH archaeologist and three members of the local Ngarigo community, and a representative of Bald Hill Quarry. The field survey on the 13th of December was carried out by a qualified NGH archaeologist.

As the survey area incorporates an active quarry which was in operation at the time of the field visit and significantly disturbed in parts, the field inspection concentrated on the less disturbed areas proposed for expansion in the east and south of the active quarry, and the Traveling Stock Route the in west. These areas being portions of Lot 659 DP 755892, Lot 7028 DP 96852, Lot 1 DP

1150973, Lot 20 DP 755892, Lot 172 DP 755892 and Lot 173 DP 755892 and the Traveling Stock Route (Figure 1-2). These less disturbed areas were examined by foot in their entirety with the visibility noted to vary from 90% within exposures to < 2% in areas of dense grass cover. The portion of the survey area not subject to pedestrian survey was significantly disturbed by past and current quarrying activities and construction and maintenance of related infrastructure.

Much of the area subject to pedestrian survey was noted to be quite disturbed through past tree clearing, agricultural practices, historic gold mining, vehicular tracks, flooding, and in particularly the destructive use of the area for rock extraction

No Aboriginal sites or objects were recorded within the survey area; however, an area of potential archaeological deposit was identified on spur overlooking the spring fed drainage leading down to Tumbarumba Creek to the north an additional drainage to the south and Tumbarumba Creek to the west. Local representatives of the Toomaroombah Kunama Namadgi Aboriginal community concurred with this identification and disclosed that the area of the potential archaeological deposit was also located on a significant song line along which a Travelling Stock Route is situated (Figure 6-3).

The Travelling Stock Route on the western boundary of the survey area was noted to be of high significance to the local Toomaroombah Kunama Namadgi community. This area is known locally as Gudja Gudja Mura (5 Ways) and it is not only the location of a large gathering place for many Aboriginal groups in the past, but also the location where seven different story lines converge. Gudja Gudja Mura was not only important to Aboriginal people in the past but is still highly valued and used by the local community today. (Figure 6-3).

Visibility during the field inspection of the north western section of the survey area was exceedingly poor on the day of the visit (< 2%). The area was noted to be highly disturbed through ground clearing and former quarrying activities. However, due to the lack of visibility and the disturbed steep landforms surrounding two mature native trees noted in this area, inspection for the presence of cultural modification on these trees was unable to be adequately carried out (Figure 6-4). Prior to any works proceeding in the area surrounding these trees, their trunks will need to be photographed and the photographs forwarded to an archaeologist for analysis to determine the presence or absence of cultural modification.

Impact assessment conclusion

A potential archaeological deposit (PAD 01) was identified on a spur on the southern boundary of the survey area bordering the Traveling Stock Route. Works must avoid the PAD 01 with a minimum 10 m buffer. If works cannot avoid PAD 01 then further assessment in the form of an Aboriginal Cultural Heritage Assessment must be undertaken, including a limited programme of subsurface testing to establish the true archaeological potential and extent of archaeological sites within the potential archaeological deposit.

The Traveling Stock Route on the western boundary of the survey area and the Traveling Stock Route bordering the southern boundary were identified as containing significant cultural value by the members of the local Aboriginal community. Ongoing consultation is recommended with the local representatives of the Toomaroombah Kunama Namadgi Indigenous Corporation for any potential future work that may impact these areas.

Due to the field conditions during the December field visit, two mature native trees in the north eastern section of the survey area were unable to be fully inspected for the presence of cultural modification. The trunks of these two trees identified in Figure 6-4 must be photographed with a

scale and the photographs forwarded on to an NGH archaeologist for assessment prior to any works proceeding in their vicinity.

As no Aboriginal sites or areas of archaeological potential were identified within the remaining survey area it is concluded that the proposed amalgamation and expansion of the Murrays Crossing Quarry operation as assessed in this report would not require any further heritage investigation and works can proceed with caution.

Recommendations

1. Works must avoid the area of Potential Archaeological Deposit (PAD) with a minimum 10 m buffer to ensure there are no inadvertent impacts to potential Aboriginal objects.
2. BHQ is encouraged to not undertake activities within the TSR as identified in Figure 6-3 due to the significant cultural value placed on the area by the local Aboriginal community. Open and ongoing dialogue with local representatives of the Toomaroombah Kunama Namadgi Indigenous Corporation is recommended.
1. Prior to works proceeding near the two mature native trees identified in Figure 6-4, BHQ must undertake physical inspection of the trunk of the trees which were unable to be assessed at the time of inspection due to safety concerns. BHQ is to photograph the trunk of each tree with a scale and forward the photographs on to an NGH archaeologist. Works can only proceed with caution following written advice by an archaeologist to confirm the presence or absence of cultural modification. If deemed to be necessary, a physical inspection may be required.
2. Works within the survey area that are outside the area of Potential Archaeological Deposit (PAD 01) and the two trees identified in Figure 6-4 can proceed with caution.
3. If the proposed works cannot avoid the PAD, then further assessment in the form of an Aboriginal Cultural Heritage Assessment (ACHA) must be undertaken, including a programme of subsurface testing to establish the true archaeological potential and extent of archaeological sites within the portion of the PAD proposed to be impacted. All subsurface testing must comply with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW.* If Aboriginal objects are recovered during the testing programme an Aboriginal Heritage Impact Permit (AHIP) must be obtained from Heritage NSW before the proposed development can proceed.
4. Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment.
5. If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and Heritage NSW notified. The find will need to be assessed and if found to be an Aboriginal object an Aboriginal Heritage Impact Permit (AHIP) may be required.
6. In the unlikely event that human remains are identified during development works, all work must cease in the immediate vicinity and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, Heritage NSW must be notified by ringing the Enviroline (131 555).

Bald Hill Quarry Pty Ltd is reminded that it is an offence under the *National Parks and Wildlife Act 1974* to disturb, damage or destroy an Aboriginal object without a valid AHIP.

1. Introduction

NGH was commissioned by Bald Hill Quarry Pty Ltd (BHQ) to undertake an Aboriginal Heritage Due Diligence assessment in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW 2010) (Due Diligence Code) for the proposed amalgamation and expansion of the Murrays Crossing Quarry operations, 71 Murrays Crossing Road, Tumbarumba NSW (Figure 1-1 and Figure 1-2Figure 1-2).

The proposal involves the amalgamation of the Murrays Crossing Quarry operations into the Tumbarumba Quarry, expanding works to extract and process ~200,000 tonnes of hard rock per year, extending the quarry life over a 25-year period. The project would involve construction and ground disturbance, including blasting; waste stockpile and removal; and an increased frequency of heavy traffic loads among other impacts. The Due Diligence assessment is undertaken to evaluate whether Aboriginal objects are present, or likely to be present, within the proposed impact area of the development activity, and if those objects would be harmed by the activity.

1.1 Subject site

The land subject to survey comprises Lots 659, 663, 665, 452, 20, 172, 173, 174, 175, 176, 177, 178, DP 755892, Lot 179 DP 1100528, Lot 1 DP 1150973, Lot 1 DP 111861, Lot 732 and 623 DP 755892. The survey area includes sections of Crown land, Snowy Valley Council Land and adjacent Crown road. At the time of survey part of a Travelling Stock Reserve (TSR) that borders the survey area to the north, south and west was included in the subject land, this has since been removed but formed part of the cultural heritage survey. The survey area is 1.6 km south of central Tumbarumba, NSW, located within the Snowy Valleys Council Local Government Agency (LGA), approximately 28 km north of the New South Wales / Victoria state border. The currently quarried land is zoned for mining purposes, with the expansion of the survey area into the adjoining lots of general grazing land.

1.2 Project personnel and Aboriginal consultation

NGH senior archaeologist Jill Taylor undertook the fieldwork and completed this report with assistance from archaeologist Dr Douglass Rovinsky who completed the background research. NGH senior archaeologist Dr Rhiannon Stammers reviewed the report for quality assurance purposes and approved it for distribution.

The due diligence process does not formally require consultation with Aboriginal community groups however BHQ requested that the Toomaroombah Kunama Namadgi Indigenous Corporation were involved and consulted with for this assessment. Early involvement with the Aboriginal community is considered best archaeological practice. In this case the engagement and consultation of the Toomaroombah Kunama Namadgi Indigenous Corporation was determined to be the appropriate Aboriginal community group for this project. This is particularly relevant as while the survey area is within the boundaries of the Toomaroombah Kunama Namadgi Indigenous Corporation interests, there is an undetermined Aboriginal land claim on the Travelling Stock Reserve Crown reserve (Saleyards TSR R51191 Lot 7028 DP 96852), which covers a portion of land within the survey area.

The Toomaroombah Kunama Namadgi Indigenous Corporation were invited to participate in the fieldwork and three members of the Corporation (Uncle John Casey, Mark Small and Bink Wilesmith) were involved in all aspects of the field inspection undertaken on the 23rd of September.

The Toomaroombah Kunama Namadgi were not involved in the field visit on the 17th of December, however BHQ will discuss the findings of and recommendations resulting from the additional December survey with representatives of the Corporation and a copy of this draft report will be provided to the Toomaroombah Kunama Namadgi Indigenous Corporation for comment.

The Planning Secretary's Environmental Assessment Requirements (SEARs) for the project also noted for heritage that "an assessment of the potential impacts on Aboriginal heritage (cultural and archaeological), including evidence of appropriate consultation with relevant Aboriginal communities/parties and documentation of the views of these stakeholders regarding the likely impact of the development on their cultural heritage" (EAR 1459 dated 06/04/2021) be undertaken. The consultation and involvement of the Toomaroombah Kunama Namadgi Indigenous Corporation for this assessment is considered to address this requirement in full.

1.3 Approach and format of this report

This report has been drafted in keeping with the sequence of steps identified in the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (Due Diligence Code) (DECCW 2010). The Due Diligence Code outlines a five-step approach to determine if an activity is likely to cause harm to an Aboriginal object, as defined by the NSW *National Parks and Wildlife Act 1974* (NPW Act). The steps follow a logical sequence of questions, and the answer to each question determines the need for the next step in the process in order to:

- Identify whether Aboriginal objects are, or are likely to be, present in the survey area;
- Determine whether or not the proposed activities are likely to harm Aboriginal objects (if present) in the study area; and
- Determine whether an Aboriginal Heritage Impact Permit (AHIP) application is required.

Table 1-1 Due Diligence steps

	Due Diligence steps
Step 1.	Will the activity disturb the ground surface?
Step 2a.	Search the AHIMS database and use any other sources of information of which you are already aware.
Step 2b.	Are activities proposed in areas where landscape features indicate the presence of Aboriginal objects?
Step 3.	Can you avoid harm to the object or disturbance of the landscape feature?
Step 4.	Undertake a desktop assessment and visual inspection. Is it likely that Aboriginal objects will be impacted by the proposed works?
Step 5.	Further investigations and impact assessment.

If the proposed activities are not 'low impact activities' (a defence for which is provided under the NPW Regulation), the considerations result in a determination of whether or not:

- Further approval under the NPW Act is required, in the form of an AHIP; or

- Due Diligence obligations for the protection of Aboriginal objects are discharged by the process under the Code.

For the purposes of the Due Diligence assessment, disturbed land is defined in the Due Diligence Code. Land is disturbed if it has been the subject of a human activity that has changed the land's surface, with the changes remaining clear and observable.

The defence against prosecution offered by following the Due Diligence Code process does not apply to situations where it is known there is an Aboriginal object present. The defence does not authorise harm to Aboriginal objects.

Each section within this report follows the relevant step outlined in the Due Diligence Code (DECCW 2010). Reference is also made, where relevant, to the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010).

Figure 1-1 General project location

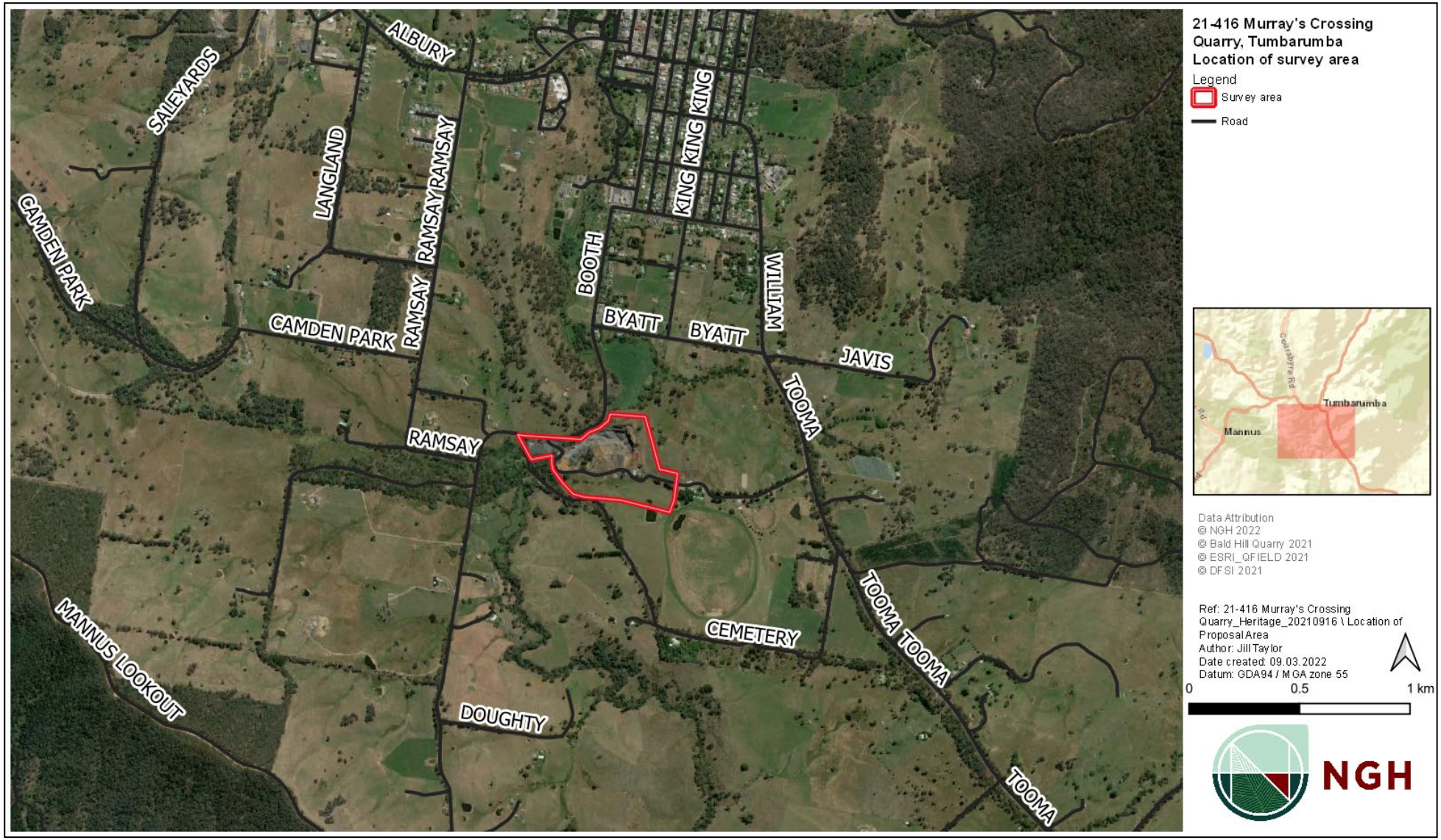

Figure 1-2 Murray's Crossing Quarry, Tumbarumba survey area

Figure 1-3 Lots within the survey area

2. Legislation

In NSW, Aboriginal heritage is principally protected by two legislative acts:

- *National Parks and Wildlife Act 1974* (NSW) (NPW Act) and its subordinate legislation, the National Parks and Wildlife Regulation 2019; and
- *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

2.1 National Parks and Wildlife Act 1974

Part 6 of the NPW Act concerns Aboriginal objects and places and various sections describe the offences, defences and requirements to harm an Aboriginal object or place. All Aboriginal material receives blanket protection under the NPW Act. The main offences under section 86 of the NPW Act are:

- A person must not harm or desecrate an object that the person knows is an Aboriginal object.
- A person must not harm an Aboriginal object.
- For the purposes of this section, "circumstances of aggravation" are:
    - that the offence was committed in the course of carrying out a commercial activity; or
    - that the offence was the second or subsequent occasion on which the offender was convicted of an offence under this section.
- A person must not harm or desecrate an Aboriginal place.

An Aboriginal object is defined as:

- Any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with the occupation of that area by persons on non-Aboriginal extraction and includes Aboriginal remains.

Section 87 sets out defences that are available to a person who is prosecuted for a particular harm offence under section 86. For example, it will be a defence in certain circumstances if the person who is being prosecuted can show that:

- the harm or desecration was authorised through an Aboriginal Heritage Impact Permit (AHIP) and conditions of the AHIP were not contravened;
- the person exercised due diligence to determine whether the act/omission constituted the offence would harm an Aboriginal object and reasonably determined no harm would occur;
- the person complied with requirements or a code of practice, as prescribed in in the National Parks and Wildlife Regulation (2019); or
- was a low impact act or omission.

Section 89A of the NPW Act also requires that a person who is aware of an Aboriginal object, must notify the Director-General in a prescribed manner. In effect, this section requires the completion of AHIMS site cards for all sites located during heritage surveys.

2.2 Environmental Planning and Assessment Act 1979

The EP&A Act regulates development in NSW. It sets up a planning structure that requires developers (individuals or companies) to consider impact of the project on the environment and to promote the sustainable manage of built and cultural heritage (which includes Aboriginal cultural heritage). The EP&A Act requires that Aboriginal cultural heritage, and the possible impacts that development may have to Aboriginal heritage be considered, as part of the environmental impact assessment process under the EP&A Act. For most projects requiring assessment under Part 4 and 5 of the EP&A Act, the NPW Act will apply and an AHIP may be required. However, where the project is a "State Significant" project approved under Part 3A of the EP&A Act, the operation of the NPW Act is excluded the Part 3A assessment will involve consideration of impact to Aboriginal cultural heritage.

It also provides for the identification, protection, and management of heritage items through inclusion of these items into schedules off planning instruments, such as Local Environmental Plans (LEPs).

2.3 Tumbarumba Local Environmental Plan 2010

The survey area is located within the Snowy Valleys Council LGA, formed in 2016 from the amalgamation of the Tumut and Tumbarumba Shires. Schedule 5 of the Tumbarumba Local Environmental Plan (LEP) 2010 details the included environmental heritage items covered by the plan. No Aboriginal sites or places are identified within close proximity to the survey area in the Tumbarumba LEP.

3. Ground disturbance

Step 1. Will the activity disturb the ground surface or any culturally modified trees?

The proposed work to be undertaken by BHQ is the amalgamation and expansion of the Murrays Crossing Quarry operations, approximately 1.6 km south of Tumbarumba. The project proposal will involve the following:

- construction and heavy ground disturbance, including quarrying
- waste stockpile and removal
- high frequency, heavy-load traffic.

These activities require significant ground disturbance, the use of heavy machinery and laydown areas. Any Aboriginal sites within the disturbance footprint could therefore be subject to harm. As the project will include ground disturbance, the next step in the due diligence process will be completed.

4. Register search and landscape assessment

Step 2a. Search the AHIMS Database and other information sources

A search of relevant heritage registers for Aboriginal sites and places provides an indication of the presence of previously recorded sites. A register search is not conclusive, however, as it requires that an area has been subject to archaeological survey, and information about any sites identified has been submitted for registration. However, as a starting point, the search will indicate whether any sites are known within or adjacent to the investigation area and provide oversight regarding the site types most commonly recorded within the locality. The Aboriginal Heritage Information Management System (AHIMS) provides a database of previously recorded Aboriginal heritage sites. A search provides basic information about any sites previously identified within a search area. The results of the search are valid for 12 months for the purposes of a due diligence level assessment.

On 15-09-2021 a search of the AHIMS database was undertaken over an approximately 50 km^2 area centred on the survey area, as follows:

- Client Service ID: 622618
- MGA Zone 55
- Lat/Long: -35.95, 147.74
- Lat/Long: -35.67, 148.23
- Aboriginal objects:
    - 98
- Aboriginal Places:
    - 0.

There were 98 Aboriginal sites recorded within this search area and no declared Aboriginal Places. Table 4-1 below shows the breakdown of site types and Figure 4-1 and Figure 4-2 show the location of the AHIMS sites in relation to the survey area.

Table 4-1 Breakdown of previously recorded Aboriginal sites in the region

Site type	Number
Artefact	55
Potential Archaeological Deposit (PAD)	15
Modified Tree	14
Aboriginal Resource and Gathering	3
Grinding Groove	2
Habitation Structure	2
Ochre Quarry	2
Aboriginal Resource and Gathering; Artefact	1

Site type	Number
Aboriginal Resource and Gathering; PAD	1
Artefact; Modified Tree	1
Stone Quarry	1
Water Hole; PAD	1
Total	**98**

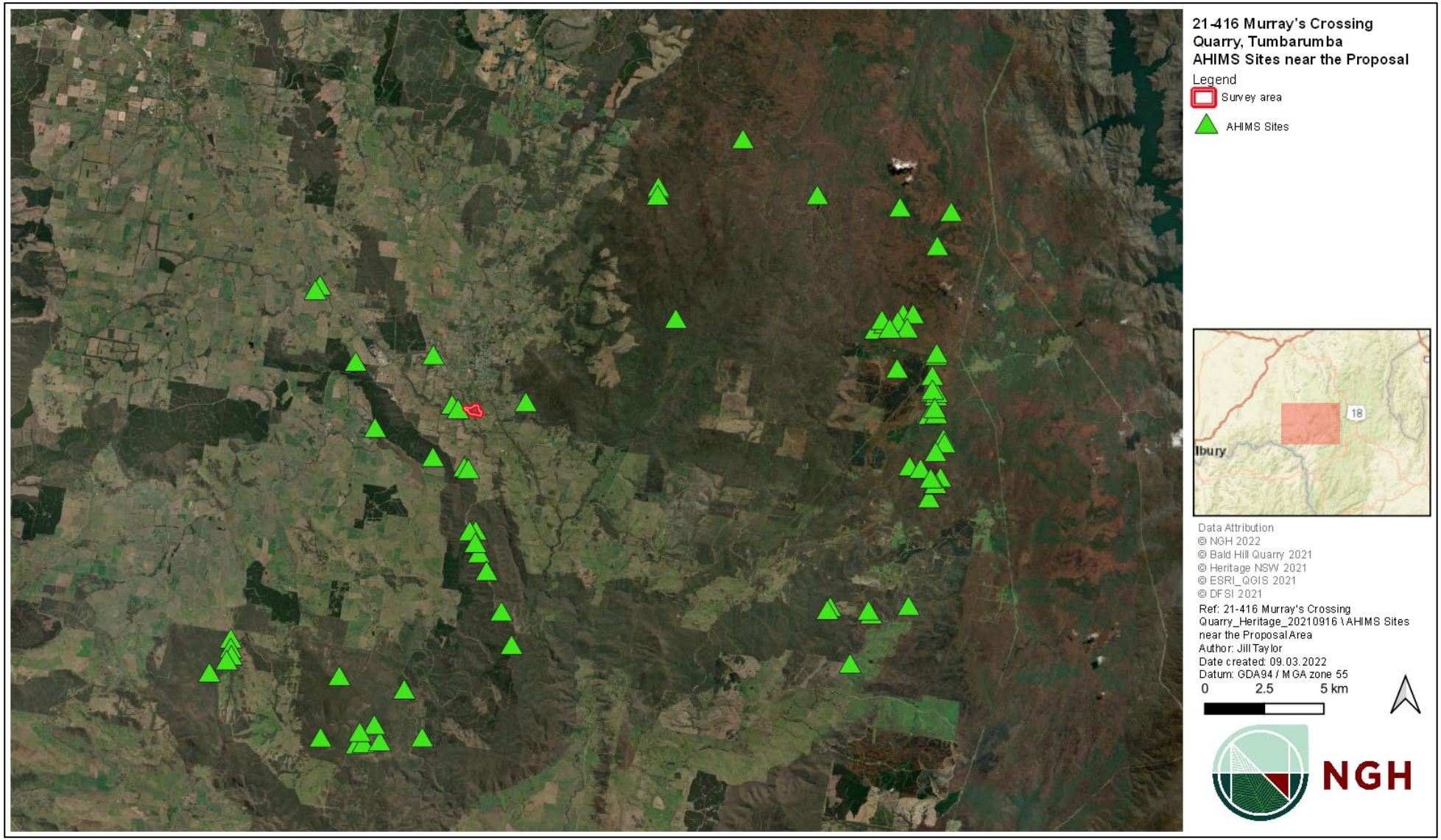

Figure 4-1 AHIMS sites near survey area

Please note, this map is not for public distribution.

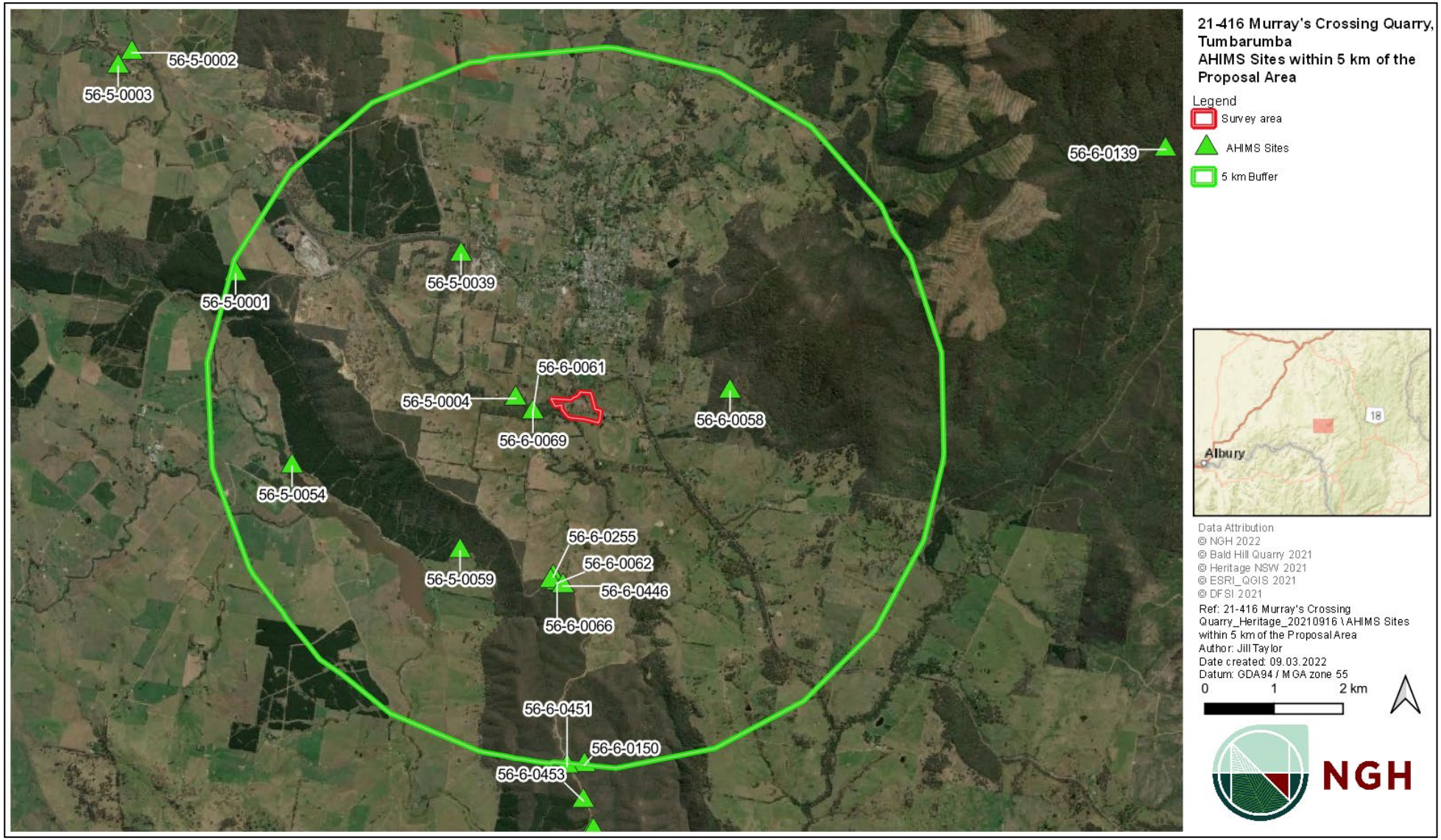

Figure 4-2 AHIMS sites within 5 km of the survey area

Please note, this map is not for public distribution.

None of the archaeological sites currently recorded on AHIMS are located within or directly adjacent to the survey area, however, ten sites occur within ~5 km. These sites are summarised in Table 4-2 below and shown in Figure 4-2.

Table 4-2 Sites within ~5 km of survey area

Site number	Site name	Site type	Distance to project (m)	Site status on AHIMS
56-6-0061	TC-OS-1 Tumbarumba Creek	Artefact	320	Valid
56-5-0004	RR-OS-1	Artefact	520	Valid
56-6-0058	TH1 Tumbarumba Hill	Artefact	2,040	Valid
56-6-0255	Mt Garland Fire Trail 1	Artefact	2,350	Destroyed
56-6-0445	Mt Garland Fire Trail 2	Artefact	2,410	Destroyed
56-6-0066	MGR-0S-1	Aboriginal Resource and Gathering; Artefact	2,440	Destroyed
56-5-0039	MH- ST - 1, Munderoo	Modified Tree	2,460	Valid
56-6-0446	Mt Garland Fire Trail 3	Artefact	2,470	Destroyed
56-5-0059	Pineview	Artefact	2,510	Valid
56-5-0054	Mannus Lake Grinding Grooves	Grinding Groove	3,875	Valid

4.1 Archaeological context

People have inhabited the Australian continent for well over 40,000 years, potentially to or beyond 65,000 (Clarkson et al. 2017; Bradshaw et al. 2021). The earliest archaeological dates for occupation in the general region are potentially as far back as 25,000 years ago (e.g., Birrigai rock shelter ~93 km northeast; Flood et al., 1987; Theden-Ringl, 2016). Sites from the greater surrounding area such as Willandra Lakes (~400 km northwest), Lake Mungo and Lake Arumpo (~500 km west-northwest), Pitt Town (~360 km northeast), and Bend Road (~350 km southwest) provide ample evidence for human occupation in the area by 32,000 years ago or earlier (Bradshaw et al. 2021).

Several archaeological surveys have been conducted within the general region. Regional surveys will be outlined here, while those performed in closer proximity to the survey area will be outlined in section 4.1.2 below.

4.1.1 Regional context

In 1992, Johnson reported on an in-depth study and survey of the Kosciusko National Park, approaching to within 30 km east of the survey area (Johnson 1992). The survey identified approximately 80 artefact scatters across the surveyed park areas and found little evidence to support previous efforts at social-level interpretive modelling (e.g., Flood 1980). Analysis of the artefact scatters indicated that materials used strongly reflected local availability, with black chert sourced and used in the northwest of the park, and silcrete in the Jindabyne and Lower Snowy River area.

A survey was performed by Navin Officer (1997) for the proposed extension of the 'Easy Does it' Ski Run in Thredbo, approximately 83 km south-southeast of the survey area. The assessment suggested that level and/or low, well drained ground associated with river corridors or ridgelines would have the highest probability to preserve sites. A single open artefact scatter was identified, consisting of five quartz flakes and a quartz core fragment.

Navin Officer (1998, 1999, 2000) conducted a series of surveys and assessments for the construction and revision of the Visy Pulp and Paper Mill at Gadara Plains, 8 km southwest of Tumut and ~56 km north-northeast of the survey area. Thirteen archaeological sites were identified from the initial survey, consisting of two artefact scatters, eight isolated finds and three potential culturally modified trees. A subsequent series of subsurface testing was conducted, with 20 test pits were excavated; three pits recovered archaeological material. Nine artefacts were recovered during the testing, from depths ranging between 10 - 30 cm. Artefacts recovered were manufactured from fine grained volcanic, fine grained siliceous, quartzite, chert, and milky quartz materials (Navin Officer 1998). Subsequent surveys for a pipeline and pump (Navin Officer 1999), and a raw water dam (Navin Officer 2000) only identified a single Aboriginal site, located at a spring in the valley mouth, preserving 17 stone artefacts including cores and flakes constructed from quartz, indurated siltstone, and black and green chert (Navin Officer 2000). These surveys indicated a low artefact density across all landforms, with a higher occurrence on elevated land within 200 m of main drainage lines, mostly basal slopes and creek banks. Valley floors, springs and low gradient slopes bordering the valley floors were identified as having high potential for archaeological sensitivity throughout the region.

An assessment was performed for a proposed recreational facility at Mill Ridge, Jindabyne, approximately 90 km southeast of the survey area (New South Wales Archaeology Pty Ltd 2004). The area, situated on a ridge and upper steep slopes removed from water and other resources, was judged to have been of low sensitivity. Two Aboriginal sites were identified: a small artefact scatter consisting of silcrete, quartz, and volcanic flakes, and an isolated silcrete flake. The artefacts were considered to represent transient use of the area and be representative of the general background scatter of land use.

In 2005, the site of a proposed holiday village on the foreshore of Lake Eucumbene, 80 km southeast of the current survey area, was surveyed by HLA Envirosciences Pty Ltd (2005). The area was modelled to be of low sensitivity, and during the survey found to have been largely disturbed by modifying activity – mostly cultivation and development. No sites of Aboriginal heritage were identified.

The site for a proposed residential subdivision in East Jindabyne, approximately 90 km southeast of the survey area, was surveyed by Archaeological Heritage Surveys (2005). A total of three Aboriginal sites were identified, all of which were low density, mostly silcrete flake scatters. A previously recorded modified tree was additionally assessed and deemed to be non-Aboriginal in

origin. The survey suggested that these low-density artefact scatters are likely to occur across the general regions.

In 2010, an assessment was performed for the proposed water supply pipeline from Tumut to Adelong, approximately 55 km north-northeast of the survey area (Comber Consultants Pty Ltd 2010). No sites of Aboriginal Cultural Heritage or areas of archaeological potential were identified during the survey. The assessment suggested that the lack of identified sites was due to previous clearing for grazing and agricultural purposes, highlighting the effect of disturbance on potentially sensitive landscapes.

A proposed day use facility associated with the Mount Selwyn Ski Resort in Kosciuszko National Park, approximately 40 km east-southeast of the survey area, was assessed by Feary (2010). The area itself was modified grassland cleared from a subalpine woodland, distant from watercourses, and was deemed to be of low archaeological sensitivity, and likely to preserve only low-density artefact scatters if any at all. No Aboriginal sites were identified within the proposed works area, though three isolated stone artefacts were identified within an erosional scar 50 m southeast of the development footprint. The assessment deemed local areas of flat, well drained land, along with traversable spurs, saddles, ridgelines and toe slopes to likely be of higher sensitivity.

OzArk Environmental & Heritage Management (2012) performed an assessment for the proposed replacement of overhead transmission wire with ground wire within an area noted in a previous survey to be a Potential Archaeological Deposit (PAD; Earth Resource Management 2012). The proposed works were located approximately 30 km east of the current survey area. Subsurface excavation of 13 50x50 cm test pits failed to recover any identifiable artefacts, and the area was deemed unlikely to contain significant records of Aboriginal heritage.

An assessment was performed for proposed upgrade works along a section of Gocup Road between Gundagai and Tumut, approaching to approximately 60 km north-northwest by Kelleher Nightingale Consulting (2015). There were six Aboriginal cultural sites recorded within the study area by Waters Consultancy Pty Ltd. These previously recorded cultural sites included two ceremonial pathways, one seasonal pathway, one meeting place and camping area, one pathway associated with specific resource use and one remnant wetland that constituted a resource gathering area. All six cultural sites were noted to be impacted by the proposed works, and mitigation measures were recommended, incuding, salvage, signage and barrier fencing.

Kelleher Nightingale Consulting (2015) also incorporated the results of their 2012 survey of the study area, which recorded ten sites including eight artefact scatters, an isolated artefact and a potential archaeological deposit. Six of these recorded archaeological sites were found to overlap the identified Aboriginal cultural sites previously recorded by Waters Consultancy Pty Ltd. The sites within the study area were generally noted to be located within 200 m of water on low gradient slopes, floodplains, ridge lines and spurs. The majority of sites had already experienced medium to high levels of disturbance from the construction and maintenance of infrastructure and services, housing construction and erosion. The identified artefacts were determined as being sourced from the local region (Kelleher Nightingale Consulting 2015).

A survey was performed by NGH Pty Ltd (2019a) for proposed road upgrades, compound, and stockpiles within a site on the Snowy Mountains Highway, near Adelong, approximately 54 km north of the survey area. No Aboriginal cultural sites were identified during the survey, which was suggested to have been the result of high-level historical disturbances to the area.

Proposed works and upgrades to the Flea Creek campground approximately 84 km northwest of the current survey area was assessed by NGH Pty Ltd (2019b). Previous work had identified that subsurface and surface artefact scatters were already known to be present in the immediate works

area. A total of two new Aboriginal sites were identified, both surface stone artefact scatters, and subsurface testing was performed at one of the previously identified Aboriginal sites. This subsurface testing identified 50 stone artefacts, the majority of which were flakes manufactured from volcanic materials but also including silcrete, chert, and quartz materials. The density of artefacts suggested that the area was likely to have been repeatedly used in the past as people moved through the Brindabella Ranges.

NGH Pty Ltd (2020) also completed a survey assessment for Transport for New South Wales to undertake proposed road safety improvements along approximately 2.1 km of the Snowy Mountains Highway, located approximately 3.5 km west of the township of Adelong and 55 km north of the survey area. No sites or areas of archaeological potential were identified during the survey. This was again suggested to be due to the high historical disturbances from road and bridge construction, ploughing, grazing and the installation of road culverts and reserves in the area.

An initial assessment for Visy Pulp and Paper Mill, approximately 56 km north-northeast of the survey area, for the proposed replacement of a low-level bridge over Sandy Creek was performed by NGH Pty Ltd (2021). The project area was noted to be highly disturbed by alluvial erosion activity, machinery, and maintenance associated with the track and the bridge, along with livestock soil trampling. No Aboriginal objects were recorded within the project area.

4.1.2 Local context

The route for a proposed optical fibre cable between Batlow–Courabyra, Courabyra–Tumbarumba, and Lower Bago–Lower Bago Break Off, approaching to within 2 km north-northwest of the survey area, was assessed by Hamm (1993). The survey considered that level ground near waterways would provide the highest sensitivity to archaeological materials, with higher-elevation montane/alpine sites occurring along plateaus and ridgelines allowing for movement or gathering of people (Hamm 1993). The majority of the route in the Tumbarumba area, however, followed the already established road easements. No Aboriginal materials were identified along the route.

An assessment for a proposed landfill site across Murrays Crossing Rd approximately 300 m southwest of the survey area was surveyed in 1998 (Stone 1998). The general site was cleared farmland with isolated *Eucalyptus* spp., approximately 300 m west of Tumbarumba Creek. No archaeological material was identified, though the assessment noted that poor visibility (average visibility was ~5%) may have hampered identification. Nonetheless, the assessment suggested that the lack of surface outcroppings of suitable materials in the area, the distance from the only significant waterway in the area, and the moderately steep adjoining slopes along the remnant ephemeral drainage lines made open campsites to have been highly unlikely.

The site for a proposed waste transfer facility was assessed by Heritage Solutions (2004a), approximately 2.7 km northwest of the survey area. Previous disturbance to the area and lack of immediate sources of water were assumed by the assessment to present a low level of archaeological sensitivity. The survey identified no Aboriginal sites.

Heritage Solutions (2004b) surveyed and assessed the Aboriginal heritage within the nature reserves and national parks of the Upper Murray Area, in total covering approximately 220.5 hectares approaching to 20 km east-southeast of the current survey area. The assessment identified 42 new Aboriginal sites, mostly consisting of stone artefact scatters (n = 16) or isolated stone artefacts (n = 12), with modified trees and PADs making up the bulk of the remainder. Most of the artefacts recorded were flakes, the majority of which were quartz, with chert and volcanics making up the majority of the remainder. The assessment identified that spur/ridge crests, sides,

and terminations, along with lower/basal slopes were of much greater archaeological sensitivity in the area than other landforms, with the vast majority of sites recorded from level or gently sloping ground within these landforms.

The context provided by the surveys within the general area suggest that areas of level ground associated with watercourses or ridgelines, providing access to resource and thoroughfare routes in the often-rugged subalpine terrain, are of highest archaeological sensitivity. Outside of these areas, a low-density background scatter of artefacts is potentially recoverable from all landforms.

4.2 Landscape assessment

Step 2b. Are there landscape features present likely to contain Aboriginal objects?

The Due Diligence Code outlines a range of general landscape features that are more likely to contain Aboriginal objects. These include land that is:

- Within 200m of water
- Located within a sand dune system
- Located on a ridge top, ridge line or headland
- Located within 200m below or above a cliff face, or
- Within 20m of a cave, rock shelter or cave mouth.

It is also necessary to consider whether any sensitive landscape features present have been disturbed or modified which would reduce the potential for Aboriginal objects to occur.

The survey area encompasses a portion of Tumbarumba Creek, and portions of several lower order watercourses and lines that drain into the creek. Areas adjacent to watercourses are well noted to have high potential for preserving Aboriginal sites, including both manufactured stone artefacts and culturally modified trees.

4.2.1 Geology

Understanding the geological character of the local area can assist with understanding what, if any, raw stone materials may have been available for the manufacture and maintenance of stone tools or for use as shelter. The basic geology underlying the region within 10 km of the survey area is divided under the Mitchell landscapes system (DECC 2002) into two major landscape types – the Tooma Granite Ranges (Tom), and the Adrah Hills and Ranges (Adr), with smaller contributions from the Cabramurra – Kiandra Basalt Caps and Sands (Cbs), and the Tipperary Hills Granites (Tip). The majority of the survey area itself overlays the Tooma Granite Ranges landscape, with a small portion of the western extent of the Area overlaying a small section of Cabramurra – Kiandra Basalt Caps and Sands. These landscapes are described below (Table 4-3).

Table 4-3 Description of the Mitchell Landscapes within the general region of the survey area (DECC 2002).

Mitchell Landscape	Landforms	Soils	Vegetation
Tooma Granite Ranges Landscape code:	Rounded hills, ranges and plateau on Silurian	Red and yellow gritty texture-contrast soils	Lower slopes with: Red Stringybark (*Eucalyptus macrorhyncha*), Narrow-leaved Peppermint (*E. radiata*), candlebark (*E. rubida*), Apple Box (*E. bridgesiana*)

Mitchell Landscape	Landforms	Soils	Vegetation
Tom Ecosystem Meso Grouping: SEH Bondo Granites	gneissic granite with well-defined rectangular drainage pattern controlled by jointing. General elevation 700 to 1,400 m.	merging to gradational profiles at about 1,000 m.	abundant shrubby understorey including numerous *Acacia* sp., and grass trees (*Xanthorrhoea* sp.). Upper slopes with; Alpine Ash (*E. delegatensis)* and Mountain Gum (*E. dalrympleana*). Snow Gum (*E. pauciflora*) on higher peaks.
Adrah Hills and Ranges Landscape code: Adr Ecosystem Meso Grouping: NSS Upper Slopes	Rolling hills, low ranges and peaks on Ordovician quartzose greywacke, slate, phyllite and schist, general elevation 250 to 720 m, local relief 200 m.	Stony, thin red and brown texture-contrast soils merging to yellow harsh texture-contrast soils on valley floors.	Forest and woodland of: Tumbledown Red Gum (*Eucalyptus dealbata*), Red Stringybark (*E. macrorhyncha*), Red Ironbark (*E. sideroxylon*), Red Box (*E. polyanthemos*), Grey Box (*E. 19acrocarpa*), Apple Box (*E. bridgesiana*) and Broad-leaved Stringybark (*E. caliginosa*) on slopes, Yellow Box (*E. melliodora*), White Box (*E. albens*) and occasional Blakely's Red Gum (*E. blakelyii*) on flats with Kangaroo Grass (*Themeda triandra*) and Plains Grass (*Stipa aristiglumis*).
Cabramurra – Kiandra Basalt Caps and Sands Landscape code: Cbs Ecosystem Meso Grouping: AA Alpine	Extensively distributed Tertiary basalt flow remnants capping hills on the high plains. Fluvial quartz gravels, sands and silts of former river channels are exposed beneath the basalt. Soil materials and sediments from the basalt and quartz sands extend down slope over Ordovician	Uniform and gradational, organic rich, brown clay loams, often stony.	Open sub-alpine woodlands of Snow Gum (*Eucalyptus pauciflora*) on the hills with extensive open grasslands, heath and bogs in the valleys. Black Sallee (*E. stellulata*) along streamlines on the valley floors. Associated shrubs and ground cover include: Leafy Bossiae (*Bossiaea foliosa*), Alpine Oxylobium (*Oxylobium alpestre*), Alpine Daisy Bush (*Olearia algida*), Candle Heath (*Richea continentis*), Alpine Baeckea (*Baeckea gunniana*), Long-leaf Hovea (*Hovea longifolia*), Alpine Phebalium (*Leionema phylicicfolium*), Alpine Orites (*Orites lancifolia*), Alpine Hovea (*Hovea montana)*, Mountain Shaggy-pea (*Oxylobium alpestre)*, snow grasses (*Poa* spp.), sedges (*Carex* spp.) and Sphagnum (*Sphagnum cristatum*).

Mitchell Landscape	Landforms	Soils	Vegetation
	meta-sediments or Silurian-Devonian granites toward the alpine valleys. Most basalt outcrops are columnar jointed and formed periglacial block streams during the Pleistocene. General elevation 1400 to 1650, local relief to 200 m.		
Tipperary Hills Granites Landscape code: Tip Ecosystem Meso Grouping: NSS Upper Slopes Granites	Rounded hills and peaks on Silurian massive and gneissic granite with some gneiss and schist, general elevation 400 to 930 m, local relief 350 m.	Gritty gradational red earths and red texture-contrast soils.	Forest of Yellow Box (*Eucalyptus melliodora*), Grey Box (*E. microcarpa*), Blakely's Red Gum (*E. blakelyii*), Red Stringybark (*E. macrorhyncha*), Red Box (*E. polyanthemos*), Apple Box (*E. bridgesiana*), Broad-leaved Peppermint (*E. dives*) and Black Cypress Pine (*Callitris endlicheri*). River Red Gum (*E. camaldulensis*) along streams.

Underlying rock in the area is generally intrusive granites to the east and north, with chert, quartzite, slate and mudstone to the west and south, interspersed with basalt, andesite, tuff, and various other volcanics. These materials may have provided a rich source for tools and other implements in the past.

The Murray's Crossing Quarry is a tertiary basalt flow quarry. Prior to its use as a quarry, it was a high point overlooking Tumbarumba Creek. It is believed that the area was an important source of basalt material to the Ngarigo people (pers comm John Casey 2021).

4.2.2 Topography

The general area is one of moderately high relief; the survey area is situated on a moderately flat to sloping area approximately 3 km to the southwest of Tumbarumba Hill, rising ~450 m above the survey area. Tumbarumba Creek cuts through the general area along a ~north-south course, amplifying local relief and providing, along with its drainage lines, ample high sensitivity areas for heritage recovery.

4.2.3 Hydrology

Tumbarumba Creek, running approximately north-south through the general area, runs directly through the survey area, as do multiple of its lower order drainage lines. This watercourse would have provided water, food, and sociocultural attractions, and its banks and associated terraces will be of high archaeological sensitivity. There are a series of springs in the south eastern portion of the survey area that make up an ephemeral drainage line leading down to Tumbarumba Creek. These springs were noted by local Aboriginal representative Uncle John Casey to remain active even in the driest of summers when Tumbarumba Creek ran dry and would have been an important resource during such times (pers comm John Casey 2021).

4.2.4 Soils

The formation and nature of soils within the survey area can provide insight into the types of sites which may be present, in addition to the likelihood for intact archaeological deposits to be present.

Soil classifications in the area generally follow an east-west trend, with kandosols in the highlands to the east trending westward through rudosols, dermosols, and kurosols. The survey area itself straddles the boundary between rudosols and dermosols, with the bed and floodplain of Tumbarumba Creek interposing a thin band of alluvial rudosols at the boundary line. This suggests at a general cline moving from low-fertility soils to more fertile soils of the Cabramurra – Kiandra Basalt Caps and Sands as one trends east-west, with a return to less fertile kurosols west of Tumbarumba Creek. Soils at the immediate survey area should be thinner red and yellow, rocky soils in the east, with deeper brown-grey, nutrient rich soils to the west of Tumbarumba Creek, which should lay in a sandy alluvial bed.

4.2.5 Flora and fauna resources

The survey area would once have been vegetated by a wide variety of plant species and would also have been inhabited by faunal resources such as Eastern Grey Kangaroo (*Macropus giganteus*), Red-necked Wallaby (*Notamacropus rufogriseus*), Common Ringtail Possum (*Pseudocheirus peregrinus*), Brushtail Possum (*Trichosurus vulpecula*), and Common Wombat (*Vombatus ursinus*), along with Murray Crayfish (*Euastacus armatus*).

Plant species in the local area that are known to have been useful to Aboriginal people living traditionally include the various species of *Eucalyptus*, which were used for food, medicines, containers, tools, and implements, particularly Grey Box (*Eucalyptus microcarpa*), which is a common species to surface modify. Additionally, Kangaroo Grass (*Themeda triandra*), Hovea (*Hovea* spp.), and Grass Trees (*Xanthorrhoea* spp.) would have been used for food and implements.

4.2.6 Historic land use

The area was established by European settlers by the late 1850s after gold was discovered in the area. After the decline of gold mining in the first half of the 20th Century, the timber industry and agriculture has become the major economic (and land use) practice. The immediate area has been reserved for quarrying since at least 1959, and subject to heavy ground disturbance since this time.

4.3 Aboriginal site prediction

Several archaeological assessments have been performed in the general area and have found that there are highly sensitive landforms that tend to preserve Aboriginal sites – mostly in the form of low-moderate density artefact scatters. Areas of level ground associated with watercourses or spurs/ridgelines, providing access to resource and travel routes in the often-rugged subalpine terrain, are of highest sensitivity.

Based upon the initial desktop assessment, using satellite imagery and topographic data, it is suggested that there is moderate potential for Aboriginal objects to occur within the survey area given that Tumbarumba Creek and several of its drainage lines cross the survey area. This potential is somewhat modified by the history of heavy ground disturbance distant from the creek due to quarrying activities, but the area around the creek and drainage lines should still be considered to have relatively moderate sensitivity.

Based upon the currently recorded AHIMS sites in the area there is potential for artefact scatters, isolated artefacts and culturally modified trees where old growth trees remain.

The desktop assessment, therefore, indicates that there are landscapes present within survey area that have the potential to contain Aboriginal objects. The nature of the works being undertaken at this site will involve significant ground disturbance and it is possible that it would impact on Aboriginal heritage objects.

An outline of predicted Aboriginal objects within the activity area is provided in Table 4-4.

Table 4-4 Aboriginal site prediction statements

Site type	Site description	Potential
Stone artefacts scatters and isolated artefacts	Stone artefact scatter sites can range from high-density concentrations through to isolated finds	High potential to occur in low to moderate densities, particularly along the watercourse margins
Potential Archaeological Deposits (PADs)	Potential subsurface deposits of archaeological material	Potential to occur within the survey area in areas of elevated, flat, dry land associated with water sources
Modified trees	Trees that have undergone cultural modification	High potential to occur within the survey area in areas where remnant mature native trees remain

5. Impact avoidance

Step 3. Can any AHIMS listed objects, or landscape features be avoided?

The proposed location of the quarry expansion is located in an area which contains Aboriginal archaeological potential, based on the nature of the landscape. The survey area encompasses a portion of Tumbarumba Creek, several of its drainage lines, and the level flats and banks associated with the watercourses. Furthermore, remnant stands of pre-European vegetation may exits along the watercourses, which may preserve modified trees.

The project activity can be amended to an extent, to avoid Aboriginal objects, landscapes and culturally sensitive areas. If Aboriginal sites are identified, efforts can be made to preserve them and their location while still allowing for substantial expansion of the quarrying works.

The desktop assessment alone is not sufficient to conclusively define the archaeological potential of the landscape or identify the location of any Aboriginal objects. Therefore, the next step in the process, a visual inspection, must be conducted to determine the presence of Aboriginal objects or potential archaeological deposits.

6. Desktop assessment and visual inspection

Step 4. Does the desktop assessment confirm that there are likely to be Aboriginal objects present or below the ground surface?

The assessment process is primarily a desktop exercise, using available information such as the AHIMS search results and relevant archaeological reports to develop or refine a model of Aboriginal site prediction based on the type of activity proposed and the level of disturbance of the area. A visual inspection is also required where landscape features are present that may contain Aboriginal objects that cannot be avoided by the activity.

A visual inspection of the survey area was carried out on the 23rd of September and again on the 13th of December 2021 after an amendment to the development footprint (Figure 6-1). Present at the September 23rd visit was qualified NGH senior archaeologist Jill Taylor and three Toomaroombah Kunama Namadgi Indigenous Corporation representatives (Uncle John Casey, Mark Small and Bink Wilesmith) and BHQ Work Health Safety and Environment Manager Belinda Fourie. NGH Senior archaeologist Jill Taylor carried out the field survey on the 13th of December.

All assessment observations, conclusions and the recommendations presented in this assessment of the September 23rd field visit were discussed in detail during the fieldwork with the three representatives from the Toomaroombah Kunama Namadgi Indigenous Corporation. At no time was any objection for any of the visual assessment items detailed below noted for the 23rd of September. BHQ will/has verbally communicated with the Toomaroombah Kunama Namadgi Indigenous Corporation regarding the findings and recommendations stemming from the December 13th visit and a copy of the draft Due Diligence Report will be provided to them for comment.

The following provides a summary of the landscape and survey area in relation to the archaeological potential for Aboriginal objects to occur.

The field inspection of the survey area was undertaken on foot, targeting areas of both low and high archaeological sensitivity, areas of proposed development, areas that appeared to be less disturbed, exposures and any areas of increased visibility (Figure 6-2).

The survey area is characterised as a gentle to steep east west tending slope leading down to Tumbarumba Creek in the western and northern boundary (Plate 6-1, Plate 6-2 and Plate 6-3). A large quarry has been cut into the slope. The quarry, combined with its associated works and infrastructure consumes approximately 75% of the survey area (Figure 6-2, Plate 6-4, Plate 6-5 and Plate 6-6). Due to the intense nature of these disturbances, the working quarry and its associated areas were not inspected.

Visibility within the survey area was generally very poor (less than 5%) with much of it covered by dense grass. Visibility was particularly poor (< 2%) during the December 13th field inspection. With chest high Phalaris impeding visibility and creating an unsafe environment, the archaeologist was unable to satisfactorily inspect the trunks of two mature native trees for cultural modification (Plate 6-7). Despite the poor visibility, some exposures were present across the survey area including along the vehicular track in the TSR on the western boundary of the survey area and number of erosion banks within the south eastern and north eastern sections of the survey area that had adequate visibility averaging 50% (Plate 6-7, Plate 6-11 and Plate 6-14).

The southern section of the survey area is characterised as flat to gently sloping wetland in the south east tending to a steep decline in the south-south west. A series of natural springs form an

unnamed drainage from the south east corner of the survey area flowing into Tumbarumba Creek approximately100 m west of the survey area (Plate 6-8). The springs are known in the area to be a permanent water source, even in periods of drought. Although the springs would have likely been utilised by Aboriginal people, the flat, wet, low-lying nature of the landform would not have been conducive to camping. A more probable location for camping occurs on the spur approximately 50 metres south of the spring fed drainage. The spur is a north facing high point overlooking the springs, an additional drainage to the south and Tumbarumba Creek to the west. Local Aboriginal representative Uncle John Casey concurred with these conclusions and a small PAD (PAD 01) was located on the spur within the survey area. Uncle John also disclosed that the area of the PAD was also located on a significant song line (Figure 6-3, Plate 6-9 and Plate 6-10). With exception of the PAD location, the remaining landform within the southern section of the survey area was deemed low probability to contain Aboriginal objects or archaeological sites due to the low-lying nature of the landform in the south east, the steep slopes on the south west and the high level of disturbances noted throughout. These disturbances included land clearing for agricultural purposes, ploughing, the construction of a dam and evidence of historic gold mining. Soils were noted to be reddish brown silty loam with rounded gravels in the south east with a much higher rocky content occurring in the south west (Plate 6-11).

The western boundary of the survey area is characterised as the low-lying wetland associated with Tumbarumba Creek (Plate 6-12 and Plate 6-13). It was noted to be quite disturbed through the construction, use and maintenance of the unsealed vehicular track forming the current TSR, land clearing, historic mining activity, quarry activity and the construction of a small bridge. It was also evident that the area is subject to frequent and intensive flooding. Given the landforms and noted disturbance there is little likelihood of *in situ* archaeological deposits occurring within and along the TSR. However, the Toomaroombah Kunama Namadgi representatives spoke of the highly significant intransient values of the TSR to the local Aboriginal people. The TSR bordering the western boundary of the survey area is known locally as Gudja Gudja Mura (5 Ways) and it is not only the location of a large gathering place for many Aboriginal groups in the past, but also the location where seven different story lines converge. Gudja Gudja Mura was not only important to Aboriginal people in the past but is still highly valued and used by the local community today. The TSR that follows the southern boundary of the survey area is also a significant song line leading up to the high country in the east (Figure 6-3). While NSW Heritage legislation does not effectively protect intangible intrinsic values placed on a location, it is recommended that no activity be undertaken by BHQ in this area without ongoing open dialogue with local representatives of the Toomaroombah Kunama Namadgi Indigenous Corporation.

The north western portion of the survey area is characterised as a moderate to steeply sloping landform tending south to north towards Tumbarumba Creek in the north (Plate 6-13 and Plate 6-14) While visibility was exceedingly poor (< 2%) on the day of the visit (Plate 6-7), the area was noted to be highly disturbed through ground clearing and former quarrying activities including but not limited to the extraction, benching and hauling of the basalt that made up the landform (Plate 6-14). Soils were noted to be reddish brown silty loam with a higher level of angular cobbles (basalt) (Plate 6-11, Plate 6-14). Several mature native trees occurred within this area however, due to the lack of visibility and the disturbed steep landforms surrounding them, two trees were unable to be adequately inspected for the presence of cultural modification (Figure 6-4). The trunks of these two mature trees demarcated in Figure 6-4 will need to be photographed prior to any works proceeding in the area and the photographs will need to be forwarded to an archaeologist to be analysed for the presence of cultural modification.

With exception of the two mature native trees mentioned above, all mature native trees within the survey area were inspected; no scars or other modifications were noted during the survey.

In general, the survey area contained a high level of ground disturbance through past tree clearing, agricultural practices, historic gold mining, vehicular tracks, flooding, and in particularly the destructive use of the area for rock extraction. With the exception of the PAD (PAD 01) on the southern boundary of the survey area, the potential for *in situ* deposits in minimal. Despite the low potential for Aboriginal objects and archaeological deposits to remain *in situ* within the survey area, the TSR encompassing the western and southern boundaries of the survey area is of significant cultural value to the local Aboriginal community. It is highly encouraged that BHQ maintain an open and ongoing dialogue with the community regarding any activity that may occur within or impact this significant area.

Site photographs below taken during field work:

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Plate 6-1 View west from eastern boundary overlooking the low-lying natural springs in south eastern portion of the survey area.</td><td>Plate 6-2 View east overlooking the moderately sloping eastern most portion of the survey area. Note the high dense grasses and very low visibility.</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Plate 6-3 View south towards the northern boundary of the eastern portion of the survey area showing the steep slope and low visibility.</td><td>Plate 6-4 The disturbance footprint of Bald Hill Quarry incorporates over 75% of the survey area.</td></tr>
</table>

Plate 6-5 Significant levels of disturbance prominent across the majority of the survey area.

Plate 6-6 Significant levels of disturbance prominent across the majority of the survey area.

Plate 6-7 Poor visibility in the north eastern portion of the survey area. View is to the north overlooking the survey area.

Plate 6-8 A section of reasonable visibility, although it is in a disturbed context (benching). Soils were thinner with basalt outcropping and loose basalt cobbles. View northeast.

Plate 6-9 PAD location. View west.

Plate 6-10 Overview looking South towards Pad.

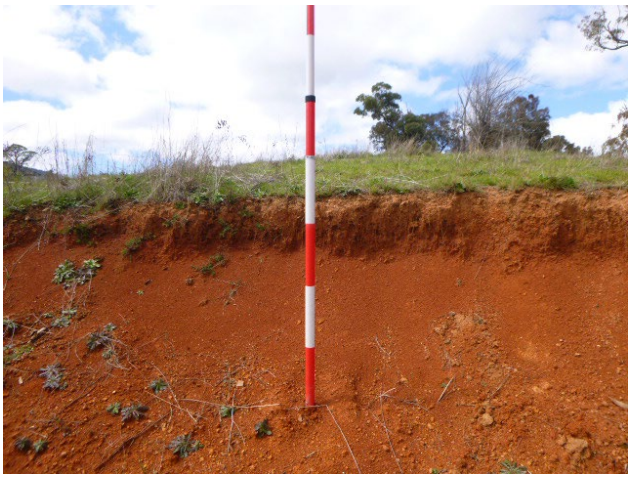

Plate 6-11 Soils in the southeast portion of the survey area were a reddish-brown silty loam with rounded gravels.

Plate 6-12 Significant Aboriginal area known as Gudja Gudja Mura located in the TSR within and bordering the western and southern portions of the survey area. View is to the south overlooking Tumbarumba Creek.

Plate 6-13 The TSR has been cleared of mature trees, subject to flooding, road grading and gravelling in the past.

Plate 6-14 Former road used for extraction within the north west portion of the survey area.

Figure 6-1 Areas Surveyed in September and December

Figure 6-2 Areas surveyed by foot

Figure 6-3 Field results

Figure 6-4 Location of Mature Trees requiring further inspection

6.1 Summary

The site inspection of the survey area, research of previous archaeological assessments, and landscape analysis identified that the survey area may contain potential for Aboriginal objects in association with Tumbarumba Creek and the basalt outcropping that is now Bald Hill Quarry which may have been used as a transient occupation location for local Aboriginal people prior to European settlement. Expected site types in these regions include isolated artefacts or scatters of stone tool artefacts formed from mainly quartz and basalt raw materials and possible evidence of quarrying near outcrops. Modified trees are also likely where old growth remnant vegetation is present.

The site inspection confirmed that the ground surface of the survey area has been significantly disturbed by the construction, extraction of materials and maintenance of the Bald Hill Quarry, previous agricultural practices, vehicular tracks, flooding and historic gold mining activity. No Aboriginal objects were located within the survey area, although one PAD (PAD 01) was identified on a spur overlooking Tumbarumba Creek to the west and two unnamed drainages to the north and south of the survey area.

Local representatives of the Toomaroombah Kunama Namadgi Aboriginal Corporation present during the survey stressed the significance of the TSR to the local Aboriginal community. The TSR running along the southern boundary is said to follow a story line that travels up to the high country and the TSR bordering the eastern boundary is Gudja Gudja Mura (5 Ways) which is a gathering place and where seven story lines converge. It is still an important gathering place to the local Aboriginal community today and should be avoided from any further development activity.

Aside from the PAD identified on a spur on the southern boundary, the survey area is considered to have low potential for Aboriginal objects and *in situ* subsurface deposits to occur due to previous significant levels of ground disturbance, the steep sloping nature of the landform in the north west and south west portion of the survey area and the low-lying nature of the landform in the south east and western sections of the survey area. The TSR is an area of very high cultural significance to the local Aboriginal Community and is a location where large gatherings of people occurred. Although this area has been subject to disturbances through quarrying, land clearing, road development and flooding resulting in the low likelihood of *in situ* archaeological deposits, the area should be avoided due to its significance to the local Aboriginal community.

7. Further assessment

Step 5. Is further investigation or impact assessment required?

The Due Diligence Code states that if, after the desktop research and visual inspection is completed, it is evident that harm will occur to Aboriginal objects or heritage places then further and more detailed assessment is required. However, if the research and inspection conclude that the proposed activity is unlikely to harm Aboriginal objects then the activity can proceed with caution.

The field assessment has identified a PAD (PAD 01) on the southern boundary of the survey area. Ball Hill Quarry must avoid the PAD location. If PAD 01 cannot be avoided, further assessment in the form of an Aboriginal Cultural Heritage Assessment (ACHA) must be undertaken.

While NSW Heritage legislation does not effectively protect intangible intrinsic values placed on a location, the TSR bordering the western and southern boundary of the survey area is of significant cultural value to the local Aboriginal community. It is recommended that no activity be undertaken by BHQ in the TSR due to the significant cultural value placed on the area without ongoing open dialogue with local representatives of the Toomaroombah Kunama Namadgi Indigenous Corporation.

Since the time of survey and in consultation with the local Aboriginal community, to ensure that the project does not impact the intrinsic values the local Aboriginal community hold for the TSR on the western boundary of the survey area, BHQ has excluded the area from the development footprint. The TSR on the southern boundary is also excluded from the development footprint and will not be impacted. This is in line with archaeological best practice.

During the December field visit to the north eastern section of the survey area, field conditions made it unsafe for the archaeologist to satisfactorily inspect two mature trees for the presence of cultural modification (Figure 6-4). Prior to work proceeding near these two trees, BHQ is to photograph the trunk of each tree with a scale and forward the photographs on to an NGH archaeologist. Works can only proceed with caution following written advice by an archaeologist to confirm the presence or absence of cultural modification. If deemed to be necessary, a physical inspection may be required

Since the time of survey BHQ has changed the development footprint and believes that the northern tree is now outside the development footprint. If this can be confirmed it will not require any further assessment.

8. Recommendations

The following recommendations are based on a number of considerations including:

- Background Aboriginal heritage research into the area;
- Assessment of Landscape;
- Land use and disturbance assessment;
- Visual inspection
- Consideration of the impact of the proposed works; and
- Legislative context for the development proposal.

Based on an assessment of the project, the location and previous level of disturbance, the proposed work can proceed with caution with the following recommendations:

1. Works must avoid the area of Potential Archaeological Deposit (PAD) with a minimum 10 m buffer to ensure there are no inadvertent impacts to potential Aboriginal objects.
2. BHQ is encouraged to not undertake activities within the TSR as identified in Figure 6-3 due to the significant cultural value placed on the area by the local Aboriginal community. Open and ongoing dialogue with local representatives of the Toomaroombah Kunama Namadgi Indigenous Corporation is recommended.
3. Prior to works proceeding near the two mature native trees identified in Figure 6-4, BHQ must undertake physical inspection of the trunk of the trees which were unable to be assessed at the time of inspection due to safety concerns. BHQ is to photograph the trunk of each tree with a scale and forward the photographs on to an NGH archaeologist. Works can only proceed with caution following written advice by an archaeologist to confirm the presence or absence of cultural modification. If deemed to be necessary, a physical inspection may be required.
4. Works within the survey area that are outside the area of Potential Archaeological Deposit (PAD 01) and the two trees identified in Figure 6-4 can proceed with caution.
5. If the proposed works cannot avoid the PAD, then further assessment in the form of an Aboriginal Cultural Heritage Assessment (ACHA) must be undertaken, including a programme of subsurface testing to establish the true archaeological potential and extent of archaeological sites within the portion of the PAD proposed to be impacted. All subsurface testing must comply with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW.* If Aboriginal objects are recovered during the testing programme an Aboriginal Heritage Impact Permit (AHIP) must be obtained from Heritage NSW before the proposed development can proceed.
6. Any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment.
7. If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and Heritage NSW notified. The find will need to be assessed and if found to be an Aboriginal object an Aboriginal Heritage Impact Permit (AHIP) may be required.
8. In the unlikely event that human remains are identified during development works, all work must cease in the immediate vicinity and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the

remains are part of crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, Heritage NSW must be notified by ringing the Enviroline (131 555).

Bald Hill Quarry Pty Ltd is reminded that it is an offence under the *National Parks and Wildlife Act 1974* to disturb, damage or destroy an Aboriginal object without a valid AHIP.

9. References

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Appendix A Results of AHIMS Extensive Search

Please note, the results of the AHIMS Search are not for public distribution.

AHIMS Web Services (AWS)

Extensive search - Site list report

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures
56-5-0038	Mundaroo Flora Reserve 1	AGD	55	569235	6036696	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-5-0036	OS2, Mundaroo	AGD	55	571093	6038591	Open site	Valid	Ochre Quarry : 1
	Contact T Russell	Recorders	State Forests of NSW - Thurgoona					Permits
56-5-0028	Crawleys Creek 1	AGD	55	580852	6028570	Open site	Valid	Artefact : 4
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-5-0026	Sapling Yards Creek 3	AGD	55	586128	6024124	Open site	Valid	Artefact : 8
	Contact	Recorders	Doctor.Julie Dibden					Permits
56-5-0025	Sapling Yards Creek 2	AGD	55	586422	6024174	Open site	Valid	Water Hole : -, Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Doctor.Julie Dibden					Permits
56-6-0461	Mt Garland Trail Scarred Tree	GDA	55	592760	6028488	Open site	Valid	Modified Tree (Carved or Scarred) : -
	Contact	Recorders	Doctor.Sue Feary					Permits
56-6-0394	C114-PAD-1	AGD	55	608340	6041800	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Jim Kelton					Permits
56-6-0402	C114-PAD-9	AGD	55	608850	6039910	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact Tumut/Brungle LALC	Recorders	Jim Kelton					Permits
56-6-0355	B62-1	AGD	55	608970	6046680	Open site	Valid	Artefact : -
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0398	C114-PAD-5	AGD	55	609100	6042200	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Jim Kelton					Permits
56-6-0340	ST4, Elliott Way	AGD	55	610185	6034467	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0364	EW-IF-1	AGD	55	610450	6038760	Open site	Partially Destroyed	Artefact : 1
	Contact T Russell	Recorders	Jim Kelton					Permits

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures
56-6-0376	IF-1 Bago State Forest	AGD	55	610490	6040450	Open site	Partially Destroyed	Artefact : 1
	Contact T Russell	Recorders	Jim Kelton					Permits
56-6-0339	ST3, Elliott Way	AGD	55	610671	6035337	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-5-0037	Mundaroo Flora Reserve	AGD	55	570450	6038545	Open site	Valid	Grinding Groove : 4
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-5-0029	Crawleys Creek 2	AGD	55	580850	6028165	Open site	Valid	Artefact : 1
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-5-0024	Sapling Yards Creek 1	AGD	55	587110	6024250	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Doctor.Julie Dibden					Permits
56-5-0059	Pineview	GDA	55	589459	6036379	Open site	Valid	Artefact : 3
	Contact	Recorders	Doctor.Sue Feary					Permits
56-6-0445	Mt Garland Fire Trail 2	GDA	55	590771	6035945	Open site	Destroyed	Artefact : 1
	Contact	Recorders	Mr.Roy Barker,Mrs.Lisa Davies					Permits
56-6-0058	TH1 Tumbarumba Hill;	AGD	55	593250	6038500	Open site	Valid	Artefact : -
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd					Permits
56-6-0265	Clarkes Hill 1	AGD	55	607763	6029588	Open site	Valid	Aboriginal Resource and Gathering : -
	Contact T Russell	Recorders	Mr.Dean Freeman					Permits
56-6-0390	C114-Q5-1	AGD	55	608920	6041670	Open site	Valid	Stone Quarry : -
	Contact	Recorders	Jim Kelton					Permits
56-6-0345	ST6, Elliott Way	AGD	55	609372	6035806	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0375	IF-2 Bago State Forest	AGD	55	610200	6037970	Open site	Partially Destroyed	Artefact : 1
	Contact T Russell	Recorders	Jim Kelton					Permits
56-5-0030	Crawleys Creek 3	AGD	55	580873	6027858	Open site	Valid	Artefact : 2
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-5-0022	Gilpins Fire Trail 1	AGD	55	588140	6026430	Open site	Valid	Artefact : 1
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-6-0451	MtGarland isolated AFT 7	GDA	55	591007	6033266	Open site	Destroyed	Artefact : -
	Contact	Recorders	Forestry Corporation of NSW - West Pennant Hills Office,Mr.Andrew Costello,Mrs.L					Permits

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Extensive search - Site list report

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures
56-6-0133	Ripple Creek Fire Trail	AGD	55	607645	6029747	Open site	Valid	Artefact : 1
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-6-0401	C114-PAD-8	AGD	55	607930	6041550	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Jim Kelton					Permits
56-6-0391	C114-QS/IF-1	AGD	55	608920	6041670	Open site	Valid	Artefact : 1
	Contact	Recorders	Jim Kelton					Permits
56-6-0363	EW-OS-2	AGD	55	610310	6038910	Open site	Partially Destroyed	Artefact : 4
	Contact T Russell	Recorders	Jim Kelton					Permits
56-6-0378	EW-OS-1	AGD	55	610430	6038240	Open site	Partially Destroyed	Artefact : 3
	Contact T Russell	Recorders	Jim Kelton					Permits
56-5-0031	Crawleys Creek 4	AGD	55	580674	6027651	Open site	Valid	Artefact : 6
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-5-0002	Glenroy Heritage Reserve 2;	AGD	55	584600	6043400	Open site	Valid	Modified Tree (Carved or Scarred) : -
	Contact	Recorders	J Dunn,Doctor.Sue Feary,Mr.Douglas Williams					Permits
56-6-0066	MGR-OS-1	AGD	55	590750	6035730	Open site	Destroyed	Aboriginal Resource and Gathering : -, Artefact : -
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd,Lisa Davis					Permits
56-6-0446	Mt Garland Fire Trail 3	GDA	55	590948	6035872	Open site	Destroyed	Artefact : 1
	Contact	Recorders	Mr.Roy Barker,Mrs.Lisa Davies					Permits
56-6-0452	MtGarland isolated AFT 3	GDA	55	591366	6032342	Open site	Destroyed	Artefact : -
	Contact	Recorders	Forestry Corporation of NSW - West Pennant Hills Office,Mr.Andrew Costello,Mrs.L					Permits
56-6-0448	MtGarland isolated AFT 2	GDA	55	591389	6032338	Open site	Destroyed	Artefact : -
	Contact	Recorders	Forestry Corporation of NSW - West Pennant Hills Office,Mr.Andrew Costello,Mrs.L					Permits
56-6-0392	C114-OS-1	AGD	55	608210	6041950	Open site	Valid	Artefact : 3
	Contact	Recorders	Jim Kelton					Permits
56-6-0399	C114-PAD-6	AGD	55	609520	6042200	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Jim Kelton					Permits
56-6-0374	IF-2 PAD Bago State Forest	AGD	55	610200	6037970	Open site	Partially Destroyed	Potential Archaeological Deposit (PAD) : -
	Contact T Russell	Recorders	Jim Kelton					Permits

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures
56-6-0362	EW-OS-3	AGD	55	610430	6038730	Open site	Partially Destroyed	Artefact : 3
	Contact	Recorders	Jim Kelton					Permits
56-6-0343	SA1, Elliott Way	AGD	55	610417	6035038	Open site	Valid	Artefact : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0342	ST5, Elliott Way	AGD	55	610440	6035064	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0337	ST1, Elliott Way	AGD	55	610464	6035061	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0346	Trail 28/3 Maragle State Forest	AGD	55	610799	6036956	Open site	Valid	Artefact : -
	Contact T Russell	Recorders	Mr.D Lalor					Permits
56-5-0021	Brewers Block 1	AGD	55	584622	6024414	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-5-0039	MH- ST - 1, Munderoo	AGD	55	589360	6040480	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	Jim Kelton					Permits
56-6-0061	TC-OS-1 Tumbarumba Creek	AGD	55	590400	6038200	Open site	Valid	Artefact : -
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd					Permits
56-6-0150	Bogandyera Nature Reserve Site 1 Isolated Find	AGD	55	591145	6033100	Open site	Destroyed	Artefact : 1
	Contact	Recorders	Mr.Alan Harbour					Permits
56-6-0449	MtGarland isolated AFT 4	GDA	55	591715	6031584	Open site	Destroyed	Artefact : -
	Contact	Recorders	Forestry Corporation of NSW - West Pennant Hills Office,Mr.Andrew Costello,Mrs.L					Permits
56-6-0393	C114-IF-1	AGD	55	608340	6041800	Open site	Valid	Artefact : 1
	Contact	Recorders	Jim Kelton					Permits
56-6-0344	Marangle State Forest	AGD	55	609835	6035702	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	Doctor.Alan Williams					Permits
56-6-0328	Bago-IF(J209)	AGD	55	610500	6038000	Open site	Valid	Artefact : 1
	Contact T Russell	Recorders	Jim Kelton					Permits
56-6-0329	Bago-IF-PAD(J208)	AGD	55	610500	6038000	Open site	Valid	Potential Archaeological Deposit (PAD) : 1

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Extensive search - Site list report

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures
	Contact T Russell	Recorders	Jim Kelton					Permits
56-6-0348	Trail 28/4 Maragle State Forest	AGD	55	610844	6036773	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	Mr.D Lalor					Permits
56-5-0032	Crawleys Creek 5	AGD	55	579953	6027139	Open site	Valid	Aboriginal Resource and Gathering : -, Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-5-0034	Sapling Yards 5	AGD	55	586880	6024948	Open site	Valid	Artefact : 3
	Contact	Recorders	Doctor.Julie Dibden					Permits
56-5-0027	Mannus Creek 1	AGD	55	588891	6024419	Open site	Valid	Artefact : 1
	Contact	Recorders	Doctor.Julie Dibden					Permits
56-5-0004	RR-OS-1	AGD	55	590150	6038400	Open site	Valid	Artefact : -
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd					Permits
56-6-0255	Mt Garland Fire Trail 1	AGD	55	590694	6035820	Open site	Destroyed	Artefact : 1
	Contact	Recorders	Doctor.Julie Dibden,Mrs.Lisa Davies					Permits
56-6-0450	MtGarland isolated AFT 5	GDA	55	591715	6031589	Open site	Destroyed	Artefact : -
	Contact	Recorders	Forestry Corporation of NSW - West Pennant Hills Office,Mr.Andrew Costello,Mrs.L					Permits
56-6-0447	MtGarland isolated AFT 6	GDA	55	592334	6029892	Open site	Destroyed	Artefact : -
	Contact	Recorders	Forestry Corporation of NSW - West Pennant Hills Office,Mr.Andrew Costello,Mrs.L					Permits
56-6-0351	Stone Flake 2	AGD	55	598830	6047470	Open site	Valid	Artefact : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0139	Benambra Park 4	AGD	55	599550	6042000	Open site	Valid	Artefact : 2
	Contact	Recorders	Charles Dearling Archaeological and Cultural Heritage Consultants					Permits
56-6-0057	PRD1 Paddys river Dam;	AGD	55	605500	6047200	Open site	Valid	Artefact : -
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd					Permits
56-6-0134	Clarkes Hill Nature Reserve 2	AGD	55	606037	6029898	Open site	Valid	Artefact : 1
	Contact	Recorders	Mr.Alan Harbour					Permits
56-6-0396	C114-PAD-3	GDA	55	608650	6041770	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Jim Kelton					Permits
56-6-0397	C114-PAD-4	AGD	55	608880	6041890	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact	Recorders	Jim Kelton					Permits

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AHIMS Web Services (AWS)

Extensive search - Site list report

You

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures
56-6-0338	ST2, Elliott Way	AGD	55	610262	6035294	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0366	EW-OS-5	AGD	55	610400	6038910	Open site	Partially Destroyed	Artefact : 3
	Contact T Russell	Recorders	Jim Kelton					Permits
56-6-0353	B62-3	AGD	55	610540	6045060	Open site	Valid	Artefact : -
	Contact	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0365	EW-OS-4	AGD	55	610490	6038750	Open site	Partially Destroyed	Artefact : 3
	Contact T Russell	Recorders	Jim Kelton					Permits
56-6-0347	Maragle	AGD	55	610466	6036406	Open site	Valid	Modified Tree (Carved or Scarred) : 1
	Contact T Russell	Recorders	Mr.D Lalor					Permits
56-6-0354	B62-2	AGD	55	611120	6046490	Open site	Valid	Artefact : -
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-5-0035	OS1, Mundaroo	AGD	55	570726	6037222	Open site	Valid	Ochre Quarry : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-5-0003	Glenroy Heritage Reserve 1;	AGD	55	584400	6043200	Open site	Valid	Modified Tree (Carved or Scarred) : -
	Contact	Recorders	J Dunn,Doctor.Sue Feary,Mr.Douglas Williams					Permits
56-5-0001	Mannus Hill 1;	AGD	55	586100	6040200	Open site	Valid	Artefact : -
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd					Permits
56-5-0054	Mannus Lake Grinding Grooves	GDA	55	587029	6037604	Open site	Valid	Grinding Groove : -
	Contact	Recorders	Miss.Anastasia Assargiotis					Permits
56-6-0350	Stone Flake 1	AGD	55	598820	6047540	Open site	Valid	Artefact : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0138	MR2	AGD	55	602370	6049550	Open site	Valid	Artefact : 14
	Contact	Recorders	Charles Dearling Archaeological and Cultural Heritage Consultants					Permits
56-6-0463	Maragle Aboriginal Camp Pits	AGD	55	606869	6027519	Open site	Valid	Habitation Structure : 9, Aboriginal Resource and Gathering : -
	Contact	Recorders	Mr.Roy Barker					Permits
56-6-0395	C114-PAD-2	AGD	55	608210	6041950	Open site	Valid	Potential Archaeological Deposit (PAD) : -

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Aboriginal objects found is 98

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AHIMS Web Services (AWS)

Extensive search - Site list report

You

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures
	Contact	Recorders	Jim Kelton					Permits
56-6-0400	C114-PAD-7	AGD	55	609270	6041600	Open site	Valid	Potential Archaeological Deposit (PAD) : -
	Contact Tumut/Brungle LALC	Recorders	Jim Kelton					Permits
56-6-0369	EW-IF-2	AGD	55	610510	6038890	Open site	Partially Destroyed	Artefact : 1
	Contact T Russell	Recorders	Jim Kelton					Permits
56-5-0023	Bogandyera Shelter 1	AGD	55	585409	6026998	Closed site	Valid	Habitation Structure : -
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-5-0033	Sapling Yards 4	AGD	55	586268	6024641	Open site	Valid	Artefact : 2
	Contact	Recorders	Doctor.Julie Dibden					Permits
56-5-0005	RR-05-1	AGD	55	590150	6038400	Open site	Valid	Aboriginal Resource and Gathering : -
	Contact	Recorders	Cathy Kelman					Permits
56-6-0069	TC-05-1	AGD	55	590400	6038200	Open site	Valid	Aboriginal Resource and Gathering : -
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd					Permits
56-6-0062	MGR-OS-1 Mount Garland Trail	AGD	55	590750	6035730	Open site	Destroyed	Artefact : -
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd,Mrs.Lisa Davies					Permits
56-6-0453	MtGarland isolated AFT 1	GDA	55	591242	6032766	Open site	Destroyed	Artefact : -
	Contact	Recorders	Forestry Corporation of NSW - West Pennant Hills Office,Mr.Andrew Costello,Mrs.L					Permits
56-6-0352	Stone Flake 3	AGD	55	598790	6047180	Open site	Valid	Artefact : 1
	Contact T Russell	Recorders	State Forests of NSW - Tumbarumba					Permits
56-6-0129	Clarkes Hill NR 1	AGD	55	605920	6029770	Open site	Valid	Artefact : 1
	Contact	Recorders	Christian Hampson					Permits
56-6-0135	Marangle	AGD	55	609331	6029942	Open site	Valid	Artefact : 2
	Contact	Recorders	Miss.Vanessa Mason					Permits
56-6-0367	EW-OS-1/PAD	AGD	55	610330	6039610	Open site	Partially Destroyed	Potential Archaeological Deposit (PAD) : 1
	Contact T Russell	Recorders	Jim Kelton					Permits
56-6-0368	EW-OS-6	AGD	55	610330	6039010	Open site	Partially Destroyed	Artefact : 4
	Contact T Russell	Recorders	Jim Kelton					Permits
56-6-0379	EW-OS-1/PAD 1	AGD	55	610430	6038240	Open site	Partially Destroyed	Potential Archaeological Deposit (PAD) : -
	Contact T Russell	Recorders	Jim Kelton					Permits

Report generated by AHIMS Web Service on 15/09/2021 for Jill Taylor for the following area at Lat, Long From : -35.95, 147.74 - Lat, Long To : -35.67, 148.23. Number of Aboriginal si Aboriginal objects found is 98

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AHIMS Web Services (AWS)

Extensive search - Site list report

You

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures
56-6-0334	Bago 115	AGD	55	610515	6040551	Open site	Valid	Artefact : 1, Modified Tree (Carved or Scarred) : 1

Contact T Russell **Recorders** Industry and Investment - Dareton **Permits**

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with cau

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the grou

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW

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Appendix F Air Quality Impact Assessment

TUMBARUMBA QUARRY

Air Quality Impact Assessment

Prepared for:

Bald Hill Quarry c/ NGH Pty Ltd
35 Kincaid Street
Wagga Wagga NSW

SLR Ref: 640.30286.00000-R01
Version No: -v1.0
April 2022

PREPARED BY

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E: melbourne@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

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

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

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

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
640.30286.00000-R01-v1.0	13 April 2022	J Cox, S Bagheri & J Shepherd	G Starke	J Cox
640.30286.00000-R01-v0.1	17 Feb 2022	J Cox, S Bagheri & J Shepherd	G Starke	DRAFT

CONTENTS

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

CONTENTS

APPENDICES

1 Introduction

NGH Pty Ltd has commissioned SLR Consulting Australia Pty Ltd (SLR) to prepare this Air Quality Impact Assessment (AQIA) for the amalgamation of current Tumbarumba operations. The AQIA assesses Stage 1 of the proposed operations. Stage 1 is considered to be a worst-case scenario due to the proximity of the extraction to sensitive receptors and assumption of a maximum annual extraction and processing of 200,000 tonnes per annum (tpa).

This AQIA has been prepared in general accordance with the NSW EPA document '*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*' (NSW EPA, 2017), hereafter referred to as 'the Approved Methods' and the Secretary's Environmental Assessment Requirements (SEARs) for the Project issued on 6 April 2021. The assessment methodology included the modelling of local meteorology and the dispersion of potential emissions from the Project to predict the level of impact that may be experienced in the surrounding environment.

1.1 Background

Bald Hill Quarry Pty Ltd (BHQ) would like to amalgamate the current operations at Murray's Crossing Quarry in Tumbarumba (the Project) and combine all disturbance areas under one approval. BHQ currently operates the crown quarry reserve located on Lot 732 and 623 DP755892, reserve number 81837. BHQ also own the surrounding land which currently has approval under DA 91/23 granted in March 1992. In addition to these areas there are also stockpiles from the quarry located on Travelling Stock Route (TSR) (51191) on Lot 7028 DP96852.

The objective of the proposal is to:

- Further establish a known high quality rock resource in the region for construction materials road base and aggregates.
- To utilise already existing disturbance and continuation of this resource into the future for council and local businesses in the region.
- To ensure long-term employment in the area; and
- Supply material locally to state significant development projects such as Snowy Hydro 2.0.

There are three aspects to the proposal that require consideration for a combined approval. The first aspect is the Crown Quarry which is currently operated under an existing land use right agreement with Snowy Valley Council (SVC) and does not have a Development Consent or background environmental information. The proposal would be to include this Crown Quarry in the application as the plant and access to the continuation of the quarry will remain on this land during the life of the quarry.

The second aspect is to establish the pathway to include the approved use of the Travelling Stock Route (TSR) and undertake background environmental information. BHQ currently have a permit to utilise the TSR, as attached in Appendix A. BHQ will liaise with Crownlands and Local Land Services regarding this parcel of land concurrently to the EIS. And lastly amend/combine the current Development consent (DA91/23) to the BHQ land.

Currently the site extracts and transports approximately 80,000 tonnes per annum (tpa), which has been from the Crown Quarry Reserve to date. The current Development consent for the BHQ land approves BHQ to extract and transport 15,000 tpa.

The Project proposes to extract and transport up to 100,000 tpa with a project specific peak volume of 200,000tpa, over approximately 25 years.

2 Project Overview

2.1 Project Location

The Project is located 2 km south of Tumbarumba, NSW (**Figure 1**). Quarry activity of extracting blue metal and road base material on the Crown Quarry Reserve has been evident since the 1940's. BHQ have been operating the Crown Quarry Reserve for 12 years under an existing land use rights agreement with the Snowy Valley Council.

Figure 1 Location of Project

2.2 Project Description

BHQ plan to expand the operations to the East and South onto BHQ owned land. Access will remain through Murrays Crossing Road and an internal access road will be developed to allow for truck movement on site.

Currently BHQ extract and transport approximately 80,000 tpa from site, which has been from the Crown Quarry Reserve. The Project plans to extract and transport approximately 100,000 tpa with peak period and project specific requirements of up to 200,000 tpa from the site.

The plan is to continue the open cut towards to East and South (Figure 3). There is a non-permanent drainage line that would be used to stockpile topsoil and waste. The proposal includes a plan to implement sediment and erosion control measures with progressive rehabilitation along with a sediment dam for control over this aspect of the project.

The current workshop, office and other services would need to be relocated to allow operations to expand and an internal haul road from trucks will be developed over time.

The ultimate site layout is presented in **Figure 2**. The operations Stage 1 operations assessed in this AQIA are presented in

The existing and Project operations, which will operate together are summarised in **Figure 3** Stage 1 Site Layout

.

Figure 2 Ultimate Site Layout

Figure 3 Stage 1 Site Layout

3 Pollutants of Interest

The key pollutants associated with mining and extractive industries are suspended particulate matter (TSP, PM_{10} and $PM_{2.5}$) and dust deposition. While emissions of pollutants associated with the combustion of diesel fuel, including nitrogen oxides (NO_x), sulphur dioxide (SO_2), carbon monoxide (CO) and Volatile Organic Compounds (VOCs), will be generated by the proposed operations at the quarry, these emissions are unlikely to compromise air quality goals at the closest receptors, given the nature and scale of the operation. They have therefore not been considered further.

In common usage, the terms “dust” and “particulates” are often used interchangeably. The term “particulate matter” refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm and is termed total suspended particulate (TSP).

Particulate matter has the capacity to affect health and to cause nuisance effects and is categorised by size and/or by chemical composition. The potential for harmful effects depends on both. The particulate size ranges are commonly described as:

- TSP – refers to all suspended particles in the air. In practice, the upper size range is typically 30 µm to 50 µm.
- PM_{10} – refers to all particles with equivalent aerodynamic diameters of less than 10 µm, that is, all particles that behave aerodynamically in the same way as spherical particles with diameters less than 10 µm and with a unit density.
- $PM_{2.5}$ – refers to all particles with equivalent aerodynamic diameters of less than 2.5 µm diameter. These are often referred to as ‘fine’ particles and are a sub-component of PM_{10}.
- Deposited dust – refers to particulate that settles out over a given area and time under the influence of gravity. Deposited dust can include particles of any size, but it generally comprises particles larger than 20 micrometres (µm) in diameter that rapidly settle out of the air near the point of emission. It is measured to assess if an emission source is causing a nuisance, such as soiling of property and materials.

Both natural and anthropogenic processes contribute to the atmospheric load of particulate matter. Coarse particles ($PM_{2.5-10}$) are derived primarily from mechanical processes, resulting in the suspension of dust, soil, or other crustal materials from roads, farming, mining, dust storms, and so forth. Coarse particles also include sea salts, pollen, mould, spores, and other plant parts.

Fine particles, or $PM_{2.5}$, are derived primarily from combustion processes, such as vehicle emissions, wood burning, coal burning for power generation, hazard reduction burns, and bush fires. Fine particles also consist of transformation products, including sulphate and nitrate particles, and secondary organic aerosol from volatile organic compound emissions.

The size of particles determines their behaviour in the respiratory system, including how far the particles are able to penetrate, where they deposit, and how effective the body's clearance mechanisms are in removing them. Additionally, particle size is an important parameter in determining the residence time and spatial distribution of particles in ambient air, which are key considerations in assessing exposure.

$PM_{2.5}$, and in particular the ultrafine sub-micron particles, may penetrate beyond the larynx and into the thoracic respiratory tract and evidence suggests that particles in this size range are more harmful than the coarser component of PM_{10}.

3.1 Air Quality Criteria

The ambient air quality impact assessment criteria set by NSW EPA for suspended particulate matter are summarised in **Table 1**. These include updated PM_{10} and $PM_{2.5}$ air quality goals established by the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) (National Environment Protection Council, 2016), which were adopted by NSW EPA through an amendment to the Approved Methods in 2017 (NSW EPA, 2017).

Table 1 AQIA Criteria

Pollutant	Averaging Time	Goal
TSP	Annual	90 µg/m^3
PM_{10}	24-Hours	50 µg/m^3
	Annual	25 µg/m^3
$PM_{2.5}$*	24-Hours	25 µg/m^3
	Annual	8 µg/m^3
Dust deposition	Annual • Total • Increase above background [a]	 4 g/m^2/month 2 g/m^2/month

* The National Environment Protection Measure (NEPM) for Air Quality was varied on 18 May 2021. From 1 January 2025 the goal for annual average $PM_{2.5}$ will be lowered to 7 µg/m^3 and the goal for 24-hour average $PM_{2.5}$ will be lowered to 20 µg/m^3. At the time of writing, it is not known if/when NSW EPA may vary the $PM_{2.5}$ impact assessment criteria.

4 Existing Environment

4.1 Local Setting

The Project is located approximately 1 km south of Tumbarumba in a rural residential area.

4.2 Sensitive Receptors

As defined in the Approved Methods, a sensitive receptor is a location where people are likely to work or reside; this may include a dwelling, school, hospital, office, or public recreational area. An AQIA should also consider the location of known or likely future sensitive receptors.

The Site is situated in a rural environment surrounded by farming properties with a number of residential dwellings in the vicinity. The closest residential receptor (R28) is located less than 300 m north-west of the entrance to the Site.

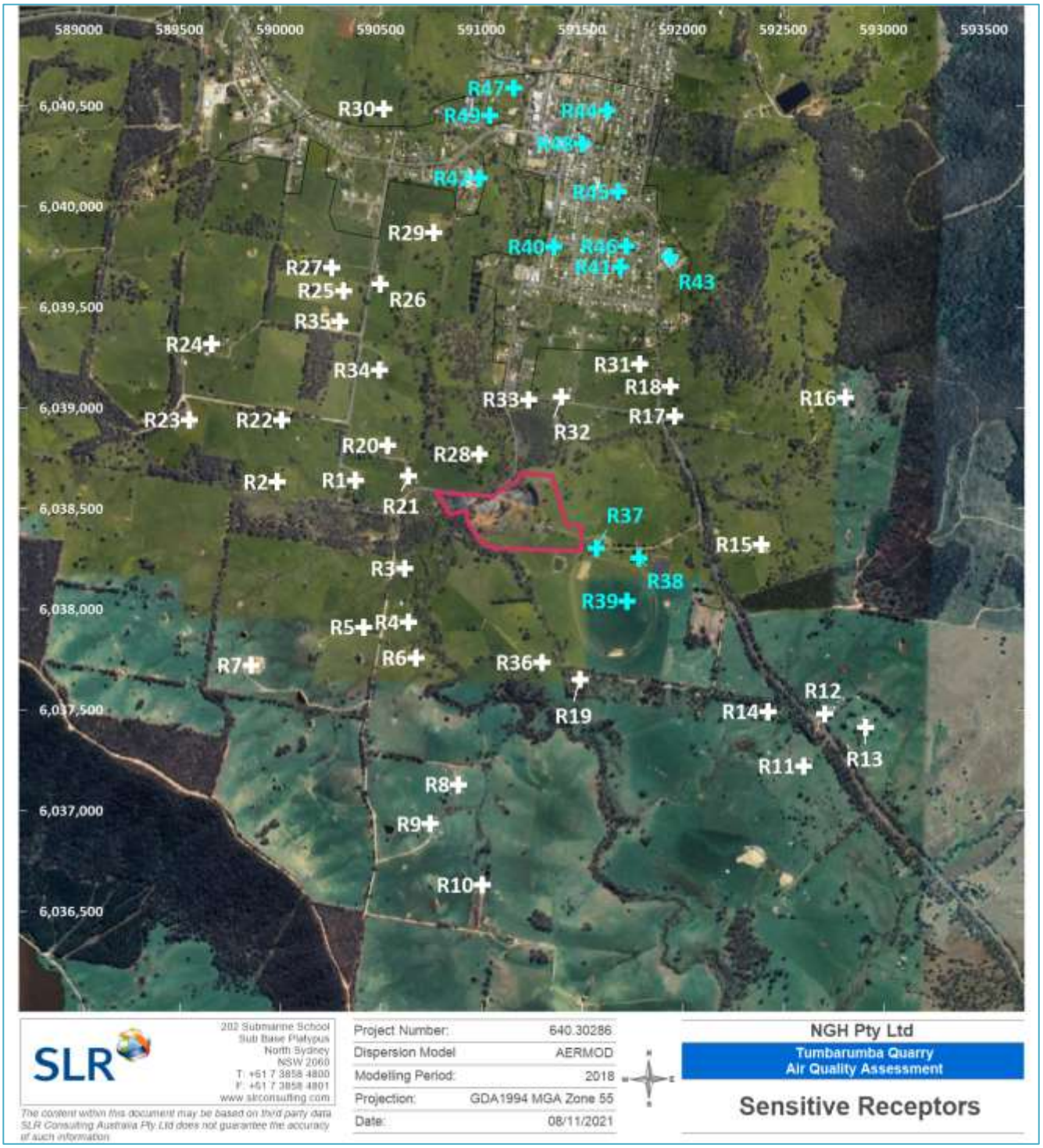
A list of sensitive receptor points identified in the immediate vicinity of the Site is shown in **Table 2**, and on (refer to **Figure 5**).

Table 2 Details of Identified Sensitive Receptors

Receptor ID	Receptor Type	Location (m, UTM)	
		Easting	Northing
R1	Residence	590,373	6,038,641
R2	Residence	589,984	6,038,633
R3	Residence	590,617	6,038,202
R4	Residence	590,636	6,037,935
R5	Residence	590,414	6,037,911
R6	Residence	590,672	6,037,759
R7	Residence	589,854	6,037,722
R8	Residence	590,886	6,037,130
R9	Residence	590,746	6,036,934
R10	Residence	591,004	6,036,631
R11	Residence	592,602	6,037,222
R12	Residence	592,705	6,037,481
R13	Residence	592,908	6,037,413
R14	Residence	592,423	6,037,492
R15	Residence	592,391	6,038,322
R16	Residence	592,807	6,039,049
R17	Residence	591,958	6,038,960
R18	Residence	591,939	6,039,106
R19	Residence	591,487	6,037,652
R20	Residence	590,533	6,038,813
R21	Residence	590,637	6,038,660
R22	Residence	590,007	6,038,940

Receptor ID	Receptor Type	Location (m, UTM)	
		Easting	Northing
R23	Residence	589,549	6,038,941
R24	Residence	589,658	6,039,316
R25	Residence	590,313	6,039,582
R26	Residence	590,497	6,039,613
R27	Residence	590,253	6,039,697
R28	Residence	590,989	6,038,770
R29	Residence	590,761	6,039,870
R30	Residence	590,515	6,040,486
R31	Residence	591,786	6,039,216
R32	Residence	591,397	6,039,053
R33	Residence	591,233	6,039,041
R34	Residence	590,491	6,039,187
R35	Residence	590,296	6,039,431
R36	Residence	591,299	6,037,735
R37	Racecourse	591,571	6,038,304
R38	Racecourse	591,781	6,038,256
R39	Racecourse	591,723	6,038,041
R40	Motel	591,358	6,039,800
R41	Motel	591,689	6,039,699
R42	Hospital	590,988	6,040,142
R43	High School	591,933	6,039,750
R44	School	591,622	6,040,476
R45	School	591,679	6,040,072
R46	Children's Centre	591,718	6,039,803
R47	Showground	591,159	6,040,587
R48	Courthouse	591,501	6,040,313
R49	Pump Track	591,039	6,040,453

Figure 4 Sensitive Receptor Locations

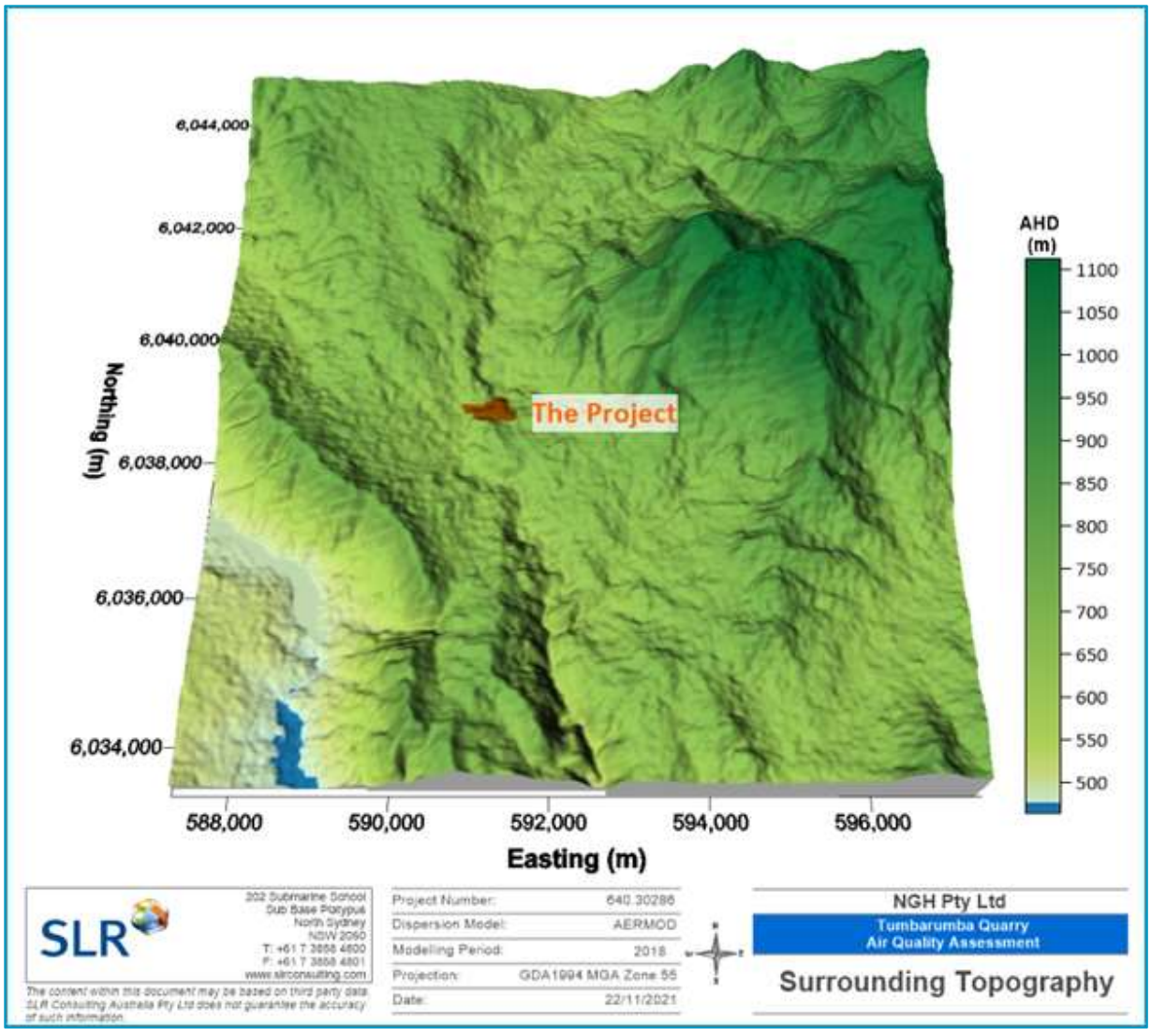


4.3 Topography

The Site sits at an elevation of approximately 700 m. The land immediately surrounding the Site is relatively flat or lightly undulating in all directions for a radius of approximately 2.5 km. Outside this radius, the land to the east rises steeply over a distance of approximately 2 km to a height of approximately 1100 m; land to the west initially increases in height slightly and then over a distance of approximately 600m it drops to a height of approximately 500 m.

A three-dimensional representation of the topographical features in the region surrounding the Project is presented in **Figure 5**.

Figure 5 Site Topography



4.4 Meteorology

Local wind speed and direction influence the dispersion of air pollutants. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of 'plume' stretching. Wind direction, and the variability in wind direction, determines the general path pollutants will follow and the extent of crosswind spreading. Surface roughness (characterised by features such as the topography of the land and the presence of buildings, structures, and trees) affects the degree of mechanical turbulence, which also influences the rate of dispersion of air pollutants.

In relation to dust emissions due to wind erosion, temperature, rainfall, and relative humidity all influence the soil moisture content and hence the threshold friction velocity, which is the minimum friction velocity required to initiate movement of soil particles by wind.

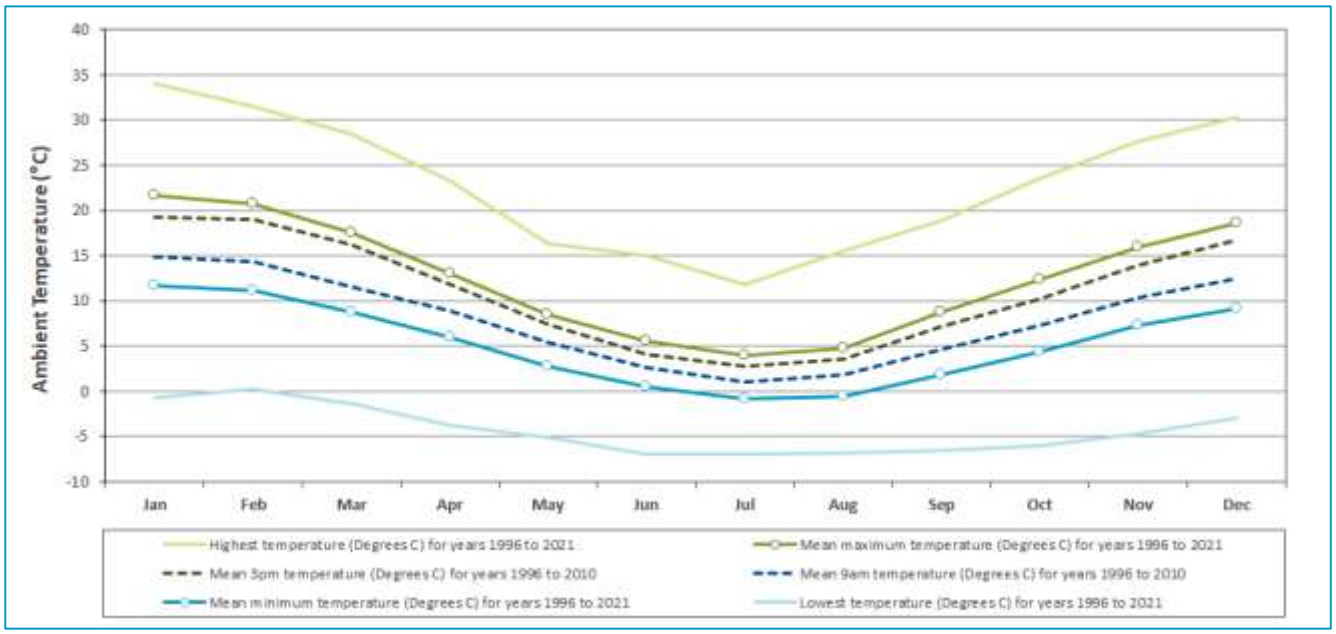
The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The nearest available automatic weather station (AWS) collecting data suitable for use in a quantitative air dispersion modelling study operated by the BoM is the Cabramurra SMHEA Automatic Weather Station (AWS) (Station ID 072161) located approximately 35 km to the southeast of the Site an elevation of 1400 m.

A review of the data collected by Cabramurra SMHEA AWS is provided in the following sections.

4.4.1 Temperature

Temperature statistics for Cabramurra SMHEA AWS between 1996 and 2021 are summarised in **Figure 6**. Mean maximum temperatures range from 3.9°C in winter to 21.6°C in summer, while mean minimum temperatures range from -0.8°C in winter to 11.7°C in summer. Longer periods of higher temperatures can dry out soil resulting in both higher background dust and on-site dust emissions.

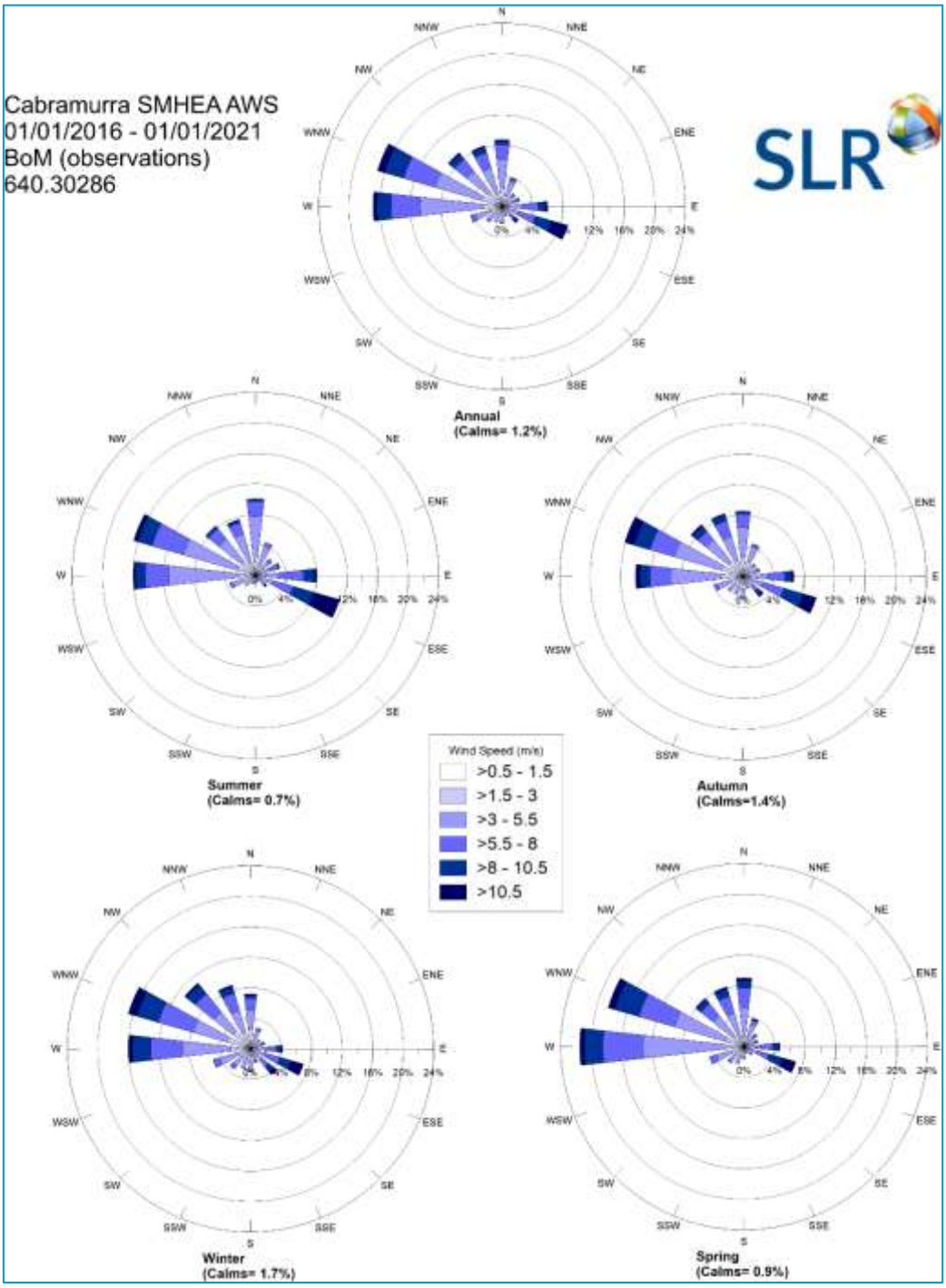
Figure 6 Temperature Trends for Cabramurra SMHEA AWS (1996 – 2021)



4.4.2 Wind

Annual and seasonal wind roses for Cabramurra SMHEA AWS for the years 2016 to 2020 are presented in **Figure 7**. The wind roses show that on an annual basis, winds from west and west-northwest are predominant, with fewer winds from the east-south-east, and between northwest and north, there are very few winds from the northeastern and southwestern quadrants. Spring, summer, and autumn are consistent with the overall distribution. Winter has winds distributed more evenly between west-northwest and north-northwest with very few winds from northeast and southwest.

Figure 7 Annual and Seasonal Wind Roses – Cabramurra SMHEA AWS (2016 – 2020)

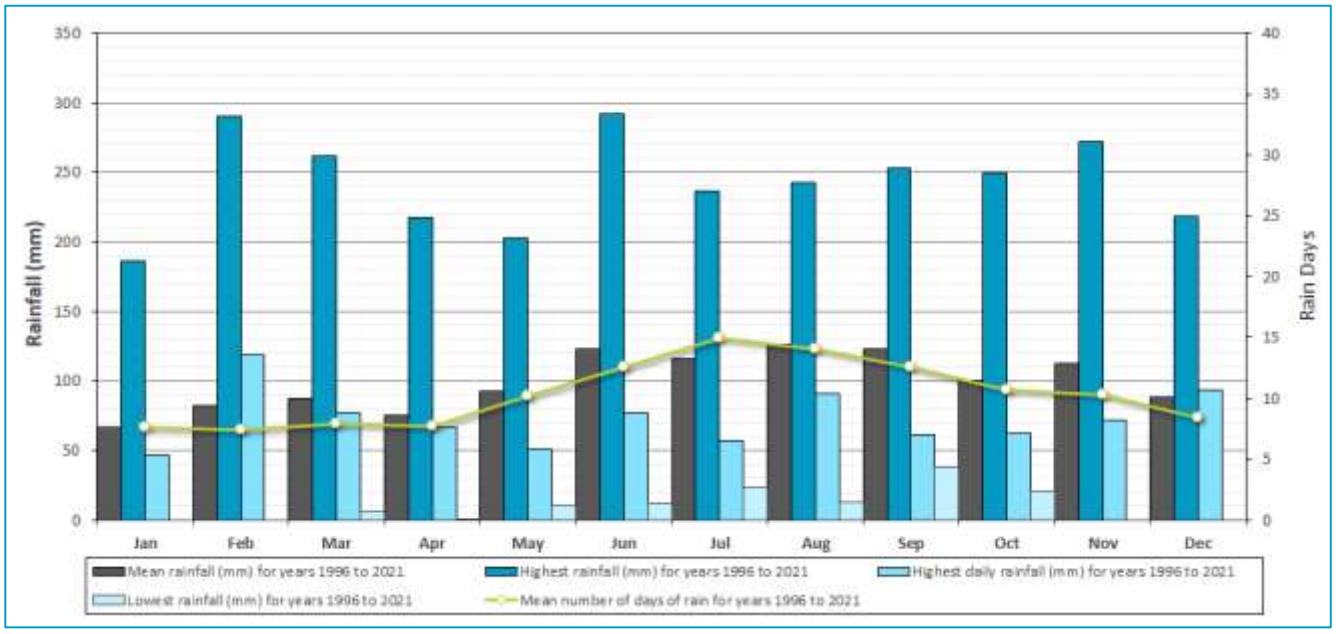


4.4.3 Rainfall

Rainfall statistics for Cabramurra SMHEA AWS for the years 1996 to 2021 are summarised in **Figure 8**. The mean annual rainfall is 1190.3 millimetres (mm) over 124.3 days. The average monthly rainfall is distributed relatively evenly across all months with the highest average monthly rainfall of 126.1 mm in August over an average of 14 rain days. The lowest monthly average of 66.2 mm over an average of 7.6 days of rain occurs in January.

Note that while rainfall may scavenge dust / particulate from the air, for the purposes of modelling it has conservatively not been considered in this assessment.

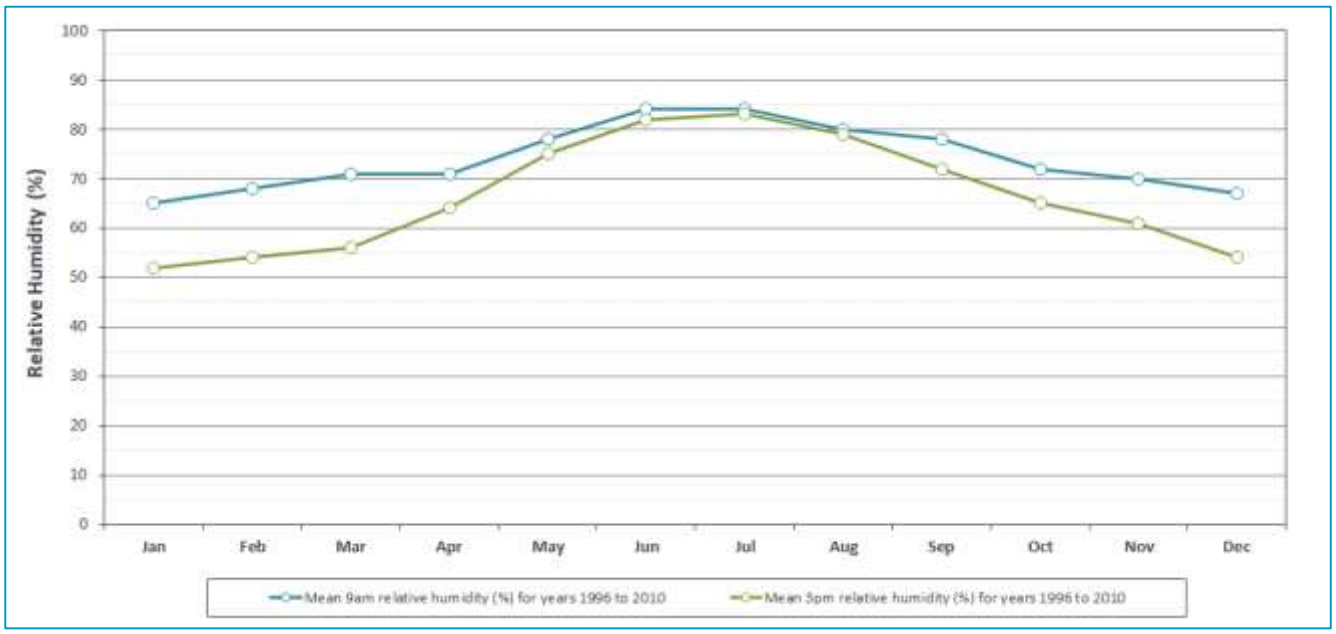
Figure 8 Long Term Monthly Rainfall Data for Cabramurra SMHEA AWS



4.4.4 Relative Humidity

Humidity statistics (9 am and 3 pm monthly averages) for Cabramurra SMHEA AWS (1996 – 2010) are summarised in **Figure 9**. Morning humidity levels range from an average of around 84% in winter to around 65% in summer. Afternoon humidity levels are slightly lower, at around 83% in winter dropping to around 54% in summer.

Figure 9 Humidity Data for Cabramurra SMHEA AWS



4.5 Background Air Quality

Section 4.5.1 details the available air quality monitoring data reviewed. The determination of the adopted background concentrations for this AQIA are discussed at **Section 4.5.2** and summarised at **Section 4.5.3**.

4.5.1 Particulate Matter

The nearest Air Quality Monitoring Stations (AQMSs) operated by the NSW Environment, Energy and Science (EES) Group - part of the Department of Planning Industry and Environment - measuring continuous TSP, PM_{10} and $PM_{2.5}$ concentrations are located at:

- Wagga Wagga North AQMS, approximately 95 km to the northwest of the Project.
    - The AQMS is located within residential area, with the nearest industry 5.5 km to the northeast. Particulate concentrations recorded by the Wagga Wagga AQMS are likely to be influenced by these local sources.
- Albury AQMS, approximately 100 km to the southwest of the Project.
    - The Albury AQMS is a part of south-west slopes air quality monitoring network and is located within a residential area, less than 1km south-west of the M31.
- Goulburn AQMS, approximately 190 km to the northeast of the Project.
    - The Goulburn AQMS forms part of the air quality monitoring network for the semi-rural area in the Southern Tablelands with the nearest industry 400 m to the west. The weather and air quality at Goulburn is likely to be influenced by these local sources.

While these AQMSs are not considered representative of the Project location due to distance and surrounding influencing sources, for the purpose of this assessment, data recorded by the Wagga Wagga North, Albury, and Goulburn AQMSs have been considered to conservatively represent background particulate concentrations at the Project site in the absence of site specific or locally acquired data.

PM_{10}

Summaries of the 24-hour average and annual average PM_{10} concentrations measured by the Wagga Wagga North, Albury, and Goulburn AQMSs during 2016 to 2020 calendar years are presented in **Table 3** and **Figure 10** to **Figure 12**.

Table 3 Summary of PM_{10} Monitoring Data at Wagga Wagga North, Albury, and Goulburn AQMSs

AQMS	Year	Maximum 24-Hour PM_{10} Concentration ($\mu g/m^3$)	Number of Exceedances of 24-Hour Criterion (days/year)	Annual PM_{10} Concentration ($\mu g/m^3$)
Wagga Wagga North	2016	59.0	2	26.3
	2017	171.6	10	20.6
	2018	127.2	34	27.4
	2019	251.7	63	35.3
	2020	295.3	25	23.2
	5 Year Average	NA	NA	26.6
Albury	2016	26.8	0	15.9
	2017	48.8	0	15.8
	2018	107.8	7	19.8
	2019	222.4	25	23.4
	2020	298.3	19	20.1
	5 Year Average	NA	NA	19.0
Goulburn	2016	-	-	-
	2017	-	-	-
	2018	-	-	-
	2019	494.1	24	83.4
	2020	556.7	18	19.2
	5 Year Average	NA	NA	51.3
Criterion		**50**	NA	**25**

Red font indicates an exceedance of the applicable criterion

Blank cells indicate lack of data.

A review of the recorded exceedances of the 24-hour average PM_{10} criterion[1] indicates that most were attributed to non-exceptional events (e.g, local agricultural activities). Greatly elevated results in 2019 and 2020 are attributed to exceptional events (i.e., regional dust storms, bush fires etc)

[1] (NSW, OEH, 2018) (NSW, OEH, 2019) (DPIE, 2020) (NSW, DPIE, 2021) (NSW, DPIE, 2021b)

Figure 10 24-Hour Average PM_{10} Data Monitored at Wagga Wagga North AQMS (2016-2020)

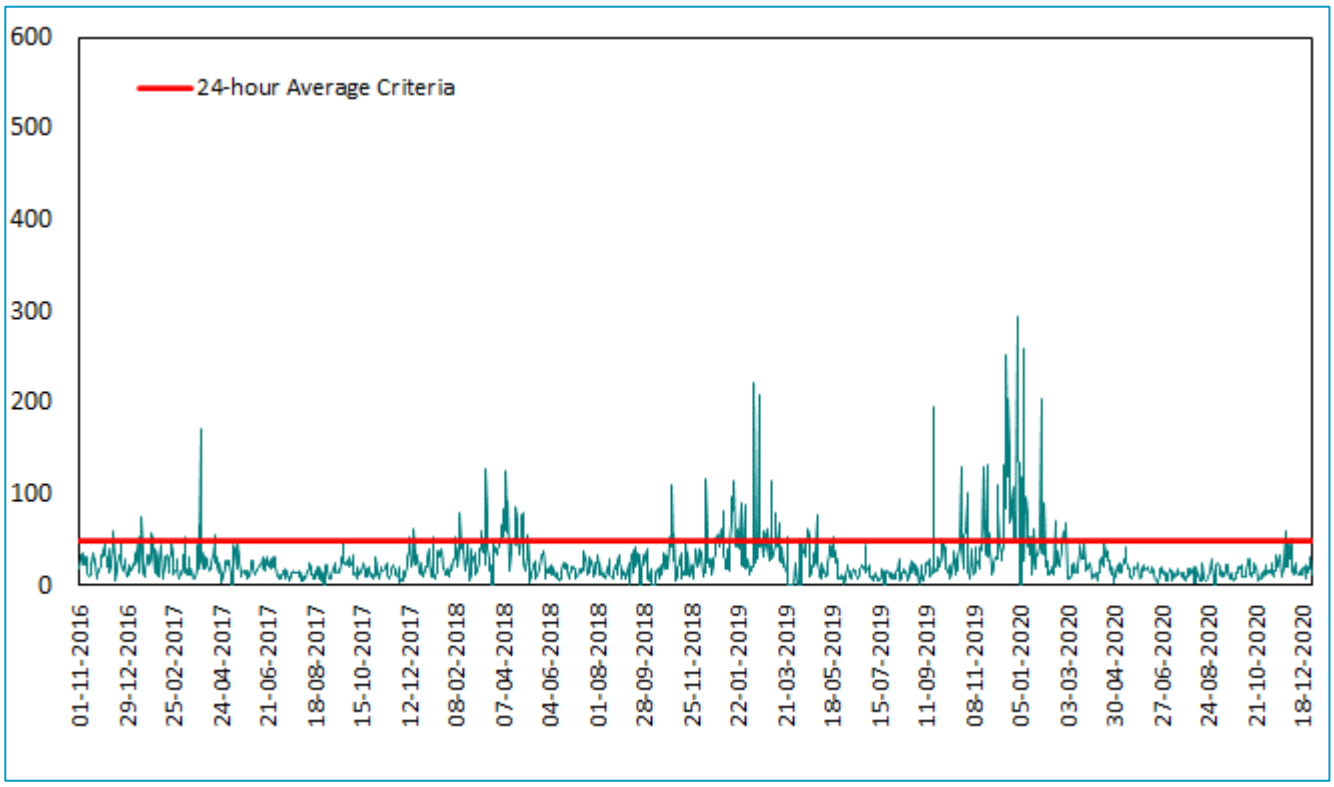


Figure 11 24-Hour Average PM_{10} Data Monitored at Albury AQMS (2016-2020)

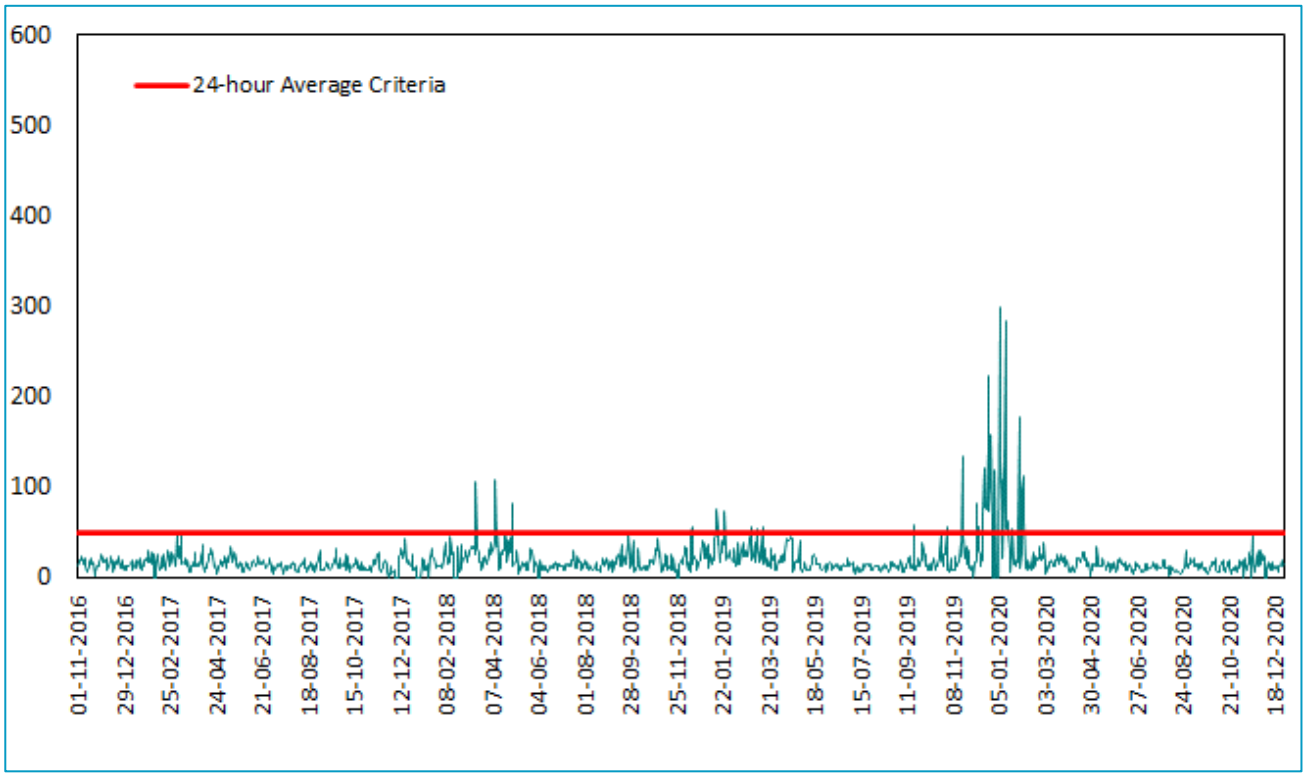
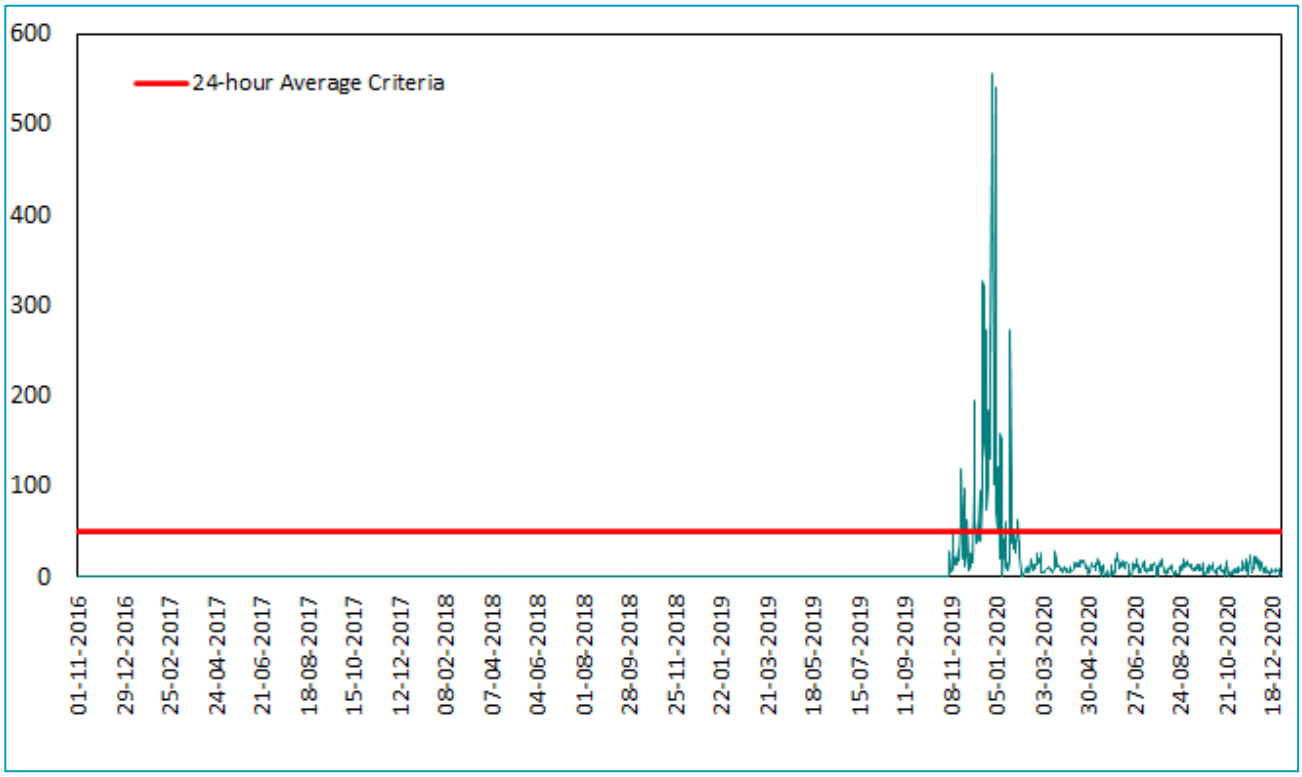


Figure 12 24-Hour Average PM_{10} Data Monitored at Goulburn AQMS (2016-2020)



$PM_{2.5}$

Summaries of the 24-hour average and annual average PM_{10} concentrations measured by the Wagga Wagga North, Albury and Goulburn AQMSs during 2016 to 2020 calendar years are presented in **Table 4**, **Figure 13** and **Figure 14** and **Figure 15**.

A review of the recorded exceedances of the 24-hour average PM_{10} criterion[2] indicates that exceedances were generally caused by exceptional events (e.g., hazard reduction burns). Greatly elevated results in 2019 and 2020 are attributed to exceptional events (i.e., regional dust storms, bush fires etc).

[2] (NSW, OEH, 2018) (NSW, OEH, 2019) (DPIE, 2020) (NSW, DPIE, 2021) (NSW, DPIE, 2021b)

Table 4 Summary of $PM_{2.5}$ Monitoring Data at Wagga Wagga North, Albury and Goulburn AQMS

AQMS	Year	Maximum 24-Hour $PM_{2.5}$ Concentration ($\mu g/m^3$)	Number of Exceedances of 24-Hour Criterion (days/year)	Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)
Wagga Wagga North	2016	9.9	0	6.2
	2017	32.5	4	8.1
	2018	21.6	0	8.4
	2019	239.6	17	11.3
	2020	559.5	13	10.7
	5 Year Average	NA	NA	8.9
Albury	2016	26.8	0	-
	2017	48.8	0	7.3
	2018	107.8	2	7.3
	2019	222.4	19	10.1
	2020	298.3	16	11.1
	5 Year Average	NA	NA	9.0
Goulburn	2016	-	NA	NA
	2017	-	NA	NA
	2018	-	NA	NA
	2019	494.1	28	60.4
	2020	556.7	16	11.8
	5 Year Average	NA	NA	36.1
	Criterion	**25**	NA	**8**

Red font indicates an exceedance of the applicable criterion

Blank cells indicate lack of data.

Figure 13 24-Hour Average $PM_{2.5}$ Data Monitored at Wagga Wagga North AQMS (2016-2020)

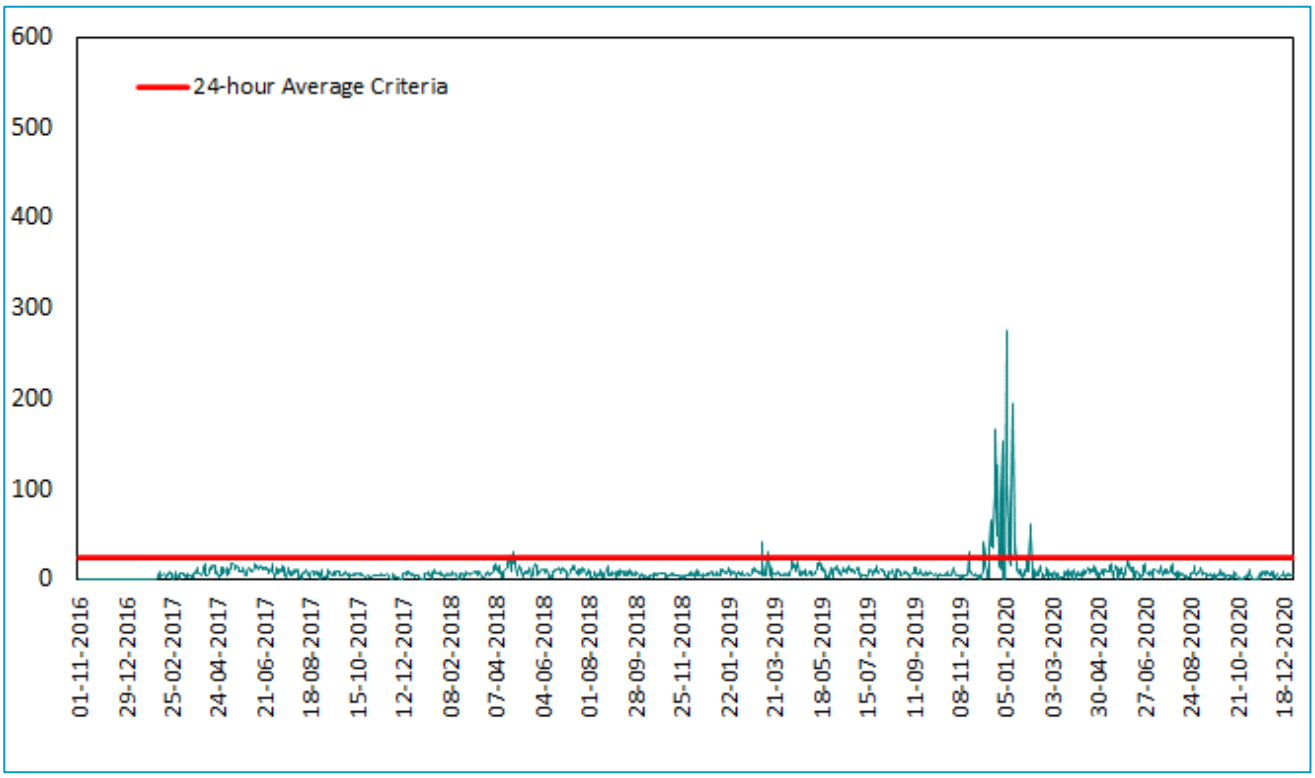


Figure 14 24-Hour Average $PM_{2.5}$ Data Monitored at Albury AQMS (2016-2020)

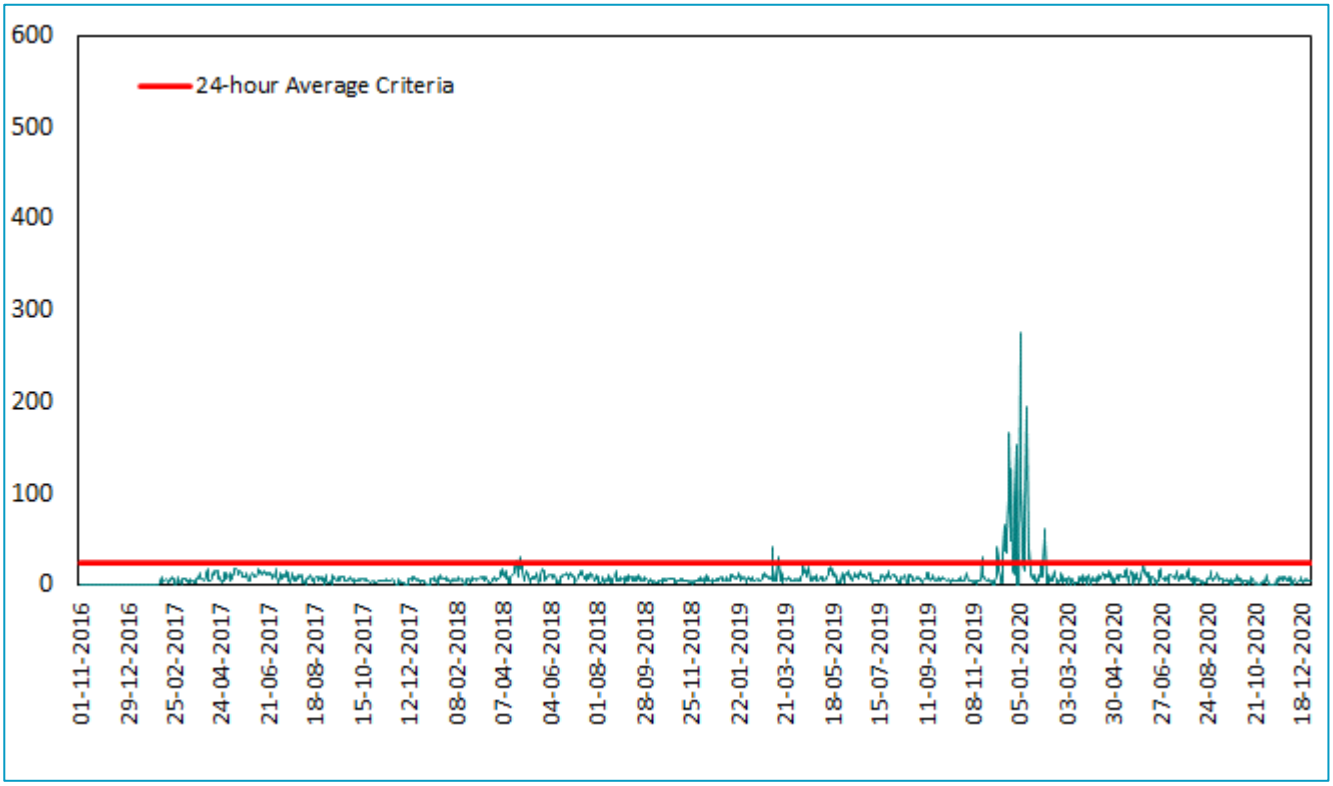
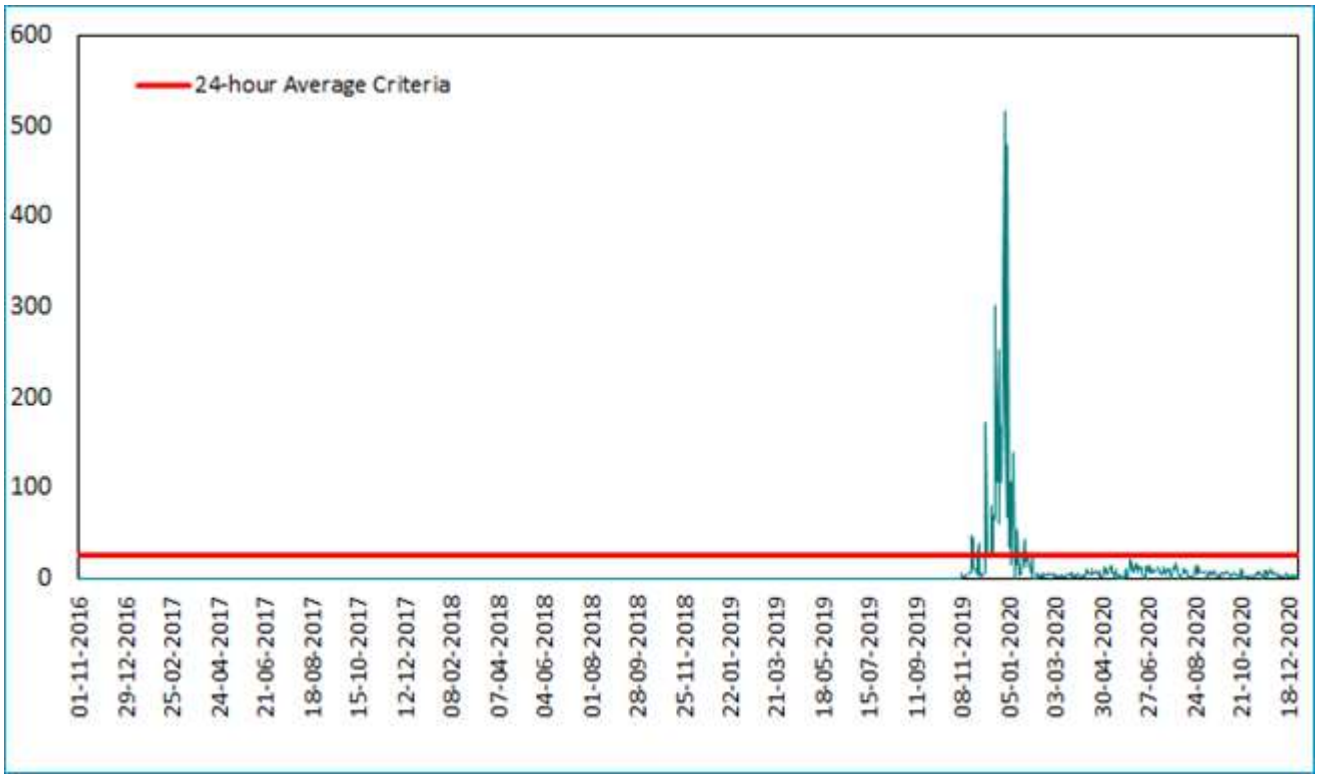


Figure 15 24-Hour Average $PM_{2.5}$ Data Monitored at Goulburn AQMS (2016-2020)



4.5.2 Adopted Background for this Assessment

4.5.2.1 PM_{10} and $PM_{2.5}$

In the absence of appropriate, site-specific hourly background data at the Project, concentrations of PM_{10} and $PM_{2.5}$ monitored at Albury AQMS, are adopted to conservatively represent the Project conditions. This can be considered a conservative approach as Tumbarumba is a less rural area, and the Albury data are impacted by anthropogenic emissions of PM_{10} and $PM_{2.5}$.

4.5.2.2 TSP

In the absence of appropriate, site-specific hourly background data at the Project, or at Albury AQMS ambient TSP concentrations have been estimated from the Albury AQMS PM_{10} concentrations using a TSP/PM_{10} ratio of 2.

4.5.3 Summary of Background Assumptions Adopted

The site-representative background ambient air quality concentrations adopted for use in this assessment are summarised in **Table 5**. In the absence of background dust deposition data, incremental impacts shall be assessed against the criterion of 2 g/m^2/month over background (**Section 3.1**).

Table 5 Adopted Background Concentrations for Cumulative Impact Assessment

Pollutant	Averaging Period	Background	Notes
TSP	Annual	39.6 µg/m^3	Assumed to be equal to 2x PM_{10} concentrations at Albury AQMS during 2018.
PM_{10}	24-hour	Daily varying	From 1-hour average as monitored at Albury AQMS during 2018
	Annual	19.8 µg/m^3	
$PM_{2.5}$	24-hour	Daily varying	
	Annual	7.3 µg/m^3	

5 Assessment Methodology

The assessment generally follows the Approved Methods using the Level 2 assessment methodology. The Approved Methods specify how assessments based on the use of air dispersion models should be completed. They include guidelines for the preparation of meteorological data to be used in dispersion models and the relevant air quality criteria for assessing the significance of predicted concentration and deposition rates from projects.

5.1 Dispersion Model

The Approved Methods lists AUSPLUME v6.0 and CALPUFF v5.7 or later as approved models. AUSPLUME is a steady state Gaussian plume dispersion model developed by the EPA Victoria (EPAV) and frequently used in Australia for simple near-field applications and is based on the Industrial Source Complex (ISC) model. ISC was replaced for regulatory purposes in the US in December 2006 by the American Meteorological Society (AMS)/USEPA Regulatory Model (AERMOD). EPAV replaced AUSPLUME with AERMOD as its regulatory model in January 2014 and in recent years the NSW EPA consider the use of AERMOD as being in accordance with the Approved Methods.

AERMOD is a steady-state plume modelling system with three components: AERMOD (dispersion model), AERMAP (terrain data pre-processor) and AERMET (meteorological data pre-processor). A significant feature of AERMOD is the Pasquill-Gifford stability-based dispersion is replaced with a turbulence-based approach that uses the Monin-Obukhov length scale to account for the effects of atmospheric turbulence-based dispersion.

Emissions from the existing and Project operations have been modelled using AERMOD to predict maximum pollutant ground level concentrations (GLC) resulting from the emissions to air from the Project.

5.2 Environmental Inputs

AERMOD requires a range of inputs to describe the Project environment:

- Topographical data
- Meteorological data
- Background pollutant concentrations

The sources of the required data are summarised in **Table 6** and these inputs are discussed in the following sections.

Table 6 Air Quality Model Input and Post Processing Data

Item	Source	Description
Topographical data	Shuttle Radar Topography Mission (SRTM)	3 second (~90m) resolution
Meteorological data	TAPM	Wind speed, wind direction, temperature, relative humidity, mixing height and insolation
Background pollutant concentrations	EPA Albury AQMS	24-hour average concentrations of PM_{10} and $PM_{2.5}$ (from 1-hour averaged concentrations)

5.2.1 Topography

Shuttle Radar Topography Mission (SRTM) three arc-second (approximately 90 m) global digital surface model data are commonly used for plume dispersion modelling purposes. The raw SRTM data cannot distinguish between ground surface topography and other elevated features such as tree canopies and buildings and is therefore subject to editing and processing, such as: delineating and flattening water bodies, better defining coastlines, removing spikes and wells, and filling small voids. Due to the relatively flat topography, few trees and few buildings in the project area, the dataset is considered adequate for the assessment. Data were processed with AERMAP for use in AERMOD.

5.2.2 Meteorology

In order to determine a representative meteorological year for use in dispersion modelling, five years of meteorological data (2016-2020) from the closest meteorological monitoring station, Cabramurra SMHEA AWS, were analysed against the five-year average meteorological conditions. Specifically, the following parameters were analysed:

- Frequency and distribution of the predominant wind directions
- Hourly wind speeds observed
- Hourly temperature
- Hourly relative humidity.

Based on this analysis, it was concluded that the year 2018 was representative of the last five years of meteorological conditions experienced at the Site while exhibiting the lowest average windspeeds. Low windspeeds generally result in reduced plume dispersion and increased impacts, hence the 2018 calendar year was adopted to in order to conduct a conservative assessment of air quality impacts. A summary of the analysis is presented in **Appendix A**.

In the absence of NSW AERMOD specific guidance, meteorological input files were developed in accordance with guidelines provided in EPAV Publication No. 1550 (EPAV, 2013), for meteorological pre-processing using AERMET. AERMET requires on-site hourly data for the following meteorological parameters:

- Wind speed
- Wind direction
- Temperature.

AERMET also requires hourly cloud cover data and twice daily vertical temperature and moisture profiles (upper air) data. In Australia this is generally limited to major airports. The nearest source of these data is Canberra Airport, approximately 90 km southwest of the Project. The distance and topography (elevation changes of approximately 300 m) between Canberra Airport and the Project means this upper air data may not be considered representative of the Project location. Furthermore, due to the longitude of Canberra Airport, the twice daily soundings that occur at midnight and noon, Greenwich time do not coincide close enough to local sunrise and sunset for dispersion modelling purposes. In the absence of on-site or upper air meteorological data for the Project location, The Air Pollution Model (TAPM v4.05) was used to generate a synthetic meteorological data set and the following parameters were used to construct an AERMET input file:

- Wind speed
- Wind direction
- Temperature at 2 m and at 10 m

- Insolation
- Mixing Height

The TAPM modelling is described in more detail in **Appendix B**.

AERMET (version 18081) was used to process these data to produce the *surface* and *profile* meteorological input files required by AERMOD.

The following surface characteristics of the Project location required for AERMET were determined in accordance with EPAV guidance (EPAV, 2013a) informed from publicly available on-line aerial imagery:

- Surface roughness - the height at which the mean horizontal wind speed approaches zero, based on a logarithmic profile
- Bowen ratio - an indicator of surface moisture.
- Albedo - an indicator of reflectivity of the surface.

A summary of AERMET modelling options and parameters used for the assessment is provided in **Table 7**. A summary of the AERMOD meteorological files is provided in **Table 8**.

Table 7 AERMET Model Parameters

Parameter	Option / Source			
Adjusted U* (surface friction velocity)	Yes			
Mixing Heights from Onsite Data or Upper Air Data	TAPM			
Threshold Wind Speed (m/s)	0.28			
Wind speed and Direction	TAPM			
Temperature	TAPM			
Relative Humidity	TAPM			
Solar Radiation	TAPM			
Cloud Cover	NA			
Upper Air Data	NA			
Scalar Parameters	**Summer**	**Autumn**	**Winter**	**Spring**
Albedo	0.18	0.18	0.12	0.18
Bowen Ratio	0.80	0.10	0.10	0.40
Surface Roughness 0° – 360° (m)	0.3	0.3	0.3	0.3

Table 8 AERMOD Meteorological Input Data

Meteorological Year	Available Hours	Missing Hours	Calms (<0.28 m/s) [a]	Valid Hours [a]
2018	8760	1 (0.01%)	53 (0.60%)	8706 (99.4%)

a AERMOD does not predict GLCs during calm periods

5.3 Source Characteristics and Emission Rates

5.3.1 Emission Rate Estimation Methodology

AERMOD requires a range of inputs to describe the emissions to air as a result of the proposed activities. Particulate emissions from the Site were estimated for various particle size fractions based on the relevant emission factors sourced from the USEPA's AP-42 Emission Factor Handbook (USEPA, 2006 and Updates). Formulae are provided in **Appendix C**.

The emission calculations were performed using the activity data and based on the following assumptions:

- Haulage distances (total vehicle kilometres travelled (VKT)) on unpaved roads were estimated based on the length of each haul route and number of trips per day.
- No suppression (i.e., industrial water sprays) will be adopted for the activities occurring in the extraction area (i.e., material handling, wind erosion from product stockpiles).
- Water sprays are used on the crushing, and screening processes.
- Emissions for each of the crushing process stages (primary, secondary, screening) are conservatively based on the total throughput.
- Due to the use of the additive, emissions associated with the coated material are assumed to be negligible and are therefore not considered further.
- Blasting and drilling emissions represent less than 0.1% of the total emissions and are therefore not considered further
- A water cart will be used on haul roads (see below).
- A maximum annual extraction rate output of 200,000 t for proposed operations.
- While emissions due to wind erosion occur on a 24/7 basis, emissions from mechanical sources (crushing, haulage, etc.) only occur during operating hours (7am to 6pm).

Wind Speed Dependent Wind Erosion

The base wind erosion emission rates presented in **Table 11** (refer to **Section 6.2**) were varied hourly based on a cubic relationship with the wind speed for that hour to accurately simulate the increased dust generation at higher wind speeds. That is, for each hour, *h, the hourly emission rate, E* is:

$$E(h) = E_{base} * u(h)^3 / \overline{u^3}$$

where E_{base} is base emission rate, *u* is the hourly wind speed contained within the meteorological file. Note that although increased wind speed generates increased wind erosion emission rates, it also promotes increased plume dispersion. This offsetting effect generally leads to reduced ground level concentrations.

Wind Speed Sensitive Emission Activities

The base emission rates of wind speed sensitive emission activities including front end loaders and trucks (dumping) presented in **Table 11** (refer to **Section 6.2**) were varied hourly based on a relationship with the wind speed for that hour to accurately simulate the increased dust generation at higher wind speeds. For each hour, *h, the hourly emission rate, E* is:

$$E(h) = E_{base} * \left(\frac{u(h)}{2.2}\right)^{1/3} \Big/ \overline{\left(\frac{u}{2.2}\right)^{1/3}}$$

Table 9 Model Parameters

AERMOD Set up			
AERMOD Set up			
MGA Coordinate Zone	55H		
Grid Spacing	200 m		
South-west Corner of Gridded Receptor Domain	588800 (Easting) 6036100 (Northing)		
No. of Grid Points	25 (East) * 25 (North)		
Terrain Data	STRM3 (~ 90m)		
Dispersion coefficient	Rural		
Building downwash	None (no buildings included)		
Particle Parameters			
Particle Type	TSP & Dust Deposition	PM_{10}	$PM_{2.5}$
Particle Method	Method 1	Method 1	Method 1
Particle diameter (microns)	17	5	1
Mass Fraction	1	1	1
Particle Density	2.5	2.5	2.5
Dry depletion	Selected	Selected	Selected
Dry Deposition	Selected	Not Selected	Not Selected

5.3.2 Accuracy of Modelling

All atmospheric dispersion models, including AERMOD, represent a simplification of the many complex processes involved in the dispersion of pollutants in the atmosphere. To obtain good quality results it is important that the most appropriate model is used and the quality of the input data (meteorological, terrain, source characteristics) is adequate.

The main sources of uncertainty in dispersion models, and their effects, are discussed below:

- **Oversimplification of physics:** This can lead to both under-prediction and over-prediction of ground level pollutant concentrations. Uncertainties are greater in Gaussian plume models as they do not include the effects of non-steady-state meteorology (i.e., spatially- and temporally varying meteorology).
- **Uncertainties in emission rates:** Ground level concentrations are proportional to the pollutant emission rate. In addition, most modelling studies assume constant worst-case emission levels, or are based on the results of a small number of stack tests (where relevant), however in reality, operations (and thus emissions) are often quite variable. Accurate measurement of emission rates and source parameters requires continuous monitoring.
- **Uncertainties in wind direction and wind speed**: Wind direction affects the direction of plume travel, while wind speed affects plume rise and dilution of plume. Uncertainties in these parameters can result in errors in the predicted distance from the source of the plume impact, and magnitude of that impact. In addition, aloft wind directions commonly differ from surface wind directions. The preference to use rugged meteorological instruments to reduce maintenance requirements also means that light winds are often not well characterised.

- **Uncertainties in mixing height:** If the plume elevation reaches 80% or more of the mixing height, more interaction will occur, and it becomes increasingly important to properly characterise the depth of the mixed layer as well as the strength of the upper air inversion.
- **Uncertainties in temperature:** Ambient temperature affects plume buoyancy, so inaccuracies in the temperature data can result in potential errors in the predicted distance from the source of the plume impact, and magnitude of that impact.
- **Uncertainties in stability estimates:** Gaussian plume models use estimates of stability class, and 3D models use explicit vertical profiles of temperature and wind (which are used directly or indirectly to estimate stability class for Gaussian models). In either case, uncertainties in these parameters can cause either under-prediction or over-prediction of ground level concentrations. For example, if an error is made of one stability class, then the computed concentrations can be off by 50% or more.

The USEPA makes the following statement in its Modelling Guideline (US EPA, 2005)) on the relative accuracy of models:

> *"Models are more reliable for estimating longer time-averaged concentrations than for estimating short-term concentrations at specific locations; and the models are reasonably reliable in estimating the magnitude of highest concentrations occurring sometime, somewhere within an area. For example, errors in highest estimated concentrations of $\pm$10 to 40% are found to be typical, i.e., certainly well within the often quoted factor-of-two accuracy that has long been recognised for these models. However, estimates of concentrations that occur at a specific time and site are poorly correlated with actually observed concentrations and are much less reliable."*

This AQIA utilises the AERMOD dispersion model, incorporating meteorological output from TAPM. The meteorological dataset has been compiled using observations from a nearby automatic weather station for a five-year period.

6 Project Inputs

6.1 Scenarios

One worst-case scenario was modelled to assess Stage 1 of the proposed operations.

6.2 Project Emissions to Air

The basis of the emission rate estimation from the proposed operations are summarised in **Table 10**. Formulae are provided in **Appendix C**. The resulting emission inventories are summarised in **Table 11**.

For the purposes of modelling, the hourly emission rates associated with the existing and proposed operations have been calculated using the annual material throughput and annual number of operational hours.

The Site operations were assumed to occur daily between 7am and 6pm, 365 days of the year. Wind erosion emissions were assumed to be emitted 24/7.

Table 10 Existing and Proposed Operations

Parameter	Quantity	Units	Comment	Source
	Stage 1			
Summary				
Throughput	200,000	t/yr	Excavated material	Client
Rock Extraction				
Drilling	171	holes/yr	-	Client[a]
Blasting	6	blasts/y	Area per blast = 600 m^2	Client[a]
Front-end-loader (FEL) pushing off bench	200,000	t/yr	6% moisture	Client
FEL picking up to travel	200,000	t/yr	6% moisture	Client
FEL travel to crushing circuit	200,000	t/yr	6% moisture	Client
Crushing and Screening				
Crushing/Screening (Ten transfers)	200,000	t/yr	6% moisture	Client
Crushing/Screening - Primary & Secondary Crushing (controlled)	200,000	t/yr	-	N/A
Crushing/Screening - Tertiary Crushing (controlled)	200,000		-	N/A
Crushing/Screening - Primary Screening (controlled)	200,000		-	N/A
Crushing/Screening - Fines Screening (controlled)	200,000		-	N/A
Unloading from crusher/screening to stockpile – 70%	140,000		6% moisture	Client
Loading product from crushing circuit to pre-coating plant - 30%	60,000		6% moisture	Client
Wheel Generated Dust (unsealed roads)				
Extracted material: FEL return travel to crushing plant.	3.42	kg/VKT	10% silt; 6.5t per load; 27.2 t average mass; return travel distance 0.5 km	Client /Calculated
Product: FEL transfer from crushing plant to product stockpile			10% silt; 6.5t per load; 27.2 t average mass; return travel distance 0.5 km	Client /Calculated
Product: empty and laden product trucks onsite to exit	4.8	kg/VKT	10% silt; 33t per load; 58.5 t average mass; return travel distance 0.7 km	Client /Calculated
Wind Erosion				
Extraction area	0.3	ha	100% active	Client
Bulk storage stockpile	0.6	ha	100% active	Client
Inactive but exposed	2.9	ha	100% active; 50% control to account for revegetation	Client

kg/VKT kg per vehicle kilometres travelled

[a] Not modelled due to inability to know when the drilling and blasting will occur. Emissions from these activities represent less than 0.1% of total emissions.

Table 11 Estimated Particulate Emissions: Proposed Operations – Stage 1

ACTIVITY	TSP emissions (kg/y)	PM_{10} emissions (kg/y)	$PM_{2.5}$ emissions (kg/y)
Rock Extraction			
Drilling	1	1	0.05
Blasting	19	10	1
FEL pushing off bench	50	24	4
FEL picking up to travel	50	24	4
FEL travel to crushing circuit	26,326	7,770	777
Crushing and Screening			
Crushing/Screening (Ten transfers)	249	118	18
Crushing/Screening - Primary Crushing (controlled)	No data		
Crushing/Screening - Secondary Crushing (controlled)	No data		
Crushing/Screening - Tertiary Crushing (controlled)	120	54	10
Crushing/Screening - Primary Screening (controlled)	2,500	860	5
Crushing/Screening - Fines Screening (controlled)	360	220	1
Unloading from crusher/screening to stockpile	35	16	2
Transfer from Crushing and Screening plant to Pre-coating Plant			
Loading product from crushing circuit to pre-coating plant - 30%	15	7	1
Unloading from pre-coating plant - 30%	-		
Transfer from Crushing and Screening plant to Product Stockpile			
FEL picking up to travel to Product Stockpile	35	16	2
FEL travel to from crushing circuit to Product Stockpile	18,428	5,439	544
Unloading product from FEL to bulk storage stockpile	50	24	4
Transfer Product offsite			
Loading product from bulk storage stockpile to trucks for off-site haulage - 70%	35	16	2
Hauling product offsite on unpaved roads	10,255	3,027	303
Waste Stockpile Activities (Not used in Stage 1)			
Load waste to dog-and truck from crushing plant for transfer to waste stockpile	-	-	-
Hauling from crushing plant to waste stockpile (unpaved roads)	-	-	-
Unload from dog-and truck for transfer to waste stockpile	-	-	-
Wind Erosion			
WE - Active Extraction Area/Exposed	1,051	526	49
WE - Bulk Storage Stockpile	2,102	1,051	98
WE- Other	5,081	2,540	238
Total emissions (kg/yr)	**66,763**	**21,744**	**2,063**

7 Assessment of Impacts

The sections below present a summary of the air quality impacts predicted by the modelling at the sensitive receptors identified in **Section 4.2**. Exceedances of the relevant impact assessment criteria discussed in **Section 3.1** are shown in **red bold** font.

7.1 PM_{10}

Table 12 presents a summary of the predicted maximum incremental and cumulative 24-hour and annual average PM_{10} concentrations at the sensitive receptors. Isopleth plots of the predicted 24-hour average incremental impacts (i.e. excluding background data) and annual average incremental and cumulative impacts due to the proposed emissions are presented in **Figure 16** to **Figure 18**.

With respect to the isopleth plot for 24-hour average concentrations, it is important to note that they do not represent the dispersion pattern for any individual time period, but rather illustrate the maximum concentration that was predicted to occur at each model calculation point given the range of meteorological conditions occurring over the 2018 modelling period.

There are no predicted exceedances of the relevant assessment criterion due to the Site alone (i.e., excluding background levels), and no predicted exceedances of the annual average criterion of 25 $\mu g/m^3$ when considering the predicted cumulative concentrations (i.e., including background levels).

As the background data set for Albury AQMS already contains exceedances of the 24-hour average criterion of 50 $\mu g/m^3$, the maximum predicted cumulative 24-hour concentrations are above the criterion at all sensitive receptors. Whilst the majority of the sensitive receptors are not predicted to experience any additional exceedances due to the operation of the Site, there are a number of sensitive receptors predicted to experience between one and three additional days exceedances. Further analysis of these additional exceedances is presented in **Section 7.1.1**.

Table 12 Maximum Predicted 24-Hour and Annual Average PM_{10} Concentrations

Pollutant		PM_{10} ($\mu g/m^3$)				
Averaging Period		Maximum 24-hour average			Annual Average	
Source		Site only	Cumulative	No. of additional days > 50	Site only	Cumulative
		Assessment Criteria				
Receptor ID	Type	-	*50*	-	-	*25*
1	Residence	9.7	**107.9**	0	0.6	20.4
2	Residence	7.5	**107.9**	0	0.3	20.1
3	Residence	12.8	**108.2**	**2**	1.2	21.0
4	Residence	9.2	**108.4**	**3**	1.2	21.0
5	Residence	7.4	**107.9**	**1**	0.6	20.4
6	Residence	8.7	**108.4**	**2**	1.3	21.1
7	Residence	5.5	**107.8**	0	0.1	19.9
8	Residence	8.9	**108.4**	**1**	1.0	20.8
9	Residence	6.1	**108.3**	**1**	0.8	20.6
10	Residence	6.0	**108.1**	**1**	0.6	20.4
11	Residence	1.8	**108.0**	0	0.1	19.9

Pollutant		PM_{10} ($\mu g/m^3$)				
Averaging Period		Maximum 24-hour average			Annual Average	
Source		Site only	Cumulative	No. of additional days > 50	Site only	Cumulative
		Assessment Criteria				
Receptor ID	Type	-	*50*	-	-	*25*
12	Residence	3.6	**107.8**	0	0.1	19.9
13	Residence	1.9	**107.8**	0	0.1	19.9
14	Residence	3.9	**108.0**	0	0.2	20.0
15	Residence	2.8	**107.8**	0	0.2	20.0
16	Residence	1.6	**107.8**	0	0.1	19.9
17	Residence	10.1	**107.8**	0	0.5	20.3
18	Residence	8.7	**107.8**	0	0.3	20.1
19	Residence	5.8	**109.0**	0	0.5	20.3
20	Residence	20.2	**108.0**	0	1.0	20.8
21	Residence	20.3	**108.2**	**2**	1.8	21.6
22	Residence	3.7	**107.8**	0	0.2	20.0
23	Residence	2.7	**107.8**	0	0.1	19.9
24	Residence	2.2	**107.8**	0	0.1	19.9
25	Residence	5.0	**107.8**	0	0.2	20.0
26	Residence	6.8	**107.8**	0	0.2	20.0
27	Residence	4.2	**107.8**	0	0.1	19.9
28	Residence	34.2	**108.2**	**3**	2.5	22.3
29	Residence	2.1	**107.8**	0	0.1	19.9
30	Residence	1.1	**107.8**	0	0.1	19.9
31	Residence	9.2	**107.8**	0	0.3	20.1
32	Residence	15.9	**108.0**	**1**	1.0	20.8
33	Residence	13.3	**108.1**	**2**	1.3	21.1
34	Residence	9.8	**107.9**	0	0.4	20.2
35	Residence	3.4	**107.8**	0	0.2	20.0
36	Residence	9.9	**109.0**	**1**	0.9	20.7
37	Racecourse	14.1	**109.2**	0	1.6	21.4
38	Racecourse	8.9	**108.0**	0	0.8	20.6
39	Racecourse	7.9	**109.2**	0	0.6	20.4
40	Motel	4.5	**107.8**	0	0.3	20.1
41	Motel	9.4	**107.8**	0	0.2	20.0
42	Hospital	2.9	**107.8**	0	0.1	19.9
43	High School	7.2	**107.8**	0	0.1	19.9
44	School	3.5	**107.8**	0	0.1	19.9
45	School	4.6	**107.8**	0	0.1	19.9
46	Children's Centre	9.1	**107.8**	0	0.2	20.0
47	Showground	2.1	**107.8**	0	0.1	19.9
48	Courthouse	3.7	**107.8**	0	0.1	19.9
49	Pump Track	2.1	**107.8**	0	0.2	20.0

Figure 16 Predicted Maximum 24-Hour Average PM_{10} Concentrations – Site Only

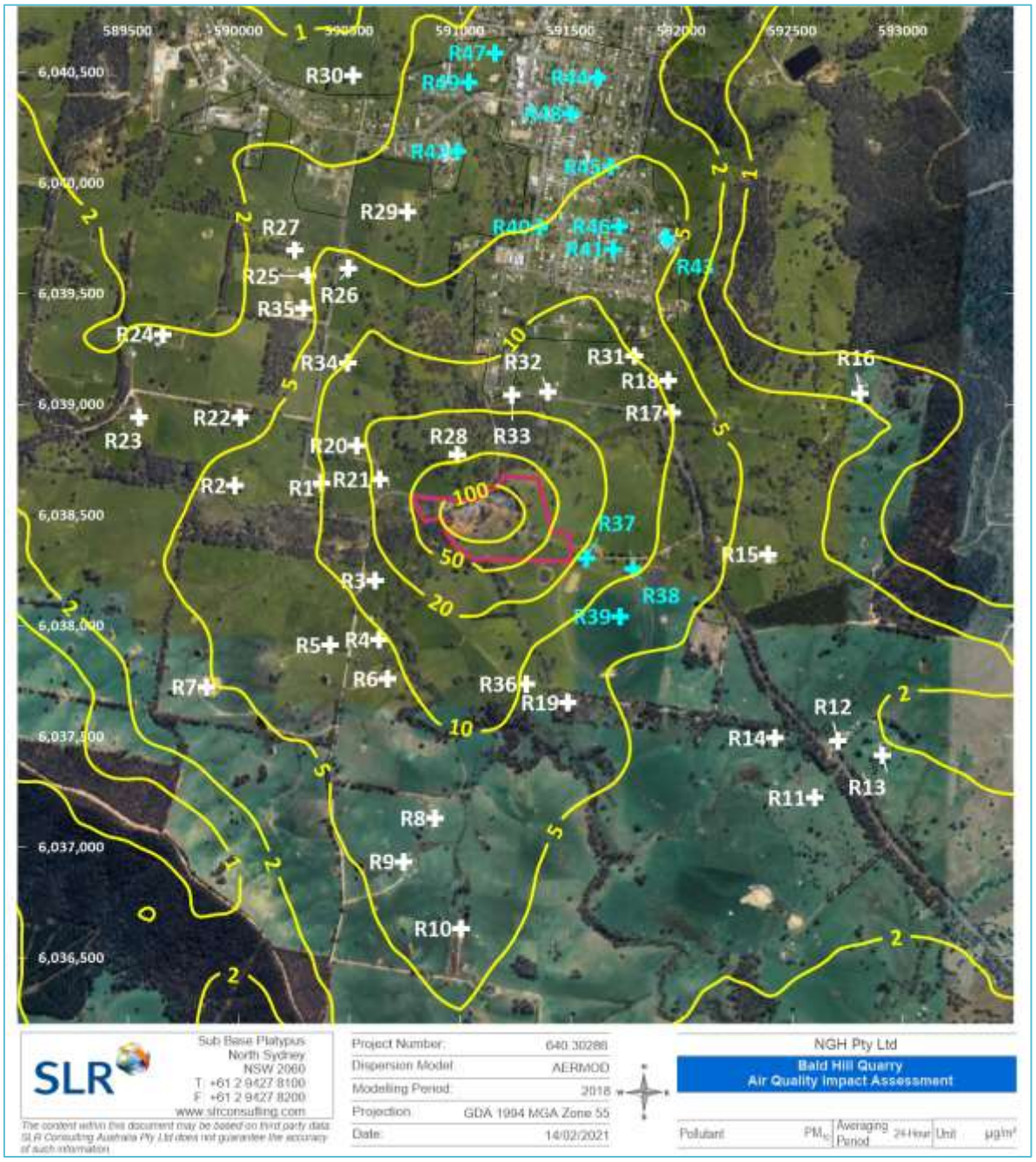


Figure 17 Predicted Annual Average PM_{10} Concentrations – Site Only

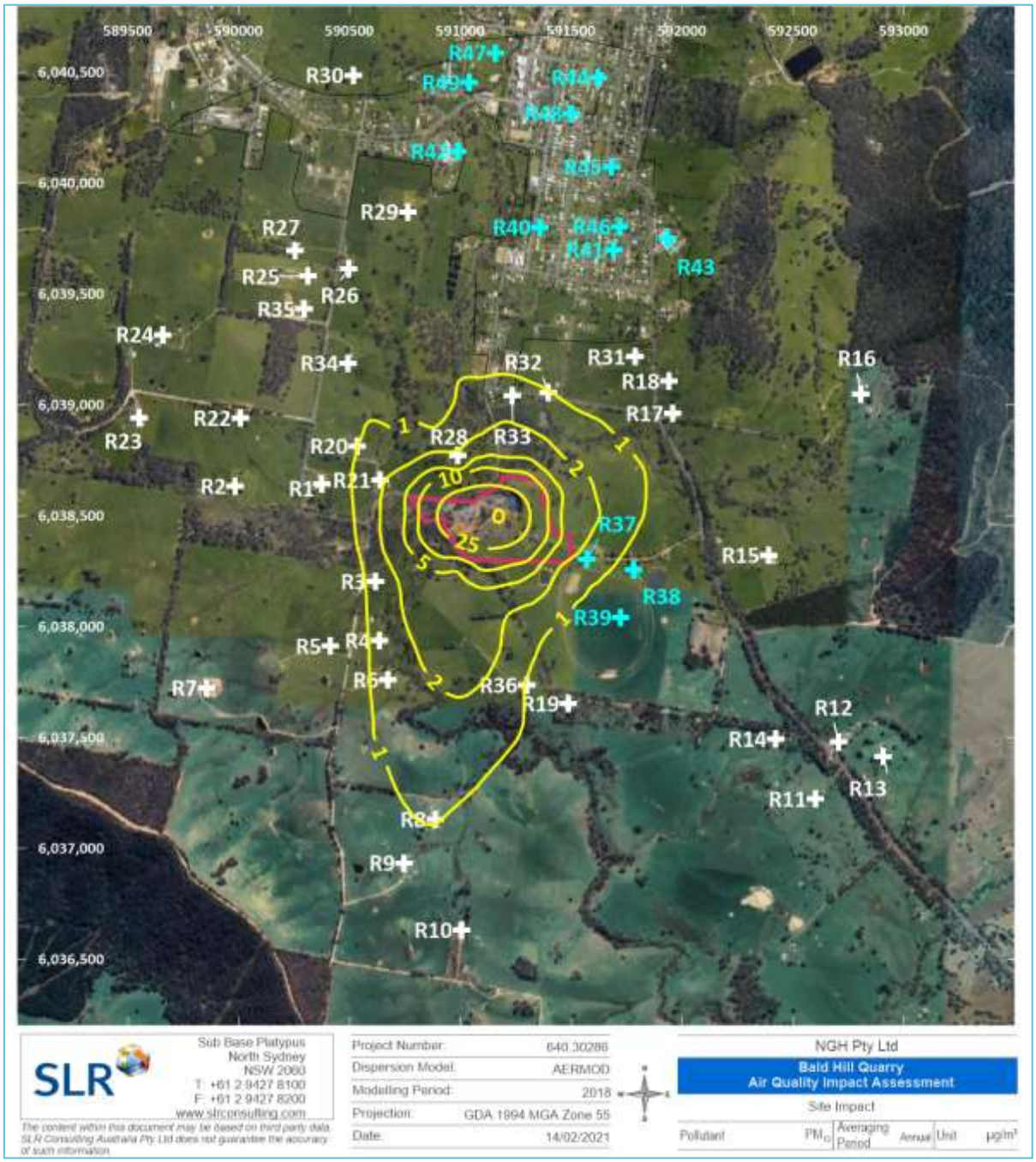
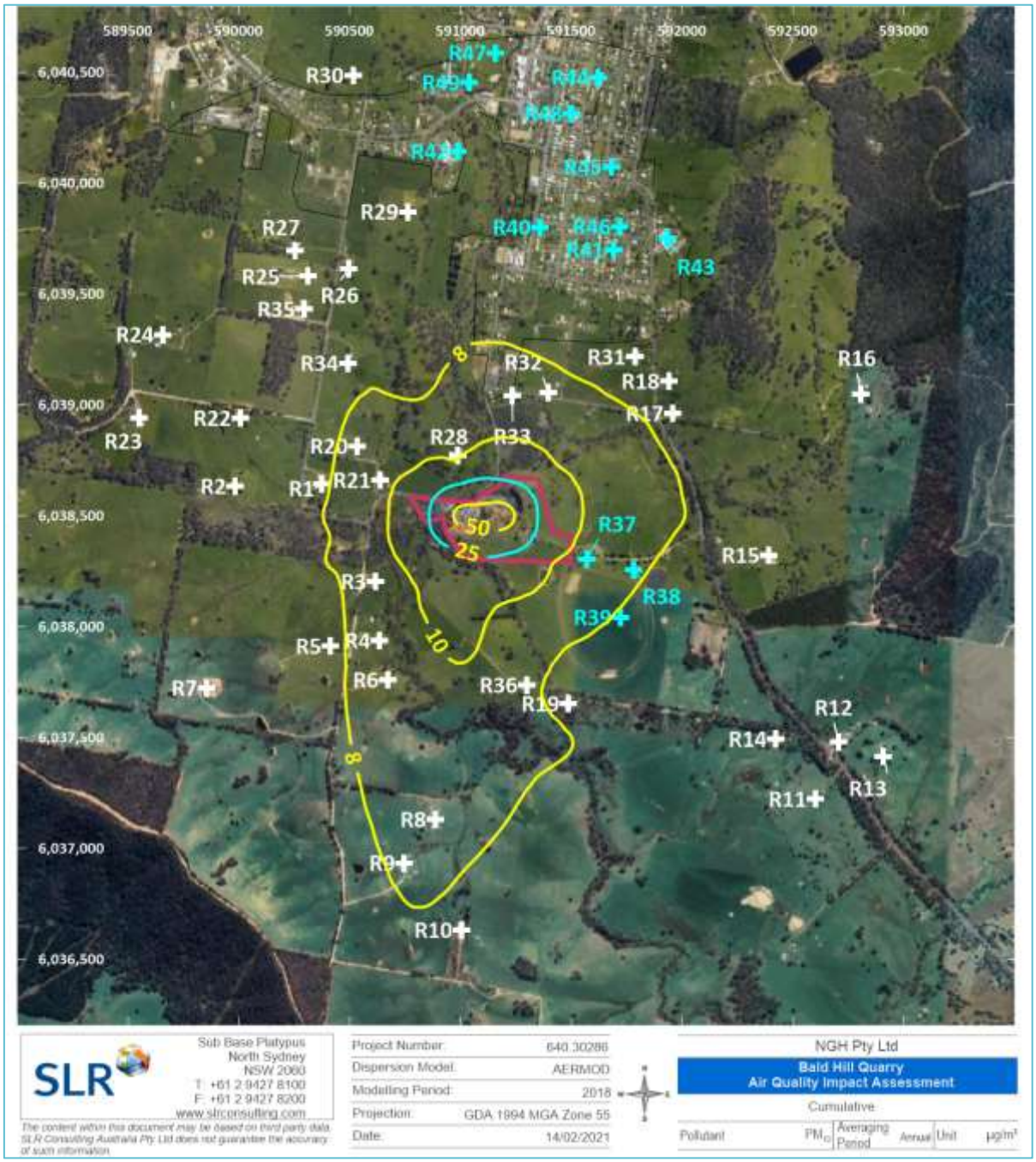


Figure 18 Predicted Annual Average PM_{10} Concentrations – Cumulative



7.1.1 Analysis of Predicted Additional Exceedances of 24-hour Average PM_{10} Criterion

As shown in **Table 12**, the majority of the sensitive receptors are not predicted to experience any additional exceedances of the cumulative 24-hour average PM_{10} criterion due to the operation of the Site. However, there are a few sensitive receptors predicted to experience between one and three additional days exceedance compared to the existing assumed background.

It is noted that, with the exception of one predicted exceedance at R28 (discussed further below), all the additional exceedances occur when the assumed background was already measuring at least 47 $\mu g/m^3$. This is shown in **Appendix D** which tabulates the predicted exceedances together with the measured background and the contemporaneous contribution from the Site. Also presented in **Appendix D** are stacked-bar plots of the assumed 24-hour average PM_{10} background for each of day of the year (blue bars) and the corresponding predicted 24-hour average PM_{10} concentration from the Site for the each of sensitive receptors identified in **Table 12** as predicted to experience an additional exceedance (orange bars).

It is considered that the use of the monitoring data from Albury AQMS is a conservative assumption of existing air quality in the vicinity of the Site. As discussed in **Section 4.5**, the Albury AQMS is located within a residential area, in proximity to major roads with a population of approximately 98,000 people in close proximity, compared to Tumbarumba that has a population of less than 2,000.

Further Analysis Related to R28

As shown on **Figure 4**, R28 is located approximately 200 m north of the Site boundary, in proximity to the crushing and screening circuit. R28 is predicted to experience an additional three exceedances of the 24-hour PM_{10} criterion as a result of the Site operations.

Whilst it has already been discussed above that the background assumptions are considered to be conservative, as shown in **Appendix D**, the maximum 24-hour PM_{10} predicted concentration due to the Site at R28 is 34.2 $\mu g/m^3$. As this represents almost 70% of the criterion, additional analysis has been completed.

Figure 19 shows a cumulative frequency plot of the predicted 24-hour average concentrations at R28 for each day of assessed year (2018). It is apparent from this figure that almost 90% of the predicted concentrations at R28 are equal to or less than 5 $\mu g/m^3$ and over 98% are equal to or less than 20 $\mu g/m^3$.

The date the maximum predicted 24-hour average occurs at R28 is 6 June 2018. It is apparent from the windrose for the day (refer to **Figure 20**) that on this day the dominant wind direction was from the south-southeast with average windspeeds of approximately 2 m/s. These winds will carry emissions from the Site in the direction of R28 for the entire day. On annual basis, winds from the south-southeast occur very infrequently (approximately 3% of the time). In order to mitigate against potential impacts at R28, it is recommended that activities at the closest to R28 (e.g., crushing and screening) are stopped when winds are blowing from the south-southeast at a speed of 2 m/s or above for more than 4 hours.

Figure 19 R28 - Cumulative Frequency Plot of Predicted 24-hour Average PM_{10} Concentrations

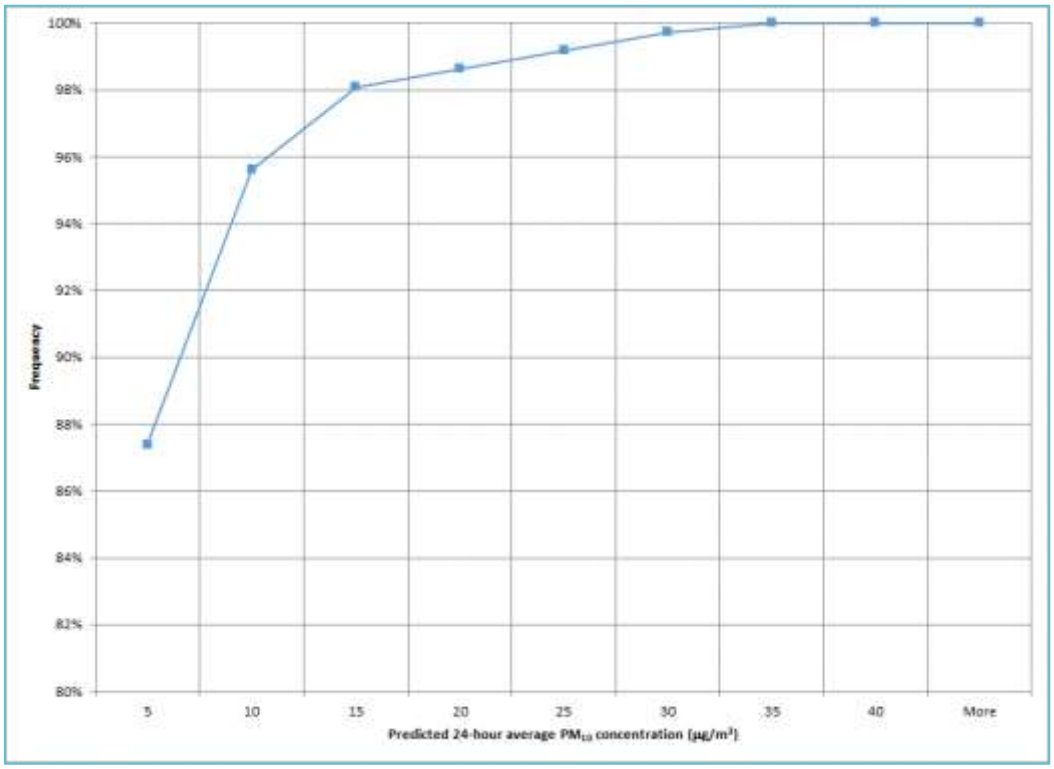
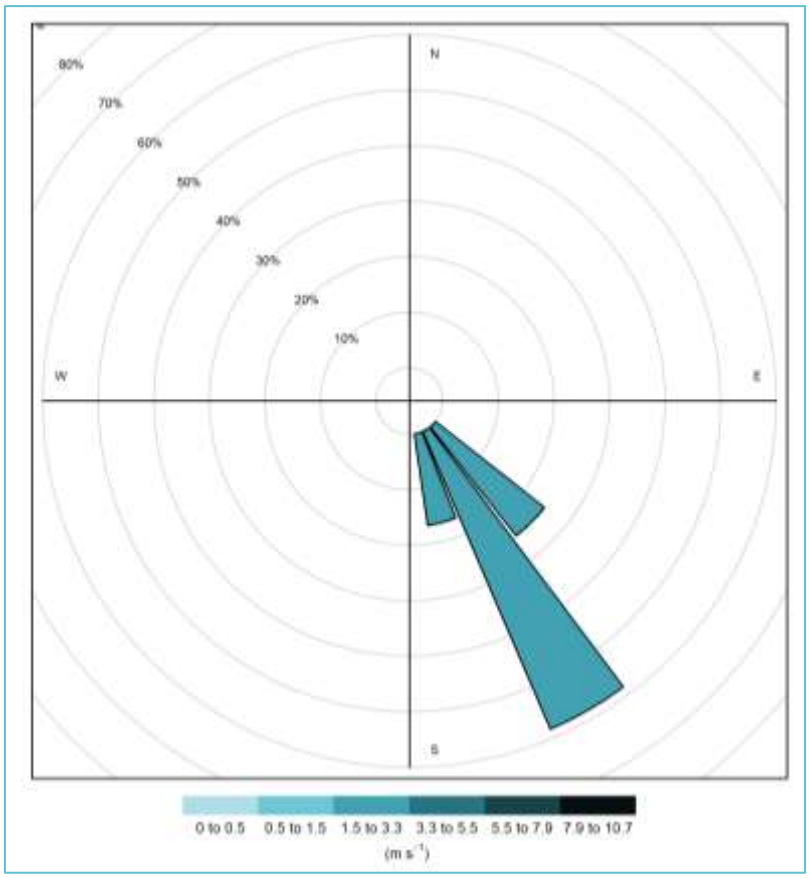


Figure 20 Windrose 6 June 2018



7.2 $PM_{2.5}$

Table 13 presents a summary of the predicted maximum incremental and cumulative 24-hour and annual average $PM_{2.5}$ concentrations at the sensitive receptors. Isopleth plots of the predicted 24-hour average incremental impacts (i.e. excluding background data) and annual average incremental and cumulative impacts due to the proposed emissions are presented in **Figure 21** to **Figure 23**.

With respect to the isopleth plot for 24-hour average concentrations, it is important to note that they do not represent the dispersion pattern for any individual time period, but rather illustrate the maximum concentration that was predicted to occur at each model calculation point given the range of meteorological conditions occurring over the 2018 modelling period.

There are no predicted exceedances of the relevant assessment criterion due to the Site alone (i.e., excluding background levels), and no predicted exceedances of the annual average criterion of 8 $\mu g/m^3$ (per Approved Methods) when considering the predicted cumulative concentrations (i.e., including background levels). When considering the 2025 NEPM annual average criterion of 7 $\mu g/m^3$, all receptors are predicted to exceed as the existing background is 7.3 $\mu g/m^3$. The Site is predicted to contribute less than 1% of the 2025 NEPM criterion at most receptors. Based on criteria used in other jurisdictions for screening out insignificant impacts, these predicted impacts would be considered insignificant as they are less than 1% of the impact assessment criterion (DWER, 2019).

As the background data set for Albury AQMS already contains exceedances of the 24-hour average criterion of 25 $\mu g/m^3$ (per Approved Methods) and the 2025 NEPM criterion of 20 $\mu g/m^3$, the maximum predicted cumulative 24-hour concentrations are above the criterion at all sensitive receptors. All the sensitive receptors are predicted to experience one additional exceedance of the annual average criterion of 25 $\mu g/m^3$ (per Approved Methods) due to the operation of the Site. This additional exceedance occurs on 1 May 2018 and when the assumed background at Albury was measured to be 25 $\mu g/m^3$ i.e., at the criterion. The Site is predicted to contribute less than 1% of the 25 $\mu g/m^3$ criterion at most receptors. As noted above, these predicted impacts would be considered insignificant as they are less than 1% of the impact assessment criterion if applying criteria used in other jurisdictions for screening out insignificant impacts (DWER, 2019).

Three of the receptors are predicted to experience one additional day over the 2025 NEPM annual average criterion of 20 $\mu g/m^3$. They all occur when the assumed background at Albury was measured to be 19 $\mu g/m^3$ or above, with the Site contributing approximately 1 $\mu g/m^3$. Given the small contribution predicted from Site compared with the assumed background, it is not considered likely that any there will be any significant impact on $PM_{2.5}$ concentrations in the vicinity.

Table 13 Summary of Maximum 24-Hour and Annual Average $PM_{2.5}$ Concentrations

Pollutant		PM_{10} ($\mu g/m^3$)						
Averaging Period		Maximum 24-hour average				Annual Average		
Source		Site only	Cumulative	No. of additional days > 25 & 20		Site only	Cumulative	
		Assessment Criteria						
Receptor ID	Type	-	*25 (current) 20 (2025)*	*25*	*20*	-	*8 (current)*	*7 (2025)*
1	Residence	1.0	**31.3**	**1**	0	0.07	7.4	**7.4**
2	Residence	0.8	**30.7**	**1**	0	0.04	7.3	**7.3**
3	Residence	1.4	**30.5**	**1**	**1**	0.13	7.4	**7.4**
4	Residence	0.9	**30.5**	**1**	**1**	0.13	7.4	**7.4**
5	Residence	0.8	**30.5**	**1**	0	0.06	7.4	**7.4**
6	Residence	0.9	**30.5**	**1**	**1**	0.14	7.4	**7.4**
7	Residence	0.6	**30.4**	**1**	0	0.01	7.3	**7.3**
8	Residence	1.0	**30.4**	**1**	0	0.11	7.4	**7.4**
9	Residence	0.7	**30.4**	**1**	0	0.09	7.4	**7.4**
10	Residence	0.7	**30.4**	**1**	0	0.06	7.4	**7.4**
11	Residence	0.2	**30.4**	**1**	0	0.01	7.3	**7.3**
12	Residence	0.4	**30.4**	**1**	0	0.01	7.3	**7.3**
13	Residence	0.2	**30.4**	**1**	0	0.01	7.3	**7.3**
14	Residence	0.4	**30.4**	**1**	0	0.02	7.3	**7.3**
15	Residence	0.3	**30.4**	**1**	0	0.02	7.3	**7.3**
16	Residence	0.2	**30.4**	**1**	0	0.01	7.3	**7.3**
17	Residence	1.0	**30.4**	**1**	0	0.05	7.3	**7.3**
18	Residence	1.0	**30.4**	**1**	0	0.04	7.3	**7.3**
19	Residence	0.6	**30.4**	**1**	0	0.05	7.3	**7.3**
20	Residence	2.2	**30.5**	**1**	0	0.11	7.4	**7.4**
21	Residence	2.2	**31.0**	**1**	0	0.19	7.5	**7.5**
22	Residence	0.4	**30.4**	**1**	0	0.02	7.3	**7.3**
23	Residence	0.3	**30.5**	**1**	0	0.01	7.3	**7.3**
24	Residence	0.2	**30.4**	**1**	0	0.01	7.3	**7.3**
25	Residence	0.5	**30.4**	**1**	0	0.02	7.3	**7.3**
26	Residence	0.7	**30.4**	**1**	0	0.02	7.3	**7.3**
27	Residence	0.4	**30.4**	**1**	0	0.01	7.3	**7.3**
28	Residence	3.2	**30.9**	**1**	0	0.25	7.6	**7.6**
29	Residence	0.2	**30.4**	**1**	0	0.01	7.3	**7.3**
30	Residence	0.1	**30.4**	**1**	0	0.01	7.3	**7.3**
31	Residence	0.9	**30.4**	**1**	0	0.03	7.3	**7.3**
32	Residence	1.7	**31.2**	**1**	0	0.11	7.4	**7.4**
33	Residence	1.4	**31.4**	**1**	0	0.14	7.4	**7.4**
34	Residence	1.0	**30.4**	**1**	0	0.05	7.3	**7.3**
35	Residence	0.3	**30.4**	**1**	0	0.02	7.3	**7.3**
36	Residence	1.0	**30.4**	**1**	0	0.09	7.4	**7.4**
37	Racecourse	1.4	**30.4**	**1**	0	0.16	7.5	**7.5**
38	Racecourse	0.9	**30.4**	**1**	0	0.08	7.4	**7.4**
39	Racecourse	0.8	**30.4**	**1**	0	0.06	7.4	**7.4**
40	Motel	0.5	**30.7**	**1**	0	0.03	7.3	**7.3**

Pollutant		PM_{10} ($\mu g/m^3$)						
Averaging Period		Maximum 24-hour average				Annual Average		
Source		Site only	Cumulative	No. of additional days > 25 & 20		Site only	Cumulative	
		Assessment Criteria						
Receptor ID	Type	-	*25 (current) 20 (2025)*	*25*	*20*	-	*8 (current)*	*7 (2025)*
41	Motel	1.0	**30.7**	**1**	0	0.02	7.3	**7.3**
42	Hospital	0.3	**30.6**	**1**	0	0.01	7.3	**7.3**
43	High School	0.8	**30.4**	**1**	0	0.01	7.3	**7.3**
44	School	0.4	**30.5**	**1**	0	0.01	7.3	**7.3**
45	School	0.5	**30.7**	**1**	0	0.02	7.3	**7.3**
46	Children's Centre	1.0	**30.6**	**1**	0	0.02	7.3	**7.3**
47	Showground	0.2	**30.5**	**1**	0	0.02	7.3	**7.3**
48	Courthouse	0.5	**30.5**	**1**	0	0.02	7.3	**7.3**
49	Pump Track	0.2	**30.5**	**1**	0	0.02	7.3	**7.3**

Figure 21 Predicted Maximum 24-Hour Average $PM_{2.5}$ Concentrations – Site Only

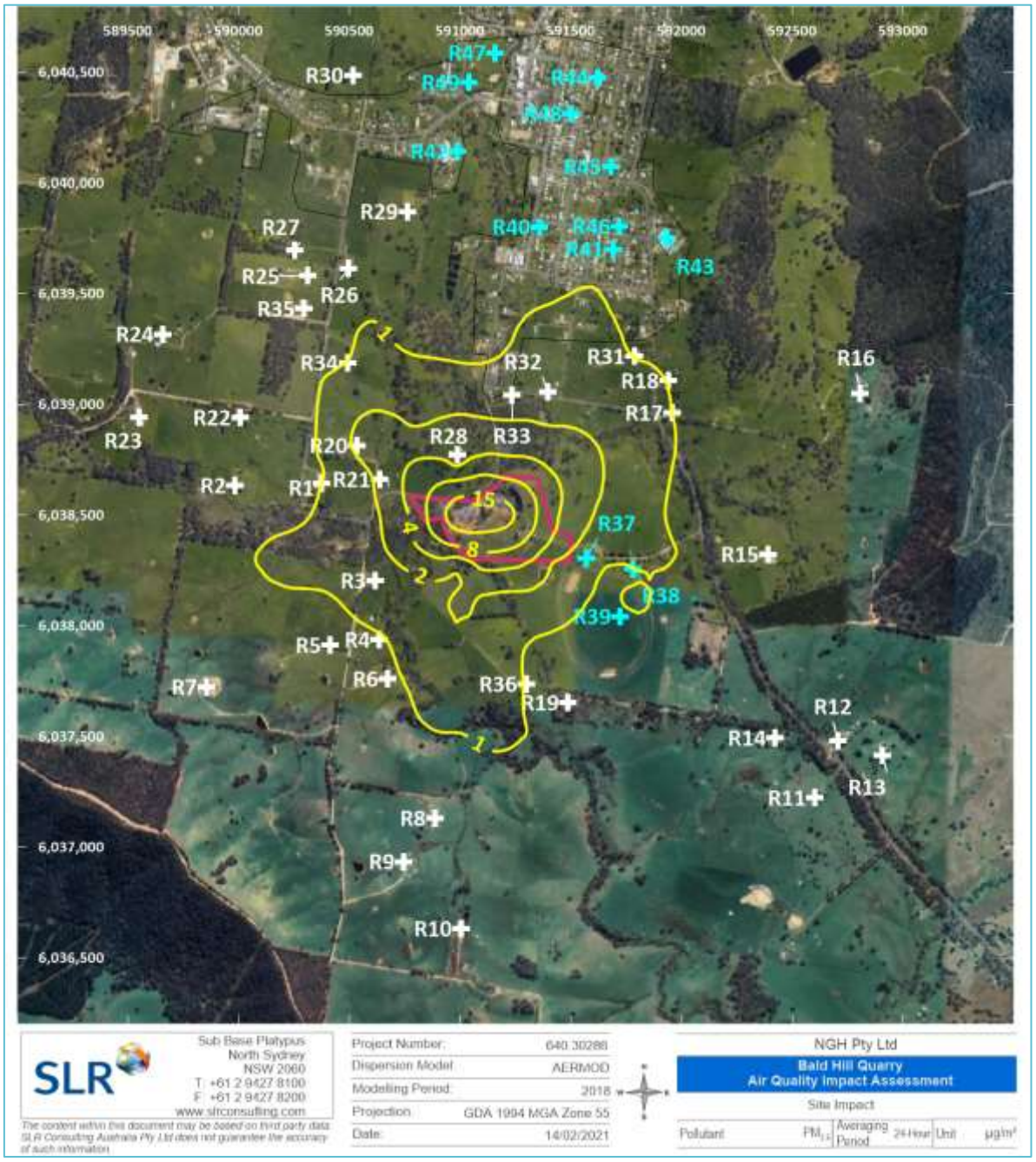


Figure 22 Predicted Annual Average $PM_{2.5}$ Concentrations – Site Only

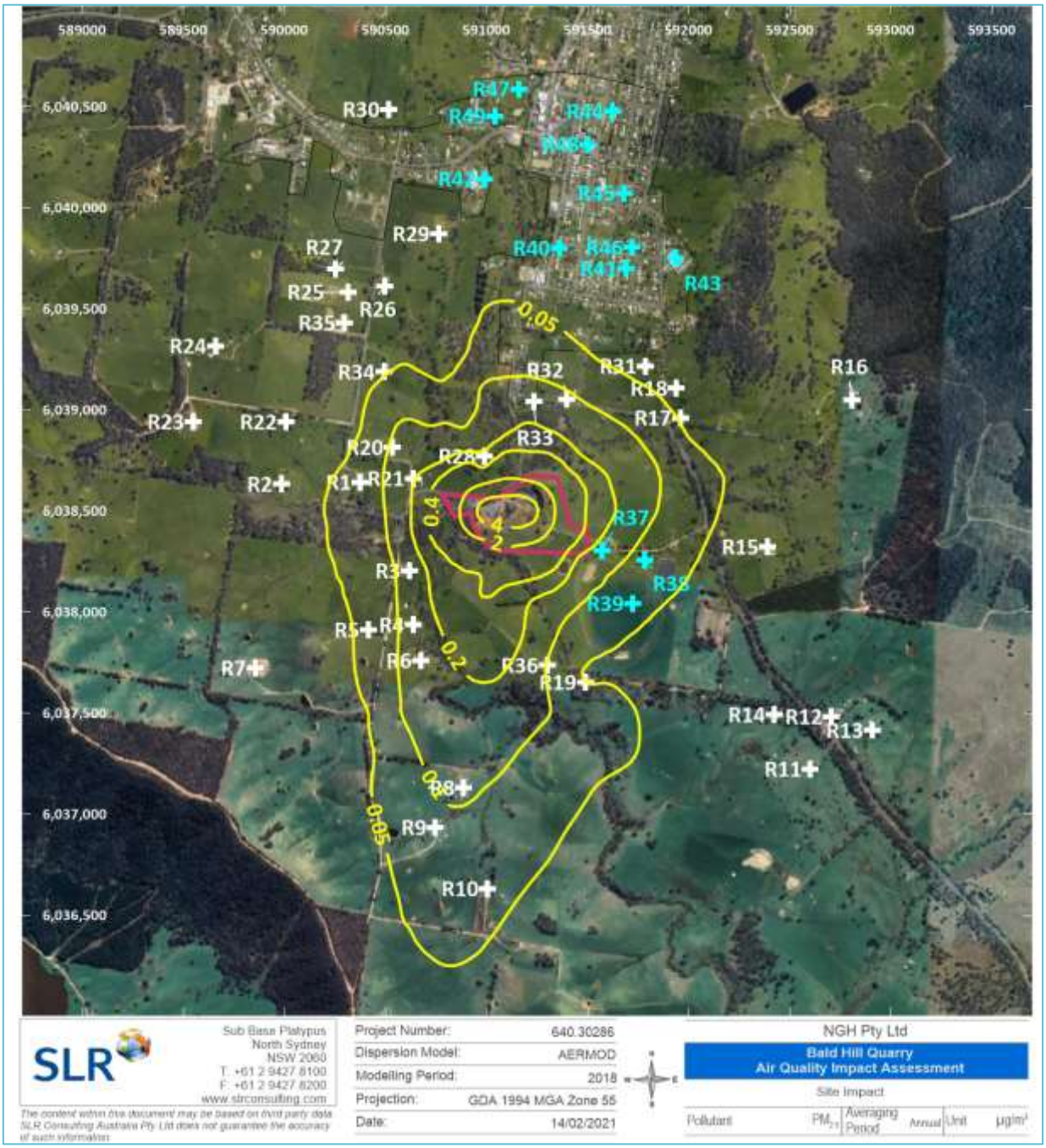
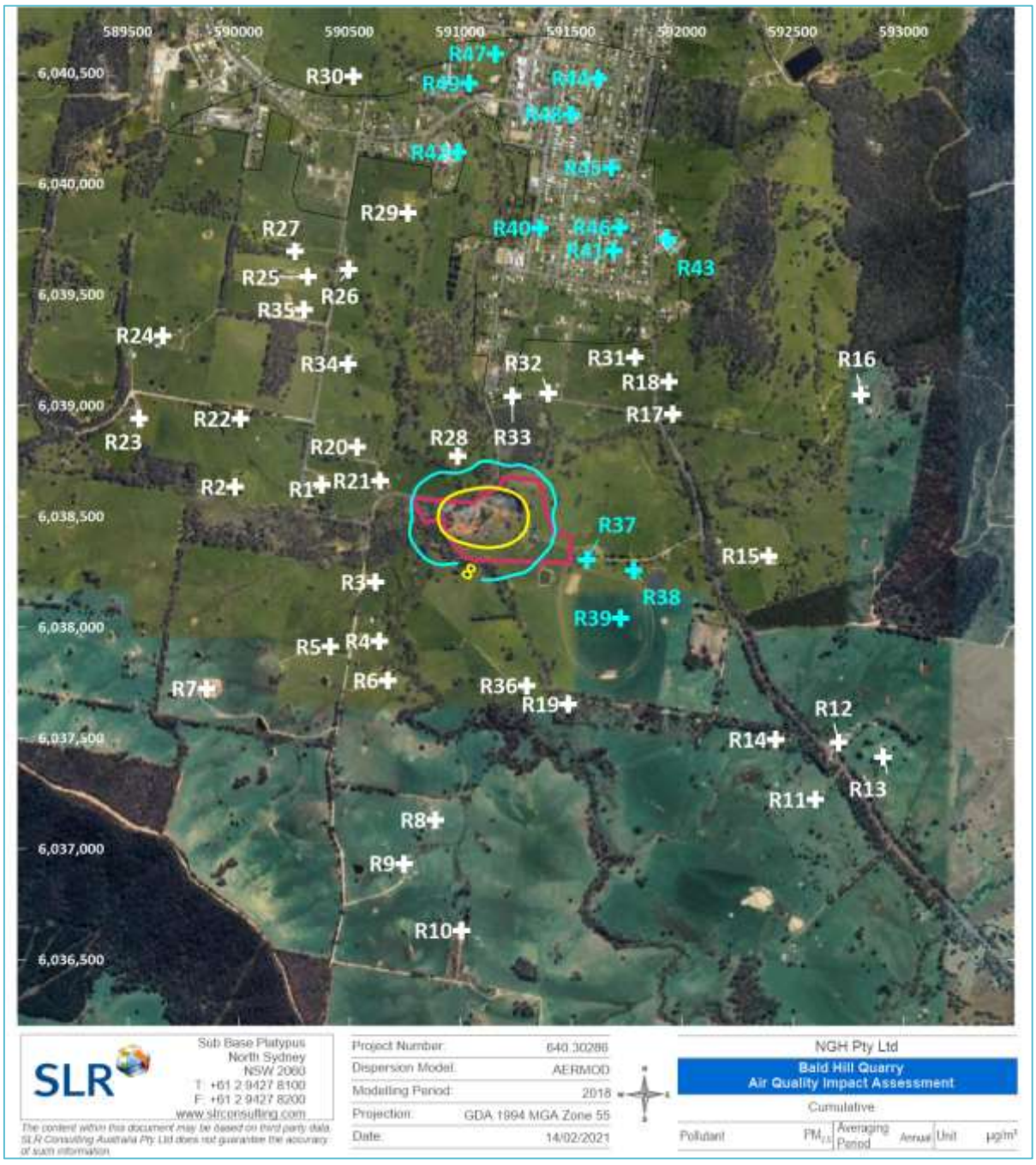


Figure 23 Predicted Annual Average $PM_{2.5}$ Concentrations – Cumulative



7.3 TSP

Table 14 presents a summary of the predicted maximum incremental and cumulative 24-hour and annual average TSP concentrations at the sensitive receptors. Isopleth plots of the predicted annual average incremental impacts (i.e., excluding background levels) and cumulative due to the proposed emissions are presented in **Figure 24** and **Figure 25**.

The predicted cumulative concentrations at all the receptors are below the annual average TSP criterion of 90 µg/m^3.

Table 14 Predicted Incremental and Cumulative Annual Average TSP Concentrations

Pollutant		TSP (µg/m3)	
Averaging Period		Annual Average	
Source		Site only	Cumulative
		Assessment Criterion	
Receptor ID	Type	-	*90*
1	Residence	2.0	42
2	Residence	1.1	41
3	Residence	3.7	43
4	Residence	3.5	43
5	Residence	1.7	41
6	Residence	3.7	43
7	Residence	0.3	40
8	Residence	3.1	43
9	Residence	2.4	42
10	Residence	1.7	41
11	Residence	0.5	40
12	Residence	0.4	40
13	Residence	0.3	40
14	Residence	0.6	40
15	Residence	0.7	40
16	Residence	0.2	40
17	Residence	1.5	41
18	Residence	1.1	41
19	Residence	1.5	41
20	Residence	3.1	43
21	Residence	5.5	45
22	Residence	0.5	40
23	Residence	0.3	40
24	Residence	0.3	40
25	Residence	0.5	40
26	Residence	0.5	40
27	Residence	0.4	40
28	Residence	7.6	47

	Pollutant	TSP (µg/m3)	
29	Residence	0.4	40
30	Residence	0.2	40
31	Residence	1.0	41
32	Residence	3.3	43
33	Residence	4.2	44
34	Residence	1.4	41
35	Residence	0.5	40
36	Residence	2.8	42
37	Racecourse	5.0	45
38	Racecourse	2.6	42
39	Racecourse	2.0	42
40	Motel	0.9	40
41	Motel	0.6	40
42	Hospital	0.4	40
43	High School	0.5	40
44	School	0.3	40
45	School	0.4	40
46	Children's Centre	0.6	40
47	Showground	0.4	40
48	Courthouse	0.5	40
49	Pump Track	0.5	40

Figure 24 Predicted Annual Average TSP Concentrations – Site Only

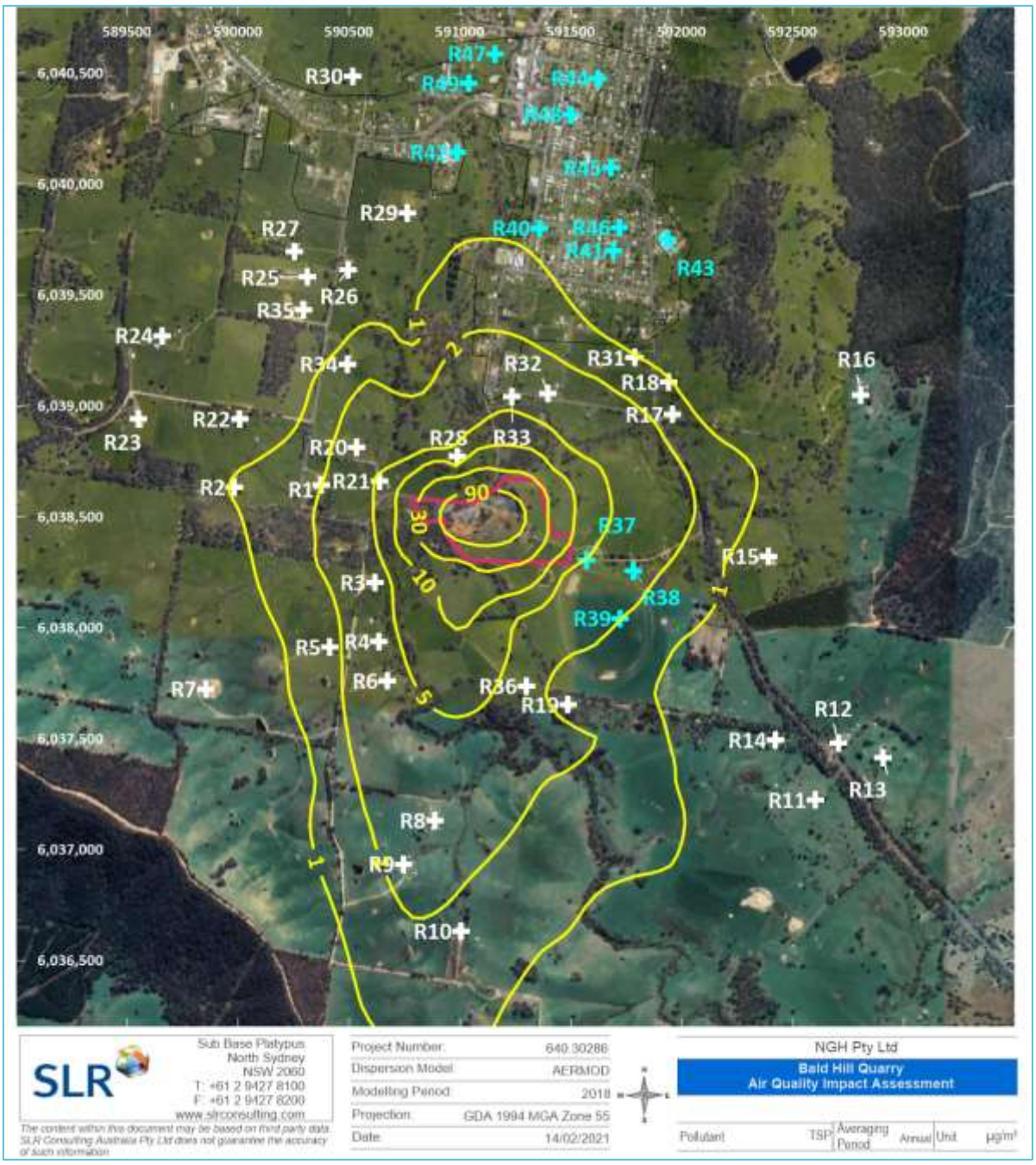
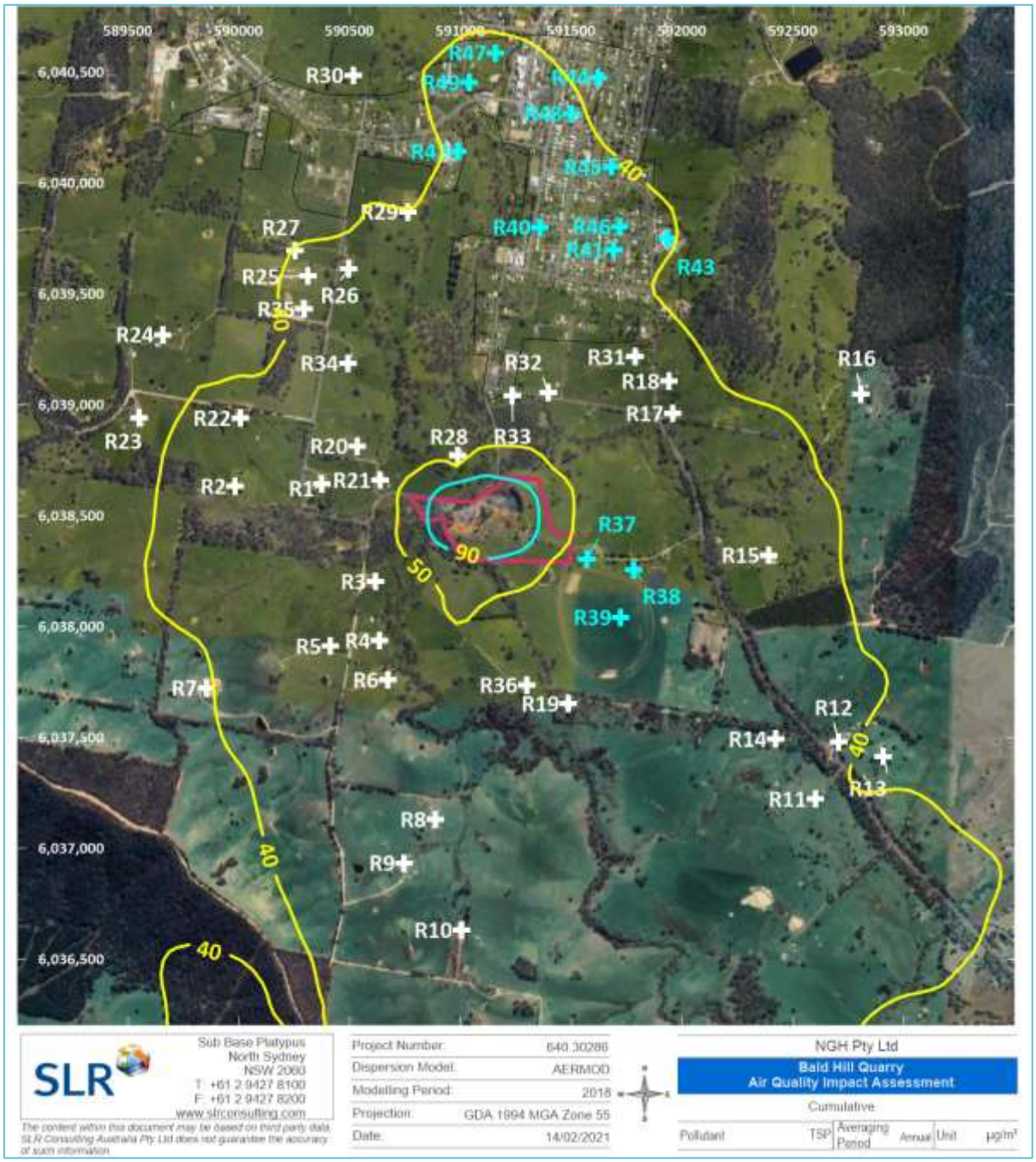


Figure 25 Predicted Annual Average TSP Concentrations – Cumulative



7.4 Dust Deposition

Table 15 presents a summary of the predicted incremental annual average dust deposition levels at the sensitive receptors. Isopleth plots of the predicted annual average incremental impacts due to the proposed emissions (i.e., excluding background levels) are presented in **Figure 26**.

In the absence of any appropriate background deposition rate, the predicted incremental deposition rate is assessed against the criterion of 2 g/m^2/month (incremental increase in dust deposition) and indicates compliance at all receptors. The impacts predicted due to the estimated emissions from the Project are low and would represent a negligible contribution to cumulative deposition at the receptors.

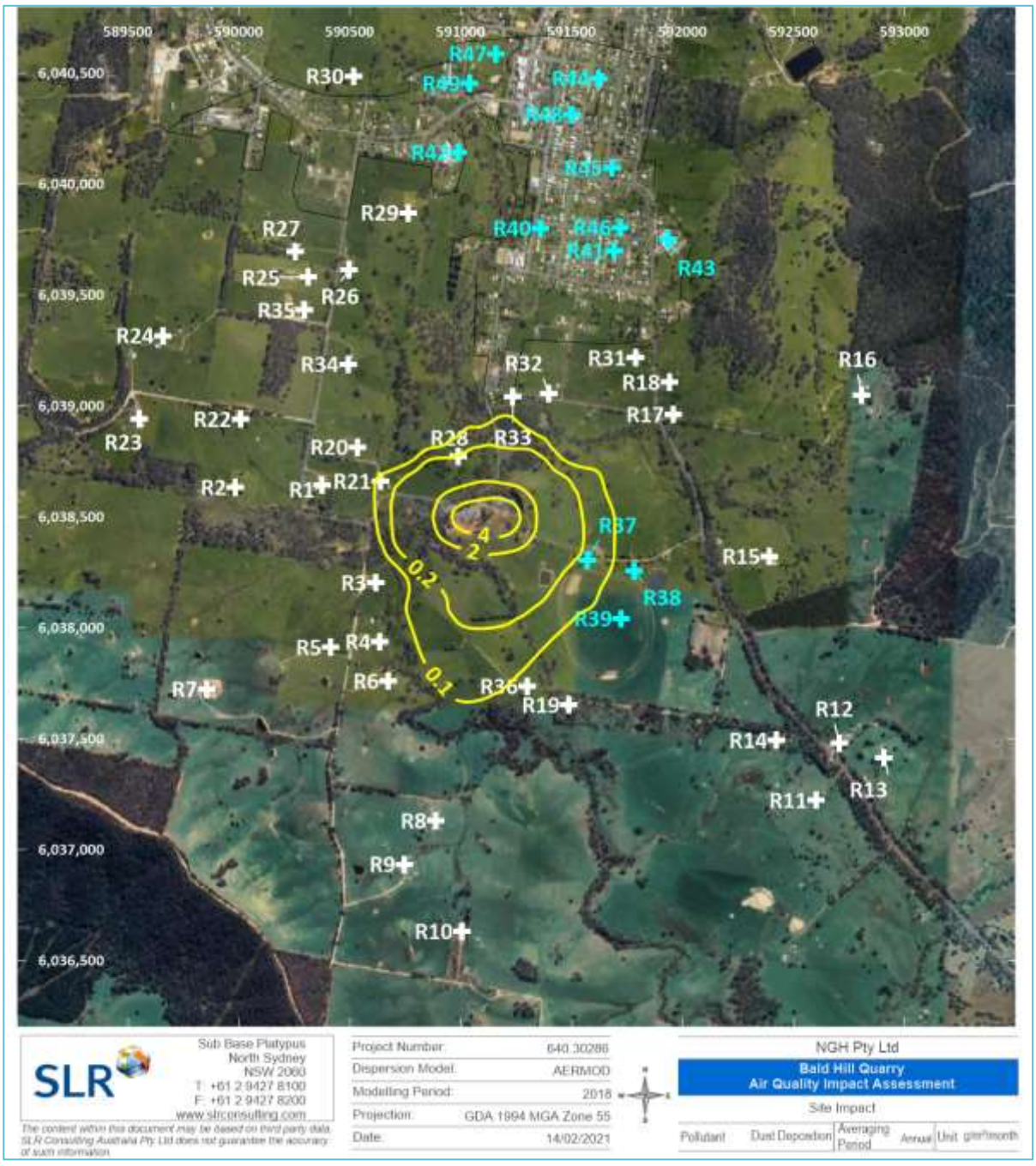
The limit of reporting associated with monitoring dust deposition rate is dependent of laboratory weighing procedures but is typically 0.1 g/m^2/month. As such, it is considered that the predicted contribution of the Site alone would not be discernible from existing levels.

Table 15 Predicted Annual Average Dust Deposition Rates

Pollutant		Dust Deposition (g/m^2/month)
Averaging Period		Annual Average
Source		Site only
		Assessment Criterion
Receptor ID	Type	*2*
1	Residence	<0.1
2	Residence	<0.1
3	Residence	0.1
4	Residence	0.1
5	Residence	<0.1
6	Residence	0.1
7	Residence	<0.1
8	Residence	<0.1
9	Residence	<0.1
10	Residence	<0.1
11	Residence	<0.1
12	Residence	<0.1
13	Residence	<0.1
14	Residence	<0.1
15	Residence	<0.1
16	Residence	<0.1
17	Residence	<0.1
18	Residence	<0.1
19	Residence	<0.1
20	Residence	0.1
21	Residence	0.1
22	Residence	<0.1
23	Residence	<0.1
24	Residence	<0.1

	Pollutant	Dust Deposition (g/m^2/month)
25	Residence	<0.1
26	Residence	<0.1
27	Residence	<0.1
28	Residence	0.2
29	Residence	<0.1
30	Residence	<0.1
31	Residence	<0.1
32	Residence	<0.1
33	Residence	<0.1
34	Residence	<0.1
35	Residence	<0.1
36	Residence	<0.1
37	Racecourse	<0.1
38	Racecourse	0.1
39	Racecourse	0.1
40	Motel	<0.1
41	Motel	<0.1
42	Hospital	<0.1
43	High School	<0.1
44	School	<0.1
45	School	<0.1
46	Children's Centre	<0.1
47	Showground	<0.1
48	Courthouse	<0.1
49	Pump Track	<0.1

Figure 26 Predicted Annual Average Dust Deposition Rate – Site Only



8 Dust Mitigation Measures

The results of the dispersion modelling indicate compliance for long term (annual average) particulate averages and potential non-compliance of short term (24-hour average) criteria for PM_{10} and $PM_{2.5}$ mainly due to elevated background concentrations.

Nevertheless, in order to ensure that impacts on off-site air quality are minimised and within the scope permitted by the existing planning approval, mitigation measures for dust emissions are recommended as listed in **Table 16**.

Table 16 Recommended Dust Mitigation Measures for the Project

Potential Pollution Source	Control Measures
Wind generated dust from exposed areas and stockpiles	Wet suppression or chemical coating Revegetation of exposed areas
Haul and road trucks	Covering all loads leaving the site
	The speed limit on unpaved surfaces is limited to 10km/hr
	High level watering (greater than 2L/m^2/hr) may be done on unpaved road surfaces. This can be achieved through the use of a water cart
	Low silt aggregate used on unpaved roads
Fixed materials handling activities: - Crushing and screening - Dumping of product to the primary crushing facility	Minimising dust-generating activities during times of high wind speeds
	Reduction of the intensity/rate of activities in response to excessive dust generation
Other quarrying activities: - Dumping of material to stockpiles by front end loaders	Minimising dust-generating activities during times of high wind speeds
	Relocation of offending plant and equipment to less sensitive on-site areas
	Reduction of the intensity/rate of activities in response to excessive dust generation
All	Minimise or cease activity in proximity to R28 when winds are blowing form the south-southeast at a windspeed of 2 m/s or greater for 4 hours or longer

9 Conclusions

Dispersion modelling has predicted that the cumulative annual average PM_{10} and TSP concentrations, and annual average dust deposition rates, would be below the respective NSW EPA impact assessment criteria at all sensitive receptors for the proposed operations.

Exceedances of the cumulative annual average $PM_{2.5}$ impact assessment criteria were predicted at each of the sensitive receptors due to the background concentrations already being above criteria. Incremental increases due to the proposed operations were less than 1% of the criteria in most cases.

When considering the cumulative maximum 24-hour average PM_{10} concentrations, with the exception of one predicted exceedance at R28, the additional exceedances predicted occur when the assumed background was already measuring at least 47 $\mu g/m^3$

The predicted additional exceedances predicted for cumulative maximum 24-hour average $PM_{2.5}$ concentrations all occur when the assumed background at Albury was measured to be 25 $\mu g/m^3$, with the Site contributing less than 1%.

Adopting background concentrations from Albury is considered conservative for Tumbarumba being a less rural area, and the Albury data are impacted by anthropogenic emissions of PM_{10} and $PM_{2.5}$. It is concluded that the proposed operations are likely to cause no, or minor additional exceedances of the 24-hour average PM_{10} and $PM_{2.5}$ criterion at the identified receptor locations,

Overall, the proposed operations are predicted to have negligible increases in cumulative concentrations at all of the sensitive receptors.

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APPENDIX A

Selection of Representative Meteorological Year

Selection of Representative Meteorological Year

Once emitted to atmosphere, emissions will:

- Rise according to the momentum and buoyancy of the emission at the discharge point relative to the prevailing atmospheric conditions
- Be adverted from the source according to the strength and direction of the wind at the height which the plume has risen in the atmosphere
- Be diluted due to mixing with the ambient air, according to the intensity of turbulence
- (Potentially) be chemically transformed and/or depleted by deposition processes.

Dispersion is the combined effect of these processes.

Dispersion modelling is used as a tool to simulate the air quality effects of specific emission sources, given the meteorology typical for a local area together with the expected emissions. Selection of a year when the meteorological data is atypical means that the resultant predictions may not appropriately represent the most likely air quality impacts. Therefore, in dispersion modelling, one of the key considerations is the representative nature of the meteorological data used.

The year of meteorological data used for the dispersion modelling was selected by reviewing the most recent five years of historical surface observations at Cabramurra SMHEA AWS (2016 to 2020 inclusive) to determine the year that is conservatively most representative of average conditions. Wind direction, wind speed and ambient temperature were compared to averages for the region to determine the most representative year.

Data collected from 2016 to 2020 are summarised in **Figure A1** to **Figure A3**. Examination of the data indicates the following:

- **Figure A1** indicates relatively similar wind roses for all years analysed.
- **Figure A2** indicates that 2018 exhibits generally wind speeds similar to the average.
- **Figure A3** shows that 2018 exhibits generally temperatures similar to the average.

Given the above considerations, the year 2018 was selected as a representative year of meteorology.

Figure A1 Frequency of Winds at Cabramurra SMHEA AWS for 2016 – 2020

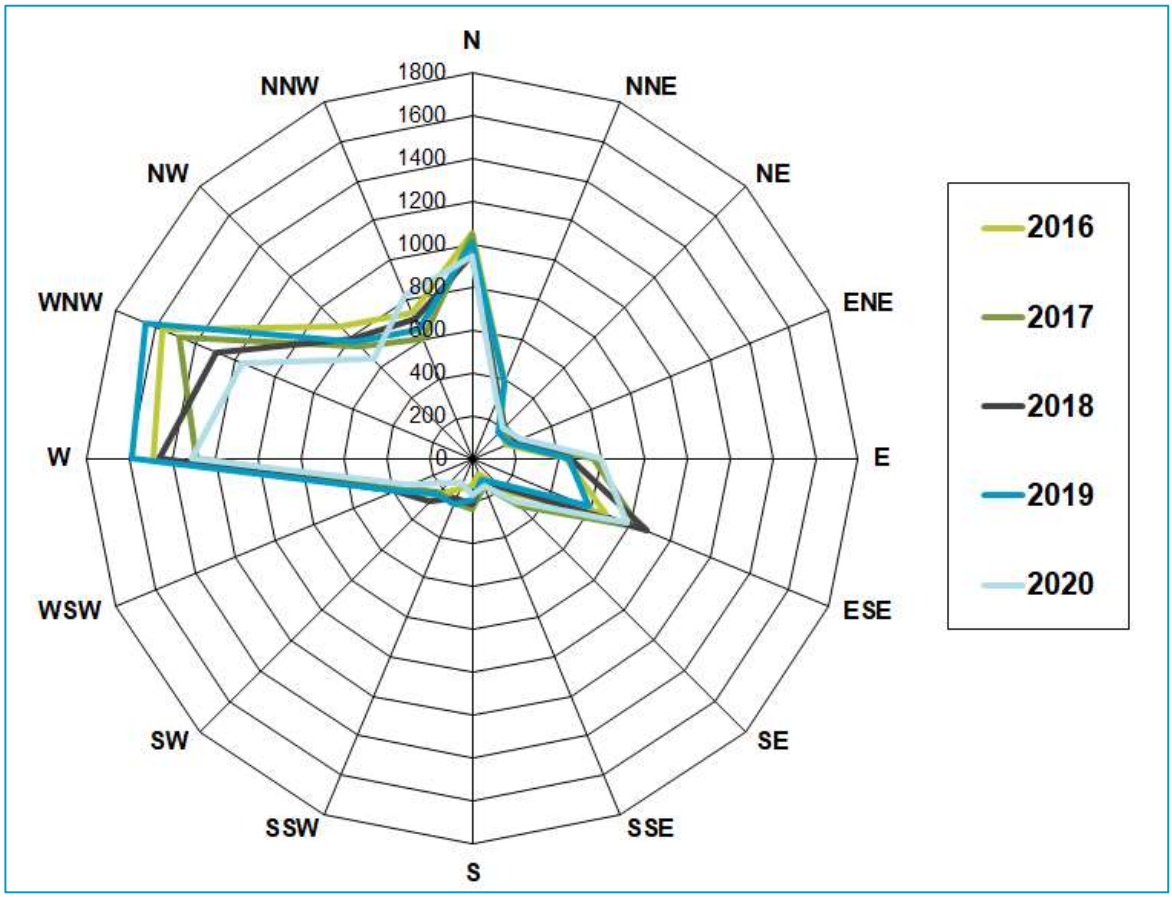


Figure A2 Monthly Average Wind Speed at Cabramurra SMHEA AWS for 2016 – 2020

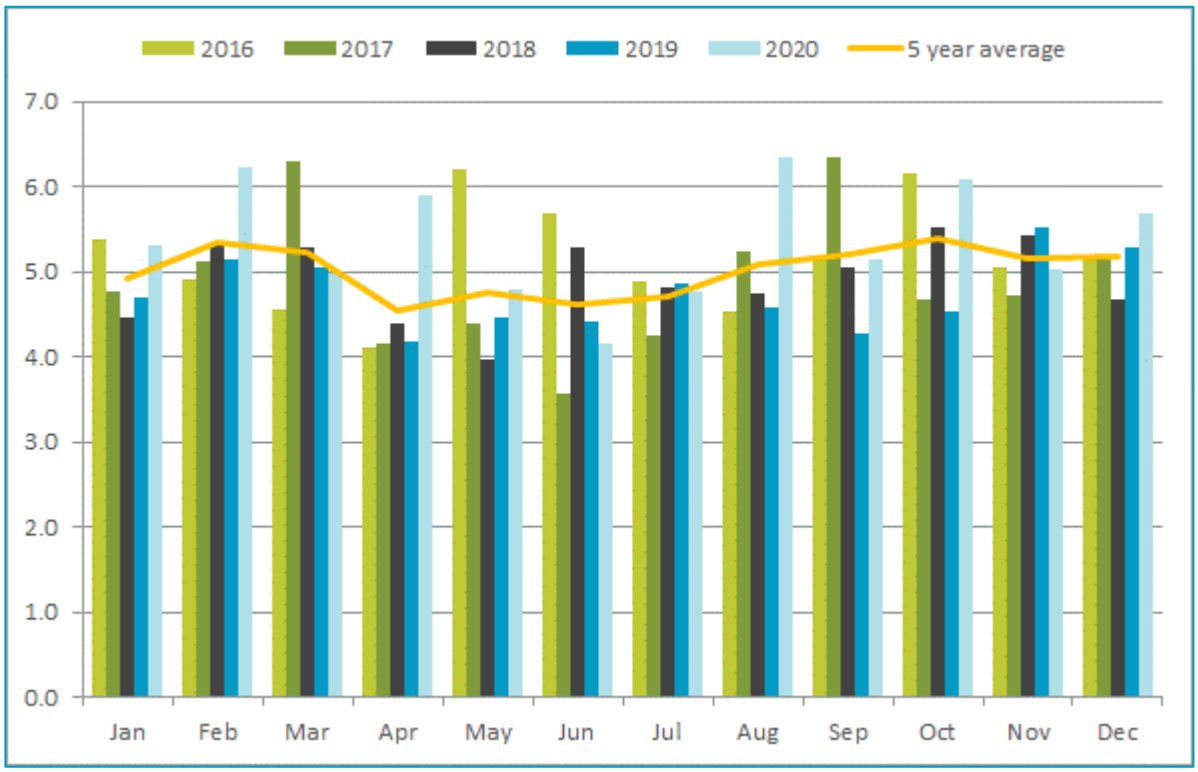
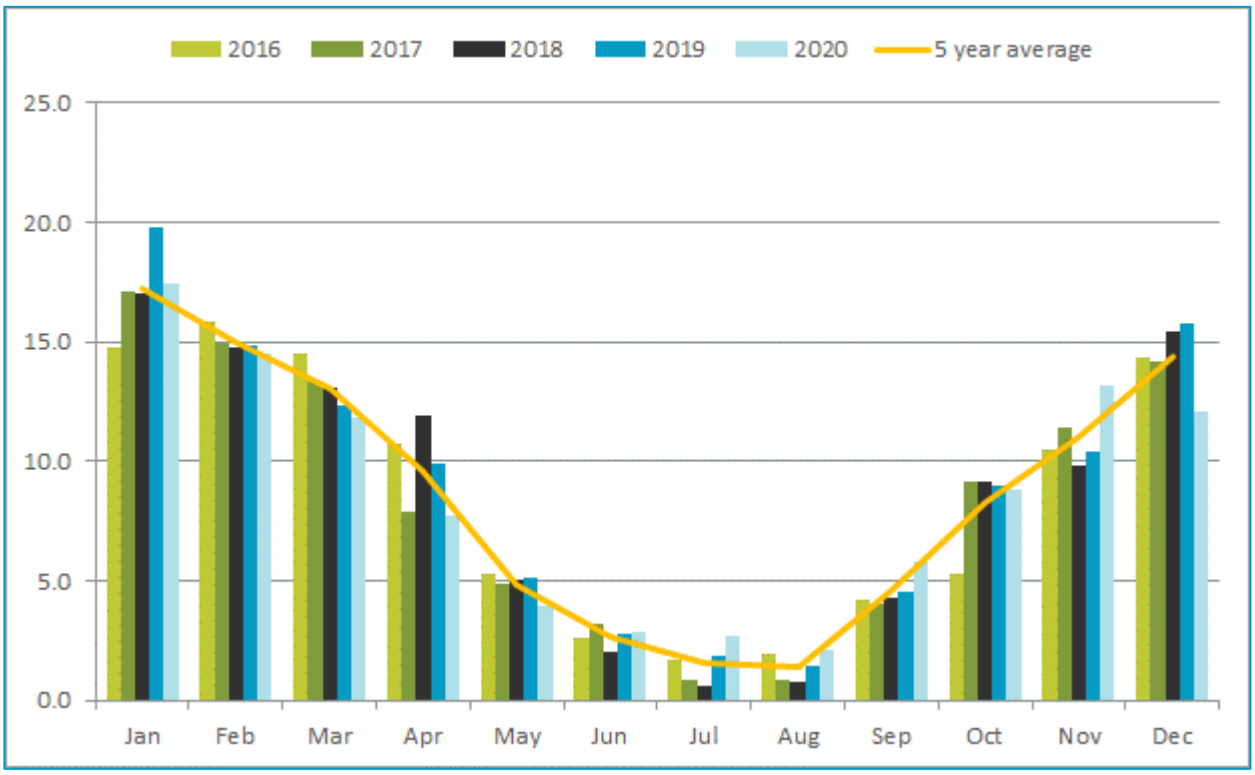


Figure A3 Monthly Average Temperature at Cabramurra SMHEA AWS for 2016 – 2020



APPENDIX B

Meteorological Modelling

TAPM Model Configuration

Prognostic models, such as The Air Pollution Model (TAPM), solve the equations of atmospheric dynamics to produce physically realistic three-dimensional meteorological fields, such as wind, temperature, humidity, surface fluxes and boundary-layer structure. They are the models used in weather forecasting and climate research, and as a basis for dispersion modelling. Data from local climate stations are optional and local flows arise through the dynamic forcing simulated by the computational model. Larger-scale fields (up to global scale) are required for their initialization and ongoing boundary updates.

TAPM (Version 4.04) was used to generate synthetic meteorological data sets, which were then processed in AERMET to create the surface and profile meteorology data sets used by AERMOD. TAPM is a model developed at Commonwealth Scientific and Industrial Research Organisation (CSIRO) Marine and Atmospheric Research which is widely used throughout Australia for this purpose and is recognised by state regulatory authorities.

TAPM was run for the 2018 with no observed data assimilation.

TAPM was initially configured with a nested model grid coverage designed to capture, broad scale synoptic flows, regional and broader scale sea breezes and land breezes, regional and broader wind channelling around terrain features and influence of land use.

The following TAPM setup was used:

- Outer grid resolution 10 km with nested grids of 3 km and 1 km
- 41-by-41 horizontal grid points centred at the location of the Site
- 25 vertical levels
- Nine-second terrain height database
- TAPM default databases for land use and sea surface temperature

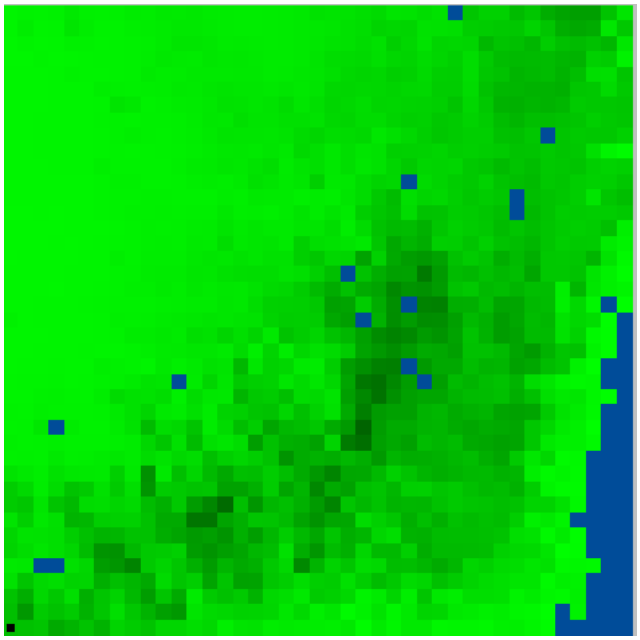
The parameters used for the model runs are provided in **Table B1** and apply to the meteorological component of TAPM. The pollution dispersion components of TAPM have not been used. For all other input parameters default values were used. Graphical representations of the three grids are presented in **Figure B1**.

Table B1 TAPM Configuration Parameters

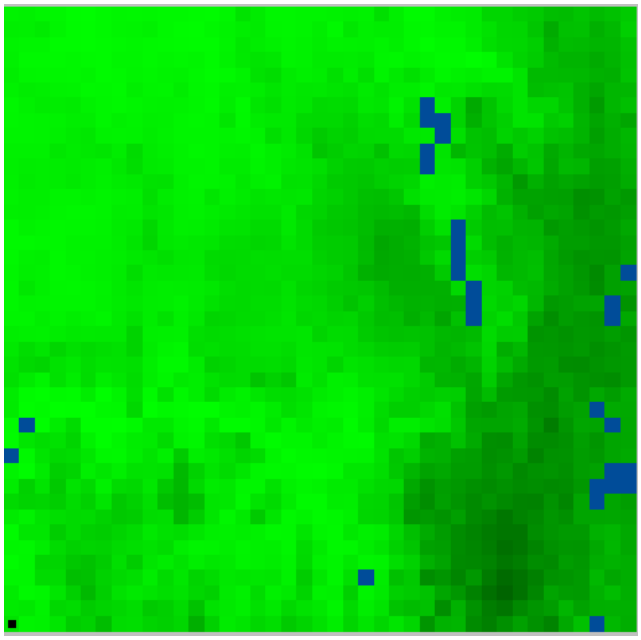
Parameter	Value
Start and end dates	31 December 2017 – 1 January 2019
Grid Centre (Lat/Long, WGS84)	35° 47.5'S, 148°0.5'E
Grid Centre (UTM Co-ordinates [m])	591,119, 6,038,689
No. of grids	4
No. of horizontal grid points	41 x 41
Horizontal grid spacing	10 km, 3 km, 1 km, 0.3km
No. of vertical levels	25 (up to 8000 m)
Monthly deep-soil moisture content (12 values)	0.15 m^3/m^3 (model default)
Topography	TAPM datasets
Vegetation and land use	TAPM datasets
Surface vegetation and precipitation processes	Included
Snow processes and non-hydrostatic processes	Excluded
Grid used for extracted profile	4 (0.3 km)
Location of extracted profile (UTM Co-ordinates [m])	591,119, 6,038,689
Data assimilation	None

Figure B1 TAPM Grids

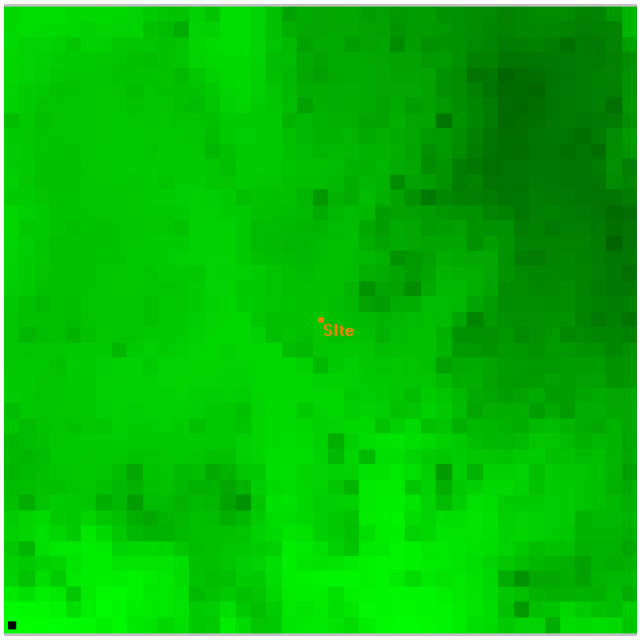
Grid 1: 10 km Resolution



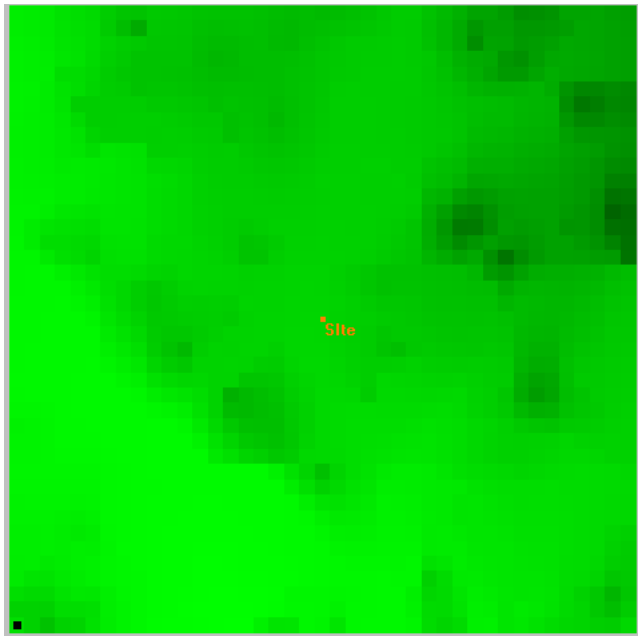
Grid 2: 3 km Resolution



Grid 3: 1 km Resolution



Grid 4: 0.3 km Resolution



TAPM Solution Summary

Wind Speed and Wind Direction

The 2018 annual, and seasonal wind roses for the TAPM model solution extracted at the Project location are presented in **Figure B2**.

The solutions indicate the following:

- Annually, winds from the north and northwest quadrants prevail, with few winds from the south and east.
- Winter sees more winds from the north.
- Summer, spring, and autumn winds are similar to the annual distribution.

TAPM predicts an annual average wind speed of 2.1 m/s at the Project; 2.2 m/s during the day (0600-1800) and 1.9 during the night (1800-0600).

The diurnal variations in maximum and average wind speed predicted by TAPM at the Project during 2018 are illustrated in **Figure B3**. Wind speeds during the day are greater due to convective forcing. The frequency of wind speeds predicted by TAPM at the Project during 2018 are illustrated in **Figure B4**. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of 'plume' stretching. In general, higher wind speeds promote dispersion and result in lower pollutant ground level concentrations.

Figure B2 TAPM Solution Annual and Seasonal Wind Roses at the Project (2018)

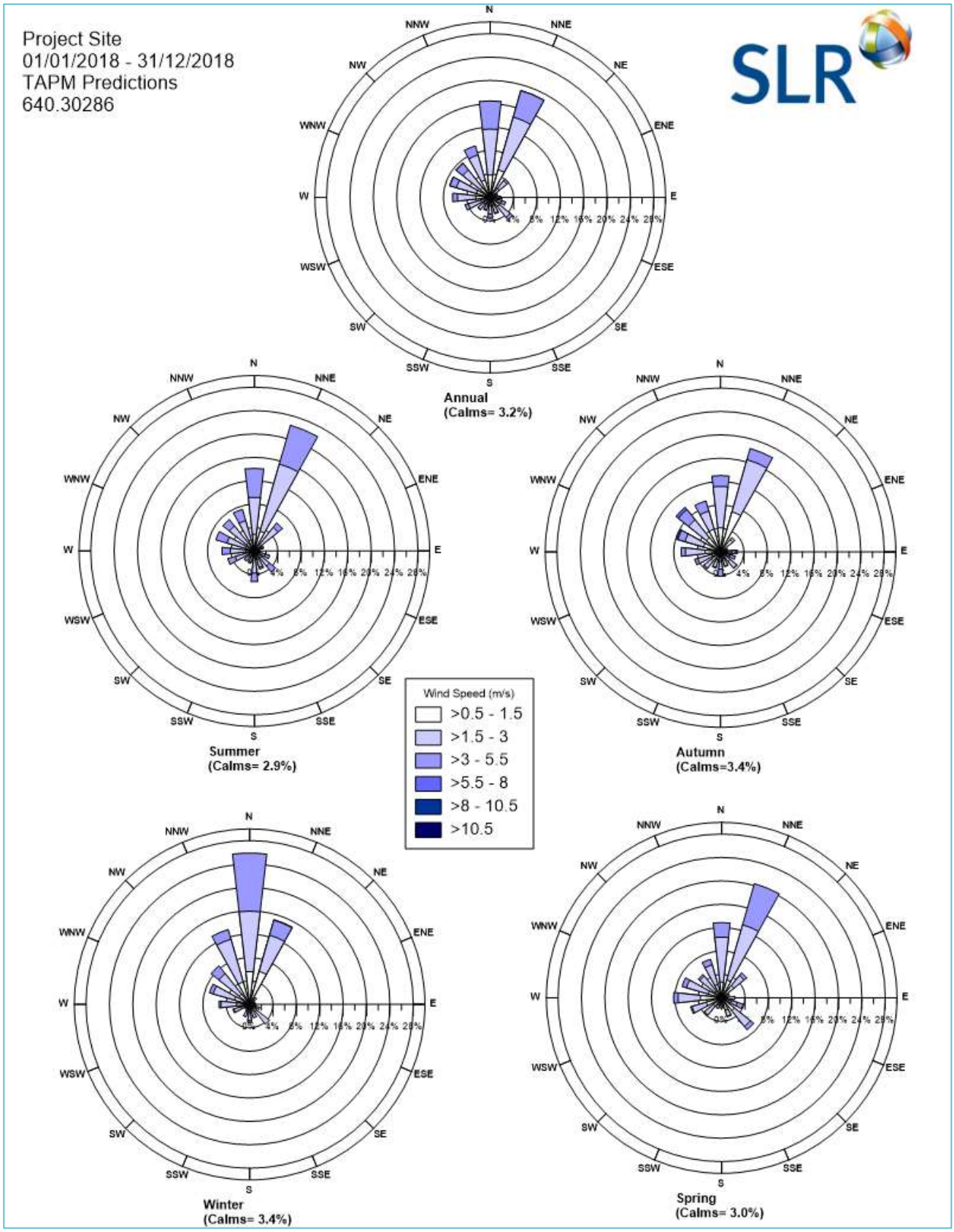


Figure B3 TAPM Predicted Diurnal Variation in Wind Speed for the Project Site (2018)

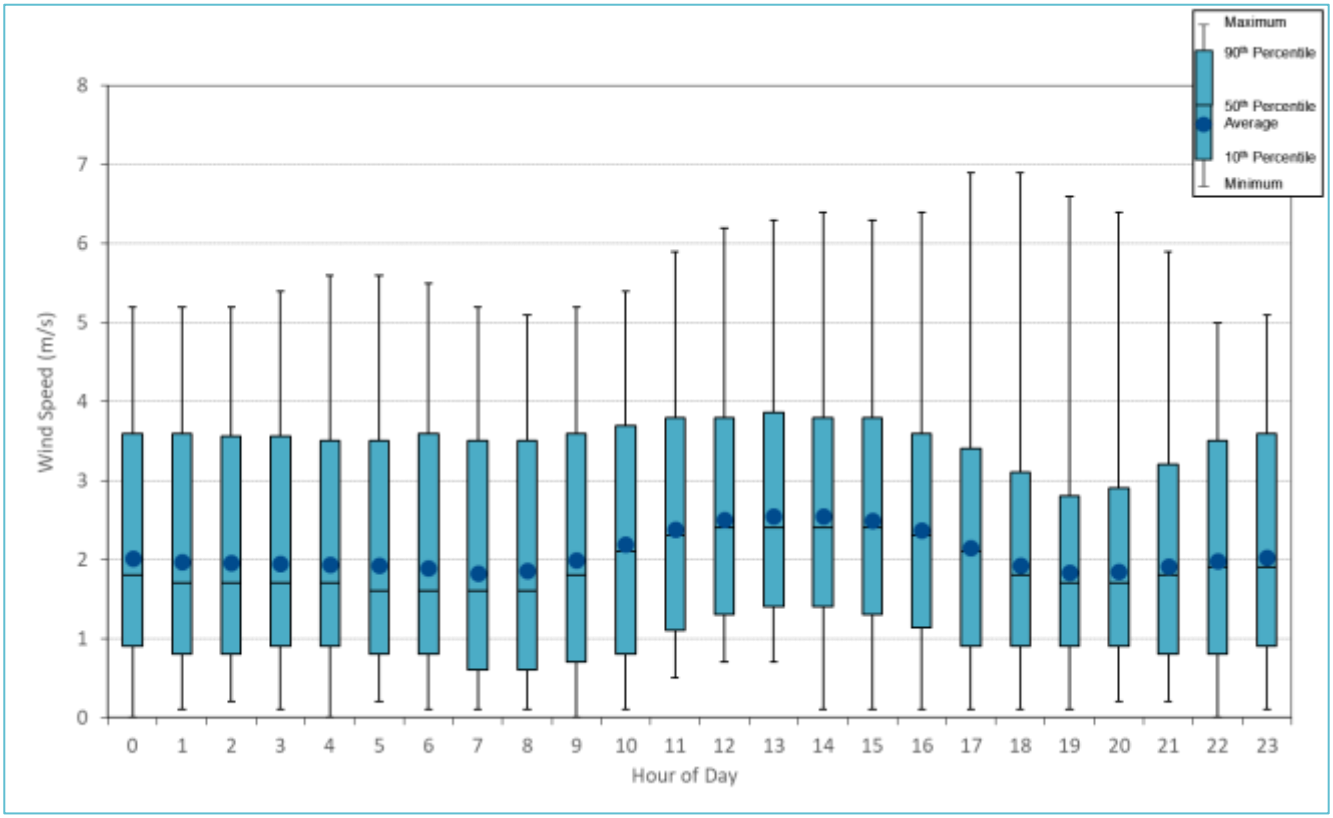
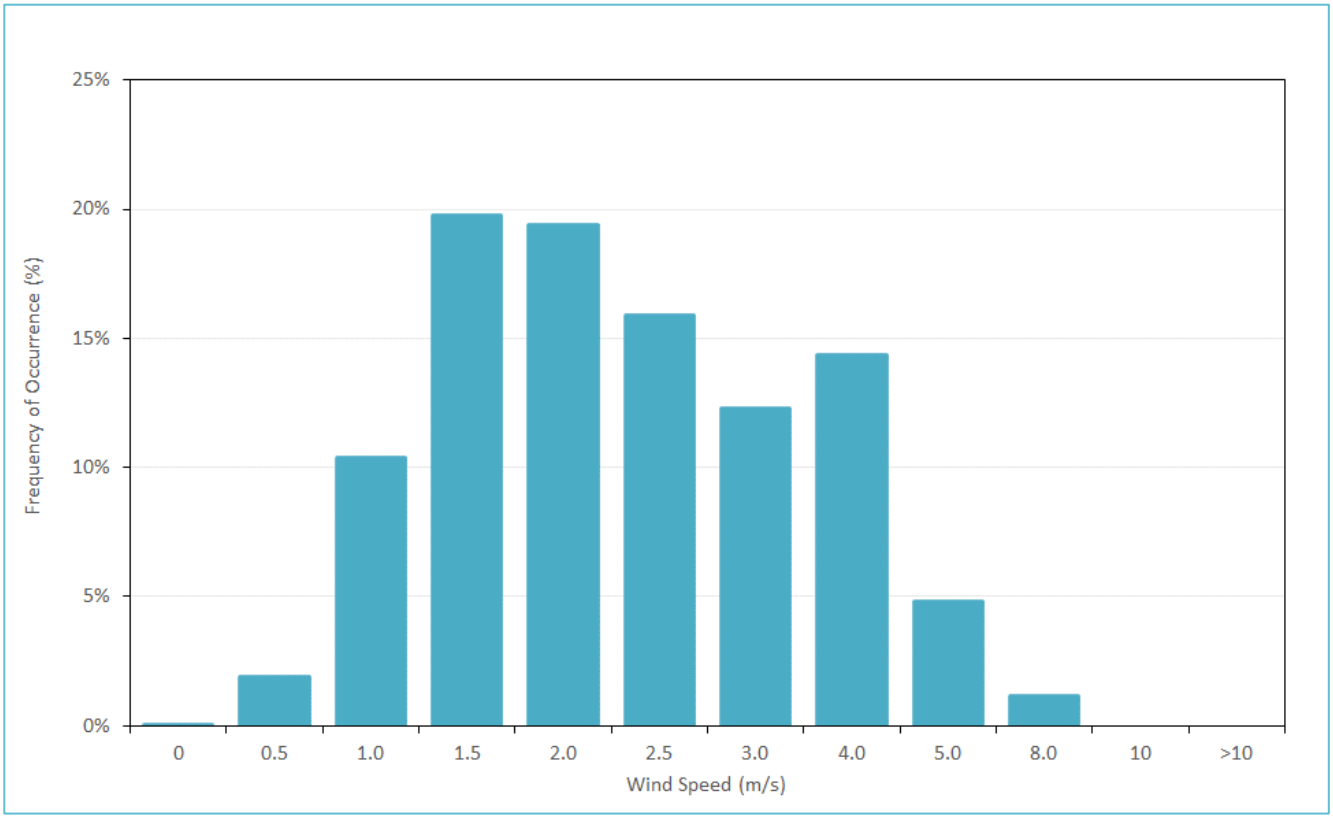


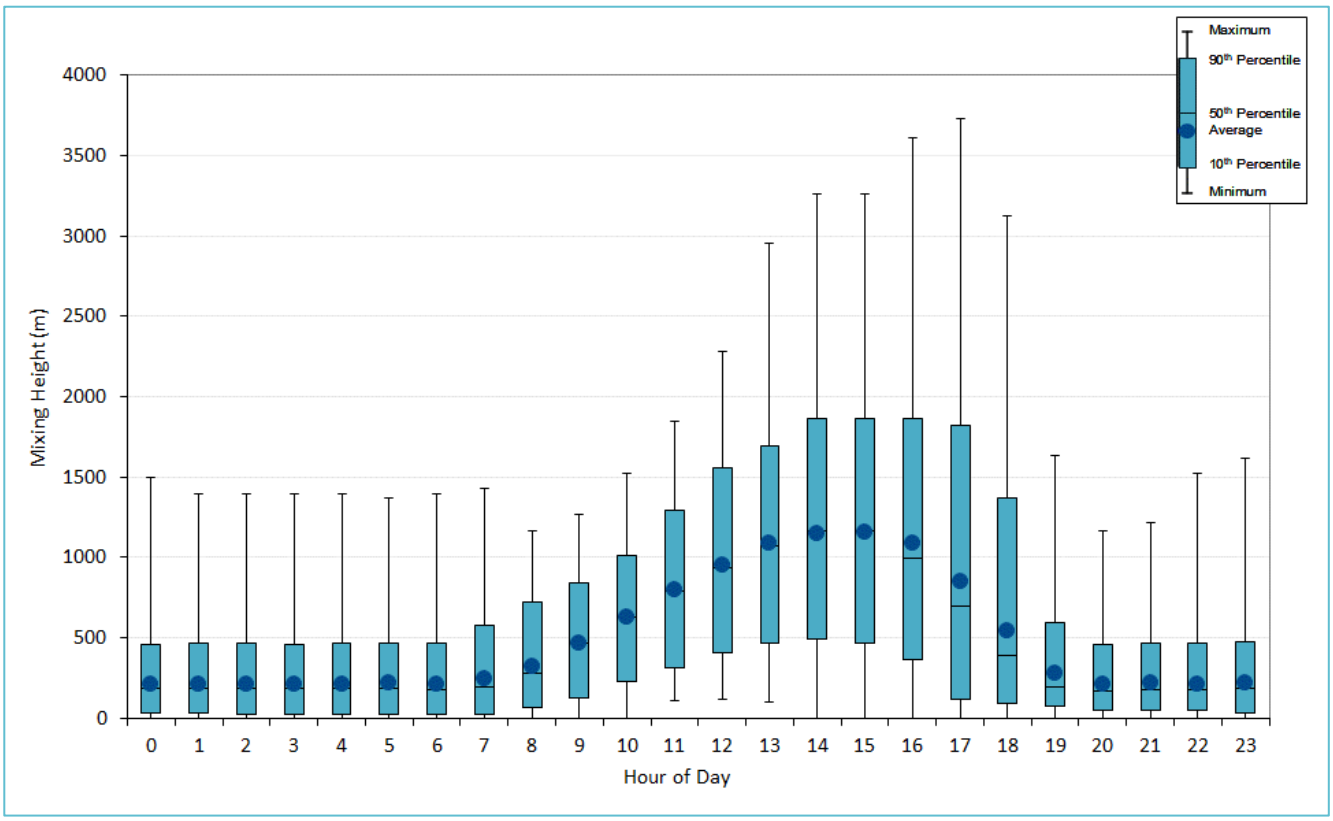
Figure B4 TAPM Predicted Wind Speed Frequency for the Project Site (2018)



Mixing Height

The TAPM data along with regional upper air data is input into AERMET to produce AERMOD ready meteorological files. The diurnal variations in maximum and average mixing heights predicted by AERMET at the Project are illustrated in **Figure B5**. An increase in the mixing depth during the morning is apparent, arising due to the onset of vertical mixing following sunrise. The maximum average mixing heights occur in the early to mid-afternoon, then begin to decrease due to the dissipation of ground-based temperature inversions and the growth of the convective mixing layer.

Figure B5 AERMET Predicted Diurnal Variation in Mixing Height for the Project Site (2018)



APPENDIX C

Emission Inventory Formulae

Inventory Activity	Units	TSP Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	Assumptions	Emission Factor Source
Rock Extraction						
Drilling	kg/hole	0.52	0.52 * TSP	0.0468 * TSP	PM_{10} based on blasting AP42 Table 11.9-2; $PM_{2.5}$ based on SPCC (1986) data	AP42 Table 11.9-4,
Blasting	kg/blast	$0.00022 \times A^{1.5}$	0.52 * TSP	0.03 * TSP	A = 600 m^2 per blast	AP42 Table 11.9-4,
FEL pushing off bench	kg/t	$0.74 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.35 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.053 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	U = 0.98 M = 6% 200,000 t/y	AP42 Section 13.2.4
FEL picking up to travel	kg/t	$0.74 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.35 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.053 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	U = 0.98 M = 6% 200,000 t/y	AP42 Table 11.9-2
FEL travel to crushing circuit	kg/VKT	$\left(\frac{0.4536}{1.6093}\right) \times 4.9 * \left(\frac{s}{12}\right)^{0.7} \times \left(\frac{W \times 1.1023}{3}\right)^{0.4}$	$\left(\frac{0.4536}{1.6093}\right) \times 1.5 * \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)$	$\left(\frac{0.4536}{1.6093}\right) \times 0.15 * \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)$	10% silt; 6.5t per load; 27.2 t average mass; return travel distance 0.5 km 200,000 t/y	AP42 Section 13.2.2
Crushing and Screening						
Crushing/Screening (Ten transfers)	kg/t	$0.74 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.35 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.053 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	U = 0.98 M = 6%	AP42 Section 13.2.4
Crushing/Screening - Primary Crushing (controlled)	No emission factor data					
Crushing/Screening - Secondary Crushing (controlled)						
Crushing/Screening - Tertiary Crushing (controlled)	kg/t	0.0006	0.00027	0.00005	200,000 t/y	AP42 Table 11.19.2-1
Crushing/Screening - Primary Screening (controlled)	kg/t	0.0125	0.0043	0.000025	200,000 t/y	AP42 Table 11.19.2-1
Crushing/Screening - Fines Screening (controlled)	kg/t	0.0018	0.0011	0.000004	200,000 t/y	AP42 Table 11.19.2-1
Unloading from crusher/screening to stockpile	kg/t	$0.74 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.35 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.053 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	U = 0.98 M = 6% 140,000 t/y	AP42 Section 13.2.4

Inventory Activity	Units	TSP Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	Assumptions	Emission Factor Source
Transfer from Crushing and Screening plant to Pre-coating Plant						
Loading product from crushing circuit to pre-coating plant - 30%	kg/t	$0.74 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.35 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.053 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	U = 0.98 M = 6% 60,000 t/y	AP42 Section 13.2.4
Unloading from pre-coating plant - 30%		Pre-coating process results in zero dust emissions				
Transfer from Crushing and Screening plant to Product Stockpile						
FEL picking up to travel to Product Stockpile	kg/t	$0.74 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.35 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.053 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	U = 0.98 M = 6% 140,000 t/y	AP42 Section 13.2.4
FEL travel to from crushing circuit to Product Stockpile	kg/VKT	$\left(\frac{0.4536}{1.6093}\right) \times 4.9 * \left(\frac{s}{12}\right)^{0.7} \times \left(\frac{W \times 1.1023}{3}\right)^{0.4}$	$\left(\frac{0.4536}{1.6093}\right) \times 1.5 * \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)$	$\left(\frac{0.4536}{1.6093}\right) \times 0.15 * \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)$	U = 0.98 M = 6% 140,000 t/y	AP42 Section 13.2.2
Unloading product from FEL to bulk storage stockpile	kg/t	$0.74 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.35 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.053 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	U = 0.98 M = 6% 200,000 t/y	AP42 Section 13.2.4
Transfer Product offsite						
Loading product from bulk storage stockpile to trucks for off-site haulage - 70%	kg/t	$0.74 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.35 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	$0.053 \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$	U = 0.98 M = 6% 140,000 t/y	AP42 Section 13.2.4
Hauling product offsite on unpaved roads	kg/VKT	$\left(\frac{0.4536}{1.6093}\right) \times 4.9 * \left(\frac{s}{12}\right)^{0.7} \times \left(\frac{W \times 1.1023}{3}\right)^{0.4}$	$\left(\frac{0.4536}{1.6093}\right) \times 1.5 * \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)$	$\left(\frac{0.4536}{1.6093}\right) \times 0.15 * \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)$	U = 0.98 M = 6% 200,000 t/y	AP42 Section 13.2.2
Wind Erosion						
WE - Active Extraction Area/Exposed	kg/ha/h	0.1	0.5 * TSP	0.0468 * TSP	PM_{10} based on blasting AP42 Section 13.2.5; $PM_{2.5}$ based on SPCC (1986) data 0.3 ha	
WE - Bulk Storage Stockpile	kg/ha/h	0.1	0.5 * TSP	0.0468 * TSP	PM_{10} based on blasting AP42 Section 13.2.5; $PM_{2.5}$ based on SPCC (1986) data 0.6 ha	

Inventory Activity	Units	TSP Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	Assumptions	Emission Factor Source
WE- Other	kg/ha/h	0.1	0.5 * TSP	0.0468 * TSP	PM_{10} based on blasting AP42 Section 13.2.5; $PM_{2.5}$ based on SPCC (1986) data 2.9 ha	

A	=	horizontal area (m2)
M	=	material moisture content (%)
s	=	material silt content (or surface silt content in unpaved roads) (%)
u	=	wind speed (m/s)
d	=	drop height (m)
W	=	mean vehicle weight (tonnes)
S	=	mean vehicle speed (km/h)

APPENDIX D

PM_{10} and $PM_{2.5}$ Cumulative 24-hour Analysis Plots

Table D.1 24-hour Average PM_{10}: Analysis of Receptors Predicted to Experience Additional Exceedances

	24-hour average PM10 concentration (µg/m³)		
Date	Assumed Background	Predicted Cumulative	Predicted Site Contribution
12-04-2018	107.8	108.2	0.4
18-03-2018	105.7	106.0	0.3
03-05-2018	83.2	83.7	0.5
15-12-2018	57.0	59.0	2.0
14-12-2018	50.5	54.1	3.6
14-04-2018	53.6	53.8	0.2
26-09-2018	**47.0**	**52.0**	**5.0**
11-04-2018	50.8	51.1	0.3
24-04-2018	**49.0**	**50.5**	**1.5**
12-04-2018	107.8	108.4	0.6
18-03-2018	105.7	106.1	0.4
03-05-2018	83.2	84.5	1.3
15-12-2018	57.0	59.3	2.3
14-04-2018	53.6	53.7	0.1
02-05-2018	**48.0**	**53.2**	**5.2**
14-12-2018	50.5	51.8	1.3
11-04-2018	50.8	51.7	0.9
24-04-2018	**49.0**	**51.3**	**2.3**
26-09-2018	**47.0**	**51.1**	**4.1**
12-04-2018	107.8	107.9	0.1
18-03-2018	105.7	105.8	0.1
03-05-2018	83.2	83.3	0.1
15-12-2018	57.0	58.1	1.1
14-04-2018	53.6	53.7	0.1
14-12-2018	50.5	52.0	1.5
11-04-2018	50.8	50.9	0.1
26-09-2018	**47.0**	**50.1**	**3.1**
12-04-2018	107.8	108.4	0.6
18-03-2018	105.7	106.1	0.4
03-05-2018	83.2	84.8	1.6
15-12-2018	57.0	58.8	1.8
02-05-2018	**48.0**	**55.1**	**7.1**
14-04-2018	53.6	53.7	0.1
11-04-2018	50.8	52.0	1.2
24-04-2018	**49.0**	**51.8**	**2.8**
14-12-2018	50.5	51.0	0.5
12-04-2018	107.8	108.4	0.6

	24-hour average PM10 concentration (µg/m³)		
18-03-2018	105.7	106.1	0.4
03-05-2018	83.2	85.1	1.9
15-12-2018	57.0	57.4	0.4
14-04-2018	53.6	53.6	0.0
24-04-2018	**49.0**	**53.5**	**4.5**
11-04-2018	50.8	52.9	2.1
14-12-2018	50.5	50.6	0.1
12-04-2018	107.8	108.3	0.5
18-03-2018	105.7	106.0	0.3
03-05-2018	83.2	85.0	1.8
15-12-2018	57.0	57.4	0.4
14-04-2018	53.6	53.6	0.0
11-04-2018	50.8	52.5	1.7
24-04-2018	**49.0**	**52.1**	**3.1**
12-04-2018	107.8	108.1	0.3
18-03-2018	105.7	105.9	0.2
03-05-2018	83.2	83.9	0.7
15-12-2018	57.0	57.1	0.1
14-04-2018	53.6	53.6	0.0
11-04-2018	50.8	51.8	1.0
24-04-2018	**49.0**	**51.4**	**2.4**
12-04-2018	107.8	108.2	0.4
18-03-2018	105.7	106.1	0.4
03-05-2018	83.2	83.6	0.4
15-12-2018	57.0	57.3	0.3
14-04-2018	53.6	53.9	0.3
11-04-2018	50.8	51.2	0.4
14-12-2018	50.5	50.7	0.2
24-04-2018	**49.0**	**50.7**	**1.7**
26-09-2018	**47.0**	**50.4**	**3.4**
12-04-2018	107.8	108.2	0.4
18-03-2018	105.7	106.1	0.4
03-05-2018	83.2	83.7	0.5
15-12-2018	57.0	57.4	0.4
14-04-2018	53.6	54.0	0.4
11-04-2018	50.8	51.3	0.5
14-12-2018	50.5	50.9	0.4
02-06-2018	16.6	50.8	34.2
24-04-2018	**49.0**	**50.4**	**1.4**
26-09-2018	**47.0**	**50.1**	**3.1**

	24-hour average PM10 concentration (µg/m^3)		
12-04-2018	107.8	108.0	0.2
18-03-2018	105.7	105.9	0.2
03-05-2018	83.2	83.4	0.2
15-12-2018	57.0	57.1	0.1
14-04-2018	53.6	53.8	0.2
11-04-2018	50.8	51.0	0.2
14-12-2018	50.5	50.6	0.1
24-04-2018	**49.0**	**50.0**	**1.0**
12-04-2018	107.8	108.1	0.3
18-03-2018	105.7	105.9	0.2
03-05-2018	83.2	83.5	0.3
15-12-2018	57.0	57.1	0.1
14-04-2018	53.6	53.8	0.2
11-04-2018	50.8	51.1	0.3
14-12-2018	50.5	50.6	0.1
29-04-2018	**40.9**	**50.4**	**9.5**
24-04-2018	**49.0**	**50.2**	**1.2**
12-04-2018	107.8	109.0	1.2
18-03-2018	105.7	106.3	0.6
03-05-2018	83.2	84.1	0.9
15-12-2018	57.0	57.1	0.1
14-04-2018	53.6	54.0	0.4
11-04-2018	50.8	52.8	2.0
14-12-2018	50.5	50.5	0.0
24-04-2018	**49.0**	**50.2**	**1.2**

Figure D.1 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R3

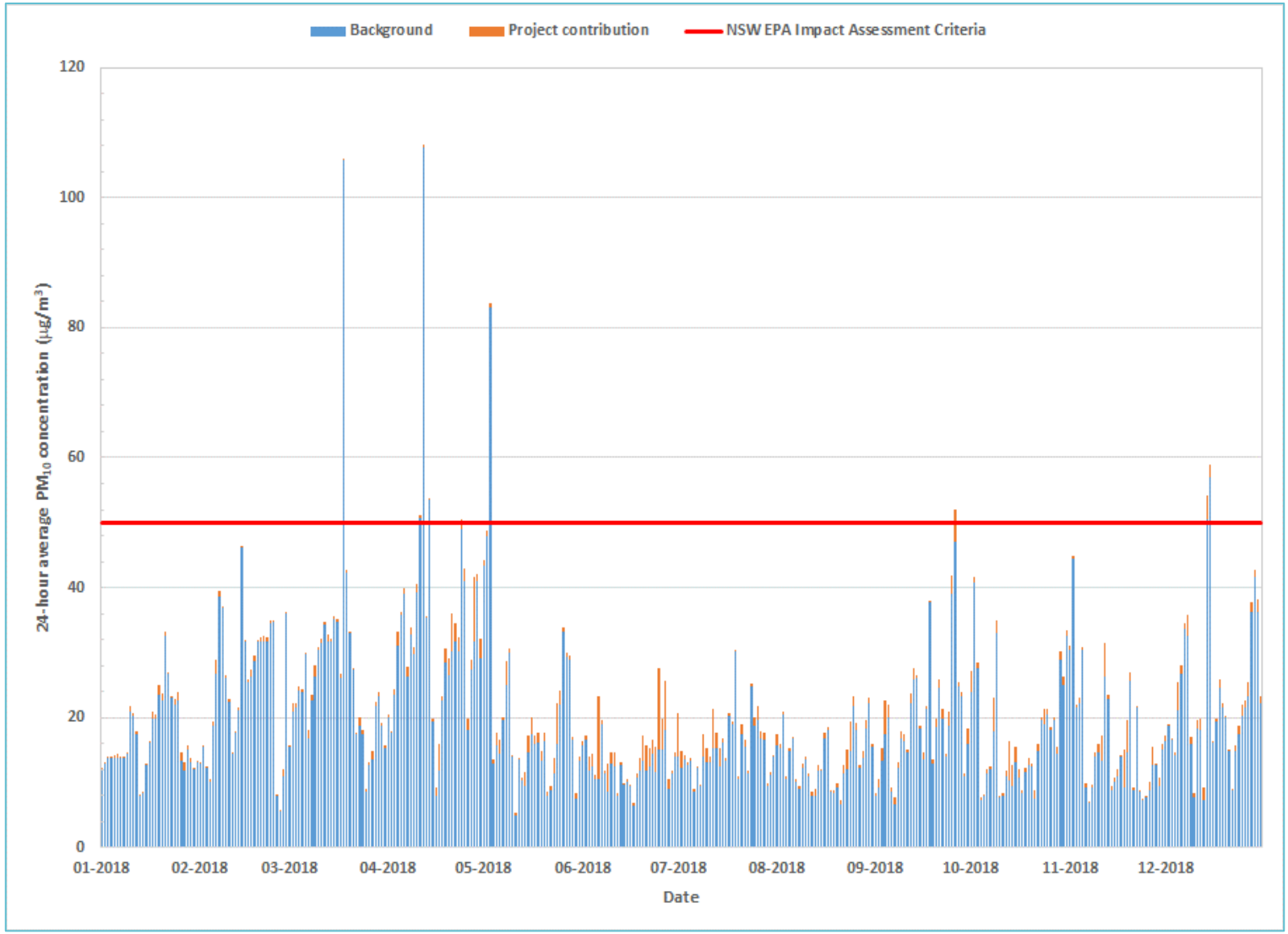


Figure D.2 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R4

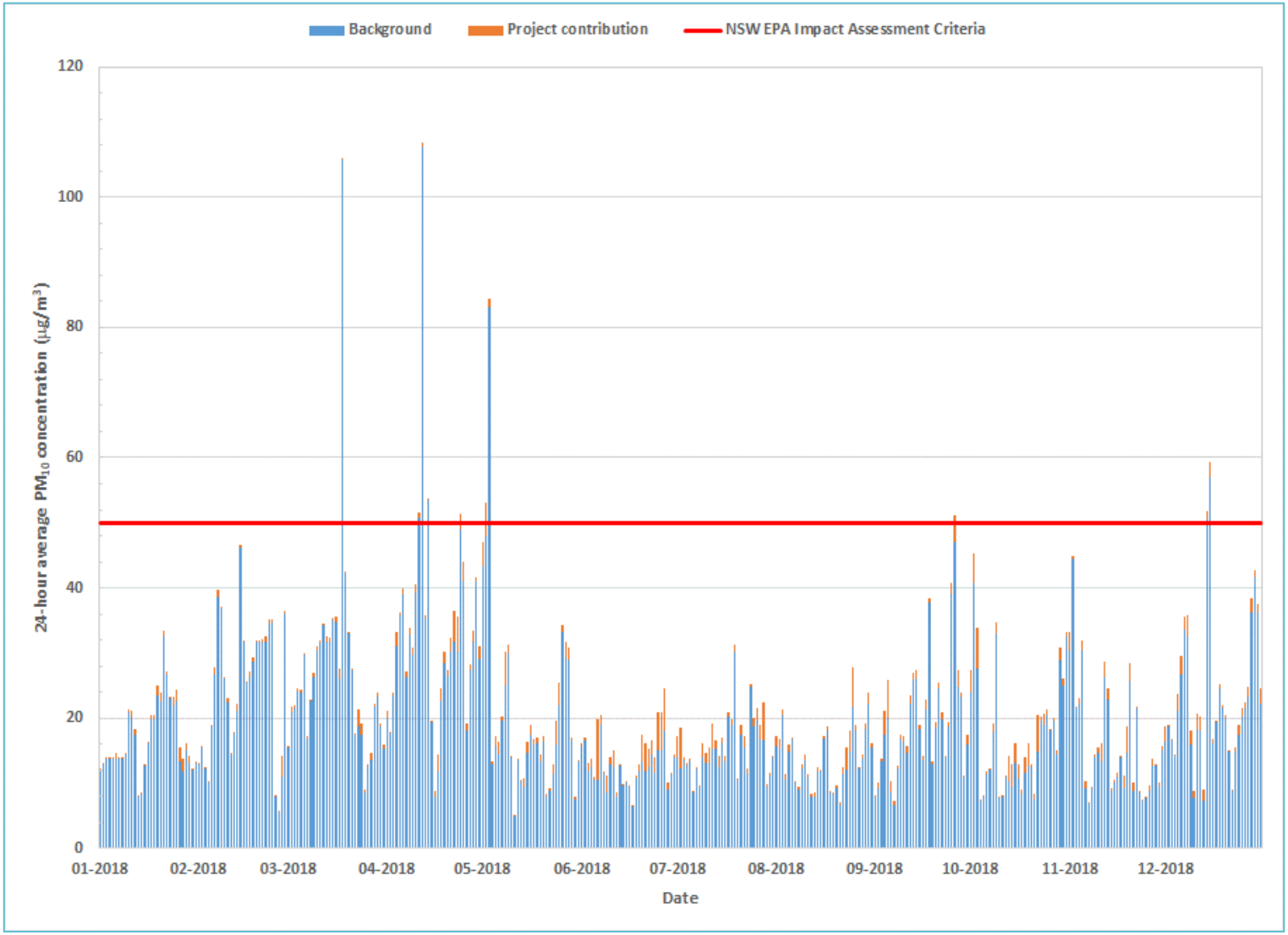


Figure D.3 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R5

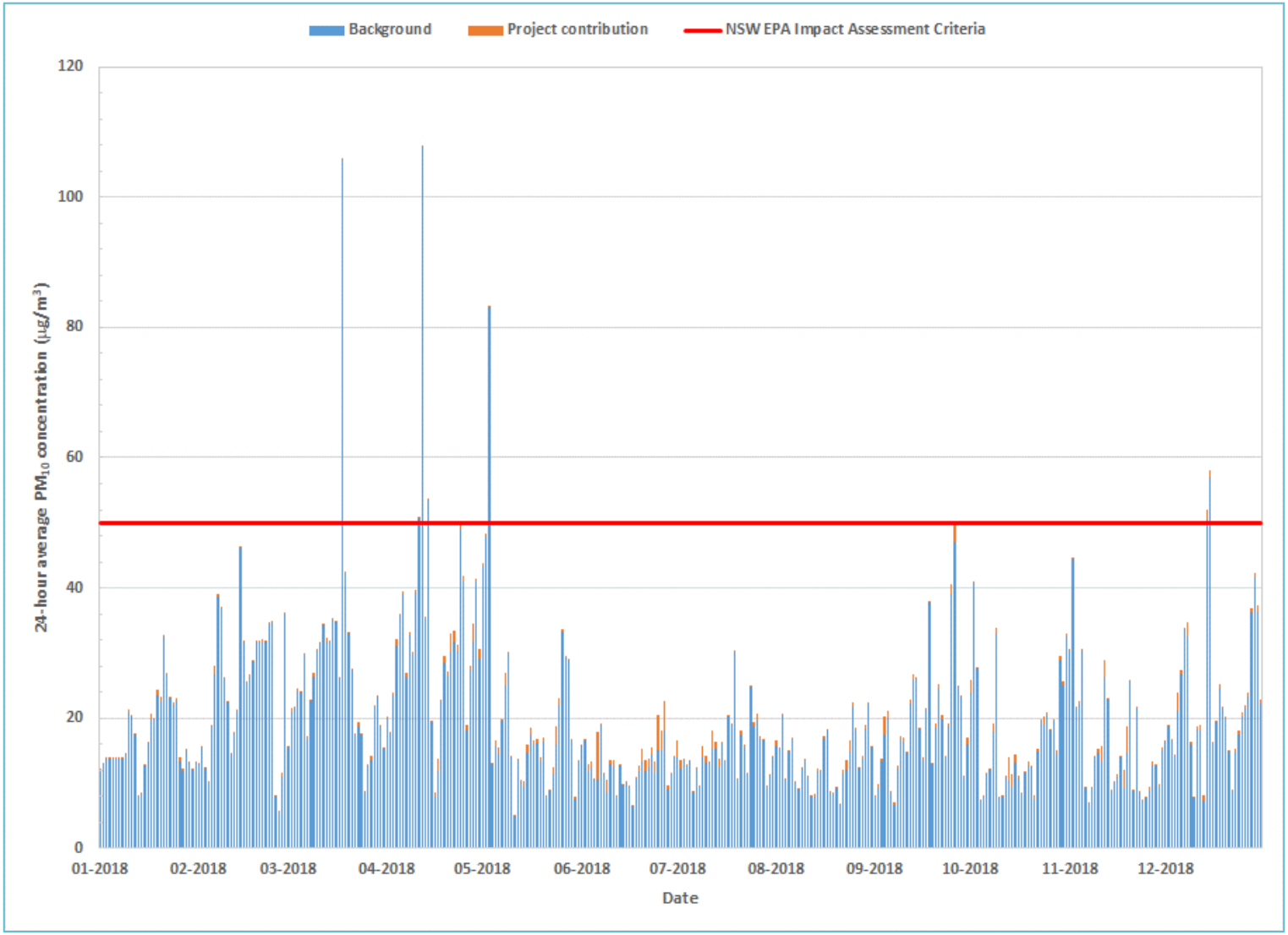


Figure D.4 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R6

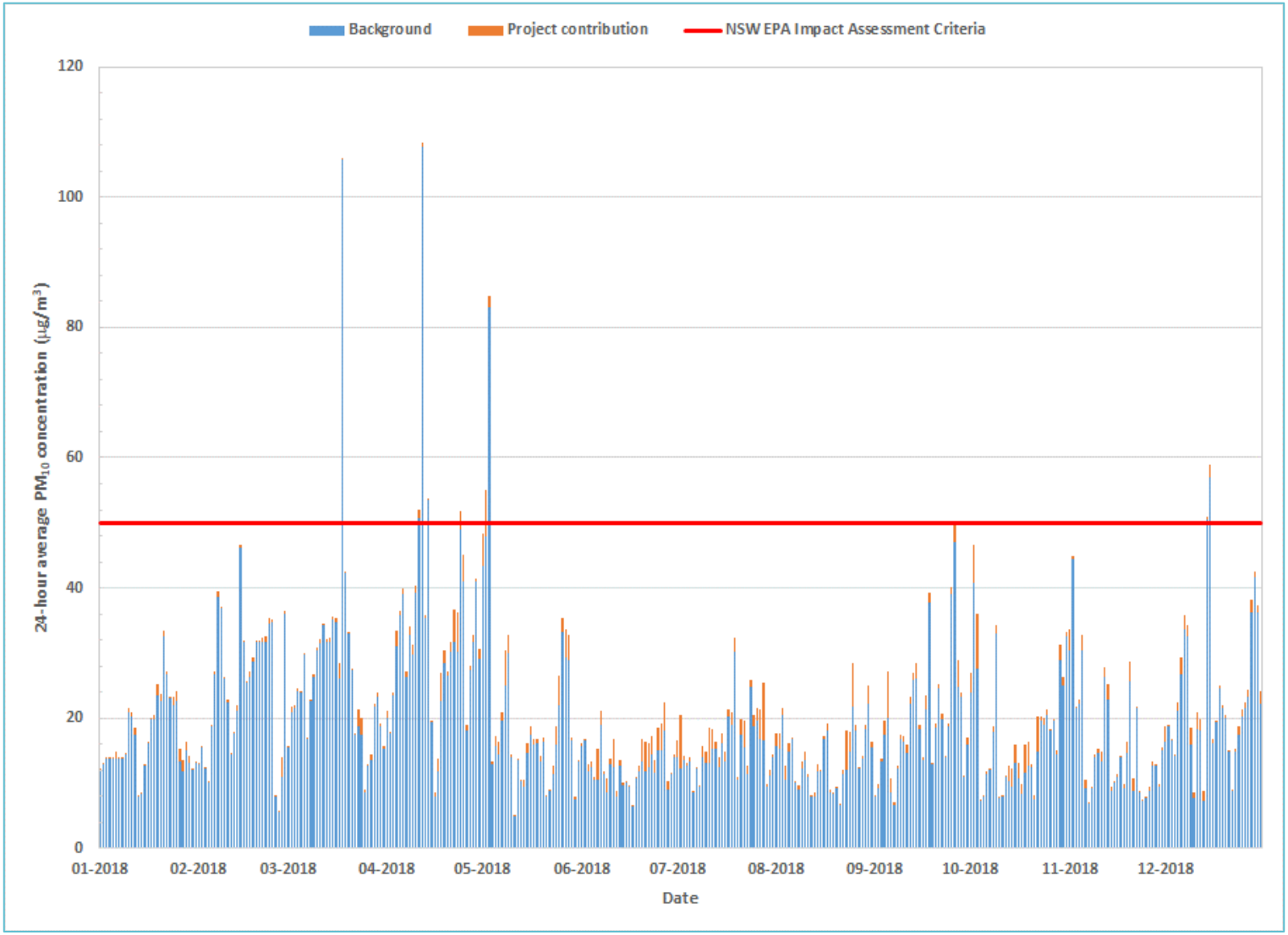


Figure D.5 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R8

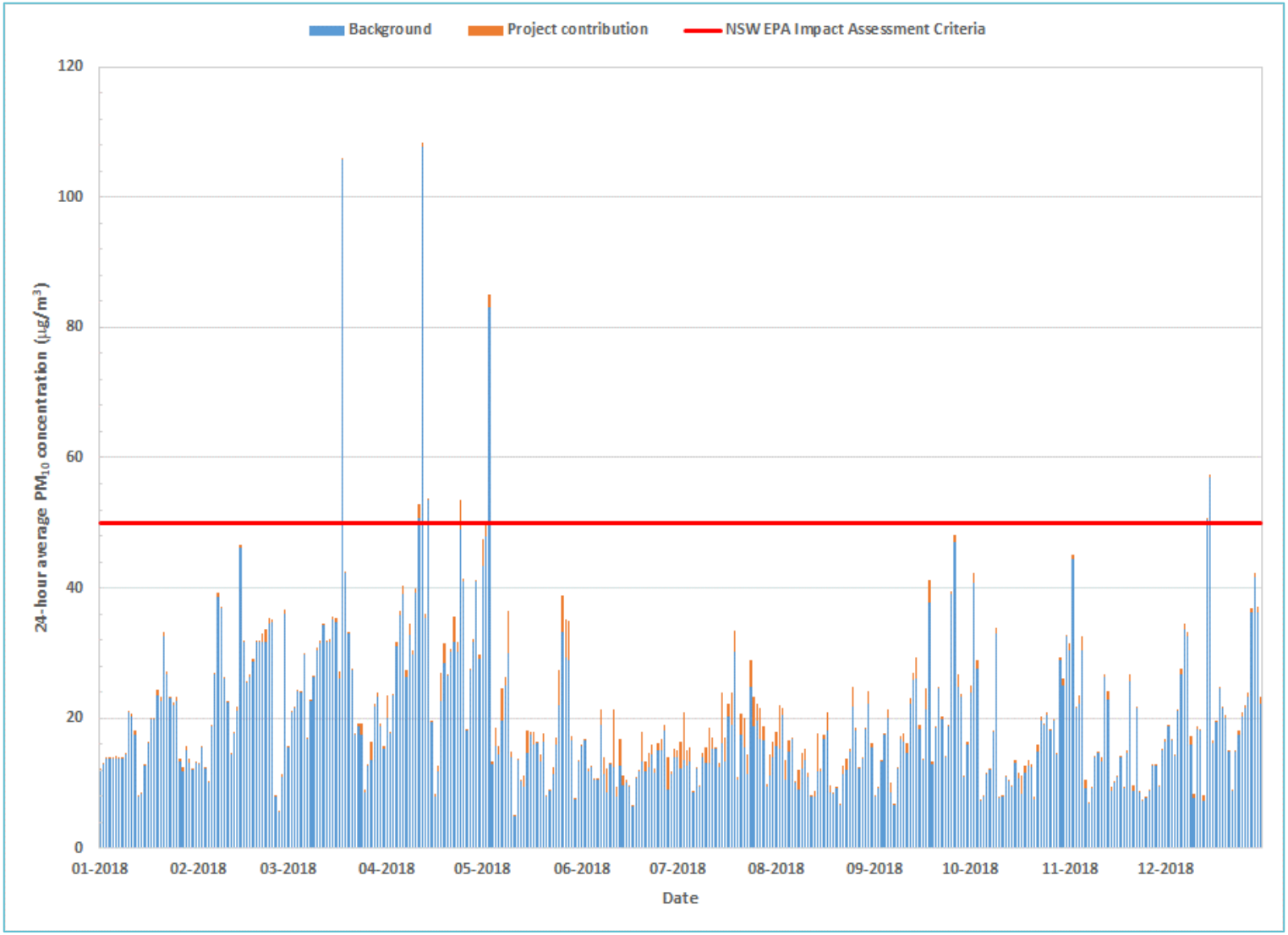


Figure D.6 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R9

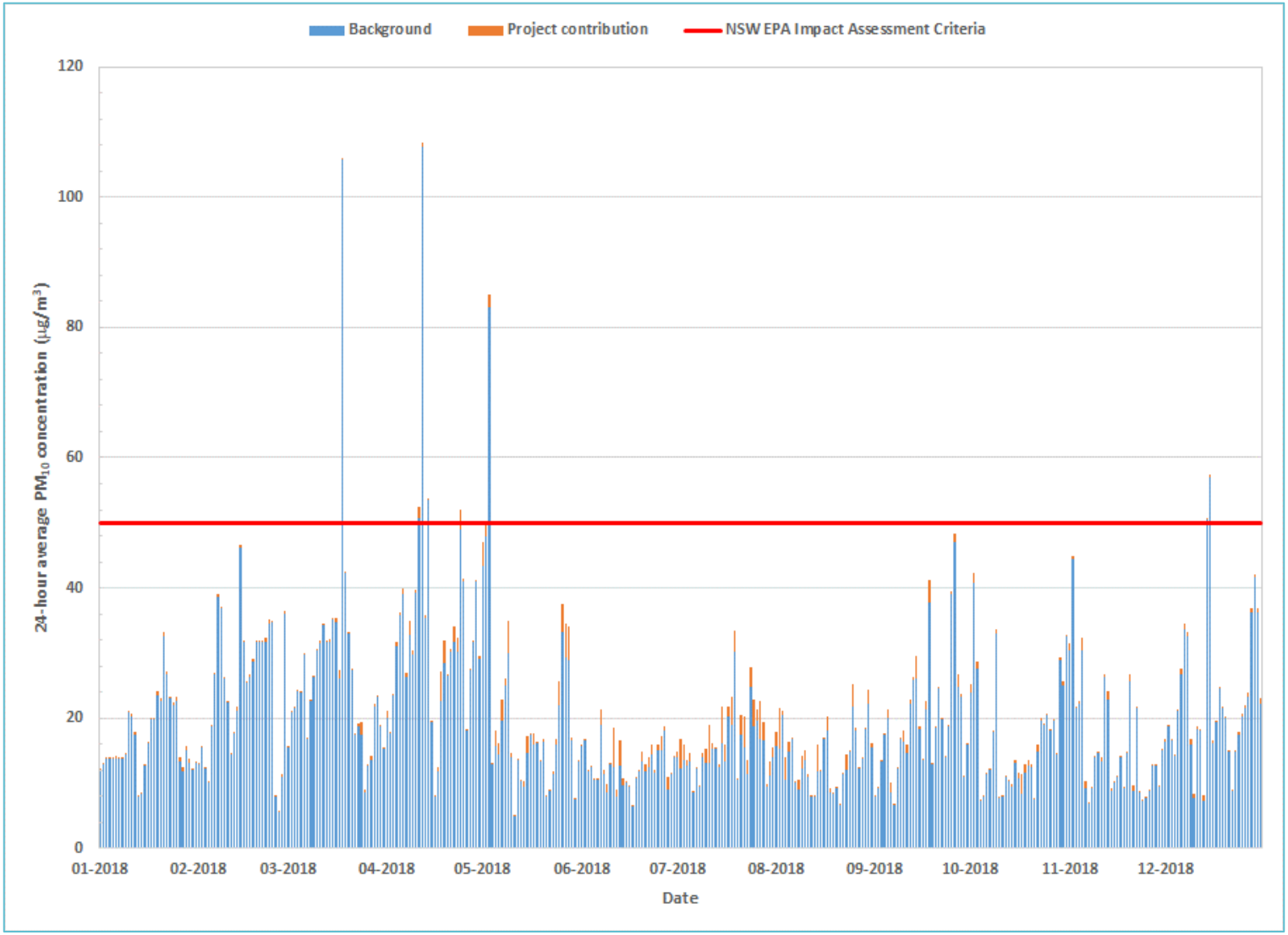


Figure D.7 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R10

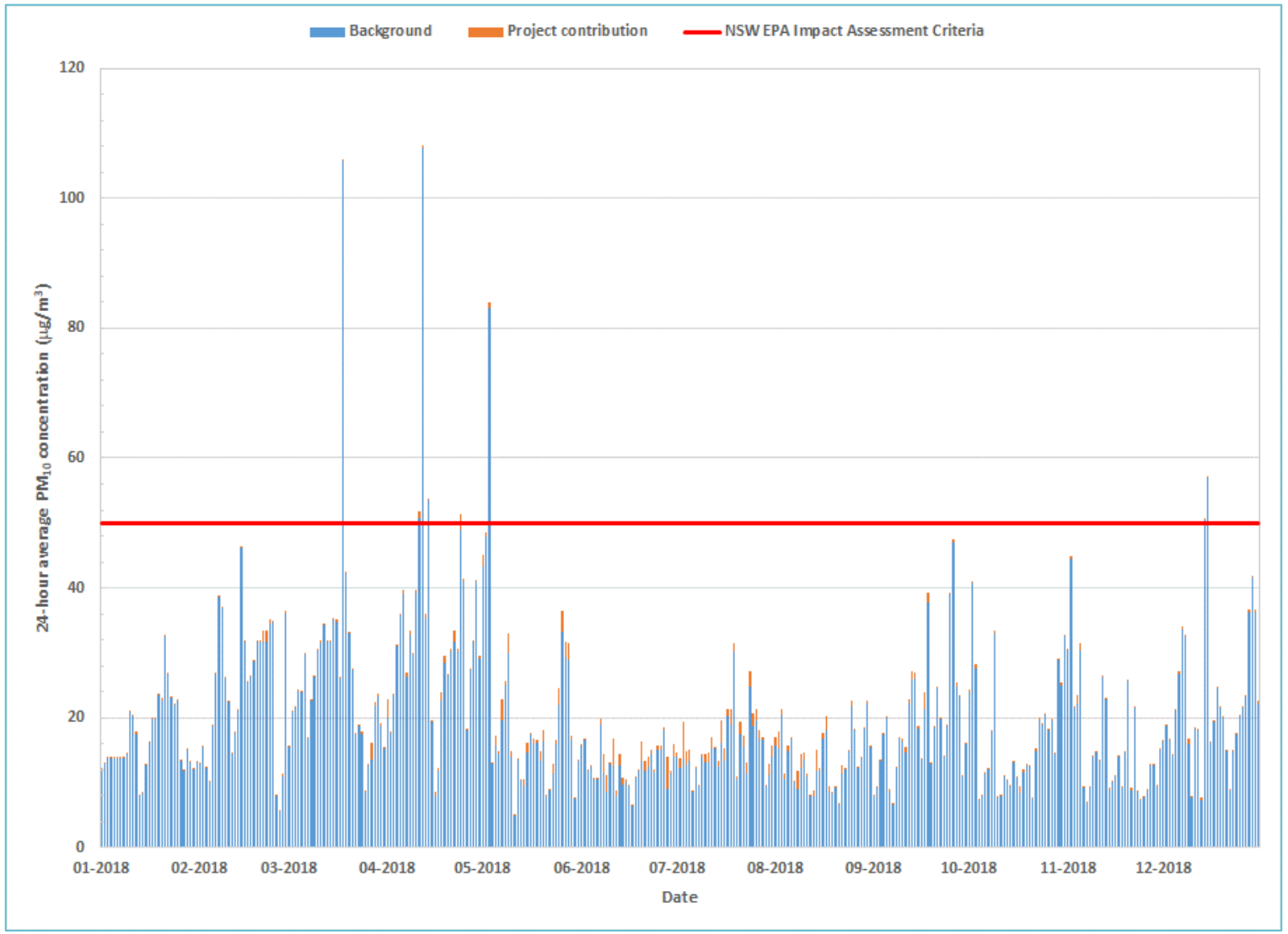


Figure D.8 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R21

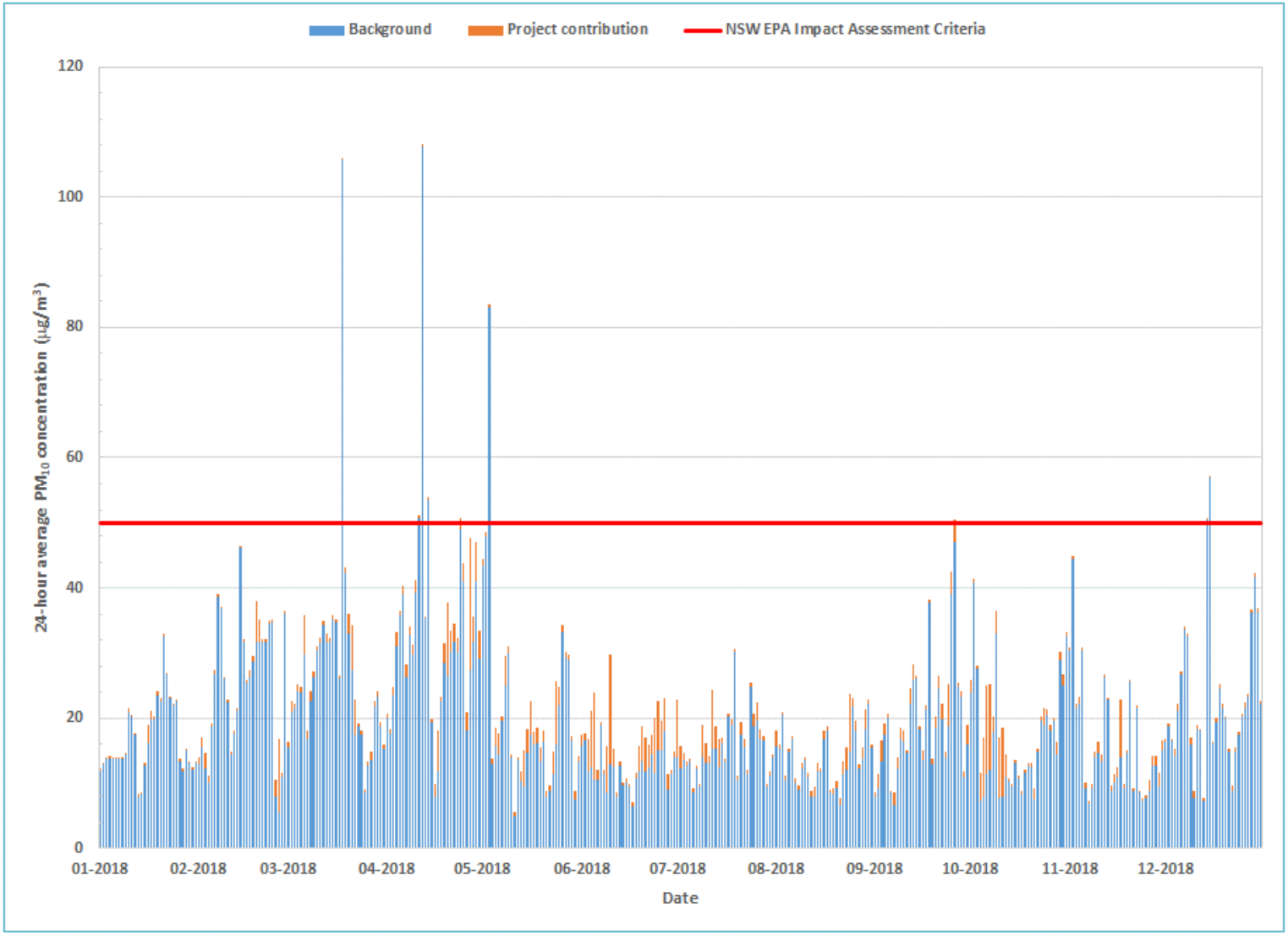


Figure D.9 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R28

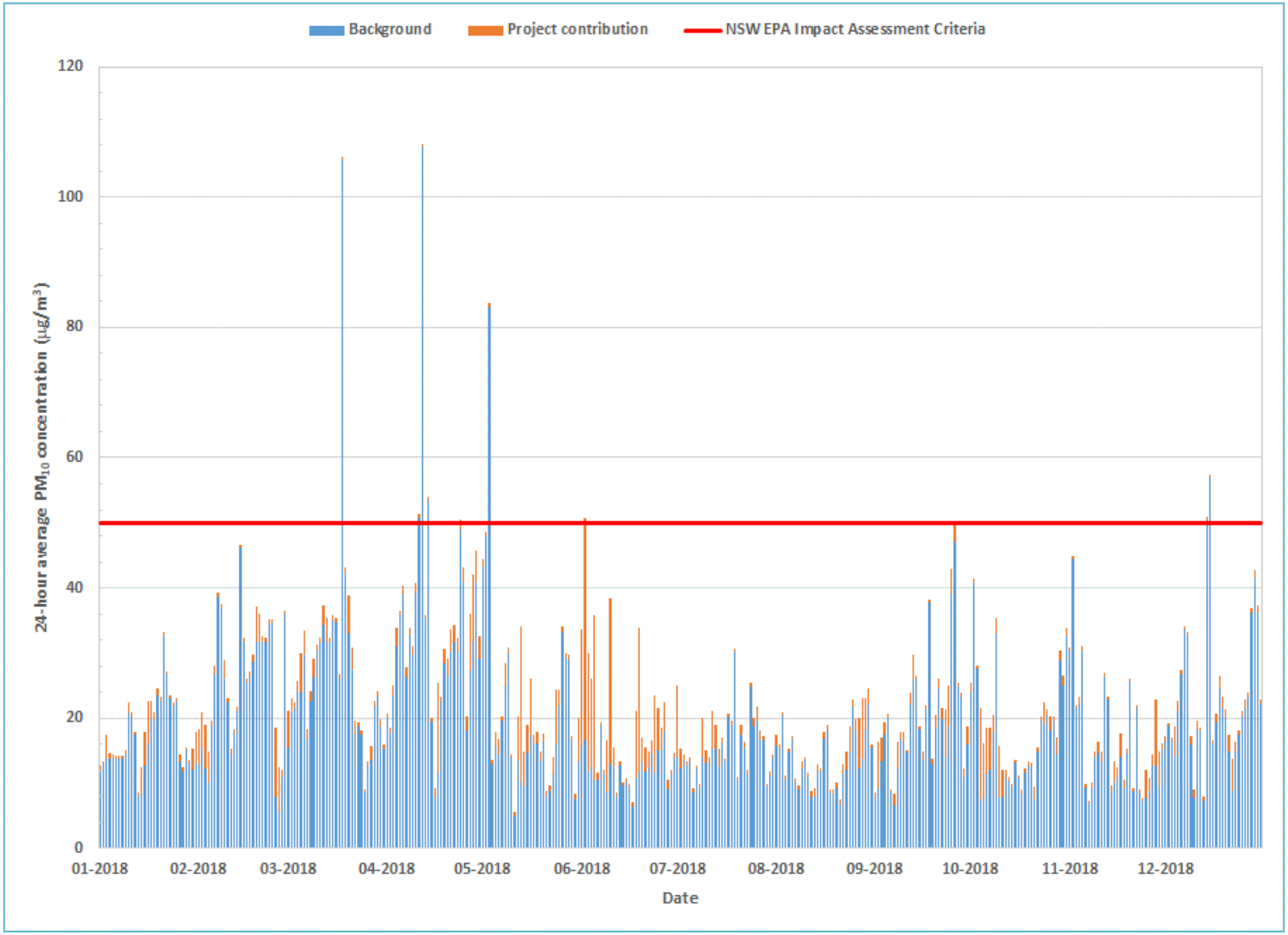


Figure D.10 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R32

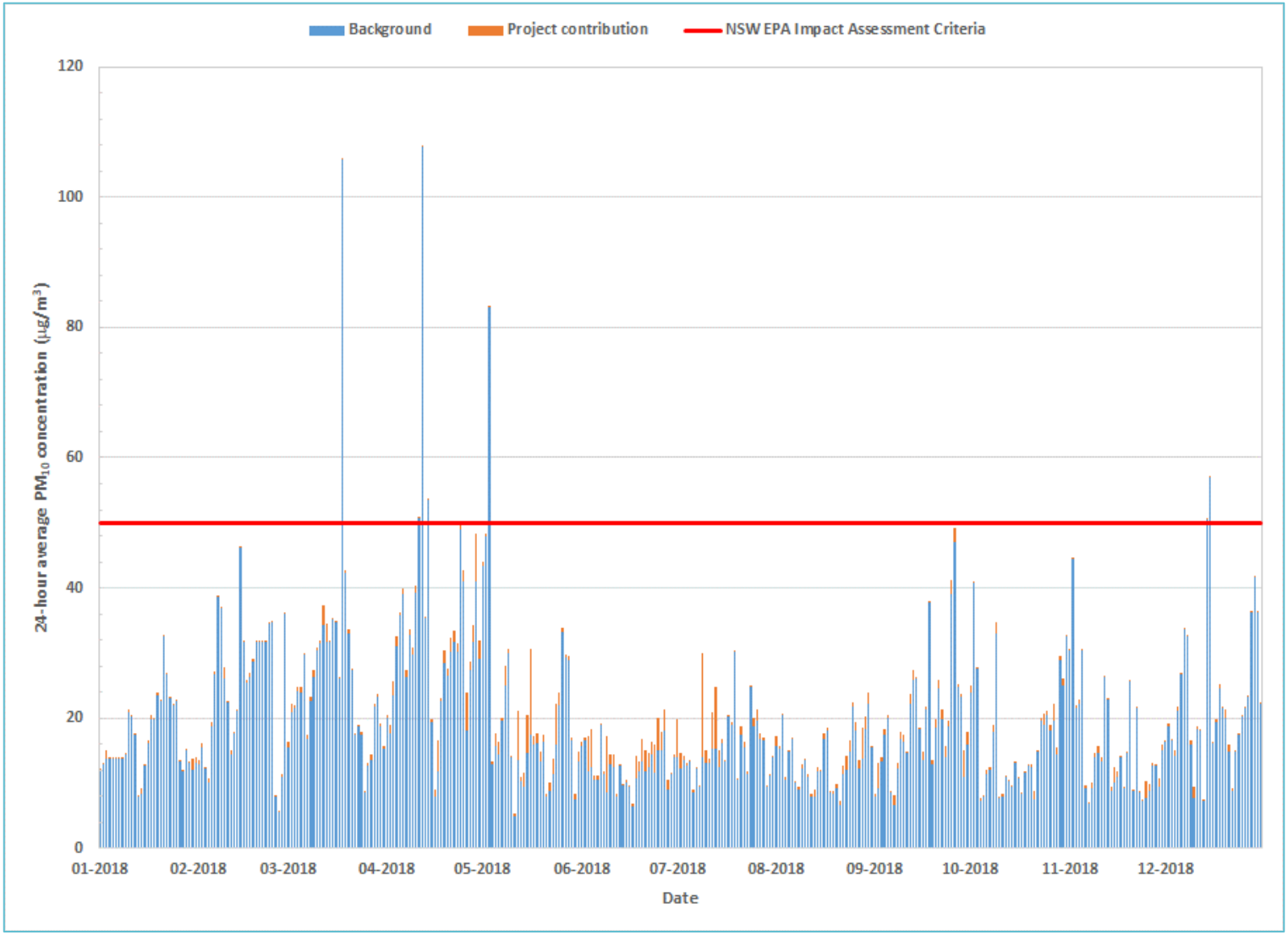


Figure D.11 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R33

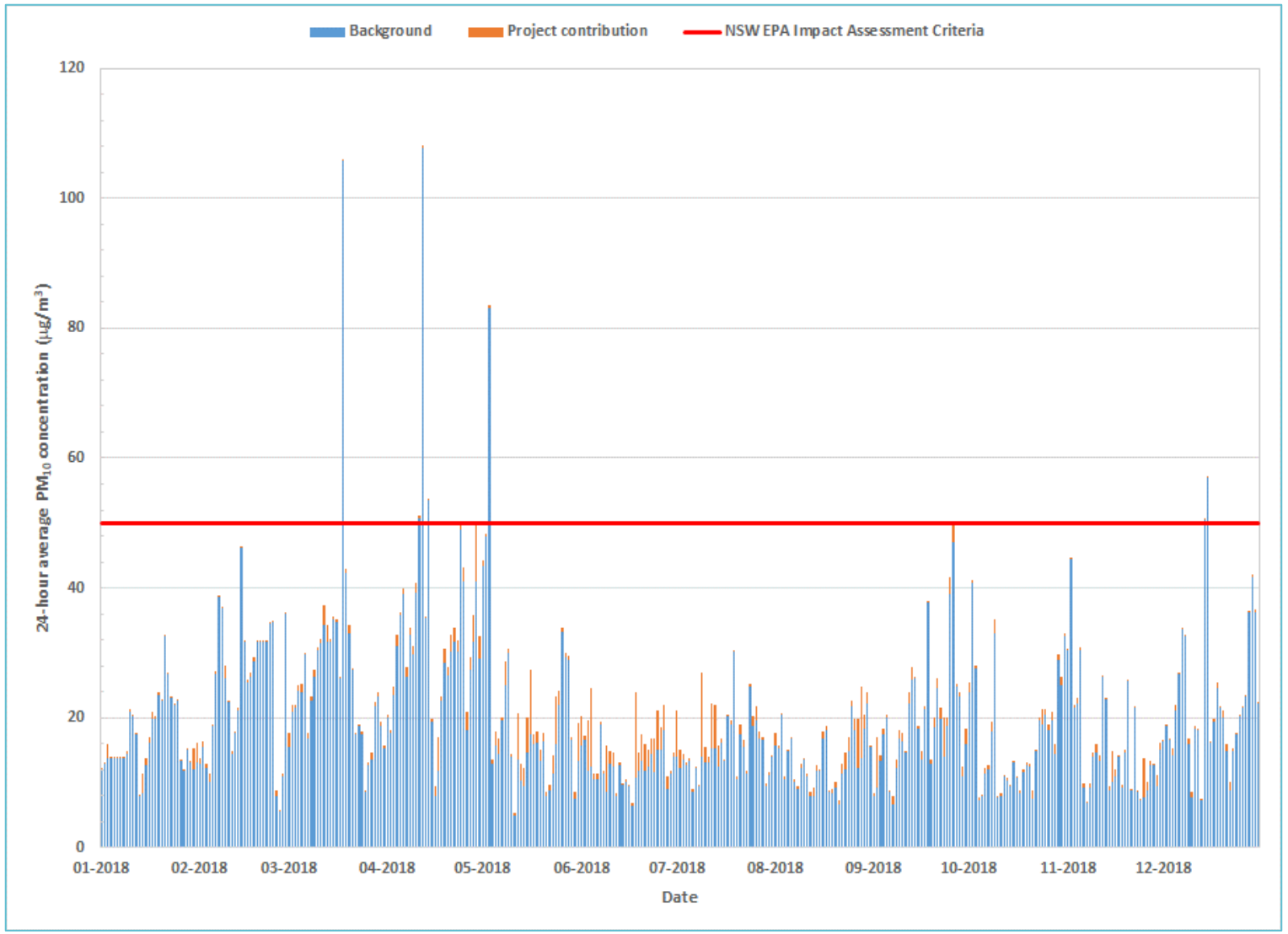
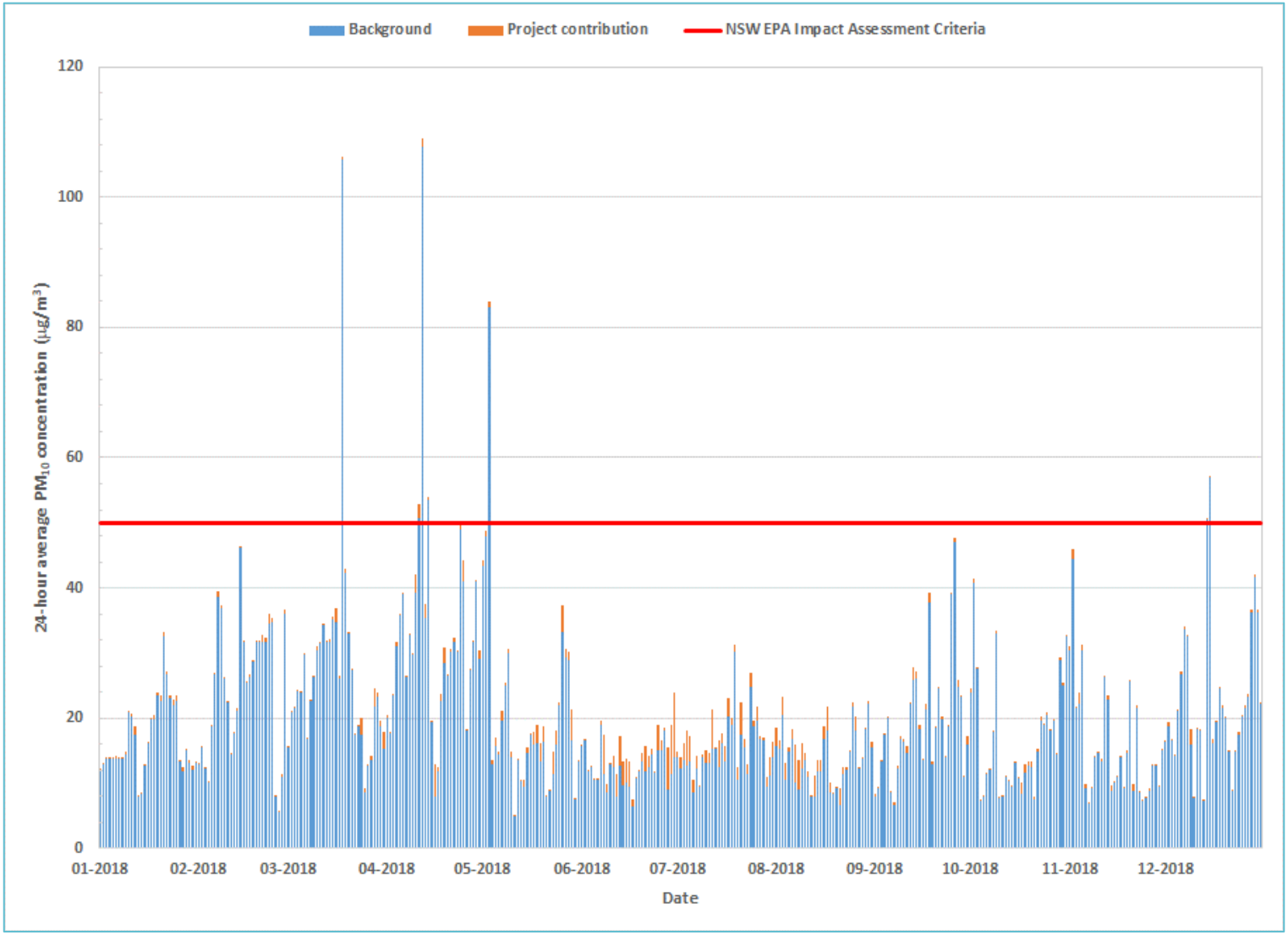


Figure D.12 Maximum Predicted 24-hour Average PM_{10} Background Concentrations and Project Contribution – Sensitive Receptor R36



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Appendix G Traffic Impact Assessment

Amber

Traffic & Transportation Direction

Murrays Crossing Quarry

Murrays Crossing Road, Tumbarumba

Traffic Impact Assessment

November 2021

Reference: 243 rep 211109 final

Murrays Crossing Quarry

Murrays Crossing Road, Tumbarumba

Traffic Impact Assessment

Prepared for: NGH Pty Ltd

Status: Final report

Date: 9 November 2021

Reference: 243 rep 211109 final

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Table of Contents

1. Introduction

1.1 Background

Amber Organisation Pty Ltd has been engaged by NGH Pty Ltd to conduct a review of the traffic matters of the Murrays Crossing Quarry located in Tumbarumba.

The proposal aims to amalgamate the current quarry operations and combine all disturbance areas under one approval. Currently the site extracts and transports approximately 80,000 tonnes per annum (tpa). The proposal would allow the quarry to extract and transport approximately 100,000 tpa with allowance for peak period and project specific requirements of up to the equivalent of 200,000 tpa from the site.

Access will continue to be provided via Murrays Crossing Road, then via a dedicated road through TSR on lot 7028 DP96852, and an internal access road will be developed to allow for truck movement on site.

1.2 Environmental Assessment Requirements

NSW Department of Planning & Environment issued Secretary's Environmental Assessment Requirements (SEARs) for the project. The required traffic and transport matters include the following:

- *Accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for transportation of quarry products;*
- *An assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road networks, detailing the nature of the traffic generated, transport routes, traffic volumes and potential impacts on local and regional roads;*
- *A description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network (particularly the proposed transport routes) over the life of the development;*
- *Evidence of any consultation with relevant roads authorities, regarding the establishment of agreed contributions towards road upgrades or maintenance; and*
- *A description of access roads, specifically in relation to nearby Crown roads and fire trails.*

1.3 Purpose of Document

This Traffic Impact Assessment has been prepared to assess the operational traffic impacts and the access arrangements of the quarry and associated increased capacity. The assessment responds to the SEARs and details how road impacts of the project traffic, particularly from heavy vehicle use, will be avoided or managed using road-use management strategies.

More specifically, the report addresses the following key matters:

- Details of both light and heavy vehicle traffic volumes and proposed transport routes;
- An assessment of the potential traffic impacts of the project on road network function and safety;

- An assessment of the capacity of the existing road network to accommodate the type and volume of traffic generated by the project;
- Details of measures to mitigate and / or manage potential impacts; and
- Details of access roads and how these connect to the existing road network.

The traffic assessment has been undertaken in conjunction with consultation with Snowy Valleys Council.

2. Existing Conditions

2.1 Site Description

The site is located on the south-eastern side of Murrays Crossing Road approximately two kilometres south of the Tumbarumba township. The location of the quarry in relation to Tumbarumba is shown in Figure 1.

Figure 1: Subject site location

Source: Nearmap

The site and the surrounding land are zoned RU1 – Primary Production, a rural zone primarily intended to promote sustainable primary industry production and as such, the surrounding land use is rural in nature excluding the township of Tumbarumba.

The site is currently occupied by a quarry which is operated by Bald Hill Quarry Pty Ltd. Access to the site is currently provided via a connection with Murrays Crossing Road which has been designed to accommodate the heavy vehicles that currently service the quarry.

2.2 Road Network

Murrays Crossing Road has a sealed carriageway width of approximately 6m which accommodates two-way traffic, with unsealed shoulders provided on both sides of the road. Murrays Crossing Road is a rural, open road and adopts the default speed limit of 100km/h.

Booth Street extends north of Murrays Crossing Road to Clara Street. It has a sealed carriageway width of approximately 6m accommodating two-way traffic, with unsealed shoulders on both sides of the road. Booth Street has several residential access driveways along its 540m length.

An 80m stretch on the western extent of Clara Street will be used for quarry traffic between Booth Street and Winton Street. Clara Street is a sealed, two-way street approximately 12.5m wide with parking on both sides.

Winton Street extends north of Clara Street and provides access for quarry vehicles from Regent Street. Winton Street is a sealed, two-way street approximately 12.5m wide with sealed parking on both sides. The intersection of Winton Street and Regent Street is controlled by a give-way, with Regent Street as the priority movement. The intersection has good visibility in both directions.

Regent Street provides access to the wider road network and delivery locations for quarry vehicles. Regent Street has a 12.5m sealed carriageway with parking both sides. It extends east away from Tumbarumba becoming William Street and then Tooma Road, all of which are approved B-double routes and suitable as the primary access route for the quarry development.

2.3 Public Transport

No public transport services are provided within the vicinity of the site.

2.4 Restricted Vehicle Access

A number of roads in the immediate vicinity are rated to accommodate B-double movements as identified within the TfNSW Restricted Access Vehicle Map which is shown in Figure 2.

Figure 2: TfNSW Restricted Access Vehicle Map

Source: TfNSW Restricted Vehicle Access Map

Key routes to surrounding demand areas include:

- Tooma Road is located 1.5 kilometres east of the site and extends to the southeast;
- Batlow Road extends northeast from Tumbarumba;

- Wagga Road extends northwest from Tumbarumba; and
- Jingellic Road extends southwest from Tumbarumba.

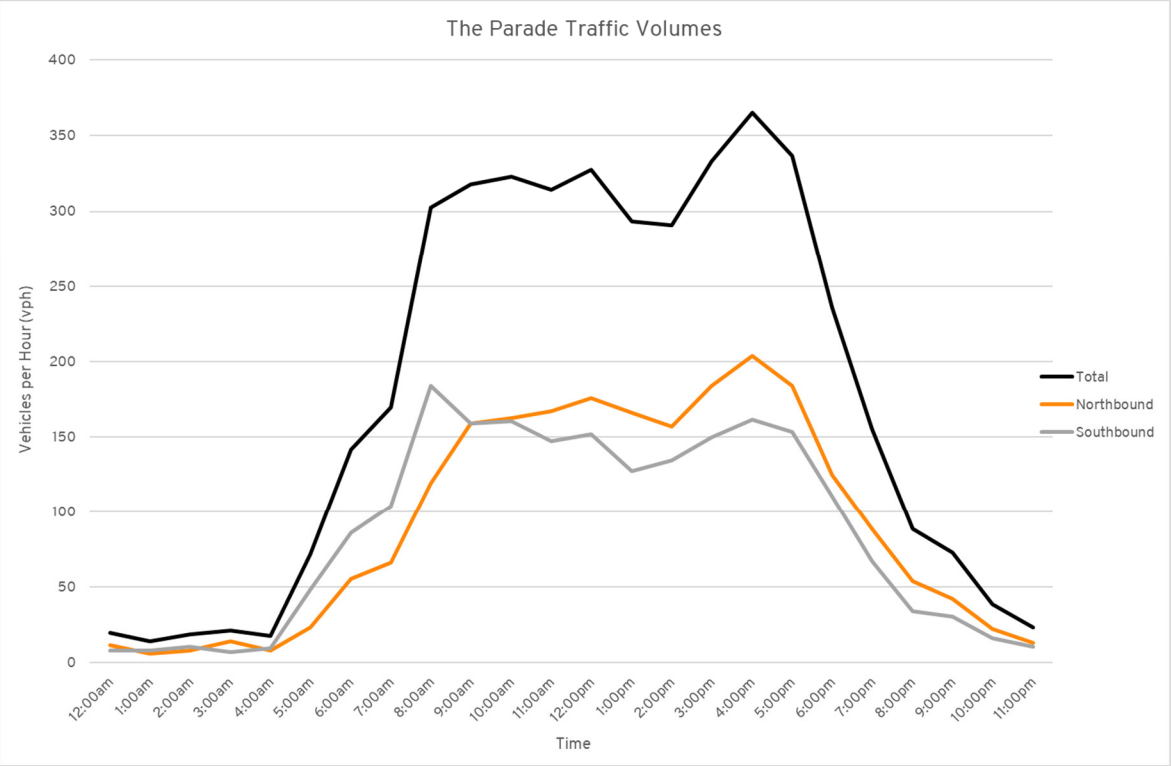
Accordingly, the surrounding road network is designed to accommodate heavy vehicle movements, including B-Doubles.

2.5 Traffic Volumes

Traffic volume data has been collected from the TfNSW Traffic Volume Viewer, which allows users to browse and search for available traffic count data in NSW. The closest available survey location was a sample traffic counter located 90m north of Albury Street on The Parade in Tumbarumba township (approximately 1.8 kilometres north of the site). The most recent recording was carried out in December 2011.

The sample counter recorded an average of 3,646 vehicles per day in both directions. The vehicle movements included 1,881 northbound vehicles and 1,765 southbound vehicles. In order to calculate the current traffic volumes on the road network a growth rate has been applied to estimate the traffic volumes for 2021. Based on a growth rate of 1.5% The Parade is estimated to be carrying 4,295 vehicles per day, with the hourly vehicle movement profile provided within Graph 1.

Graph 1: The Parade Traffic Volume Data Calculated to 2021



The graph demonstrates that the traffic volumes are relatively constant between 8:00am and 5:00pm, with a maximum of 365 vehicle per hour recorded at 4:00pm.

Within a closer vicinity of the subject site, on Murrays Crossing Road, the traffic volumes are expected to be much lower due to the smaller number of origin and destination demand generators and that Murrays Crossing Road is not a main access in or out of the Tumbarumba township.

2.6 Crash History

Amber has conducted a review of the TfNSW Centre for Road Safety Crash and Casualty Statistics database for all injury crashes within one kilometre of the site access. The crash database provides the location and severity of all injury and fatal crashes for the five-year period from 2015 to 2019. The crash search revealed no crashes within the search area and as such, it is concluded that the road network is currently operating in a safe manner.

3. Project Description

The proposal involves the expansion of the current extraction operations at Murrays Crossing Quarry. Access will continue to be provided via Murrays Crossing Road, then via a dedicated road through TSR on lot 7028 DP96852, and a new proposed internal road within the quarry crown reserve that will follow the perimeter of the pit to the north then around to the east. The subject site is remote from the classified road network.

The development aims to amalgamate the current operations at Murrays Crossing Quarry in Tumbarumba and combine all disturbance areas under one approval. Currently the site extracts and transports approximately 80,000 tpa. The project plans to extract and transport approximately 100,000 tpa with peak period and project specific requirements of up to the equivalent of 200,000 tpa from the site.

The quarry will be utilised to provide material for road upgrades/maintenance and construction projects within the surrounding area. Generally, five staff are on-site at any time and no changes are expected to the on-site staff numbers as part of the proposal. The current approved working hours for the site are as follows:

- Monday to Friday - 7am to 6pm; and
- Saturday and Sunday - 8am to 4pm as required.

The material is proposed to primarily be transported by truck and dog trailers. No changes are proposed to the vehicles used for operation of the quarry as part of the proposal.

4. Traffic Assessment

4.1 Traffic Generation

A maximum of five staff are anticipated to be on-site at any one time which is not proposed to change as part of the proposal. The quarry is expected to generate six light vehicle movements during peak hour periods associated with staff arriving and departing the site, and 12 light vehicle movements per day. This is equal to the number of vehicle movements occurring under existing conditions.

Truck and dog vehicles will primarily be used to transport the quarry material. Under existing conditions, the Murrays Crossing Quarry generates in the order of 24 truck and dog movements per day, including up to 10 truck and dog movements in the peak hour. Under the proposed conditions the quarry is expected to generate approximately 30 truck movements per day. To fulfil large orders, the quarry may operate at a higher capacity which would see in the order of 60 truck movements generated per day, or 20 truck movements during the peak hour.

The truck movements will typically commence at 7:00am and be completed by 4:00pm in order to allow time for the last load to be delivered to the relevant destination. However, it is noted that the operating times may extend outside of these times and on weekends.

It is noted that deliveries such as fuel will be generated by the quarry which will be undertaken by smaller MRV/HRVs and will generate approximately 2 vehicle movements per day, outside of peak times.

Table 1 summarises the traffic movements generated by the site.

Table 1: Traffic Generation

Vehicle Type	Daily (vpd)			Peak Hour (vph)		
	Existing	Proposed (100k tpa)	Proposed (200k tpa)	Existing	Proposed (100k tpa)	Proposed (200k tpa)
Light Vehicle (car/4WD)	12	12	12	6	6	6
MRV/HRV	2	2	2	0	0	0
Truck and Dog/Semi-Trailer	24	30	60	10	14	20
Total	**36**	**44**	**74**	**16**	**20**	**26**

Accordingly, under typical future operating conditions the site is expected to generate approximately 44 vehicle movements per day and 20 vehicle movements during the peak operating hour of the quarry.

To allow for the fulfilment of large orders and peak operating conditions the quarry will generate up to the equivalent of 200k tpa, resulting in 74 vehicle movements per day and 26 vehicle movements during the peak operating hour of the quarry.

During the evening peak hour on the surrounding road network the site will only generate vehicle movements associated with staff as the last truck movements depart the site prior to the evening peak.

Overall, the Murrays Crossing Quarry is expected to generate an increase in traffic of 10 truck movements during the peak hour, and an increase of 38 truck movements per day. This is an increase of approximately one vehicle every six minutes during the peak hour.

4.2 Traffic Distribution and Assessment

Material from the quarry will be utilised for road upgrades/maintenance and construction projects within the surrounding area, resulting in the traffic movements being distributed on the surrounding road network.

All vehicles will access and exit the site via Murrays Crossing Road using the current access route. Vehicles exiting the site will travel north along Murrays Crossing Road and Booth Street to Clara Street. Vehicles will then utilise Winton Street to travel north or connect with Regent Street and primarily travel south on Tooma Road. Vehicles will be able to utilise Batlow Road and Albury Street to access other locations as required. Transport routes are shown in Figure 3.

Figure 3: Transport Routes

The surrounding road network has a low vehicle demand and is considered to have adequate capacity to readily accommodate the modest increase in traffic associated with the expansion of the quarry which is expected to be in the order of 4-10 truck movements during the peak hour. As such, the proposal will have no discernible impact on the operation of the surrounding road network and the traffic can be accommodated in a safe manner.

5. Site Access

Access to the site is proposed to continue to be provided via the existing connection with Murrays Crossing Road. Turning movements are currently facilitated by an approximately 25-metre-wide vehicle crossing which allows safe ingress and egress of vehicles to the site.

Murrays Crossing Road is considered to have very low traffic volumes and accounting for the site traffic generation, it is deemed that the existing site access is appropriate. The existing access arrangement provides safe and efficient movement from the road network and can accommodate the minor increase in traffic as part of the proposal.

6. Conclusions

Amber has assessed the traffic impacts of the proposed Murrays Crossing Quarry located approximately two kilometres south of Tumbarumba. The site currently accommodates a quarry operation, and the proposal will result in an increase output capacity of quarry material. Access to the site is proposed via the existing connection with Murrays Crossing Road. The above assessment determined the following:

- The existing site outputs 80,000 tpa of quarry material. Under future conditions, the site will output 100,000 tpa of quarry material, with peak periods of up to the equivalent of 200,000 tpa;
- The existing site currently generates 36 vehicle movements per day with a peak hour trip generation of 16 vehicles, which includes six light vehicle movements by staff;
- The future site operation is expected to generate 44 vehicle movements per day on average, which is an increase of seven vehicle movements per day and an increase of four vehicle movements during the peak hour;
- In peak operating conditions the site is expected to generate 74 vehicle movements per day, and 26 vehicles during the peak hour, which is an increase of 10 vehicles in peak hours, or one vehicle every six minutes;
- The road network is able to readily accommodate the traffic generated by the development in a safe and efficient manner; and
- Existing traffic on Murrays Crossing Road is considered to be very low. Turning movements from Murrays Crossing Road into the site access are currently facilitated by a wide vehicle crossing and is expected to continue to provide safe and efficient movement of vehicles at the intersection.

Accordingly, based on the assessment above, it is concluded that the proposed access arrangements and existing road network are suitable to accommodate the expected vehicle types and traffic volumes of the future quarry operation.

Appendix H Blast Management Plan (BMP)

BALD HILL QUARRY

Tumbarumba Quarry Blast Management and Explosives Control Plan

OCTOBER 2021

Table of Contents

Figures

Appendices

DOCUMENT CONTROL

Version	Date	Amendment	Author	Authorised
1	19/09/2021	Created	B FOURIE	J WILKINSON

1. Introduction

1.1 Background

The location of Tumbarumba Murrays Crossing Quarry (Tumbarumba Quarry) has been operating for well over 30 years with anecdotal evidence of disturbance back as far as 1940's.

Bald Hill Quarry (BHQ) currently operates the crown quarry reserve located on Lot 732 and 623 DP755892, reserve number 81837. BHQ also owns the surrounding land to the east and south which currently has approval under DA 91/23 granted in March 1992, however this approval is currently being modified.

1.2 Project Description

Tumbarumba Quarry is located 2km south of Tumbarumba, NSW (Figure 1). Quarry activity of extracting blue metal and road base material on the Crown Quarry Reserve has been evident since the 1940's. BHQ have been operating the Crown Quarry Reserve for 12 years under an agreement with the Snowy Valley Council.

The current site is operated by drill and blast extraction methods, followed by the use of loaders and excavators feeding the crushing and processing plant. The processed material is stockpiled and later transported off site via truck and dogs.

Currently the site extracts and transports approximately 80,000 tonnes per annum (tpa), which has been from the Crown Quarry Reserve to date, vis 2 blasts per year. The current Development consent for the BHQ land approves BHQ to extract and transport 15,000 tpa, however the modification is to increase this to 100,000 tpa with project specific peak volume of 200,000tpa, requiring 5 to 6 blasts per year.

1.3 Purpose and Scope

The Blast Management and Explosives Control Plan (BMECP) is to ensure compliance with statutory requirements and potential specific requirements from Development Consents or Environmental Protection Licence. This document is to also capture how blast related impacts are managed, including ground vibration, air blast overpressure, flyrock, fume, dust and misfire.

1.4 Objective

The objectives of this BMECP include:

- Establish a blast monitoring system to assess the impact of blast emissions (noise and vibration) on surrounding sensitive receivers with the management of blasting to consider 'best practice' principles;
- Provide a mechanism to assess blasting procedures and monitoring again relevant development consent criteria or EPL requirements;
- Detail the requires for reporting blast criteria exceedances to the relevant stakeholders;
- Detail the controls to be implemented to minimise blasting impacts from the site, including potential impacts from blast fume generation;

- Manage blast-related community complaints in a timely and effective manner; and
- Detail the roles and responsibilities and management of contractor process.

1.5 Review and Improvement

The BMECP will be reviewed and updated on a regular basis. The review would be undertaken to ensure the BMECP is in line with any changes to legislation, conditions or to incorporate any recommended measure to improve the environmental performance of the sites.

FIGURE 1 – MURRAYS CROSSING QUARRY LOCATION

2. Statutory Requirements

2.1 Development Consent

The current Development Consent (DA91/23) outlines the occupiers of any adjacent properties shall be given 24 hours' notice of any impending blasting. The site currently does not hold an Environmental Protection License. It is anticipated once the modification is approved there will be additional statutory requirements.

2.2 Licences and Permits

Relevant clauses that relate to the BMECP from schedule 2 Clause 4 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 (WHS Regulation 2014) are listed in Table 1.

TABLE 1 BLAST-RELATED CONDITIONAL REQUIREMENTS OF WHS REGULATION 2014

No	Condition	Comment
1	An explosive control plan must set out the control measures for risks to health and safety associated with explosives at the mine or petroleum site taking into account: (a) The potential for unintended or uncontrolled detonation of explosives	BHQ do not store or handle explosives on site. An external Contractor is used for all explosives handling.
	(b) The characteristics of relevant explosives and the purposes for which they are to be used	BHQ is not registered under the Explosives Act 2003. An external licenced Contractor is used for all blasting requirements on site.
	(c) The characteristics of the places in which the explosives are to be used	An external licenced contractor is used for all aspects of Drill and Blast operations for all BHQ Quarries. See Section 1.3 and 1.4
	(d) The full set of phases for the use of relevant explosives such as the charging and firing phases	An external licenced contractor is used for all aspects of Drill and Blast operations for all BHQ Quarries. See Section 9.5
	(e) The potential for explosives to deteriorate	An external licenced contractor is used for all aspects of Drill and Blast operations for all BHQ Quarries. No explosives are stored on site
	(f) The potential for the theft or misuse of explosives	An external licenced contractor is used for all aspects of Drill and Blast operations for all BHQ Quarries. No explosives are stored on site, the licenced contractor has control of all aspects of the blasting operation.

	(g) The potential for the ejection of fly rock or other material as a result of the detonation of an explosive	See section 9.6
2	An explosives control plan must also set out the following: (a) The procedures for inspecting, reporting, isolation and disposing of deteriorated or damaged explosives	BHQ is not licenced under the Explosives Act 2003 to use, handle or store explosives. An external licenced contractor is used for all blasting requirements on site and are only on site on an 'as need' basis.
	(b) The procedure for finding, recovering and disposal of explosives that misfire	
	(c) The inspection, testing, reporting and maintenance procedures in relation to the equipment used at the mine or petroleum site for manufacturing, storing, transporting and delivering explosives	
	(d) The procedures and equipment used int storing and transporting explosives at the mine or petroleum site	
	(e) The procedure for the accounting of explosives at the mine or petroleum site	
	(f) The arrangements for the keeping of a regiater identifying persons who are licenced under the Explosives Act 2003 to transport, use, store or handle explosives at the mine or petroleum site	
	(g) The procedures for ensuring that any person transporting, using, storing or handling explosives at the mine or petroleum site has any licence necessary under the Explosives Act 2003	
	(h) The procedure in relation to consultation and co-operation to ensure that any transportation, use, storage, or handling of explosives at the mine or petroleum site is conducted safely in accordance with any condition attached to the licence under which that transportation, use, storage and handling takes place.	

2.3 Other Legislation and Relevant Requirements

BHQ will conduct the project consistent with the requirements of Development Consent and any other legislation that is applicable to an approved integrated designated development approved under Part 4 of the Environment Planning and Assessment Act (EP&A Act).

- *Aboringal Land Rights Act, 1983*
- *Biodiversity Conservation Act, 2016*
- *Biosecurity Act, 2015*

- *Crown Land Management Act, 2016*
- *Dangerous Goods (Road and Rail Transport) Act, 2008*
- *EP&A Act, 1979*
- *Mining Act, 1992*
- *National Parks and Wildlife Act, 1974*
- *POEO Act,*
- *Water Management Act, 1912*
- *Work Health and Safety Act 2011*
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013*
- *Work Health and Safety Regulation 2017*
- *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*
- *Explosives Act 2003*
- AS2187 Explosives -Storage, transport, and use

3. Existing Environment

3.1 Baseline Data

Blasting has been undertaken on the current crown quarry reserve for many years, which contains material with characteristics similar to that expected to be expanded into. Since the ground borne vibration and air blast wave overpressure associated with blasting may cause damage and/or annoyance to residence, the current EPA recommendations for blasting vibration and overpressure level to avoid disturbance to nearby residence is as follows:

- Vibration – 5mm/sec
- Overpressure – 115 dBL

These limits are to apply between 9 am and 5 pm, Monday to Saturdays with lower levels required at other times, according to the EIS, 1992.

3.2 Sensitive Receptors

There are twelve sensitive receivers within the vicinity of Tumbarumba Quarry, with residences up to 1.3 km in regular contact in regards to blasting particularly west of the quarry, which is the direction of the open face and most potential direction for noise to travel (Figure 2)

There are two residences within 500m of the current blasting locations on Byatt street. The vibration monitoring is conducted at this location (Figure 3).

As the pit moves closer to the racecourse regular communication will be undertaken especially if there are horses housed at the racecourse.

FIGURE 2 – LOCATION OF NINE RESIDENCES

FIGURE 3 – 500M EXCLUSION ZONE AND TWO RESIDENT LOCATIONS

3.3 Metrological Conditions

The closest Bureau of Meteorology Station (BoM) automatic weather station site is at the Tumbarumba Post office (station 072043) located 1.6 km North of Murrays Crossing Quarry.

The wind roses generated for the Tumbarumba post office present wind direction and wind speed as a percentage of time for 1965 to August 2021 (figure x and X). Winds are dominant the north and north-west in both the morning and afternoon. The morning has winds to a lesser extent from all other directions and in the afternoon majority of the winds to a lesser extent are from the west and south-west.

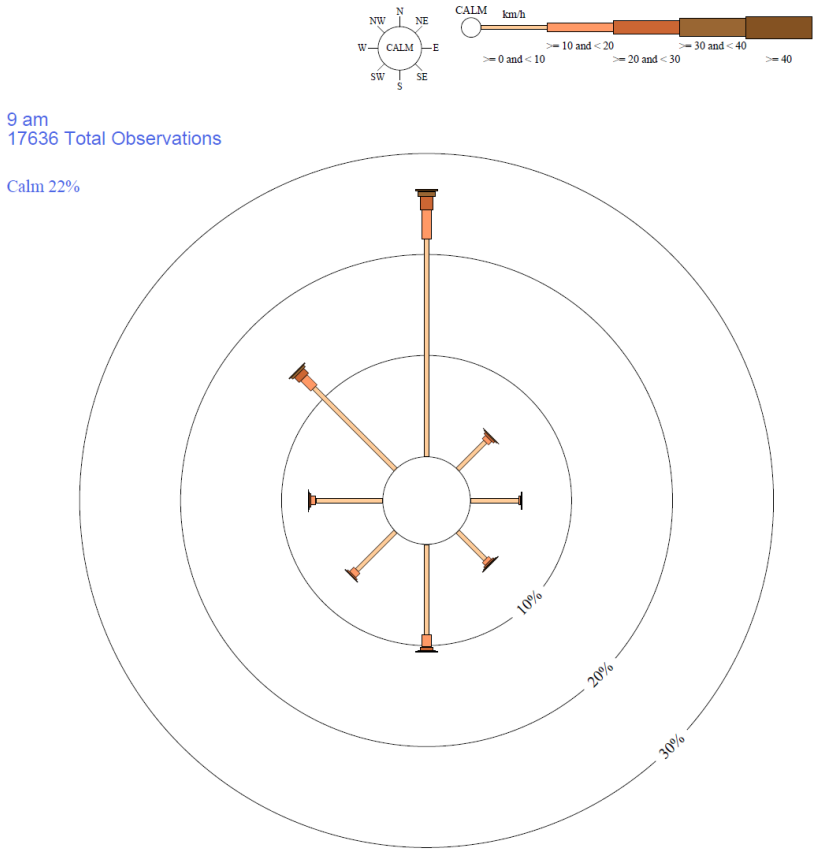


FIGURE 4 – WIND ROSE 9AM

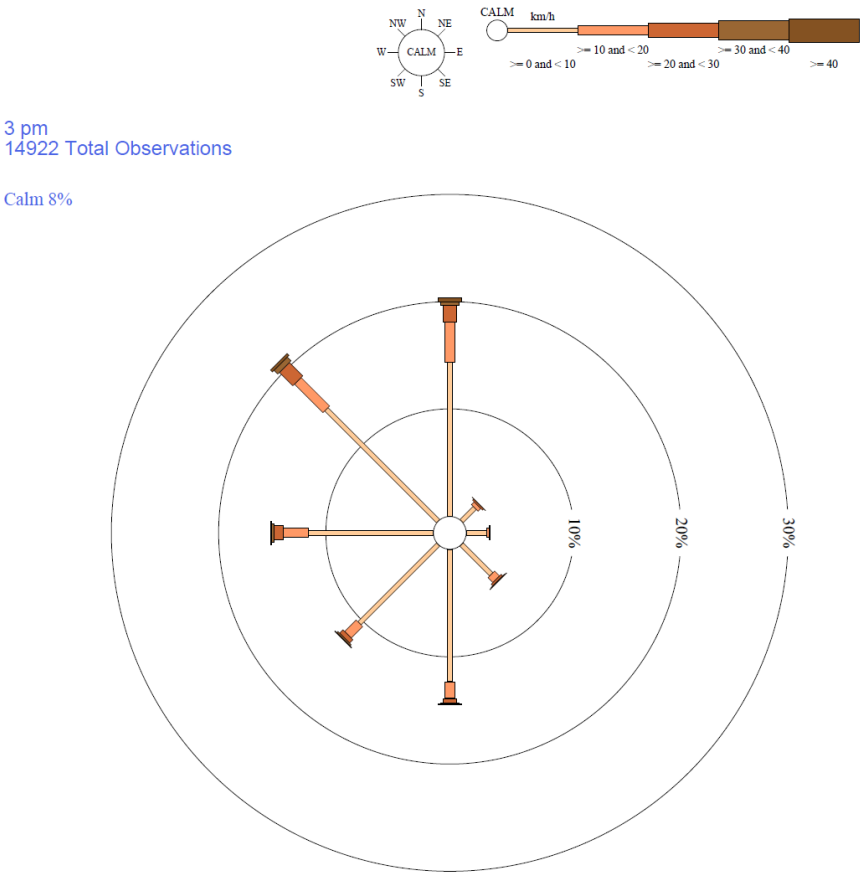


FIGURE 5 – WIND ROSE 3PM

4. Blast Criteria

4.1 Development Application

To be updated once new development application is approved.

4.2 Other Licences

To be updated once the EPL is issued.

4.3 Monitoring Locations

Blast monitoring will be undertaken on the corner of Murray's Crossing Road and Byatt Street.

5. Roles and Responsibilities

Role	Accountabilities
Quarry Manager (Blast Guard)	Provide sufficient resources for the implementation of this plan. Liaise closely with blasting contractor to achieve the best outcomes for • Achieving the Quarry's short/ medium/ long term plans • Authorise blast pattern • Clear site benches • Provide dates of blasting for neighbour notification • Optimising blast dimensions and firing directions • Minimising blast risk • Achieving environmental compliance. • safe firing positions • Guard locations
Blasting contractor	• Develop and set in place the Health and Safety Management System • Provide sufficient resources to successfully implement, maintain, review, and develop the Health and Safety Management System • Research and revise changes to the legislation and obligation under the relevant Acts and Regulations • Ensure all levels of management implement the Health and Safety Management System • Ensure the risk to all persons from any plant or operations is at an acceptable level of risk • Train workers so that they are competent to perform their duties • Ensure all supervisors have adequate guidance as to their role requirements through the use of job descriptions • Establish a system to establish communication of safety issues relevant to the health and safety of all workers • To provide: • Adequate planning, organisation, leadership, and control of operation; and • The carrying out of critical work that requires particular technical competencies; and • Adequate supervision and control, either directly or indirectly, of each project; and • Regular monitoring and assessment of the working environment, work procedures, equipment in the workplace. • Hold and renew all relevant competencies, licenses and permits
Driller	• Inspect the area around the blast for fly-rock distribution • Set up drill rigs in a safe manner • Mix and test drilling fluids • Carry out routine maintenance and repairs • Clean and maintain equipment. • Driving and operating drilling machines to allocated areas on site in a safe manner. • Loading blast holes with explosives • Measuring locations and identifying areas to be drilled
Shotfirer	• Magazine keeper • Ensuring the safety of themselves and others when handling or using explosives and their ingredients • The supervision of the blast crew • The Preparation and Set-up of a blast area

	• Operation of Explosives Charging Equipment in accordance with the Manufactures recommendations. • Conducting and/or being part of risk assessments with relation to explosive activities • Ensuring the correct processes for the manufacture of explosives used in the blast is compliant with legislation • Blast loading activities which include. • The completion and maintenance of Blasting Records • The preparation for the firing of shots including • Ensure the clearance of all personnel and equipment from the blast exclusion zone • The firing and post blast examination • Completion of blasting reports and explosives usage reconciliation • The handling of misfires • Transport of Explosives • The security of explosives • Attend and participate in Safety and toolbox meetings • Reporting of any concern, incident or issue pertaining to explosive activities • The sign off of decontaminated explosive handling equipment prior to maintenance • Organisation of maintenance of explosives handling equipment under their control
Subcontractors	• Safety and compliance with the company's safety policies. • Work in a safe and secure manner. • Compliance with instructions given by blasting contractor • Complete appropriate paperwork on delivery operations • Operation, basic maintenance, and cleanliness of their plant • Operating the vehicle in a safe and professional manner, • Assistance in the environmental impact of their delivery of explosives equipment • Respect other persons rights, be professional and courteous at all times to fellow employees, customers, and the general public. • Complete daily inspection check lists for vehicle. • Work under instruction of Supervisors and Production managers • The disposal of damaged or deteriorated explosives in a safe manner

6. Blast Impact and Predictions

6.1 Ground Vibration

Energy released after a blast event can result in vibration that has the potential to damage infrastructure and buildings

6.2 Air blast overpressure

Blasting generates a transient air pressure greater than the surrounding atmospheric pressure, known as overpressure. Overpressure has the potential to damage infrastructure and buildings

6.3 Fly rock, Dust and Debris

Fly rock is any rock material ejected from the blast by the force of the blast. Fly rock has the potential to damage infrastructure and buildings and poses a risk to public safety. The amount of debris and dust emitted from the blast site post-blast depends on several factors including the blast design and the rock material being blasted, the debris and dust may pose a risk to public safety.

6.4 Fumes

Blasting has the potential to generate post-blast gases (fumes) from the use of ammonium nitrate-based explosives. Such gases commonly include nitric oxide (NO) and nitrogen dioxide (NO2) and are known as Oxides of Nitrogen or NOx. While NO is invisible, NO2 ranges from yellow to dark red depending on the concentration and size of the gas cloud

6.5 Misfire

A blast misfire can occur when one (or more) hole(s) in a blast pattern fail to initiate, resulting in a blast event that is different to the blast design.

6.6 Blast Prediction

The shot design must consider the effects of air blast, air pressure, dust generation, fly rock, ground vibration and noise. The standard is to ensure the ground vibration and overpressure levels do not exceed 5mm/second and 115 dB (Linear)

7. Blast Management and Control Measures

7.1 Public Safety and Livestock

Where the blast clearance zone includes public roads, the following shall be adhered to:

- Application to authorities to block a public road
- Signs to be erected warning public of possible delays
- Authorisation from State roads authority or council to erect the sign.
- All Blast guards that block a public road must be competent in traffic control
- Emergency access shall be given to emergency vehicles whereby the guard would notify the Shotfirer of the situation and hold the shot.

7.2 Residential Locations

Where blasting in close proximity to houses and buildings the drill and blast engineer shall design to minimise environmental effects including vibration, air overpressure, fly rock, dust, and fumes

7.3 Public Infrastructure

Where blasting public infrastructure that is controlled and serviced by persons not associated with the site, notification shall be made to the local representative.

- The area shall be checked prior to blasting.

8. Blasting Implementation and procedure

8.1 Blasting Arrangement

Blasting at Tumbarumba Quarry is undertaken by Dropshot Blasting Services who are licensed to store, transport, and use explosives at times they are assisted by Orica who supply explosives.

The standard blasting parameters for the site haver been determined based on the Drilling and blasting standard of operation of the blasting contractor

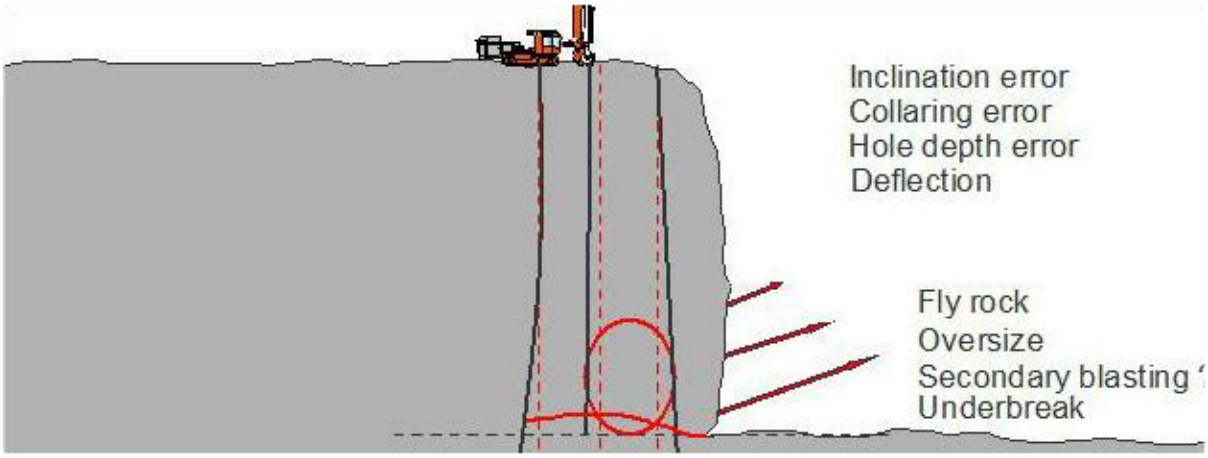
8.2 Blast Timing and Frequency

In accordance with the development consent and environmental protection license, blasting occurs between the hours of 9 am and 5 pm Monday to Saturdays with lower levels required at other times

8.3 Bore Hole Tracking

Bore Hole Tracking technology may be used to ensure the precision and accuracy of each bore hole drilled and to confirm charge placement. Bore Hole tracking consists of a 3D survey of bore holes and audits of the blast face, giving objective measurement of burden and spacing.

Contractors with access to this technology will be preferred for sites having a requirement for strict controls on minimising fly rock and air blast.



8.4 Notification Protocol

9.3.1 Road Closure

Notification of blast date and time is provided to Snowy Valleys Council Tumbarumba, on the day of the blast the road is blocked, with traffic control managed by Snowy Valley Council.

9.3.2 Community notification

Permanent signage has been erected on Murray Crossing Road, information on the blast date and time, is displayed one week prior to the date of the blast. Residents on the neighbours register are notified the day prior to the scheduled blast.

8.5 Exclusion procedure

At the Tumbarumba Quarry the process and procedure for establishing the exclusion zone and exclusion of people from site is as follows and presented in Figure 6.

- SVC provide road closure at each end of Murrays Crossing Road;
- Both access gates are locked with the gate near the racecourse being manned by a guard;
- All personnel leave site except the shotfirer
- All communication is conveyed over the radio channel 11 to announce the blast, prior to the blast and clearance after the blast. Radio silence is maintained until the blast is clear.

FIGURE 6 – BLAST PROTOCOL

8.6 Meteorological forecasting

Regional weather forecasts are available from the Bureau of Meteorology (BoM). The data will be reviewed by the Quarry Manager and/or blasting contractor who will check weather conditions for coming blast events and plan accordingly for adverse weather.

Adverse weather in terms of blasting impacts relates to:

- Wind direction and wind speed
- Conditions likely to be indicative of temperature inversions i.e. fog or frost conditions

8.7 Blast design and review

The Quarry Manager and blast contractors will implement a continuous improvement protocol for blasting through implementation of the following procedures.

- Blast energies are to be minimised as far as possible.
- Quality control practices are to be implemented on the ground to ensure blasts are kept within design tolerances.
- Blasts will be designed to ensure fly-rock, dust and fumes, and the impact/damage to people, property, livestock, and infrastructure, are limited as much as reasonably practicable
- Each blast will be monitored to confirm compliance with air blast overpressure and ground vibration criteria.
- Following each blast, the area surrounding the blast location will be inspected. Blast contractors, in conjunction with the Quarry Manager, will review blast monitoring records to enable continuous improvement and quality control, resulting in continual development of optimum blast parameters
- Use of a 500m exclusion zone to manage potential flyrock occurrence

Blast design shall never compromise safety and safety goals will have the highest design priority.

8.8 Fly rock management

The generation of fly-rock is managed by incorporating appropriate controls in blast designs, these controls include examination of the blast site use of materials to minimise the potential for generating fly-rock, ensuring adequate burden is maintained to minimise the risk of generating fly-rock due to face bursting. These measures, along with an appropriate exclusion zone with relevant mine safety regulations, are used to ensure there is no damage or injury to personnel, livestock, property, equipment, or power lines from fly-rock.

8.9 Dust emissions

The risk of excessive dust emissions from blasting are considered low given the geology of the rock (hard with low fines content) and small to moderate blast size. The risk will be reduced further by ensuring that blasts are not undertaken under conditions likely to enhance the dispersion of dust, i.e., dry windy conditions. Weather forecast monitoring for excessive wind conditions and adverse wind direction will be undertaken prior to each blast. If risk of elevated dust emissions is identified, blasting will be postponed to a time with favourable weather conditions

8.10 Blast fumes

The risk of fume generation from blasting at the Quarry is considered low, due to the low moisture content of the rock, and has not historically been an issue. The primary risk factors for fume generation identified in *Australian Explosives Industry and Safety Group (AEISG) Code of Good Practice: Prevention and Management of Blast Generated NOx Gases in Surface Blasting, Edition 2, 2011* ("the Code"), are identified below along with the measures to be implemented to reduce these risks.

8.11 On bench practices/contamination of explosives

- Blast zones will be maintained free of loose rock and fine materials which could contamination blast holes and affect explosion.
- Blast holes will be dewatered if subject to heavy rainfall.
- Inspections of blasts before initiation will ensure drilling has been completed as per design.
- The Company will minimise the time between drilling and charging of blast holes and avoid sleeping blasts to further reduce the potential for contamination.

8.12 Additional forecasting and proactive mitigation measures

Bald Hill Quarry will implement the following additional blast impact mitigation measures to ensure the safety of site personnel, public and private infrastructure equipment, and vehicles in the surrounding areas.

- Scheduling of activities to limit blasting activities during periods when adverse conditions are most likely to occur.
- Short-term modification of blasting activities in response to forecasting of adverse conditions
- Blasts are only fired in optimal weather conditions. In the event that unfavourable meteorological conditions are identified, the shot-firer will liaise with the production Manager to determine whether to postpone a blast.
  Unfavourable conditions include:
    - excessively wet conditions during which blast fumes may result; or
    - dry and windy conditions that may result in dust flumes leaving the site.
      Blast events will be considered individually, and additional mitigation measures or postponement of blasting considered by the Quarry Manager.
    - Training will be provided to all relevant personnel on environmental obligations in relation to blasting controls.
    - No blasting will be initiated within 30 metres of any power line infrastructure, or within 100 metres of any other public infrastructure or underground utilities (such as Telstra infrastructure) without the written permission of the agency responsible for managing that infrastructure.

Bald Hill Quarry will implement the following quality control measures to minimise the dust emissions of blasting.

- Monitoring of blast performance with improvements to be made in response to elevated ground vibration or air overpressure.
- Restricting blast firing to times of optimal weather conditions, where practical.
- Use of high quality stemming products.
- Minimising blast energies.

8.13 Blast Safe Work Procedure

The general and site specific blasting hazards will be defined for each blasting site. The following general hazard areas shall be reviewed to help identify potential site-specific hazards and controls for each blast site.

- Control access to the blasting area.
- Review vibration
- Notify appropriate authorities and personnel prior to blast.
- Know the location and condition of all nearby utilities that are above and below the ground or water surface.
- Potential for fly-rock shall be assessed through observation and profiles of the free face conditions, review of drill logs.
- Loading and stemming of blast holes
- The connection of initiation systems
- Exclusion zones
- Dealing with misfires
- The initiation of explosives or explosive precursors by an electric charge
- The security of explosives and explosive precursors

- Storage and transport of explosives and explosive precursor
- Working in and around the edge of quarry benches

Hazards associated with regular work activities and processes as identified are in Safe work method statements additional JSA/JSEA may be developed to cover particular hazards which were not anticipated or covered by the SWMS.

9. Blast Monitoring

Bald Hill Quarry will undertake monitoring of blasts to ensure that the operational and design controls in blasting activities are effective.

To assess compliance the following monitoring will be undertaken for each blast

- Overpressure and vibration monitoring at the closest privately-owned residence (see Figure 3)
    - Vibration – 5mm/sec
    - Overpressure – 115 dBL
- Visual monitoring for blast fumes.

Blast monitoring reports will be provided by the blasting contractor for each blast they will be reviewed and stored electronically

10. Reporting and Compliance

10.1 Incident Report

An incident is defined as a set of circumstances that causes or threatens to cause material harm to the environment and/or breaches or exceeds the limits or performance measures/criteria in the Development consent.

Explosive contractors need to report any incidents to the production manager. In the event that review of blasting monitoring data indicates an incident has occurred, the incident will be reported to the Resources Regulator and any other relevant agencies immediately after BHQ becomes aware of the incident.

A misfire or unplanned explosion of an explosive or explosive precursor (other than where the misfired explosive can be fired without any significant risk to a person) must be reported to the Resources Regulator as a high potential incident, in accordance to Section 128 of the WHSMP Regulation 2014.

If an ejection of rock from blasting falls outside the exclusion zone, it is to be reported to the Resources Regulator as a dangerous incident, in accordance with Section 179 of the WHSMP Regulation 2014.

10.2 Complaints

Bald Hill Quarry maintain a Complaints register, complaints can be made by contacting head office on 02 6227 7817 or emailing jugiong@baldhillquarry.com.au as part of the complaints process an investigation of the issue will be undertaken and actions to resolve the complaint taken as soon as possible ,Bald Hill Quarry will commit to updating the community member regularly until a complaint is resolved.

Appendices

Appendix A – Contractor documents

Appendix I Water Quality Documentation

		Grease/oil/ sheen	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (ppm)	Specific Conductivity (SPC uS/cm)	Conductivity (uS/cm)	Total Dissolved Solids (TDS)	pH	Oxidation Reduction Potential (mV)	Turbidity (NTU)	Total Suspended Solids (TSS)
Point 1	Month 1	No	8.1	88	10.19	0.036	24.4	23	6.88	-32.1	17	36
	Month 2	No	11	87.2	9.61	37.3	-	-	7.21	-5.5	18.13	27
	Month 3	No	13.1	93.2	9.81	47.1	36.4	-	7.3	37.4	15.20	38
	Month 4	No	15.2	133	13.35	33.7	27.4	24	6.7	32.7	72.3	47
	Month 5	No	16.1	119.2	11.74	38.1	31.6	25	10.95	-19.4	14.51	8
	Month 6	No	17.2	-	-	35	29.8	22.757	7.23	93	34.5	19
Point 2	Month 1	No	8.8	66	7.65	0.06	42.2	39	6.32	-35	49	15
	Month 2	No	10.8	88.6	9.81	34.1	-	-	-	-	16.17	29
	Month 3	No	13.0	93.8	9.90	38.0	38.0	-	7.22	61.5	15.12	7
	Month 4	No	14.8	128.7	13.03	37.1	29.9	24	6.92	22.4	41.85	52
	Month 5	No	16	110.6	10.92	35.9	29.7	23	9.95	-17	15.24	8
	Month 6	No	16.9	-	-	44	37	28.429	7.27	128	18.5	7
Point 3	Month 1	No	8.4	91.9	10.77	0.001	1	1.1	6.47	-19.9	0.4	32
	Month 2	No	10.6	83.7	9.31	34.7	-	-	7.55	-35.9	18.88	29
	Month 3	No	12.7	94.1	9.96	37.7	28.9	-	7.24	78.7	14.85	10
	Month 4	No	14.6	126.8	12.89	37.5	30.1	22	6.97	2	34.08	49
	Month 5	No	16	110.6	10.91	39.3	32.6	26	9.46	40.6	23	9
	Month 6	Yes	16.7	-	-	38	32.1	24.83	7.57	76	17.9	13

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **15J100067**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.76mS		369734	2.75mS
2. Temp		19.3°C		Testo	19.2°C
3. pH 4		pH 4.00		367234	pH 4.13
4. pH 7		pH 7.00		372012	pH 7.16
5. pH 10		pH 10.00		370064	pH 9.95
6. DO		0.00ppm		1910294760	-0.02ppm
7.Turbidity		50NTU		369873	47NTU
8. mV		236.2mV		371922/367457	229.9mV

Calibrated by: **Gary Needs**

Calibration date: **15/09/2021**

Next calibration due: **15/10/2021**

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **15J100066**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.76mS		369734	2.77mS
2. Temp		20.9°C		Testo	19.2°C
3. pH 4		pH 4.00		367234	pH 4.02
4. pH 7		pH 7.00		372012	pH 7.08
5. pH 10		pH 10.00		370064	pH 10.02
6. DO		0.00ppm		371864	0.01ppm
7.Turbidity		50 NTU		369873	50.3NTU
8. mV		231.8mV		365451/370891	232mV

Calibrated by: **Sarah Lian**

Calibration date: **15/10/2021**

Next calibration due: **14/11/2021**

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **15J100066**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.76mS		377099	2.75mS
2. Temp		19.9°C		Testo	19.6°C
3. pH 4		pH 4.00		367234	pH 4.09
4. pH 7		pH 7.00		368801	pH 7.01
5. pH 10		pH 10.00		364961	pH 9.71
6. DO		0.00ppm		371864	0.02ppm
7.Turbidity		50 NTU		369873	46.88NTU
8. mV		234mV		365451/370891	233.9mV

Calibrated by: **Gary Needs**

Calibration date: **16/11/2021**

Next calibration due: **16/12/2021**

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **15J100066**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.76mS		377099	2.75mS
2. Temp		19.4°C		Testo	18.6°C
3. pH 4		pH 4.00		367234	pH 4.01
4. pH 7		pH 7.00		368081	pH 7.12
5. pH 10		pH 10.00		370064	pH 9.81
6. DO		0.00ppm		371864	-0.01ppm
7.Turbidity		50 NTU		369873	49.73NTU
8. mV		235.7mV		365451/370891	236.2mV

Calibrated by: **Gary Needs**

Calibration date: **15/12/2021**

Next calibration due: **14/01/2022**

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **20F162173**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. D.O		0.00 ppm		371864	-0.00ppm
2. Conductivity		2760 ms/cm		362912	2.74mS/cm
3. pH 10		pH 10.00		370064	10.03
4. pH7		pH 7.00		368081	pH 7.21
5. pH4		pH 4.00		380327	pH 4.08
6. ORP mV		227.4 mV		365451/370891	227.3mV
7. NTU		50NTU		374601	48.92NTU
8. Temp °C		22.9°C		probe	22.8°C

Calibrated by: **Gary Needs**

Calibration date: **17-Jan-22**

Next calibration due: **16-Jul-22**

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **15J100067**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.76mS		377099	2.74mS
2. Temp		21.0°C		Testo	20.8°C
3. pH 4		pH 4.00		380327	pH 4.01
4. pH 7		pH 7.00		368081	pH 7.11
5. pH 10		pH 10.00		370064	pH 10.01
6. DO		0.00ppm		371864	-0.03ppm
7.Turbidity		50NTU		38196	51.3NTU
8. mV		231.8mV		365451/370891	231.6mV

Calibrated by: **Evan Weller**

Calibration date: **11/02/2022**

Next calibration due: **13/03/2022**

21-416 Water quality screening		Grease/oil/ sheen	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (ppm)	Specific Conductivity (SPC uS/cm)	Conductivity (uS/cm)	Total Dissolved Solids (TDS)	pH	Oxidation Reduction Potential (mV)	Turbidity (NTU)	Total Suspendded Solids (TSS) LAB
Point 1 Wetland	Month 1	No	8.1	88	10.19	0.036	24.4	23	6.88	-32.1	17	36
	Month 2	No	11	87.2	9.61	37.3	-	-	7.21	-5.5	18.13	27
	Month 3	No	13.1	93.2	9.81	47.1	36.4	-	7.3	37.4	15.20	38
	Month 4	No	15.2	133.0	13.35	33.7	27.4	24	6.70	32.7	72.3	
	Month 5		~~16.7°C~~	1	0.1	~~38.0~~	32.1	~~24.83~~	~~7.57~~	~~76.0~~	~~17.9~~	
	Month 6		17.2			35	29.8	22.757	7.23	93	34.5.	
Point 2 Upstream	Month 1	No	8.8	66	7.65	0.06	42.2	39	6.32	-35	49	15
	Month 2	No	10.8	88.6	9.81	34.1	-	-	7.18	-23.2	16.17	29
	Month 3	No	13.0	93.8	9.90	38.0	38.0	-	7.22	61.5	15.12	7
	Month 4	No	14.8	128.7	13.03	37.1	29.9	24	6.92	22.4	41.85	
	Month 5		16.9	1	0.1	44	370	28.429	7.27	128	18.5	
	Month 6											
Point 3 Downstream	Month 1	No	8.4	91.9	10.77	0.001	1	1.1	6.47	-19.9	0.4	32
	Month 2	No	10.6	83.7	9.31	34.7	-	-	7.55	-35.9	18.88	29
	Month 3	No	12.7	94.1	9.96	37.7	28.9	-	7.24	78.7	14.85	10
	Month 4	No	14.6	126.8	12.89	37.5	30.1	22	6.97	2.0	34.08	
	Month 5		~~16.7°C~~				~~32.1~~	~~24.83~~	~~7.57~~	~~76.0~~	~~17.9~~	
	Month 6		~~16.7°C~~ 16.7°C	1	01	38.0	32.1	24.85	7.57	76.0	17.9.	

	Date	Comments
Month 1	20/09/2021	11:08am to 11:34am. Weather was heavy rain, no wind. Samples were opaque, particulate matter, light brown with no odour
Month 2	20/10/2021	12.15 to 13.00. Weather was sunny, no wind. Creek was at or nearing bankfull with fast flow. Channel lined with phragmites. Water at each site was turbid brown, suspended pyrite, no odour evident and no visual evidence of grease or oil.
Month 3	19/11/2021	11:45am to 12:35pm. Weather was light rains, mild temperature with no wind. Samples were all clear with some PM, slight brown tinge and no significant odour.
Month 4	21/12/2021	12.44 pm to 1.30 pm. Weather was sunny, light breeze. Creek was nearing bankfull. Colour was brown with visible pyrite particles. Channel lined with flattened phrgamites and mud drapes indicating recent overbank flow.
Month 5		
Month 6	18.2.22	10.40am to .weather sunny, light breeze. creek was bankfull. Brown, pyrite, phragmites

Note:

Call Belinda Fourie on 0414471404 before heading out and take whipper snipper

21-416 Water quality screening		Grease/oil	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (ppm)	Specific Conductivity (SPC uS/cm)	Conductivity (uS/cm)	Total Dissolved Solids (TDS)	pH	Oxidation Reduction Potential (mV)	Turbidity (NTU)	Total Suspendded Solids (TSS) LAB
Point 1 Wetland	Month 1	No	8.1	88	10.19	0.036	24.4	23	6.88	-32.1	17	17
	Month 2	No	11	87.2	9.61	37.3			7.21	-5.5	18.13	18.13
	Month 3	~	13.1	93.2	9.81	41.1	36.4		7.30	37.4	15.20	
	Month 4											
	Month 5											
	Month 6											
Point 2 Upstream	Month 1	No	8.8	66	7.65	0.06	42.2	39	6.32	-35	49	49
	Month 2	No	10.8	88.6	9.81	34.1					16.17	16.17
	Month 3		13.9	93.8	9.90	38.0	38.0		7.22	61.5	15.12	
	Month 4											
	Month 5											
	Month 6											
Point 3 Downstream	Month 1	No	8.4	91.9	10.77	0.001	1	1.1	6.47	-19.9	0.4	0.4
	Month 2	No	10.6	83.7	9.31	34.7			7.55	-35.9	18.88	18.88
	Month 3	~	12.7	94.1	9.96	37.7	28.9		7.24	78.7	14.85	
	Month 4											
	Month 5											
	Month 6											

Month 1	20th September, 11:08am to 11:34am. Weather was heavy rain, no wind. Samples were opaque, particulate matter, light brown with no odour
Month 2	20th October, 12.15 to 13.00. Weather was sunny, no wind. Creek was at or nearing bankfull with fast flow. Channel lined with phragmites. Water at each site was turbid brown, suspended pyrite, no odour evident and no visual evidence of grease or oil.
Month 3	19th, 11:45 - , light consistent rain, samples near, clearer, some PM, V light brown, nil odour, nil wind, Clear
Month 4	
Month 5	
Month 6	

705.5 mmHg, 705.7, 706.7

123492
123202
290

1.08 Start time.

11.34 Finish time

Point 1 - 8.7°C

DO - 88

11 Ppm - 10.19

SPC - 0.036

C_{cm}^{us} - 24.4

TDS - 23

pH - 6.88

ORPMV - 32.1

NTU - 17

Point 2 - C - 8.4

DO - 66

11 Ppm - 7.65

SPC - 0.06

C_{cm}^{us} - 42.2

TDS - 39

pH - 6.32

ORP - -35

NTU - 49

Point 3 - C° - 8.4

DO - 91.9

DO PPM - 10.77

SPC - 0.001

C_{cm}^{us} - 1.0

TDS - 1.1

pH - 6.47

ORPmv - 19.9

NTU - 8.4,

Appendix J Site water balance calculations

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Decile 5 rainfall		mm	57.1	48.8	51.6	58	71.2	89.2	93.2	103.9	87	88.7
		m	0.571	0.488	0.516	0.58	0.712	0.892	0.932	1.039	0.87	0.887
Site water balance												
Site water balance		m3	87991.1	75200.8	79515.6	89378	109719.2	137457.2	143621.2	160109.9	134067	136686.7
land size (subject land) 154100 m2												
runoff C for all pervious		m3	**3519.644**	**3008.032**	**3180.624**	**3575.12**	**4388.768**	**5498.288**	**5744.848**	**6404.396**	**5362.68**	**5467.468**
Dev. Footprint m2	53342	10668.4	0.571	0.488	0.516	0.58	0.712	0.892	0.932	1.039	0.87	0.887
Fraction impervious		0.2	6091.656	5206.179	5504.894	6187.672	7595.901	9516.213	9942.949	11084.47	9281.508	9462.871
			341.1328	291.546	308.2741	346.5096	425.3704	532.9079	556.8051	620.7302	519.7644	529.9208
Haul Road m2	13300	11305	0.571	0.488	0.516	0.58	0.712	0.892	0.932	1.039	0.87	0.887
Fraction impervious		0.85	6455.155	5516.84	5833.38	6556.9	8049.16	10084.06	10536.26	11745.9	9835.35	10027.54
			361.4887	308.943	326.6693	367.1864	450.753	564.7074	590.0306	657.7701	550.7796	561.542
Pit footprint m2	86800	73780	0.571	0.488	0.516	0.58	0.712	0.892	0.932	1.039	0.87	0.887
Fraction impervious		0.85	42128.38	36004.64	38070.48	42792.4	52531.36	65811.76	68762.96	76657.42	64188.6	65442.86
			2359.189	2016.26	2131.947	2396.374	2941.756	3685.459	3850.726	4292.816	3594.562	3664.8
Site Office m2	120	120	0.571	0.488	0.516	0.58	0.712	0.892	0.932	1.039	0.87	0.887
Fraction impervious		1	68.52	58.56	61.92	69.6	85.44	107.04	111.84	124.68	104.4	106.44
			3.83712	3.27936	3.46752	3.8976	4.78464	5.99424	6.26304	6.98208	5.8464	5.96064
Workshop m2	538	538	0.571	0.488	0.516	0.58	0.712	0.892	0.932	1.039	0.87	0.887
Fractionimpervious		1	307.198	262.544	277.608	312.04	383.056	479.896	501.416	558.982	468.06	477.206
			17.20309	14.70246	15.54605	17.47424	21.45114	26.87418	28.0793	31.30299	26.21136	26.72354

154100

63.2% AEP 24hr duration (m3))

56.1mm convert to m

0.056

Quarry pit m2	4860.8
Development footprint	2987.152
Haul Road m2	744.8
Site Office	6.72
Workshop	30.128
total AEP 24 hr	8629.6

Nov	Dec	Ann	
68.4	63.9	959.2	
0.684	0.639	9.592	
105404.4	98469.9	1478127	
4216.176	**3938.796**	59125.09	
0.684	0.639	9.592	
7297.186	6817.108	102331.3	m3
408.6424	381.758	**5730.552**	m3
0.684	0.639	9.592	
7732.62	7223.895	108437.6	m3
433.0267	404.5381	**6072.503**	m3
0.684	0.639	**9.592**	
50465.52	47145.42	707697.8	m3
2826.069	2640.144	39631.07	
0.684	0.639	9.592	
82.08	76.68	1151.04	m3
4.59648	4.29408	64.45824	
0.684	0.639	9.592	
367.992	343.782	5160.496	m3
20.60755	19.25179	288.9878	

Dev Footprint	5.3342	ha	53342 m2
Pit footprint	8.68	ha	86800 m2
haul road	1.33	ha	13300 m2
Site office	0.012	ha	120 m2
Workshop	0.0538	ha	538 m2

63.2% AEP 24hr duration total	
	2,987
	4,861
	745
	7
	30
Total	**8,630**

runoff (m3)	725812.4	Runoff total (m3)	5731
			39,631
			6,073
			65
			289
		Total	**51789**

Appendix K Flood Report

NGH
PO Box 506
Wodonga VIC 3690

Job No. FX545

Attn: Ms Sue Mahon

17 June 2022

Re: Murrays Crossing Quarry Flooding Investigation

Dear Madam,

This letter sets out the findings of an investigation that was undertaken to define the nature of flooding in the vicinity of the Murrays Crossing Quarry (**the quarry**) which is located a short distance to the south of the township of Tumbarumba on the eastern overbank of Tumbarumba Creek. **Figure 1** attached shows the location of the quarry relative to the township of Tumbarumba.

1. Background

It is understood that as part of its assessment of a planning proposal for the quarry, the Department of Planning and Environment (**DPE**) has requested that its owners engage a suitably qualified consultant to undertake a flooding investigation in order to define the nature of flooding in its vicinity.

During initial discussions, DPE advised that it would be sufficient to derive design peak flow estimates in Tumbarumba Creek by undertaking a flood frequency analysis of the stream flow record of the nearby WaterNSW operated *Tumbarumba Creek at Tumbarumba No. 2* stream gauge (Gauging Station (**GS**) 401007) (**Tumbarumba No. 2 stream gauge**), the location of which is shown on **Figure 1**.

The following sections of this letter set out the methodology that was adopted for deriving design peak flow estimates at the gauge site, as well the conversion of those peak flows to peak flood levels and flow velocities using the HEC-RAS hydraulic modelling software. The results of the hydraulic modelling were then used to plot the indicative extent of inundation in the vicinity of the quarry for design floods with Annual Exceedance Probabilities (**AEPs**) of 5% (1 in 20) and 1% (1 in 100). The HEC-RAS hydraulic model and its results were also used to define the extent of the 1% AEP floodway, flood storage and flood fringe areas in the immediate vicinity of the quarry.

2. Analysis of Stream Gauge Data

2.1 Analysis of Historic Stream Gauge Data

A stream gauge was originally established on Tumbarumba Creek in June 1946 before being decommissioned in December 1983 (**Decommissioned Tumbarumba stream gauge**). While the exact location of the Decommissioned Tumbarumba stream gauge is not known, WaterNSW's PINNEENA database indicates that it was located about 2 km upstream of the current Tumbarumba No. 2 stream gauge, which places it in close proximity to the quarry. The largest flood that was recorded by the Decommissioned Tumbarumba stream gauge occurred in October 1955 when the peak flow in the creek was about 39 m^3/s.

Records show that the Tumbarumba No. 2 stream gauge was installed in April 2000 and that it is still in operation. **Figure 2**, sheet 1 shows the location of the Tumbarumba No. 2 stream gauge relative to the quarry site, while **Figure 1** shows the extent of the 157 kilometre square catchment which lies upstream of its location.

The left hand side of **Figure 3** shows a comparison of the WaterNSW derived rating table that was adopted when the Tumbarumba No. 2 stream gauge was first established (refer *Rating Table No. 59*), as well as the current rating table (refer *Rating Table No. 72.02*). A review of the historic rating tables found that the stage-discharge relationship for the gauge has not changed since the gauge was first established in April 2000.

The right hand side of **Figure 3** shows the cross section at the stream gauge based on WaterNSW's survey data taken from its PINNEENA database and supplemented by LiDAR survey data. **Figure 3** also shows the historic peak gauge height for the largest flood that has been recorded by the gauge which occurred in November 2021 when the water level reached RL 2.55 m, noting that this equates to a peak flow of about 42.5 m^3/s based on the currently adopted rating curve.

2.2 Derivation of Design Peak Flows

Table 1 over the page shows a comparison the design peak flow estimates at the Tumbarumba No. 2 stream gauge that were derived by the following methods:

- Probabilistic Rational Method (**PRM**) based on the procedures set out in the 1987 edition of *Australian Rainfall and Runoff* (**ARR 1987**) (refer **Column B** in **Table 1**).
- Regional Flood Frequency Estimation (**RFFE**) Model based on the procedures set out in 2019 edition of *Australian Rainfall and Runoff* (**ARR 2019**) (refer **Column C** in **Table 1**), noting that two of the *Nearby Catchments*[1] are the WaterNSW *operated Adelong Creek at Batlow Road* (GS 401061) (**Adelong stream gauge**) and *Kyeamba Creek at Book Book* (GS 410057) (**Book Book stream gauge**) stream gauges which have total catchment areas of 155 km^2 and 145 km^2, respectively.[2]
- **Column D** shows the design peak flow estimates at the Adelong stream gauge which were derived as part of the *Adelong Floodplain Risk Management Study and Plan* (Lyall & Associates, 2018). While the Adelong stream gauge is located approximately 50 km to the north of the quarry, the design peak flows at the gauge have been presented in **Table 1** as the total catchment area is comparable to that of the Tumbarumba No. 2 stream gauge.
- **Column E** sets out the design peak flow estimates at the Book Book stream gauge which were derived as part of a flooding investigation that Lyall & Associates recently undertook on behalf of TransGrid. While the Book Book stream gauge is located approximately 75 km to the north-west of the quarry, the design peak flows at the gauge have been presented in **Table 1** as the total catchment area is also comparable to that at the Tumbarumba No. 2 stream gauge.

A log-Pearson Type III (**LP3**) distribution was fitted to the annual series of peak flows for the two Tumbarumba stream gauges using the TUFLOW FLIKE Software. The left hand side of **Figure 4** shows the resulting flood frequency curves, along with the 5% and 95% confidence limits for the 38 years of recorded data at the Decommissioned Tumbarumba stream gauge, while the right hand

[1] *Nearby Catchments* are the 15 gauged catchments that are in close proximity to the study catchment and have been relied upon by the RFFE Model to estimate design peak flows at the gauge site.

[2] While design peak flow estimates at the Adelong and Book Book stream gauges are available in the raw RFFE Model output data, they have been superseded by the results of previous flooding investigations that have been undertaken by Lyall & Associates.

side shows similar data for the 21 years of data at the Tumbarumba No. 2 stream gauge. **Columns F** and **G** in **Table 1** set out the flood frequency derived design peak flow estimates at the Decommissioned Tumbarumba and Tumbarumba No. 2 stream gauge, respectively.

TABLE 1
ESTIMATES OF DESIGN PEAK FLOWS AT TUMBARUMBA No. 2 STREAM GAUGE
VALUES IN m^3/s

AEP	ARR 1987[1]	ARR 2019	*Nearby Catchments*		Present Study[4]	
	PRM	RFFE	Adelong Stream Gauge (GS 410061)[2]	Book Book Stream Gauge (GS 410057)[3]	Decommissioned Tumbarumba stream gauge	Tumbarumba Creek at Tumbarumba No. 2 (GS 401007)
[A]	[B]	[C]	[D]	[E]	[F]	[G]
1%	198	183	375	330	46	89
2%	155	144	270	230	39	65
5%	108	101	180	138	31	45
10%	81	74	120	85	25	34
20%	61	51	84	46	19	23

1. Shown for comparison purposes only.
2. Derived as part of the *Adelong Creek Floodplain Risk Management Study and Plan* (Lyall & Associates, 2018).
3. Derived as part of a recent flooding investigation that Lyall & Associates has undertaken on behalf of TransGrid.
4. Derived using the TUFLOW Flike software.

The key findings of the derivation of design peak flows at the Tumbarumba No. 2 stream gauge are as follows:

- The PRM derived peak flows (refer **Column B** in **Table 1**) are similar to those that were derived using the RFFE Model (**Column C**).
- The RFFE Model (**Column C**) underestimates flows when compared with the *Nearby Catchments* which it relies upon to derive the design peak flow estimates, particularly the Adelong (**Column D**) and Book Book (**Column E**) stream gauges which are the two *Nearby Catchments* which have a comparable catchment area to the Tumbarumba No. 2 stream gauge.
- The flood frequency derived design peak flow estimates at the Decommissioned Tumbarumba stream gauge (**Column F**) are about 75% lower than the RFFE derived flows (**Column C**) and about 90% lower than the flood frequency derived peak flow estimates at the *Nearby Catchment* at Adelong (**Column D**).
- The flood frequency derived design peak flow estimates at the Tumbarumba No. 2 stream gauge (**Column G**) are about 50% lower than the RFFE derived flows (**Column C**) and about 75% lower than the flood frequency derived peak flow estimates at the *Nearby Catchment* at Adelong (**Column D**).

Table 1 shows that the design peak flow estimates vary significantly depending on the methodology that is adopted for their derivation. While a more detailed flooding investigation involving the development of hydrologic and hydraulic computer models of Tumbarumba Creek at its catchment would be required to ascertain the reason for the lower peak flow estimates at the gauge site, this is beyond the scope of the present investigation and also the requirements of DPE.

For the purpose of undertaking the present investigation, the RFFE derived design peak flows shown in **Column C** have been adopted for defining the nature of flooding in the immediate vicinity of the quarry (**best estimate design peak flows**), with the flood frequency derived peak flow estimates at the Adelong (**Column D**) and Tumbarumba No. 2 (**Column G**) stream gauges used to derive the upper and lower bound limits of flooding for the 5% and 1% AEP flood events.

3. Derivation of Design Peak Flood Levels and Flow Velocities

The design peak flows set out in **Columns** C, **D** and **G** in **Table 1** were converted to peak flood levels and flow velocities using the HEC-RAS hydraulic modelling software. Cross sections of the inbank area of Tumbarumba Creek, as well as details of the two existing bridge crossings in the immediate vicinity of the quarry were surveyed by Gray Surveyors who are based in Tumut.

The available LiDAR survey data were used to extend the surveyed cross sections across the full width of the floodplain, as well as develop a number of additional cross sections that were used to extend the HEC-RAS model to a location downstream of the Tumbarumba No. 2 stream gauge. **Figure 2** (2 sheets) attached show the location of the cross sections that comprise the HEC-RAS model of Tumbarumba Creek in the vicinity of the quarry.

It was found that a Manning's n roughness value of 0.12 was required within the banks of the creek and on the immediate overbank area of Tumbarumba Creek in order to reproduce the shape of the WaterNSW derived rating tables (refer *HEC-RAS Derived Rating Table* on the left hand side of **Figure 3**).

Annexures A and **B** of this letter each contain a table setting out the results of the HEC-RAS modelling for design floods with AEPs of 5% and 1%, respectively, while **Annexures C** and **D** contain plots showing the width and depth of flow at each cross section comprising the HEC-RAS model of Tumbarumba Creek for design floods with AEPs of 5% and 1%, respectively. **Figure 6** attached is a long section of Tumbarumba Creek showing design water surface profiles for the 5% and 1% AEP flood events.

A set of 3D surfaces were generated based on the design peak flood levels set out in **Annexures A** and **B** for the 5% and 1% AEP best estimate design peak flows. These were then compared with the available LiDAR survey data in order to derive the indicative extent and depth of inundation for design floods with AEPs of 5% and 1%. **Figure 7** attached shows the indicative extent of inundation in the immediate vicinity of the quarry for the "best estimate" 5% and 1% AEP peak flow estimates of 101 m^3/s and 183 m^3/s, respectively.

The automated function in the HEC-RAS software for determining the extent to which each cross section in the model could be constricted before peak 1% AEP flood levels are increased by 0.1 m was used to determine the extent of the floodway in the immediate vicinity of the quarry. The assessment found that due to the low capacity nature of the inbank area of Tumbarumba Creek in combination with the steep sided nature of the floodplain, flood fringe areas are confined to the very edges of the inundated areas. Flood storage areas in the immediate vicinity of the quarry are also limited to the quarried area which is inundated by floodwater to a depth of about 1 m in a 1% AEP flood event. **Figure 8** shows the hydraulic categorisation of the floodplain in the immediate vicinity of the quarry for the best estimate 1% AEP design peak flow of 183 m^3/s.

We trust that the findings of the flooding investigation will assist DPE complete its assessment of the planning proposal for the quarry. However, please do not hesitate to contact me should you have any queries or wish to discuss any aspect of this letter.

Yours faithfully
Lyall & Associates Consulting Water Engineers

Scott Button
Principal

List of Figures

LAUREL HILL
TARADALE
GREEN HILLS
157 km² CATCHMENT UPSTREAM OF TUMBARUMBA CREEK AT TUMBARUMBA No. 2 STREAM GAUGE
BUDDONG FALLS
WILLIGOBUNG
BUDDONG
ROSEWOOD
BRDLEAF PARK RD
TARCUTTA CREEK
BATLOW RD
LONG POINT RD
BACK CREEK
BULLONGRA RD
COURABYRA
HARDYS MILL
TARADALE RD
TUMBARUMBA RD
WAGGA WAGGA
MANNUS
COURABYRA RD
TUMBARUMBA CREEK
BACO FOREST RD
PERKINS RD
PADDYS
THE ISLAND
CREEK
BATLOW RD
POUND CREEK
ASH CREEK RD
RIVER
COFFEE POT
GLENROY
RAILWAY
TUMBARUMBA RD
CHARCOAL GAP RD
PADDYS RIVER
MASONS HILL RD
CREEK
TUMBARUMBA
MANNUS GLENROY RD
TUMBARUMBA CREEK AT TUMBARUMBA No. 2 (GS 401007)
MUNDEROO ACCESS RD
MANNUS
MANNUS LOOKOUT RD
TOOMARD
BURRA

N

1 0 1 2 3 km

Scale: 1:100,000

Lyall & Associates

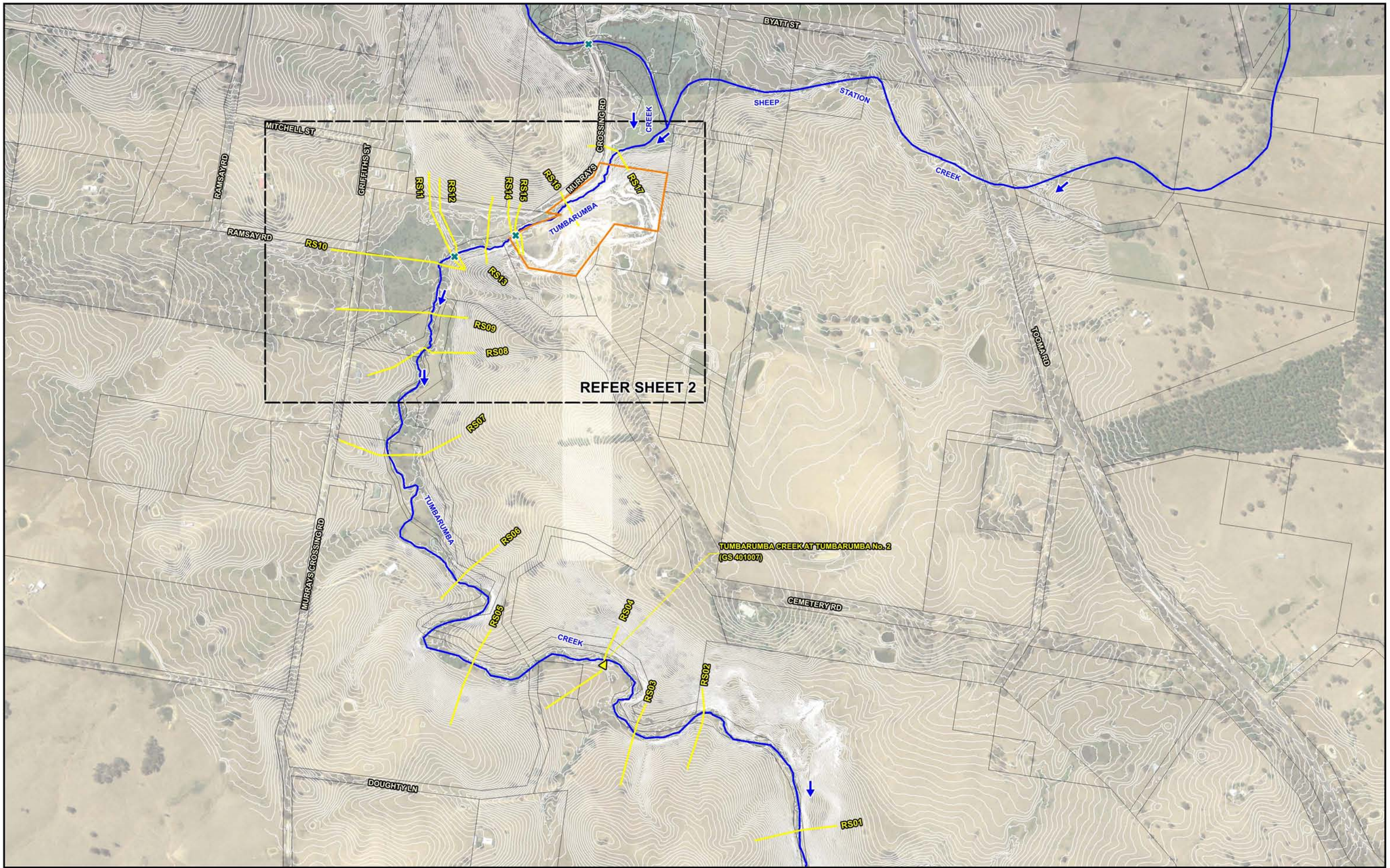
LEGEND

- Study Catchment
- WaterNSW Stream Gauge
- Quarry Location

MURRAYS CROSSING QUARRY FLOODING INVESTIGATION

Figure 1

LOCATION AND CATCHMENT PLAN



N

80 0 80 160 240 m

Scale: 1:8,000

Lyall & Associates

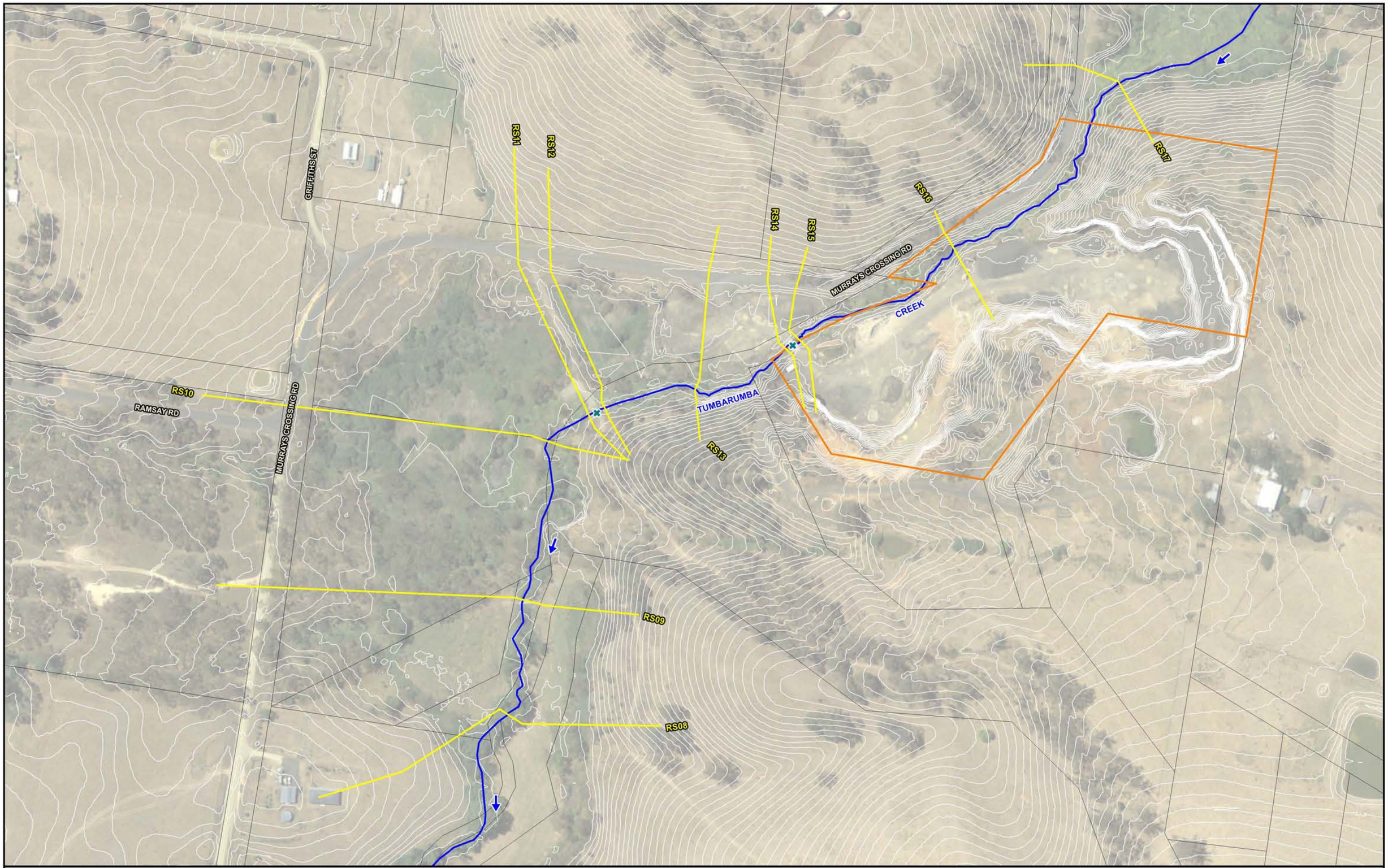
LEGEND

- RS01 — HEC-RAS Cross Section and Identifier
- Quarry Boundary
- WaterNSW Stream Gauge
- Existing Bridge

MURRAYS CROSSING QUARRY
FLOODING INVESTIGATION

Figure 2
(Sheet 1 of 2)

HEC-RAS MODEL LAYOUT



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25 0 25 50 75 m

Scale: 1:2,500

Lyall & Associates

LEGEND

RS17 HEC-RAS Cross Section and Identifier

Quarry Boundary

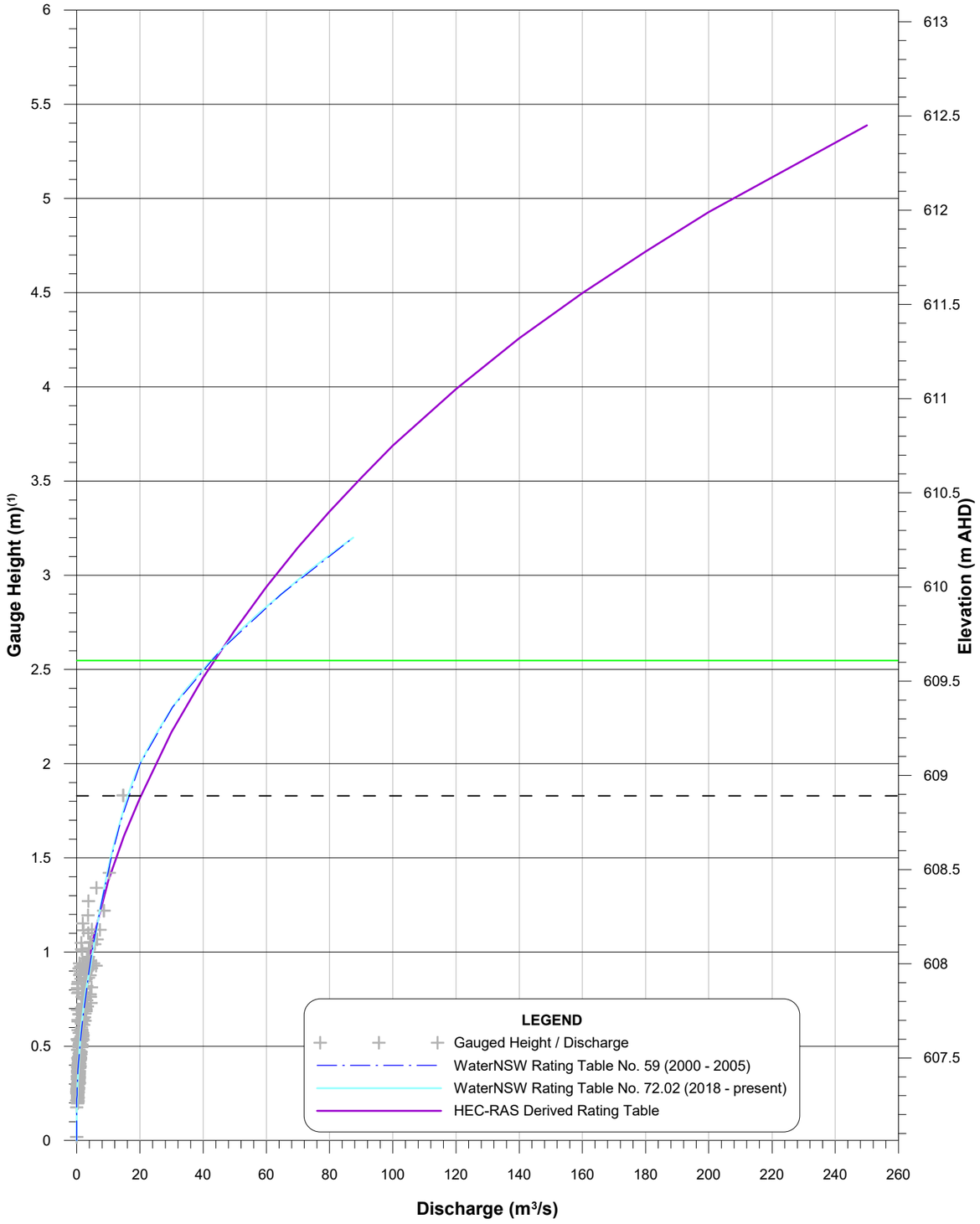
Existing Bridge

MURRAYS CROSSING QUARRY FLOODING INVESTIGATION

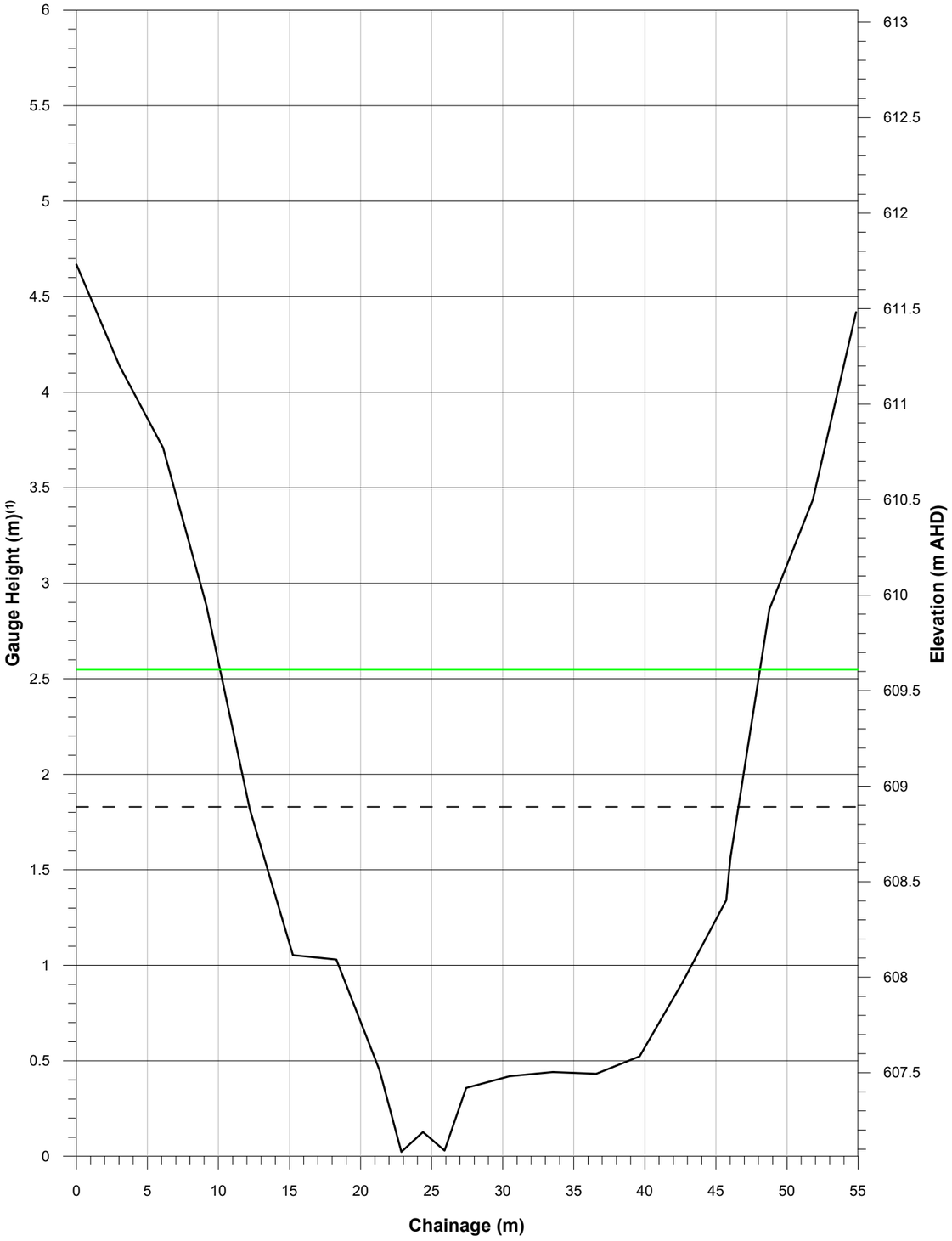
Figure 2
(Sheet 2 of 2)

HEC-RAS MODEL LAYOUT

RATING CURVES



CROSS SECTION(2)



LEGEND

November 2021 Peak Height - 2.55 m (609.61 m AHD)

Max Gauged Height - 1.83 m (608.89 m AHD)

Lyall & Associates

NOTES:

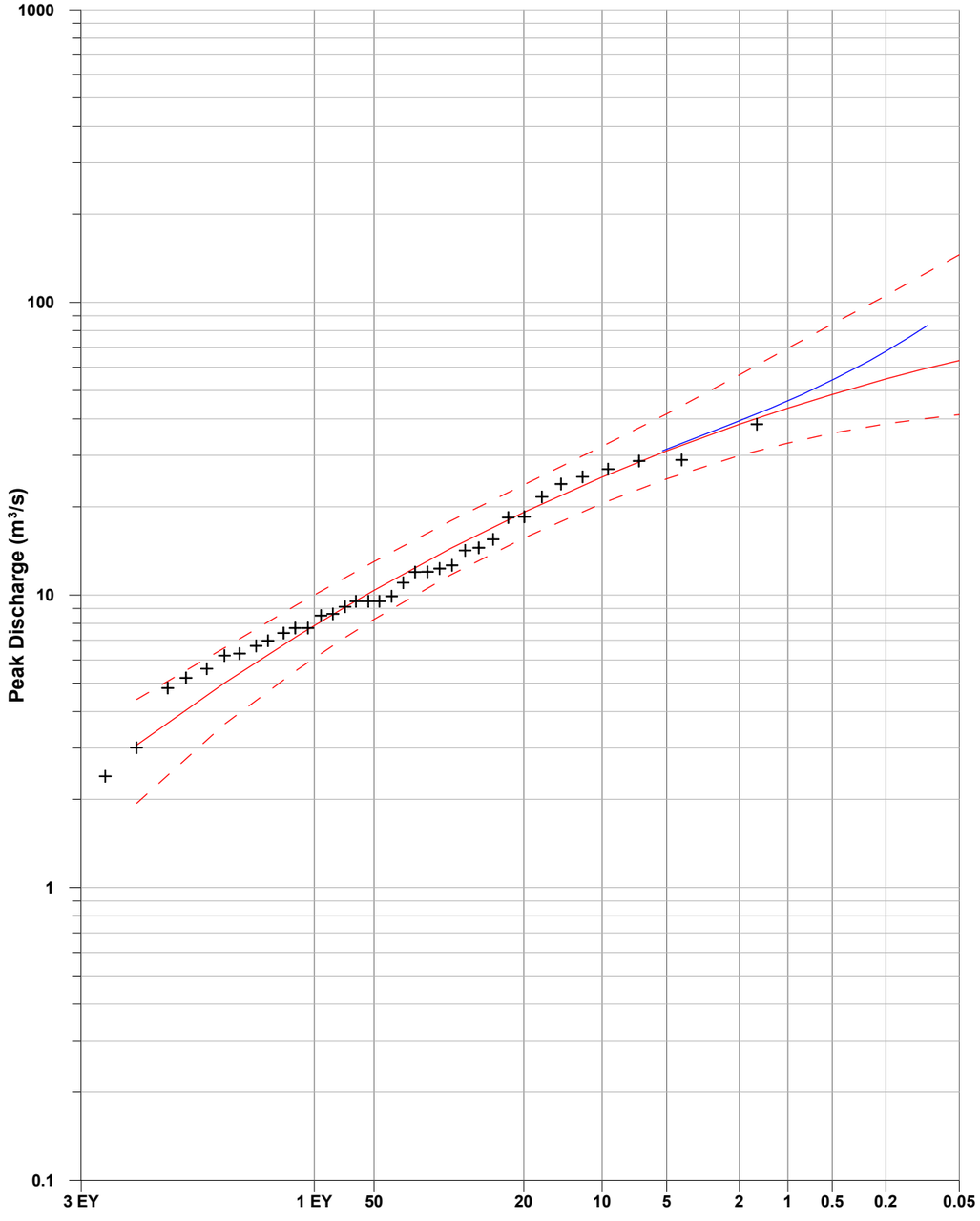
1. Gauge zero = 608.06 m AHD.
2. Surveyed cross section from WaterNSW PINNEENA database.

MURRAYS CROSSING QUARY FLOODING INVESTIGATION

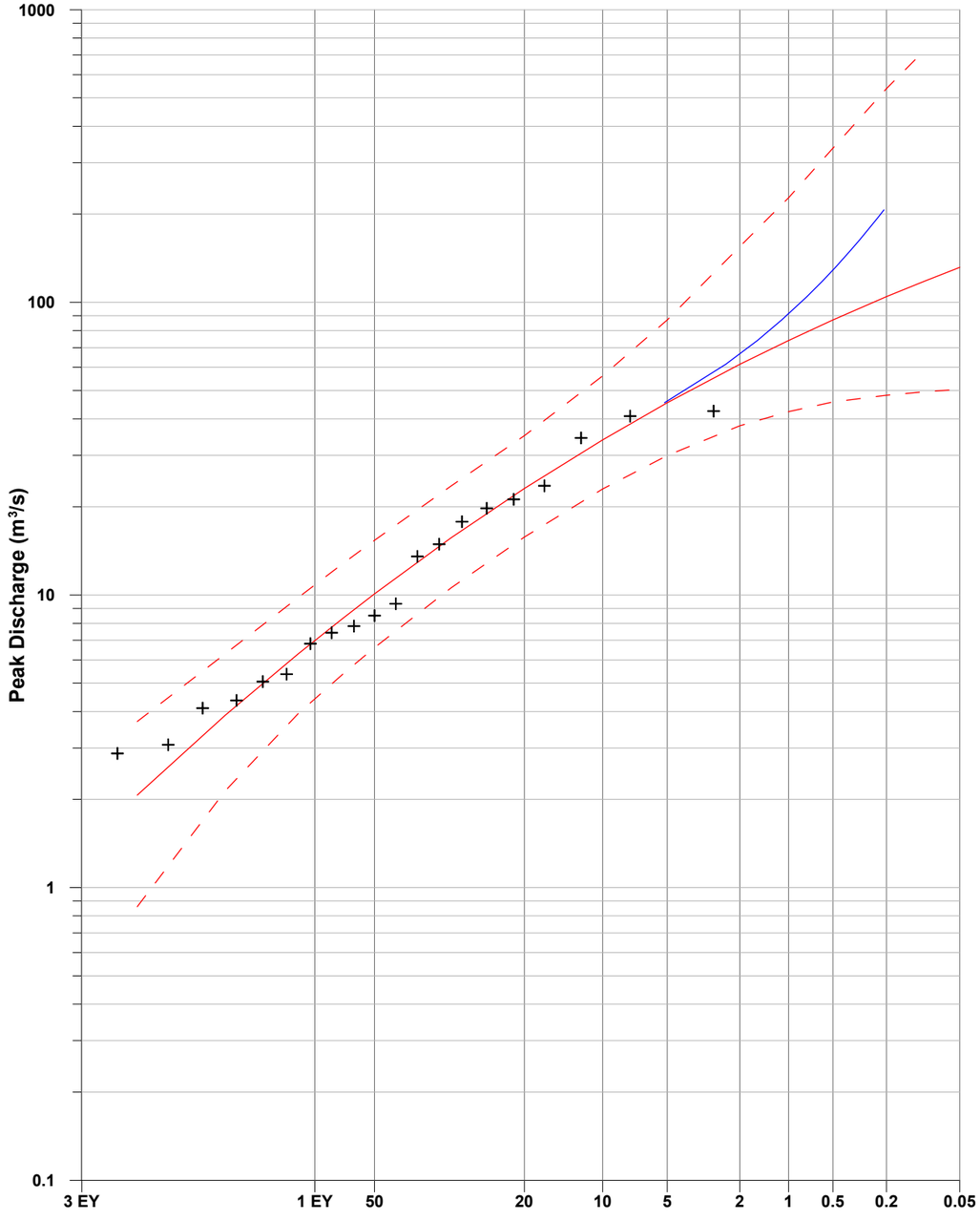
Figure 3

SURVEYED CROSS SECTION AND RATING CURVES
TUMBARUMBA CREEK AT TUMBARUMBA NO. 2 STREAM GAUGE

DECOMMISSIONED TUMBARUMBA STREAM GAUGE
FULL PERIOD OF RECORD (1946-1983)



TUMBARUMBA CREEK AT TUMBARUMBA No. 2 (GS 401007) STREAM GAUGE
FULL PERIOD OF RECORD (2001-2021)



LEGEND

- Expected Probability Adjustment
- Log-Pearson III 5% Confidence Limits
- Log-Pearson III Fit
- \+ Recorded Annual Maximum Discharge

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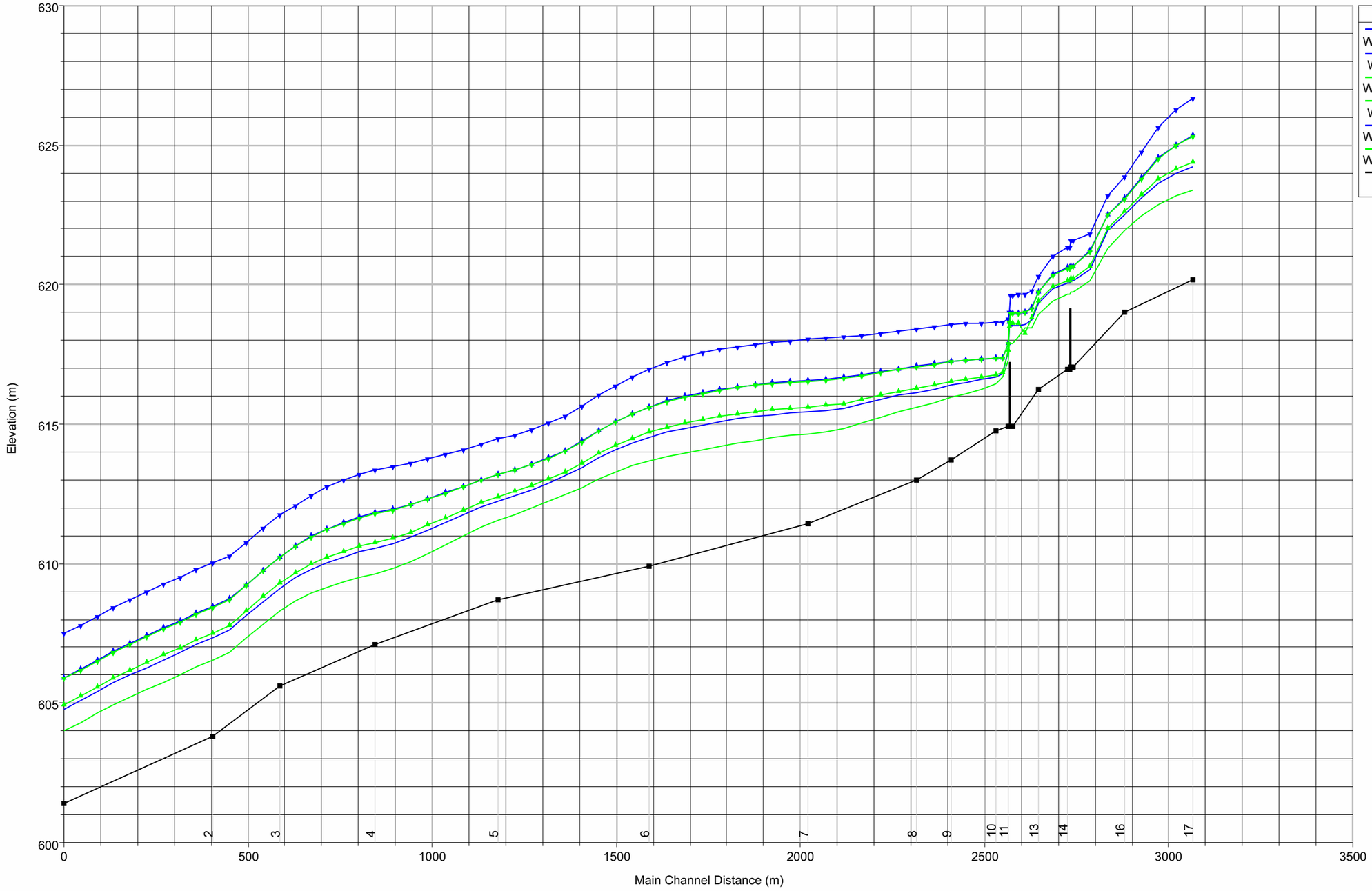
MURRAYS CROSSING QUARY
FLOODING INVESTIGATION

Figure 4

FLOOD FREQUENCY RELATIONSHIP
LOG-PEARSON 3 ANNUAL SERIES



MURRAYS CROSSING QUARRY
FLOODING INVESTIGATION

Figure 5

DESIGN WATER SURFACE PROFILES - TUMBARUMBA CREEK IN IMMEDIATE VICINITY OF QUARRY
5% AND 1% AEP

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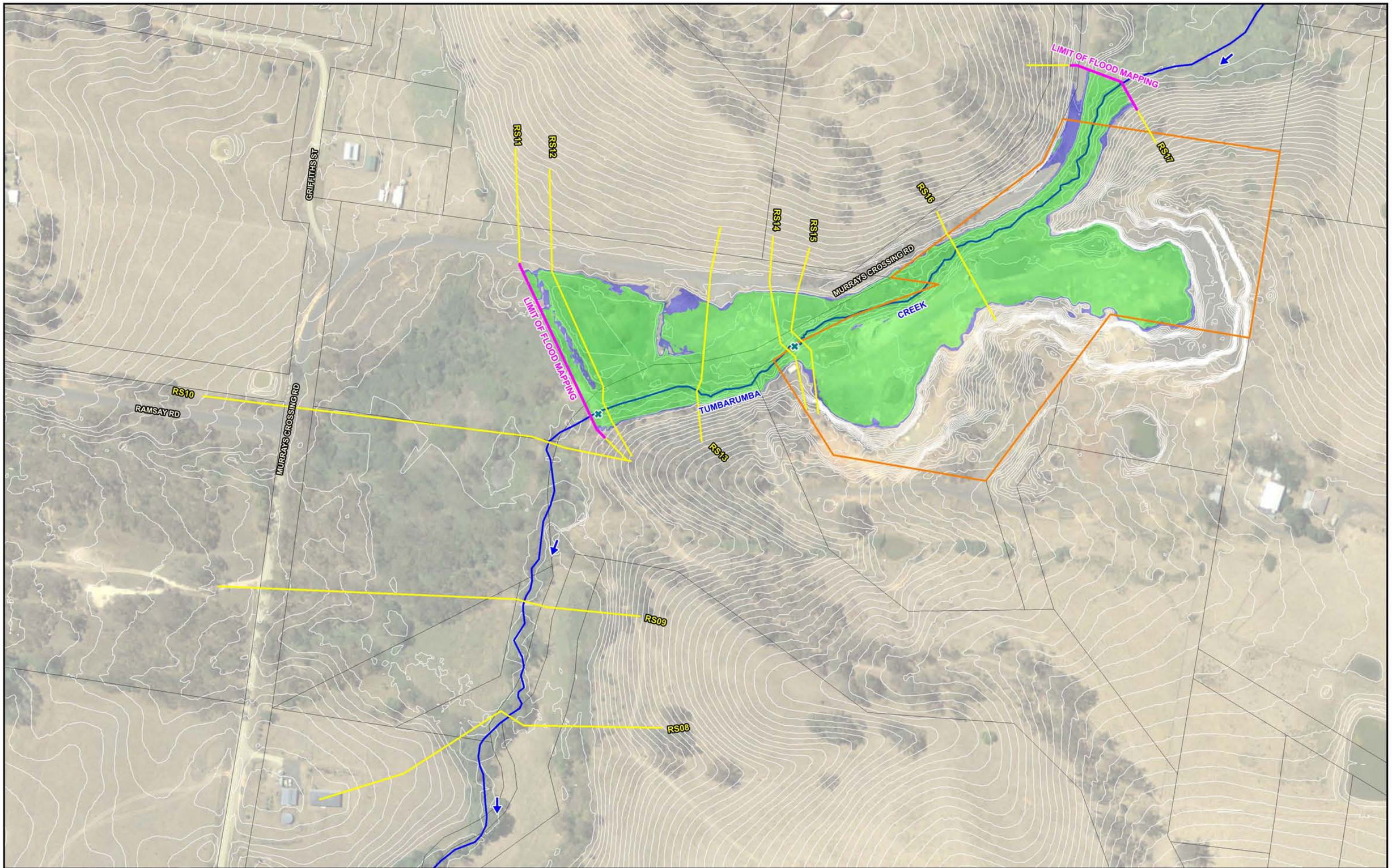


N

25 0 25 50 75 m

Scale: 1:2,500

Lyall & Associates

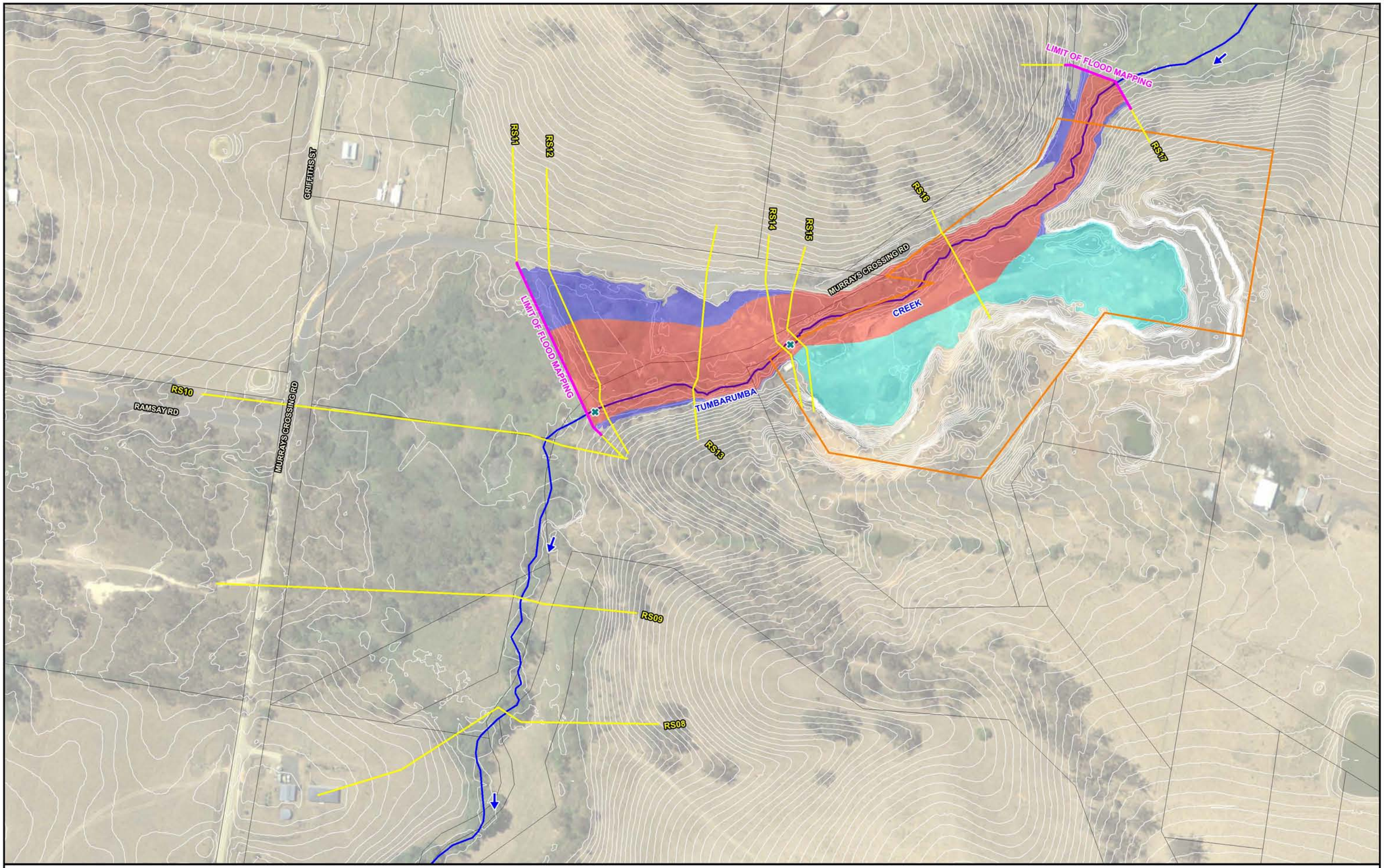
LEGEND

- RS17 — HEC-RAS Cross Section and Identifier
- Quarry Boundary
- Existing Bridge
- 5% AEP Extent
- 1% AEP Extent

MURRAYS CROSSING QUARRY
FLOODING INVESTIGATION

Figure 6

INDICATIVE EXTENT OF INUNDATION - TUMBARUMBA CREEK IN IMMEDIATE VICINITY OF QUARRY
5% AND 1% AEP FLOOD EVENTS



Lyall & Associates

MURRAYS CROSSING QUARRY
FLOODING INVESTIGATION

Figure 7

HYDRAULIC CATEGORISATION OF FLOODPLAIN - TUMBARUMBA CREEK IN IMMEDIATE VICINITY OF QUARRY
1% AEP FLOOD EVENT

ANNEXURE A

TABULATED HEC-RAS MODEL RESULTS – 5% AEP

HEC-RAS Plan: TumCK_5AEP_Comp River: 1 Reach: 113

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Q Left	Q Channel	Q Right	Vel Left	Vel Chnl	Vel Right	Max Chl Dpth	Crit Depth	Froude # Chl
			(m3/s)	(m)	(m)	(m3/s)	(m3/s)	(m3/s)	(m/s)	(m/s)	(m/s)	(m)	(m)	
113	17	5% AEP Lower Bou	45.00	620.19	623.37	3.72	20.01	21.27	0.50	0.89	0.70	3.18	1.75	0.17
113	17	5% AEP Best Esti	101.00	620.19	624.40	12.73	38.82	49.44	0.78	1.25	0.99	4.22	2.24	0.21
113	17	5% AEP Upper Bou	180.00	620.19	625.30	31.23	61.62	87.15	1.15	1.60	1.26	5.11	2.78	0.24
113	16	5% AEP Lower Bou	45.00	619.01	621.95	0.41	44.59	0.00	0.48	1.43	0.08	2.94	1.58	0.31
113	16	5% AEP Best Esti	101.00	619.01	622.61	30.02	70.61	0.36	1.55	1.72	0.50	3.60	2.43	0.33
113	16	5% AEP Upper Bou	180.00	619.01	623.08	86.03	92.68	1.30	2.33	1.92	0.69	4.07	3.52	0.34
113	15	5% AEP Lower Bou	45.00	617.05	619.74	1.48	22.32	21.20	0.43	0.89	1.08	2.68	1.73	0.20
113	15	5% AEP Best Esti	101.00	617.05	620.21	7.22	35.79	57.99	0.75	1.15	1.71	3.16	2.45	0.23
113	15	5% AEP Upper Bou	180.00	617.05	620.65	22.93	50.51	106.56	1.03	1.38	2.26	3.59	2.82	0.26
113	14.5		Bridge											
113	14	5% AEP Lower Bou	45.00	616.95	619.63	0.05	21.81	23.14	0.21	0.86	1.00	2.68	1.72	0.20
113	14	5% AEP Best Esti	101.00	616.95	620.14	0.39	33.79	66.82	0.37	1.05	1.55	3.19	2.47	0.22
113	14	5% AEP Upper Bou	180.00	616.95	620.59	1.13	49.46	129.41	0.52	1.30	2.13	3.64	2.77	0.24
113	13	5% AEP Lower Bou	45.00	616.25	618.93	4.04	34.46	6.50	1.02	1.77	0.62	2.69	1.86	0.37
113	13	5% AEP Best Esti	101.00	616.25	619.41	8.81	56.96	35.24	1.46	2.42	1.20	3.17	2.83	0.46
113	13	5% AEP Upper Bou	180.00	616.25	619.72	13.33	76.54	90.13	1.79	2.93	1.89	3.47	3.34	0.53
113	12	5% AEP Lower Bou	45.00	614.92	617.89		43.62	1.38		1.99	0.70	2.97	2.18	0.50
113	12	5% AEP Best Esti	101.00	614.92	618.60	0.80	17.48	82.72	0.27	0.56	0.50	3.67	3.29	0.12
113	12	5% AEP Upper Bou	180.00	614.92	618.95	2.53	28.72	148.75	0.46	0.79	0.73	4.03	3.29	0.15
113	11.5		Bridge											
113	11	5% AEP Lower Bou	45.00	614.92	617.29	0.00	18.30	26.70	0.02	1.48	0.70	2.37	2.14	0.36
113	11	5% AEP Best Esti	101.00	614.92	617.66	0.46	26.93	73.61	0.46	1.79	1.09	2.74	2.42	0.39
113	11	5% AEP Upper Bou	180.00	614.92	617.88	2.27	40.67	137.06	0.92	2.45	1.61	2.95	2.65	0.51
113	10	5% AEP Lower Bou	45.00	614.75	616.44		5.84	39.16		0.46	0.66	1.69	1.40	0.18
113	10	5% AEP Best Esti	101.00	614.75	616.78	0.31	9.56	91.13	0.15	0.50	0.81	2.03	1.58	0.16
113	10	5% AEP Upper Bou	180.00	614.75	617.35	2.08	14.35	163.57	0.23	0.48	0.79	2.60	1.75	0.12
113	9	5% AEP Lower Bou	45.00	613.73	615.97	5.53	15.78	23.69	0.33	0.63	0.38	2.24	1.70	0.18
113	9	5% AEP Best Esti	101.00	613.73	616.54	21.00	23.15	56.85	0.49	0.64	0.46	2.81	1.93	0.15
113	9	5% AEP Upper Bou	180.00	613.73	617.24	44.48	32.15	103.37	0.58	0.64	0.49	3.51	2.17	0.13
113	8	5% AEP Lower Bou	45.00	612.99	615.59	13.81	14.93	16.27	0.43	0.58	0.40	2.59	1.87	0.14
113	8	5% AEP Best Esti	101.00	612.99	616.28	43.08	22.95	34.97	0.60	0.64	0.50	3.28	2.19	0.13
113	8	5% AEP Upper Bou	180.00	612.99	617.04	87.32	32.94	59.74	0.74	0.70	0.56	4.05	2.41	0.13
113	7	5% AEP Lower Bou	45.00	611.45	614.65	4.32	16.54	24.14	0.39	0.48	0.32	3.20	1.74	0.10
113	7	5% AEP Best Esti	101.00	611.45	615.62	15.23	25.89	59.88	0.54	0.53	0.42	4.17	2.21	0.09
113	7	5% AEP Upper Bou	180.00	611.45	616.54	33.82	37.79	108.39	0.67	0.60	0.52	5.09	2.73	0.09
113	6	5% AEP Lower Bou	45.00	609.90	613.68	17.00	21.61	6.39	0.66	1.02	0.54	3.78	2.13	0.18
113	6	5% AEP Best Esti	101.00	609.90	614.71	42.72	36.31	21.96	0.96	1.32	0.89	4.81	2.87	0.20
113	6	5% AEP Upper Bou	180.00	609.90	615.59	79.65	52.31	48.04	1.25	1.59	1.23	5.69	3.52	0.22
113	5	5% AEP Lower Bou	45.00	608.70	611.55	0.10	14.24	30.66	0.25	0.89	0.94	2.85	1.95	0.18
113	5	5% AEP Best Esti	101.00	608.70	612.40	0.81	21.74	78.45	0.39	1.01	1.23	3.70	2.35	0.18
113	5	5% AEP Upper Bou	180.00	608.70	613.18	2.32	29.93	147.75	0.49	1.12	1.51	4.48	2.87	0.18
113	4	5% AEP Lower Bou	45.00	607.09	609.65	4.48	15.59	24.93	0.58	0.76	0.65	2.56	1.14	0.16
113	4	5% AEP Best Esti	101.00	607.09	610.76	14.40	31.12	55.48	0.83	1.01	0.82	3.68	1.60	0.18
113	4	5% AEP Upper Bou	180.00	607.09	611.78	28.13	46.03	105.84	0.97	1.15	0.96	4.70	2.08	0.18
113	3	5% AEP Lower Bou	45.00	605.60	608.29	6.37	32.84	5.80	0.80	1.39	0.72	2.69	1.69	0.30
113	3	5% AEP Best Esti	101.00	605.60	609.29	18.77	59.49	22.74	1.05	1.74	1.17	3.69	2.41	0.31
113	3	5% AEP Upper Bou	180.00	605.60	610.21	39.88	89.16	50.96	1.29	2.04	1.57	4.61	3.04	0.32
113	2	5% AEP Lower Bou	45.00	603.80	606.53	0.85	37.58	6.57	0.87	1.12	1.07	2.73	1.43	0.24
113	2	5% AEP Best Esti	101.00	603.80	607.50	3.55	69.14	28.32	1.24	1.44	1.59	3.70	2.25	0.26
113	2	5% AEP Upper Bou	180.00	603.80	608.42	8.79	104.81	66.40	1.54	1.69	2.01	4.62	2.86	0.27
113	1	5% AEP Lower Bou	45.00	601.40	604.00	0.06	37.60	7.34	0.46	1.22	1.30	2.60	1.54	0.28
113	1	5% AEP Best Esti	101.00	601.40	604.95	1.69	73.24	26.07	1.08	1.59	1.93	3.55	2.25	0.30
113	1	5% AEP Upper Bou	180.00	601.40	605.88	6.92	117.15	55.92	1.55	1.92	2.41	4.48	2.86	0.31

ANNEXURE B

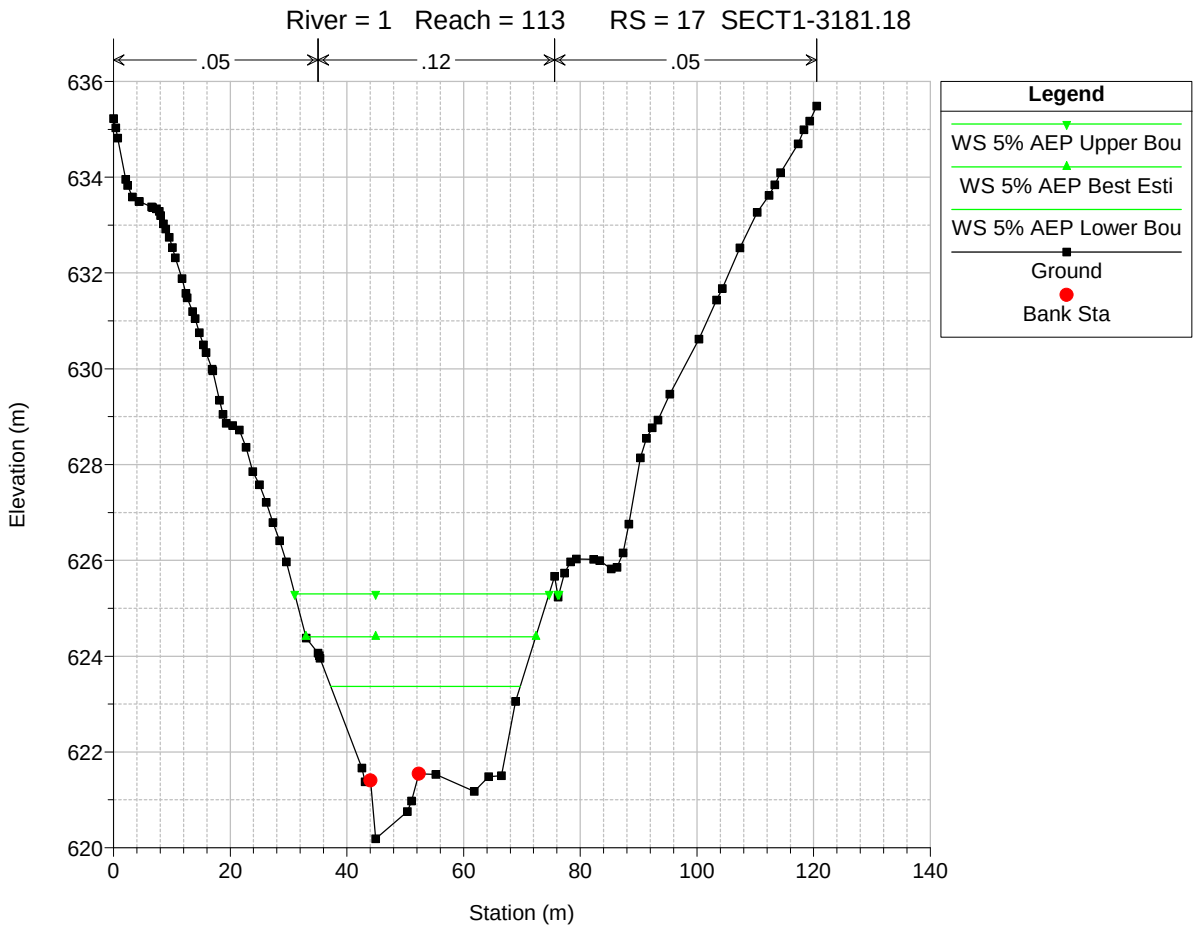
TABULATED HEC-RAS MODEL RESULTS – 1% AEP

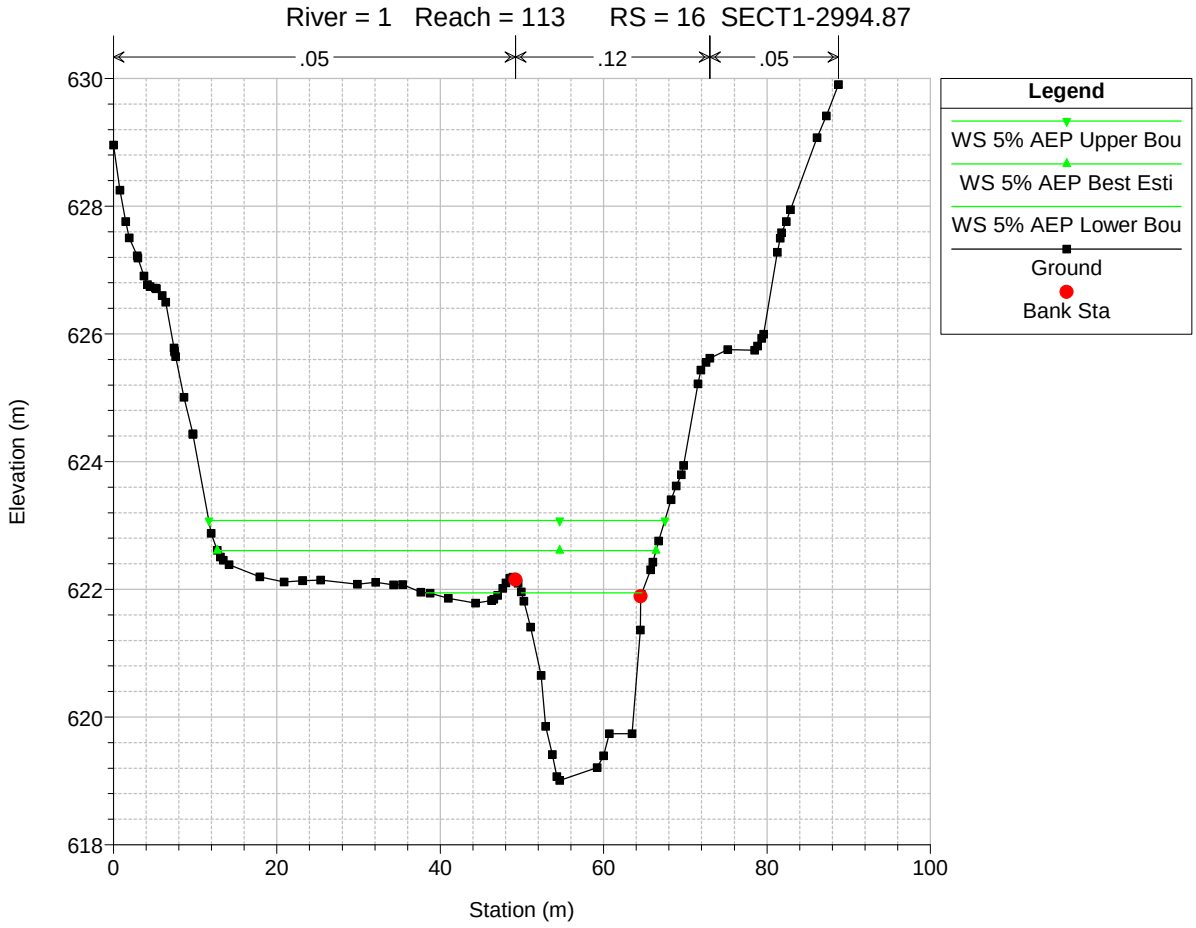
HEC-RAS Plan: TumCK_1AEP_Comp River: 1 Reach: 113

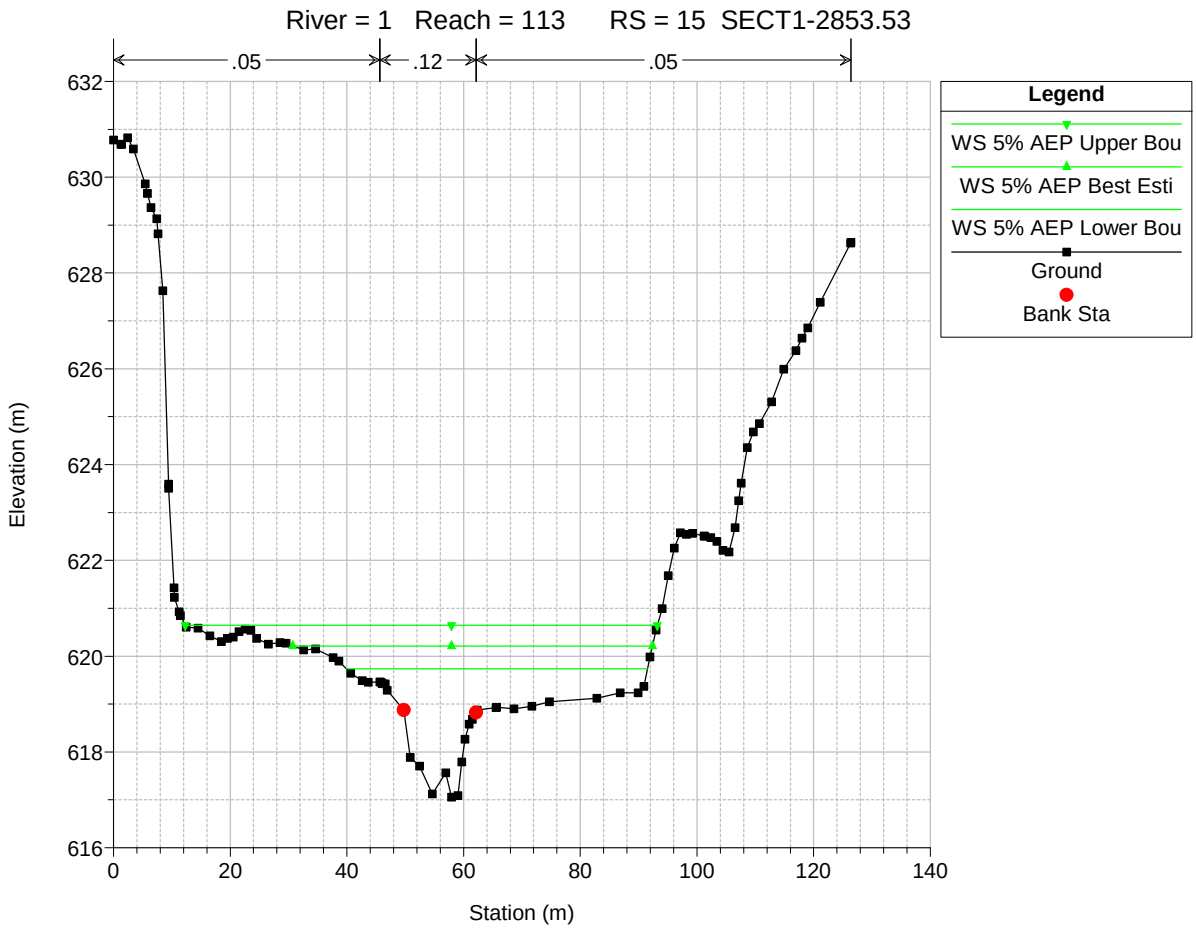
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Q Left	Q Channel	Q Right	Vel Left	Vel Chnl	Vel Right	Max Chl Dpth	Crit Depth	Froude # Chl
			(m3/s)	(m)	(m)	(m3/s)	(m3/s)	(m3/s)	(m/s)	(m/s)	(m/s)	(m)	(m)	
113	17	1% AEP Lower Bou	89.00	620.19	624.23	10.37	35.06	43.57	0.71	1.18	0.94	4.04	2.14	0.20
113	17	1% AEP Best Esti	183.00	620.19	625.33	32.02	62.42	88.56	1.16	1.61	1.27	5.14	2.79	0.24
113	17	1% AEP Upper Bou	375.00	620.19	626.67	82.03	104.74	188.23	1.74	2.10	1.71	6.49	3.83	0.27
113	16	1% AEP Lower Bou	89.00	619.01	622.51	21.95	66.79	0.25	1.37	1.68	0.45	3.50	2.27	0.33
113	16	1% AEP Best Esti	183.00	619.01	623.09	88.23	93.43	1.34	2.35	1.92	0.70	4.09	3.53	0.34
113	16	1% AEP Upper Bou	375.00	619.01	623.86	232.07	138.15	4.77	3.48	2.29	0.95	4.85	4.13	0.37
113	15	1% AEP Lower Bou	89.00	617.05	620.13	5.99	33.05	49.96	0.74	1.10	1.59	3.08	2.37	0.23
113	15	1% AEP Best Esti	183.00	617.05	620.67	24.21	50.68	108.11	1.04	1.38	2.26	3.62	2.83	0.26
113	15	1% AEP Upper Bou	375.00	617.05	621.56	100.62	70.66	203.72	1.74	1.48	2.67	4.51	3.72	0.24
113	14.5		Bridge											
113	14	1% AEP Lower Bou	89.00	616.95	620.05	0.30	31.28	57.41	0.34	1.01	1.45	3.10	2.42	0.21
113	14	1% AEP Best Esti	183.00	616.95	620.60	1.16	50.03	131.81	0.53	1.30	2.15	3.65	2.80	0.25
113	14	1% AEP Upper Bou	375.00	616.95	621.33	3.89	84.41	286.70	0.73	1.75	3.15	4.38	3.53	0.29
113	13	1% AEP Lower Bou	89.00	616.25	619.34	7.98	53.46	27.56	1.40	2.33	1.09	3.09	2.72	0.45
113	13	1% AEP Best Esti	183.00	616.25	619.73	13.47	77.10	92.43	1.79	2.94	1.91	3.48	3.34	0.53
113	13	1% AEP Upper Bou	375.00	616.25	620.28	21.23	106.80	246.98	2.00	3.46	3.02	4.04	3.83	0.58
113	12	1% AEP Lower Bou	89.00	614.92	618.53	0.60	15.69	72.70	0.23	0.51	0.45	3.60	3.09	0.11
113	12	1% AEP Best Esti	183.00	614.92	618.96	2.60	29.14	151.26	0.47	0.80	0.74	4.04	3.29	0.16
113	12	1% AEP Upper Bou	375.00	614.92	619.62	9.54	53.67	311.79	0.84	1.18	1.15	4.70	3.29	0.21
113	11.5		Bridge											
113	11	1% AEP Lower Bou	89.00	614.92	617.60	0.23	25.25	63.52	0.36	1.73	1.02	2.67	2.38	0.39
113	11	1% AEP Best Esti	183.00	614.92	617.88	2.35	41.20	139.46	0.94	2.47	1.63	2.96	2.66	0.52
113	11	1% AEP Upper Bou	375.00	614.92	618.76	19.06	49.50	306.44	1.43	2.15	1.56	3.84	3.11	0.38
113	10	1% AEP Lower Bou	89.00	614.75	616.70	0.17	8.81	80.02	0.13	0.50	0.80	1.95	1.55	0.16
113	10	1% AEP Best Esti	183.00	614.75	617.38	2.17	14.53	166.30	0.23	0.48	0.79	2.63	1.74	0.12
113	10	1% AEP Upper Bou	375.00	614.75	618.64	9.20	27.10	338.70	0.29	0.50	0.77	3.89	2.06	0.09
113	9	1% AEP Lower Bou	89.00	613.73	616.42	17.48	21.74	49.78	0.46	0.64	0.45	2.69	1.90	0.16
113	9	1% AEP Best Esti	183.00	613.73	617.26	45.37	32.48	105.15	0.58	0.65	0.50	3.53	2.16	0.13
113	9	1% AEP Upper Bou	375.00	613.73	618.58	102.57	53.81	218.61	0.71	0.71	0.56	4.85	2.47	0.11
113	8	1% AEP Lower Bou	89.00	612.99	616.14	36.60	21.34	31.06	0.58	0.63	0.48	3.15	2.14	0.13
113	8	1% AEP Best Esti	183.00	612.99	617.07	89.02	33.32	60.66	0.74	0.70	0.57	4.07	2.42	0.13
113	8	1% AEP Upper Bou	375.00	612.99	618.42	194.28	55.12	125.60	0.93	0.82	0.71	5.42	2.80	0.12
113	7	1% AEP Lower Bou	89.00	611.45	615.44	12.76	23.95	52.30	0.52	0.51	0.40	3.99	2.21	0.09
113	7	1% AEP Best Esti	183.00	611.45	616.57	34.62	38.21	110.17	0.68	0.60	0.52	5.12	2.74	0.09
113	7	1% AEP Upper Bou	375.00	611.45	618.03	91.36	63.04	220.60	0.92	0.74	0.69	6.58	3.18	0.10
113	6	1% AEP Lower Bou	89.00	609.90	614.53	37.09	33.53	18.37	0.90	1.27	0.83	4.63	2.76	0.20
113	6	1% AEP Best Esti	183.00	609.90	615.62	81.05	52.85	49.09	1.26	1.59	1.24	5.72	3.56	0.22
113	6	1% AEP Upper Bou	375.00	609.90	616.96	170.61	82.05	122.34	1.72	1.97	1.77	7.06	4.59	0.24
113	5	1% AEP Lower Bou	89.00	608.70	612.25	0.62	20.32	68.06	0.37	0.98	1.18	3.55	2.27	0.18
113	5	1% AEP Best Esti	183.00	608.70	613.20	2.38	30.22	150.40	0.49	1.12	1.52	4.50	2.89	0.18
113	5	1% AEP Upper Bou	375.00	608.70	614.46	8.75	46.39	319.85	0.71	1.32	1.98	5.76	3.74	0.18
113	4	1% AEP Lower Bou	89.00	607.09	610.57	12.27	28.34	48.38	0.80	0.98	0.79	3.48	1.51	0.18
113	4	1% AEP Best Esti	183.00	607.09	611.82	28.62	46.50	107.88	0.98	1.15	0.97	4.73	2.10	0.18
113	4	1% AEP Upper Bou	375.00	607.09	613.36	56.22	67.32	251.46	1.08	1.24	1.07	6.27	2.96	0.16
113	3	1% AEP Lower Bou	89.00	605.60	609.11	16.06	54.21	18.73	1.02	1.68	1.09	3.51	2.28	0.31
113	3	1% AEP Best Esti	183.00	605.60	610.24	40.82	90.12	52.05	1.30	2.04	1.58	4.64	3.06	0.32
113	3	1% AEP Upper Bou	375.00	605.60	611.75	122.94	135.39	116.67	1.69	2.26	2.01	6.14	4.08	0.30
113	2	1% AEP Lower Bou	89.00	603.80	607.32	2.89	63.10	23.01	1.18	1.39	1.50	3.52	2.14	0.26
113	2	1% AEP Best Esti	183.00	603.80	608.45	9.02	106.07	67.91	1.55	1.69	2.02	4.65	2.88	0.27
113	2	1% AEP Upper Bou	375.00	603.80	610.02	26.15	175.65	173.20	1.88	2.03	2.49	6.22	3.98	0.27
113	1	1% AEP Lower Bou	89.00	601.40	604.77	1.16	66.01	21.83	0.98	1.53	1.83	3.37	2.15	0.30
113	1	1% AEP Best Esti	183.00	601.40	605.91	7.17	118.72	57.11	1.56	1.93	2.43	4.51	2.88	0.31
113	1	1% AEP Upper Bou	375.00	601.40	607.49	28.36	210.31	136.32	2.19	2.43	3.11	6.09	4.05	0.33

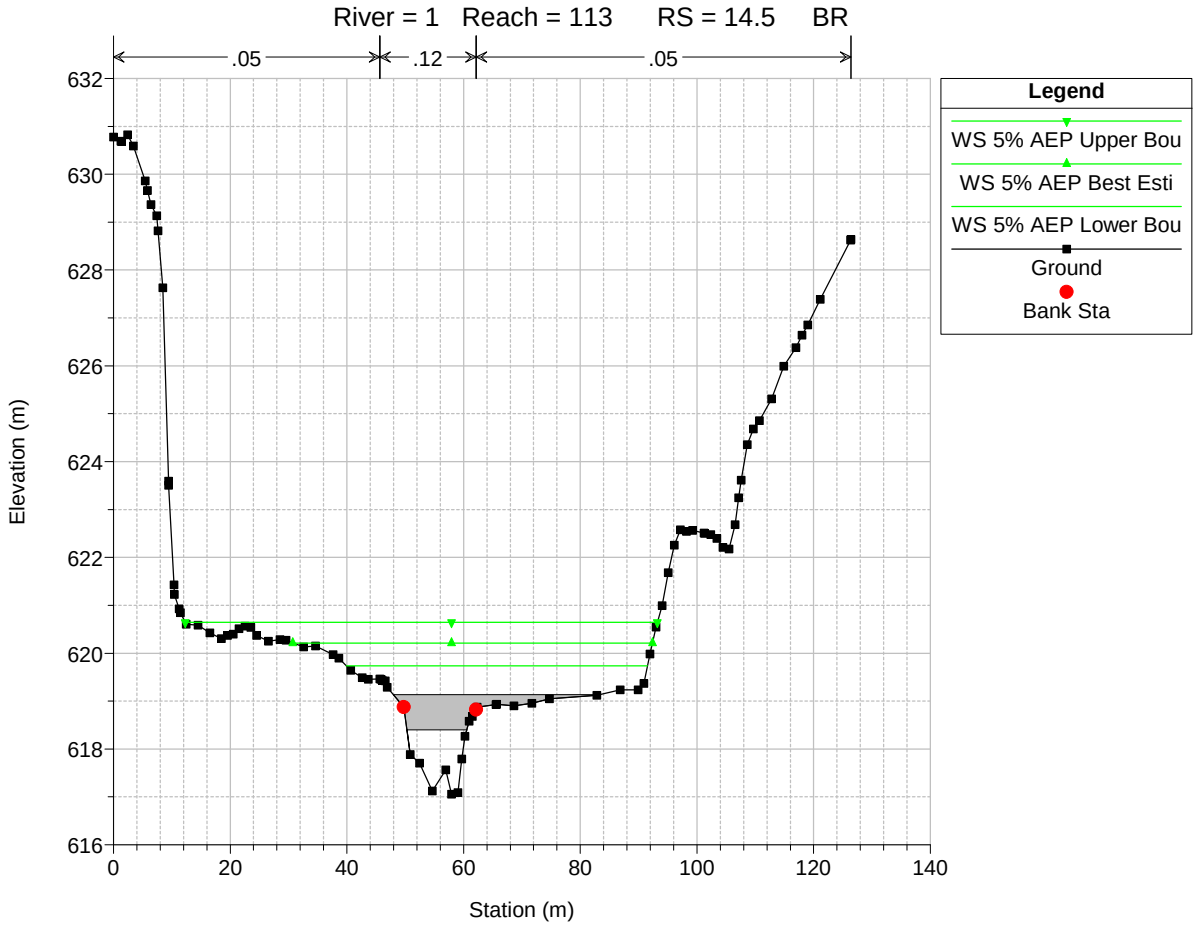
ANNEXURE C

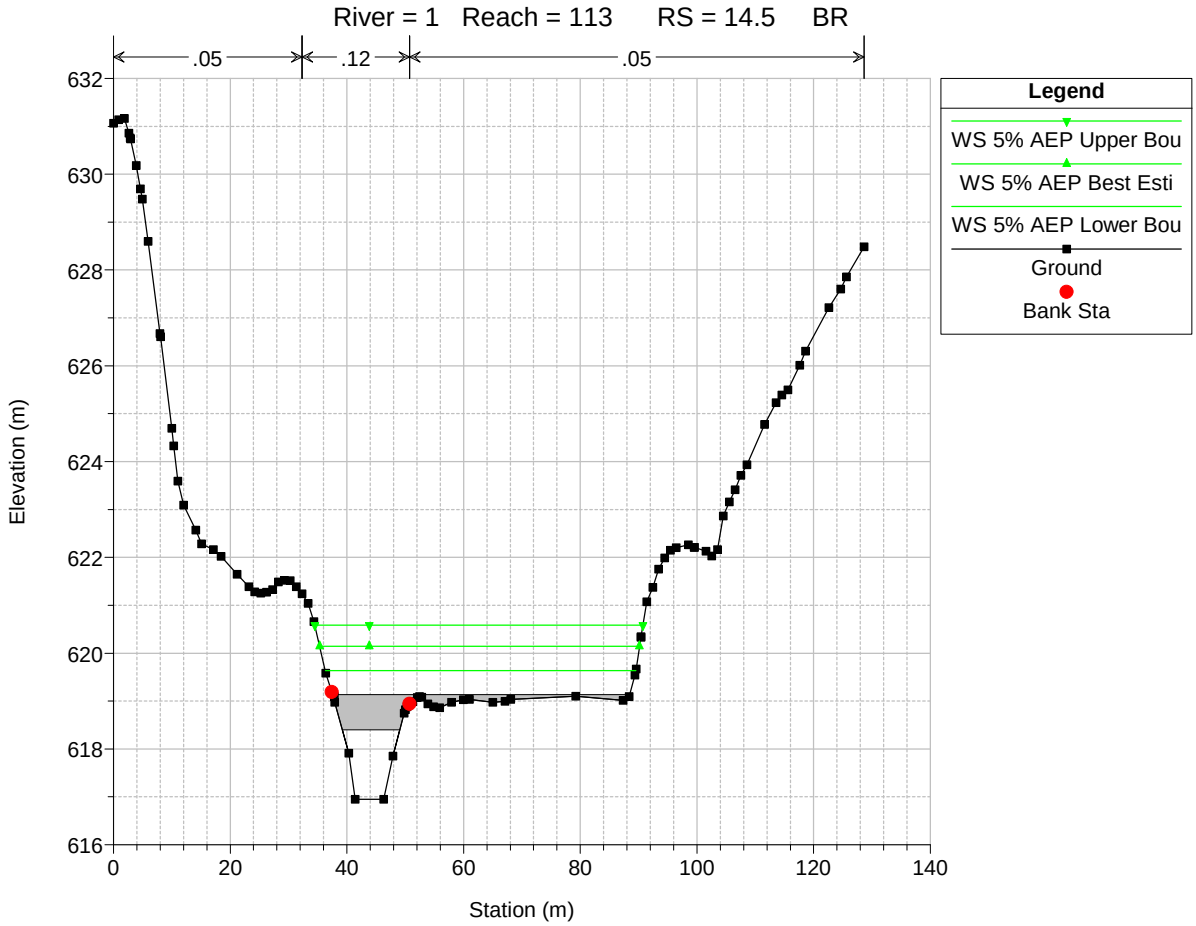
HEC-RAS MODEL CROSS SECTIONS – 5% AEP

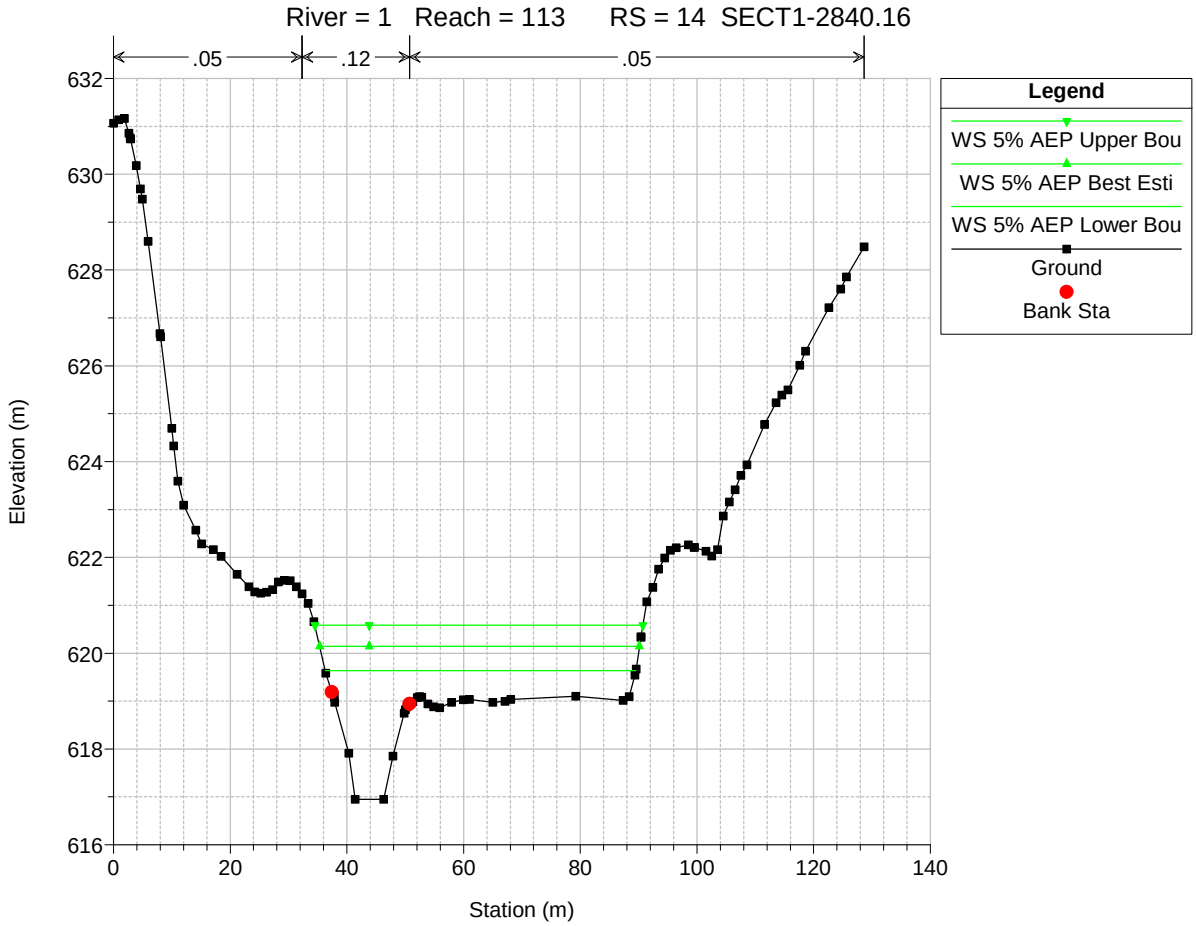

River = 1 Reach = 113 RS = 17 SECT1-3181.18
.05
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)
636
634
632
630
628
626
624
622
620
0
20
40
60
80
100
120
140


River = 1 Reach = 113 RS = 16 SECT1-2994.87
.05
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)
630
628
626
624
622
620
618
0
20
40
60
80
100


River = 1 Reach = 113 RS = 15 SECT1-2853.53
.05
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)
632
630
628
626
624
622
620
618
616
0
20
40
60
80
100
120
140


River = 1 Reach = 113 RS = 14.5 BR
.05
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)
632
630
628
626
624
622
620
618
616
0
20
40
60
80
100
120
140


River = 1 Reach = 113 RS = 14.5 BR
.05
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)
632
630
628
626
624
622
620
618
616
0
20
40
60
80
100
120
140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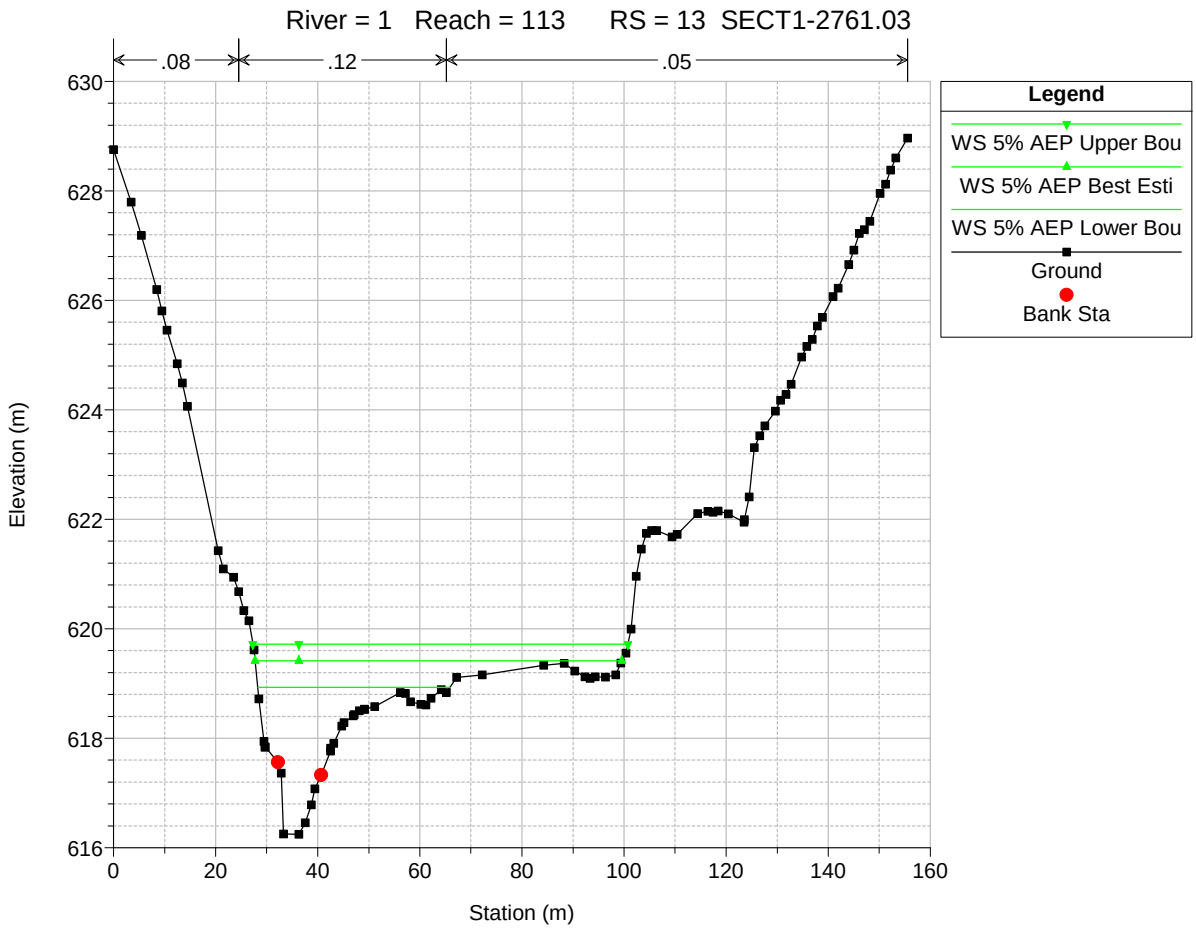
.05
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)
632
630
628
626
624
622
620
618
616
0
20
40
60
80
100
120
140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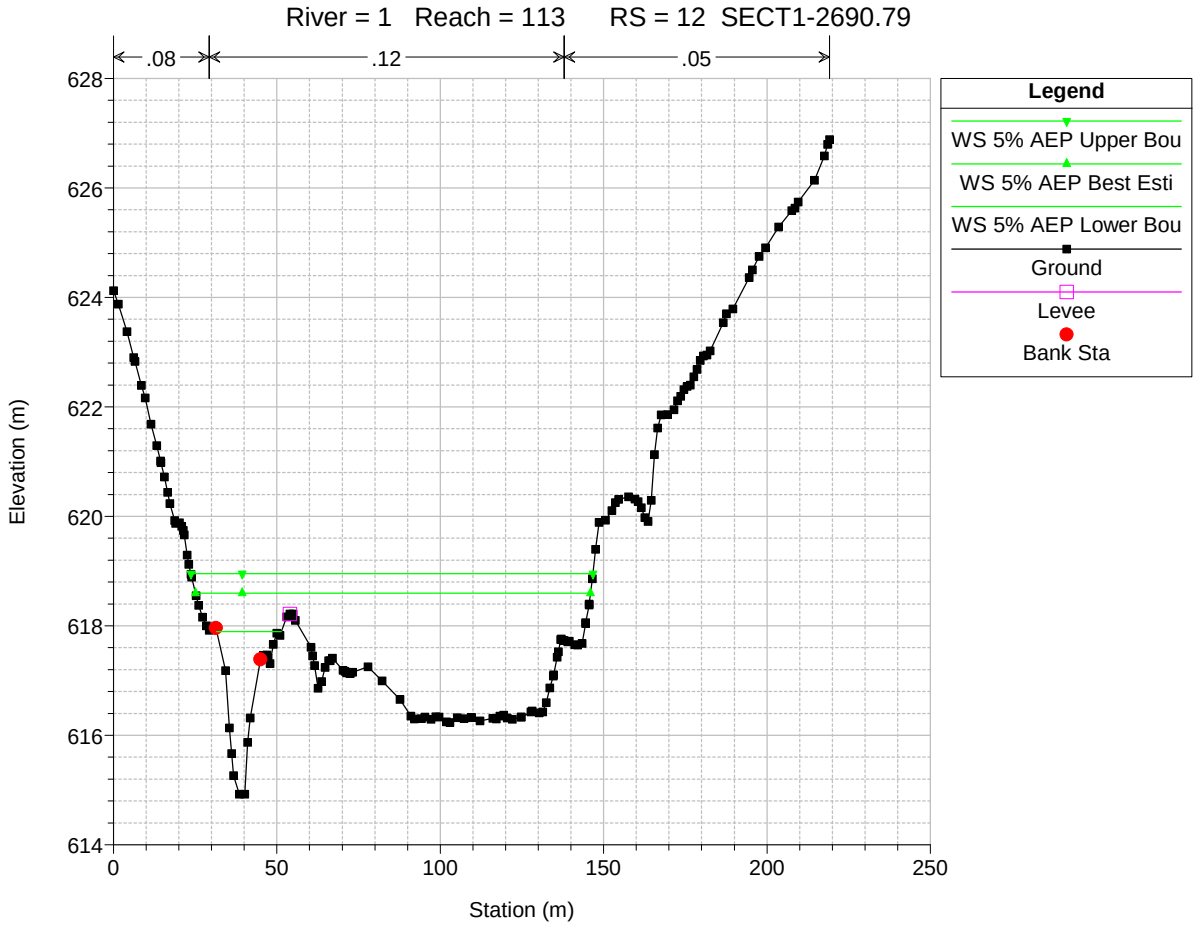
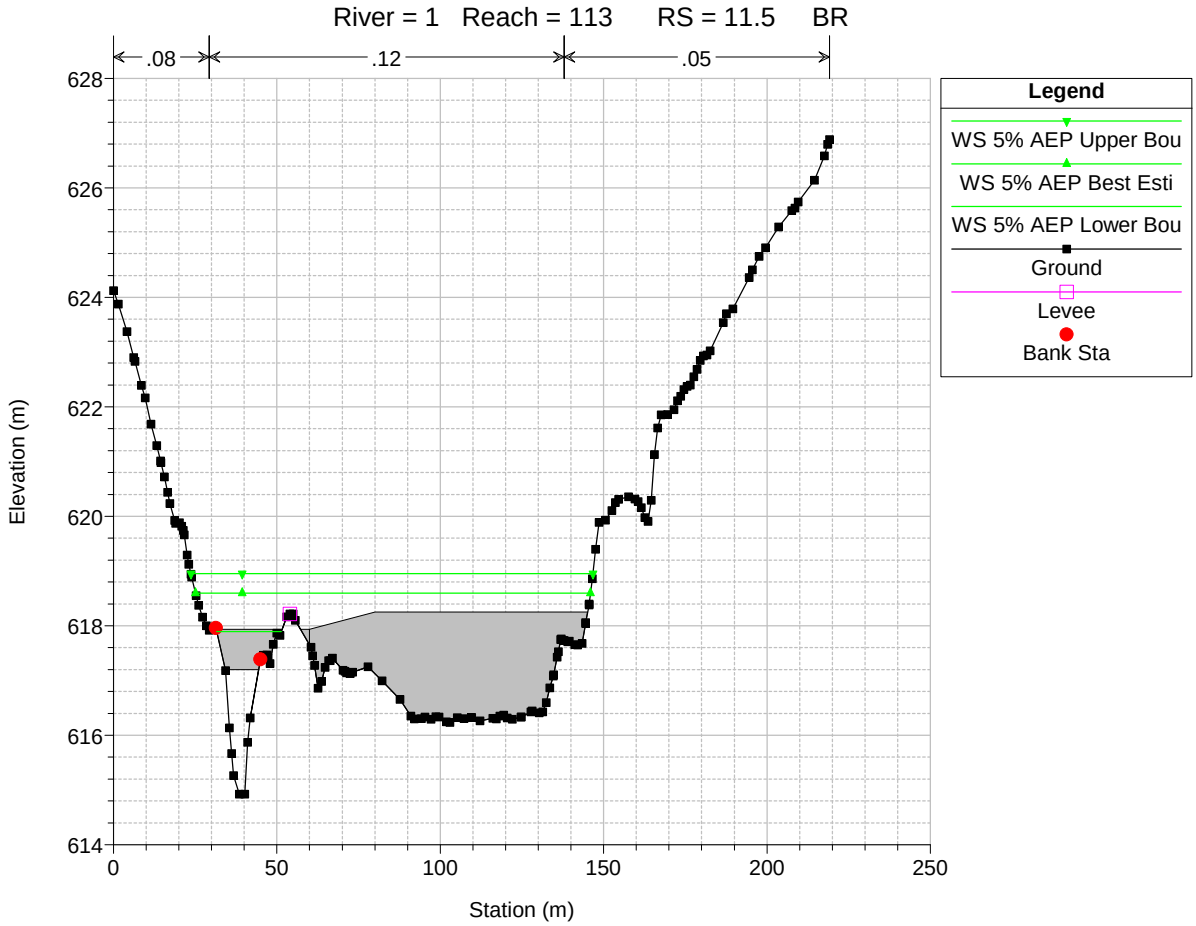
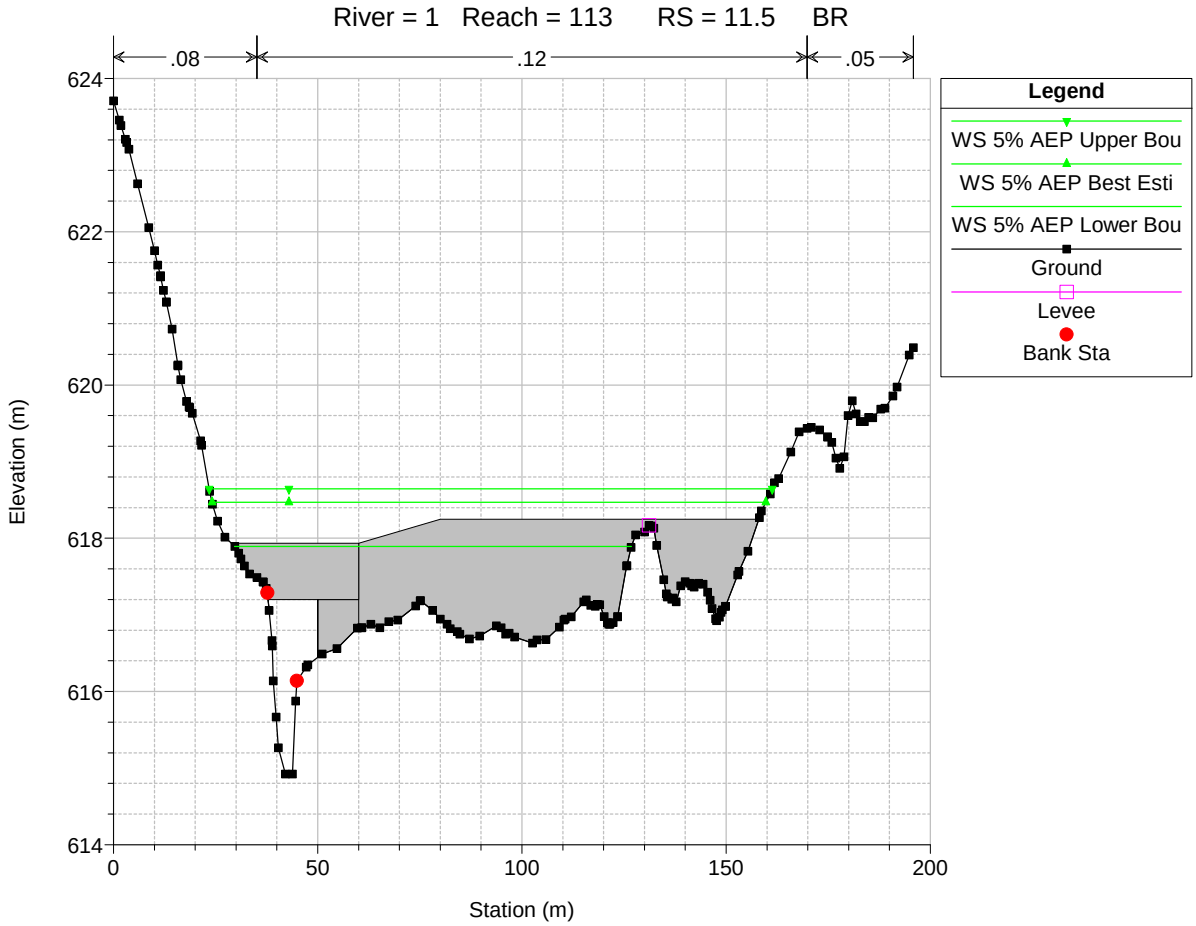
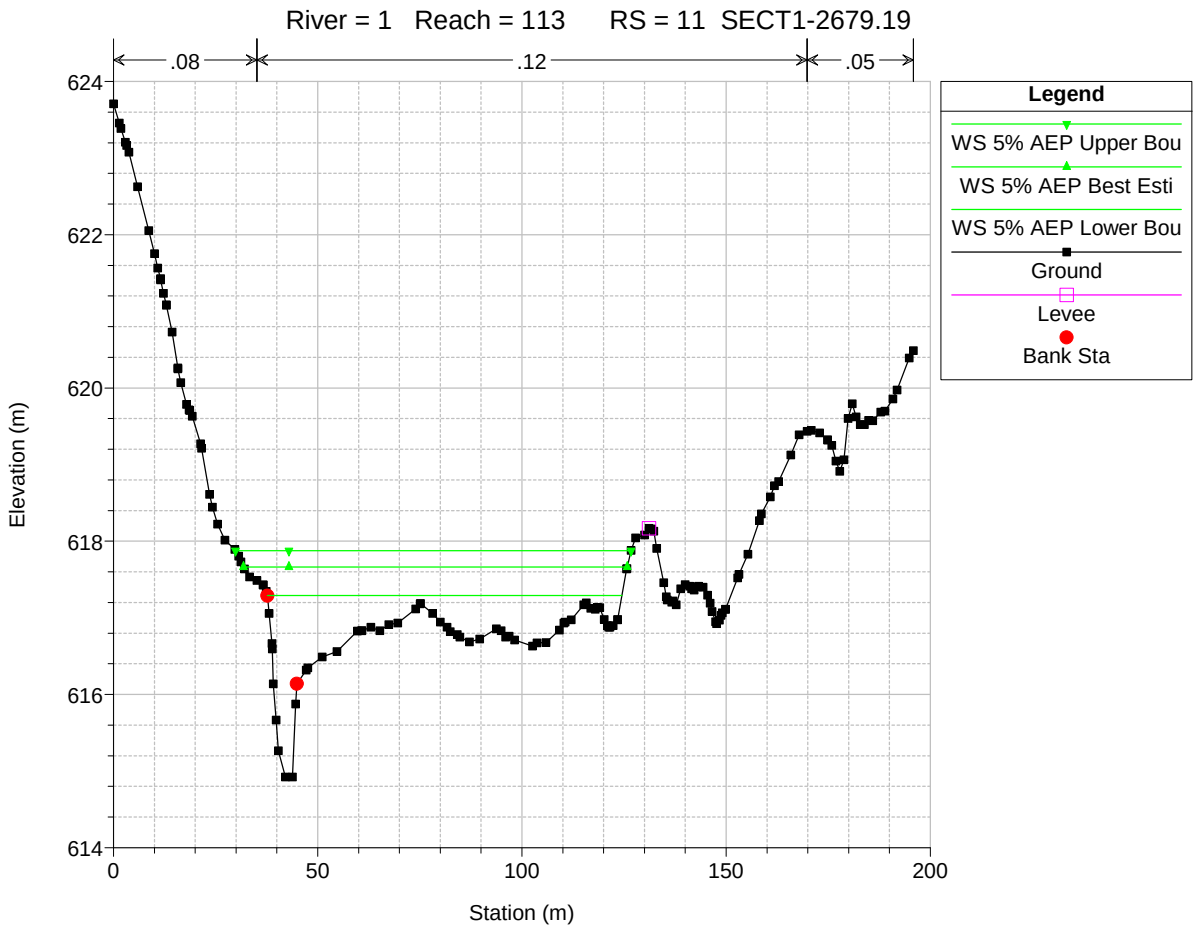
.08
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)
630
628
626
624
622
620
618
616
0
20
40
60
80
100
120
140
160


River = 1 Reach = 113 RS = 12 SECT1-2690.79
.08
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
628
626
624
622
620
618
616
614
0
50
100
150
200
250


River = 1 Reach = 113 RS = 11.5 BR
.08
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
628
626
624
622
620
618
616
614
0
50
100
150
200
250


River = 1 Reach = 113 RS = 11.5 BR
.08
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
624
622
620
618
616
614
0
50
100
150
200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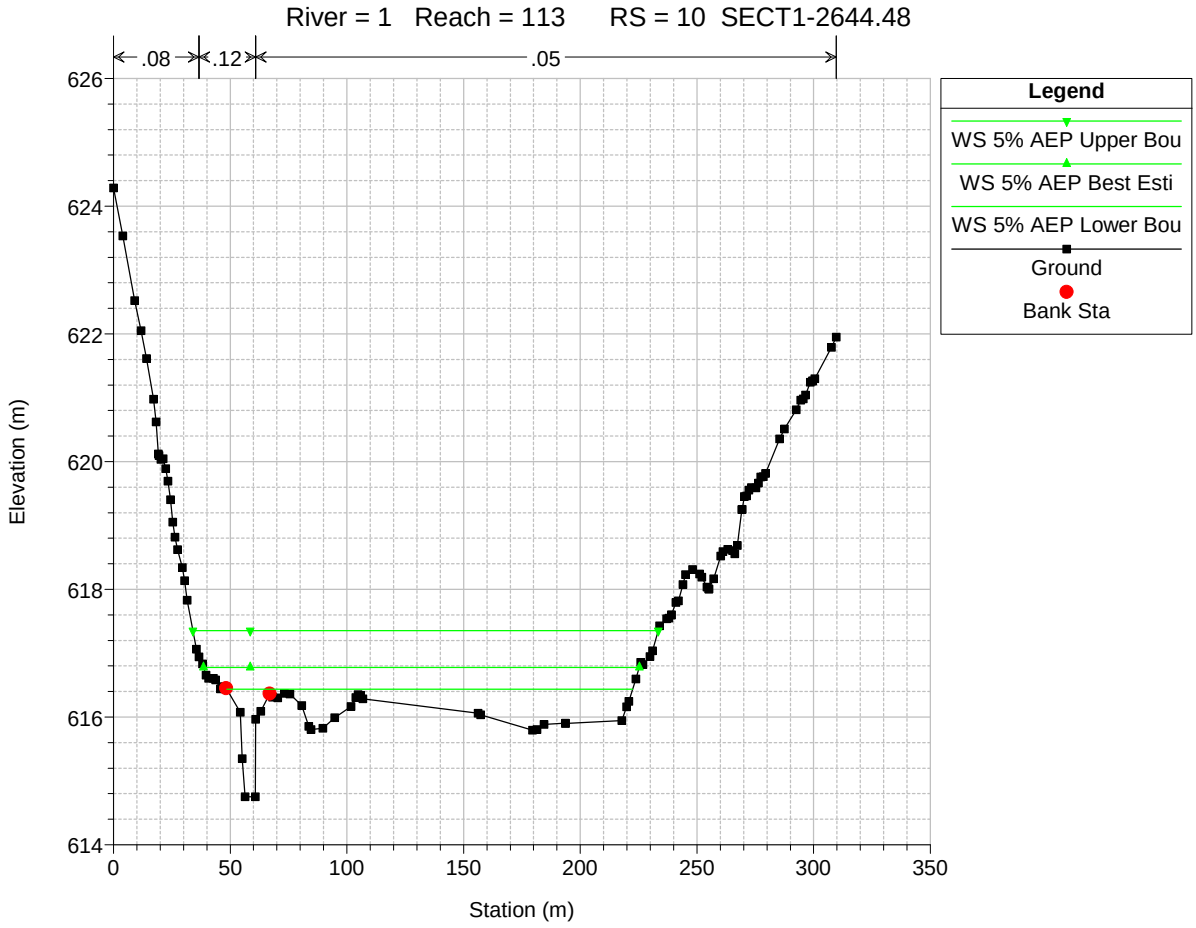
.08
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
624
622
620
618
616
614
0
50
100
150
200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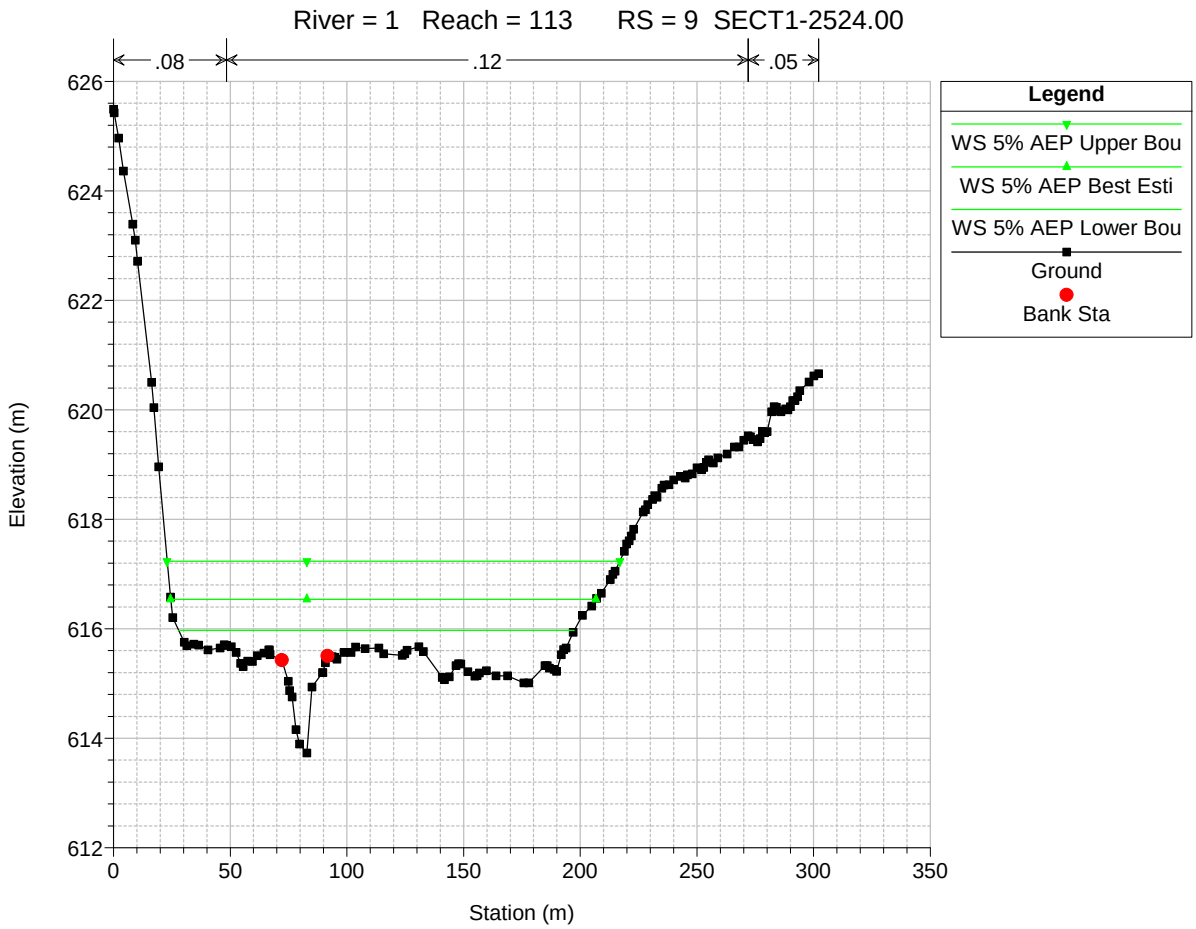
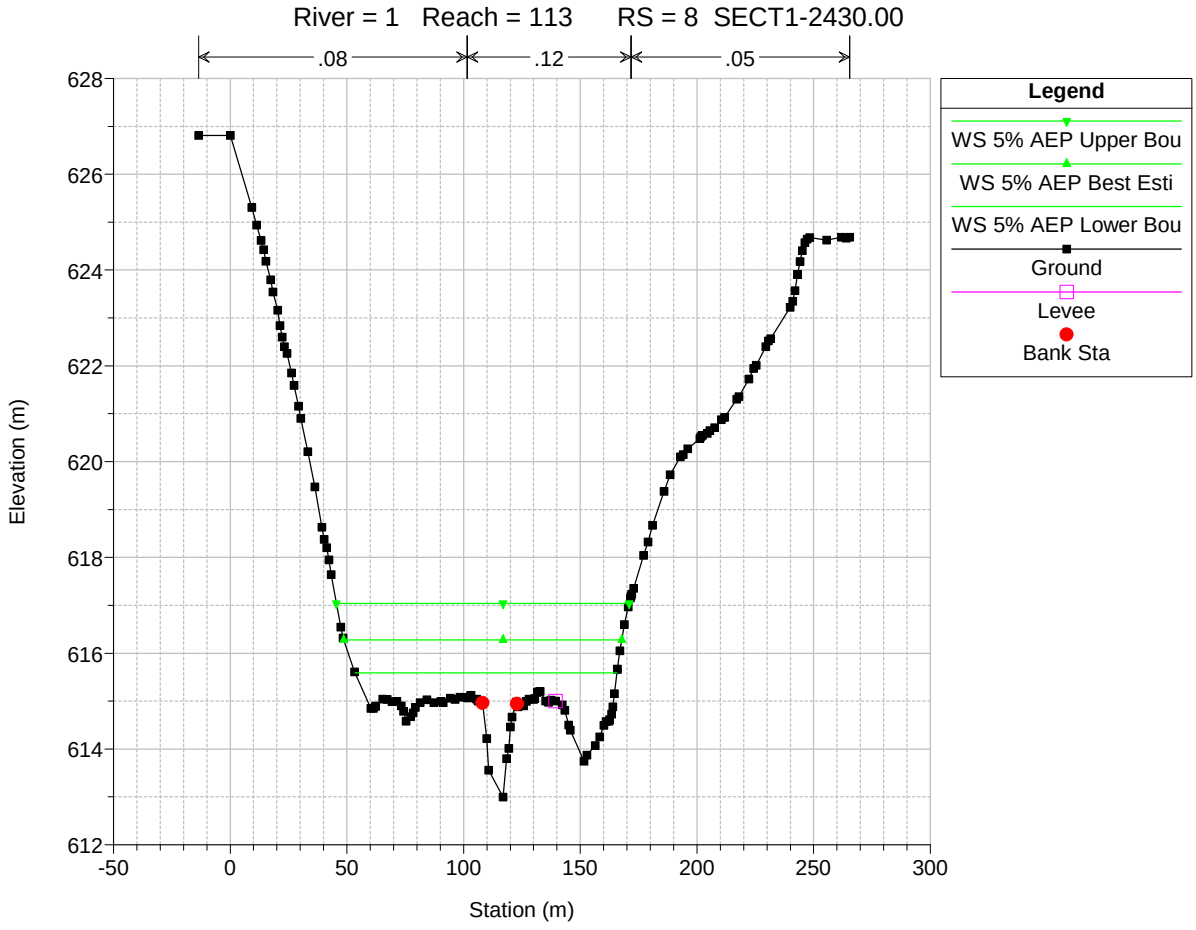
.08
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)
626
624
622
620
618
616
614
0
50
100
150
200
250
300
350


River = 1 Reach = 113 RS = 9 SECT1-2524.00
.08
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)
612
614
616
618
620
622
624
626
0
50
100
150
200
250
300
350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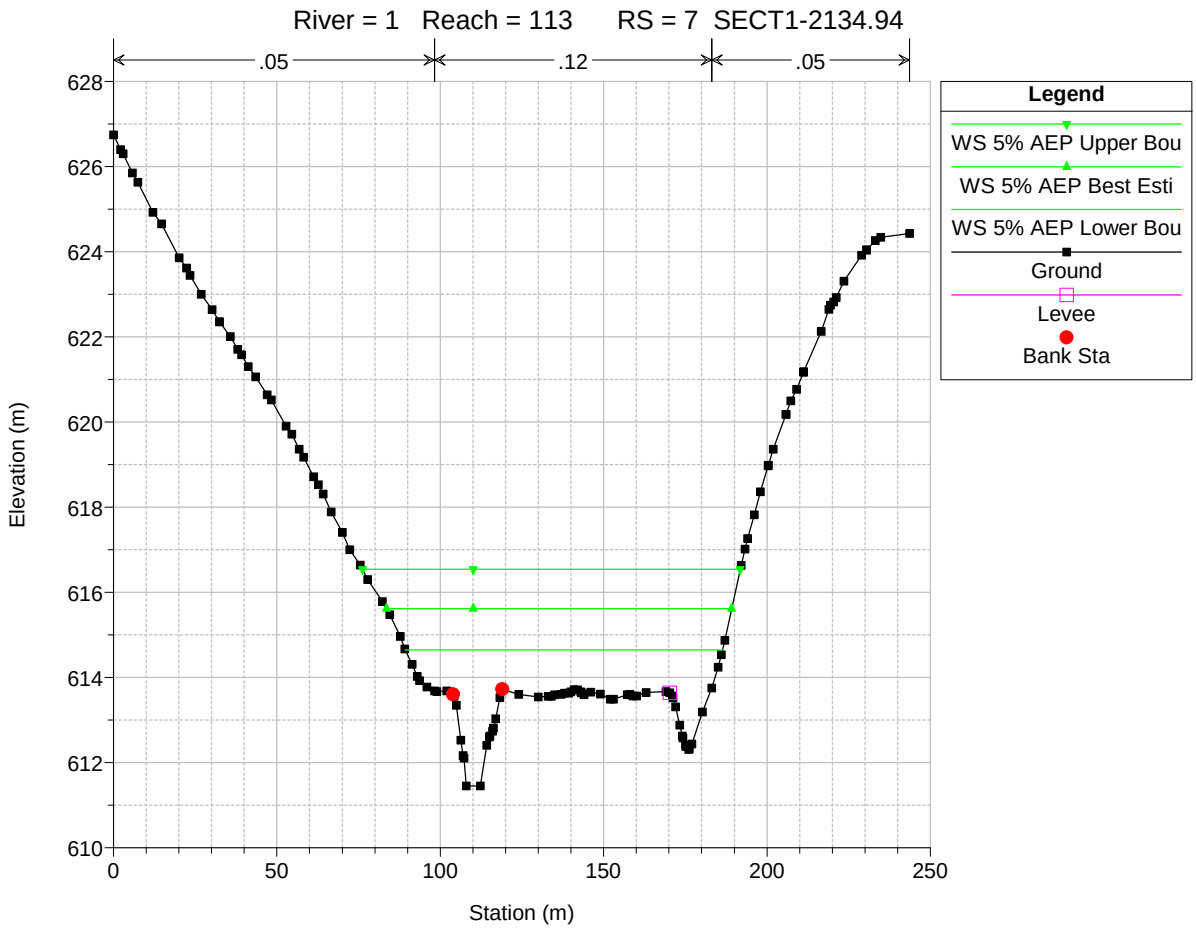
.08
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
612
614
616
618
620
622
624
626
628
-50
0
50
100
150
200
250
300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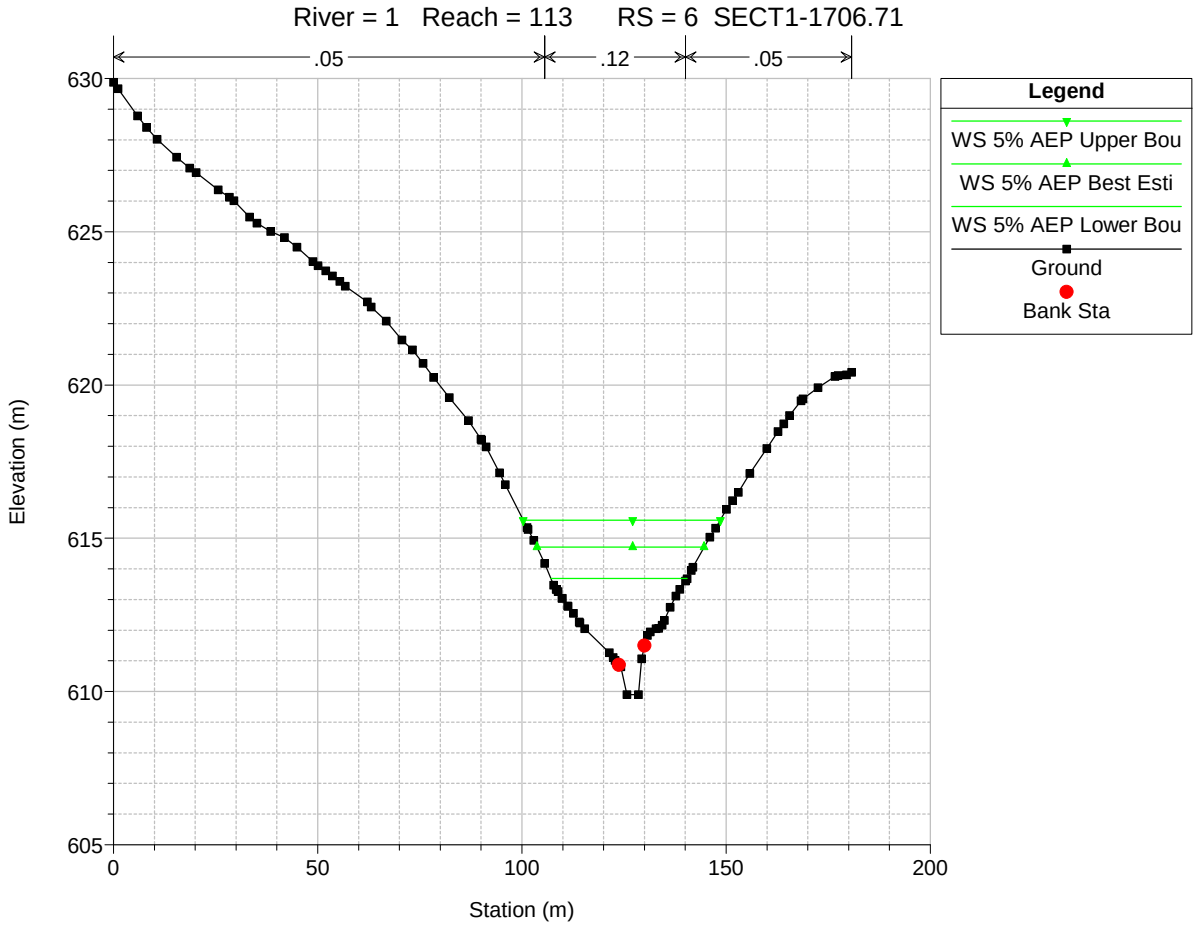
.05
.12
.05
Legend
WS 5% AEP Upper Bou
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Levee
Bank Sta
Elevation (m)
Station (m)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.05
.12
.05
Legend
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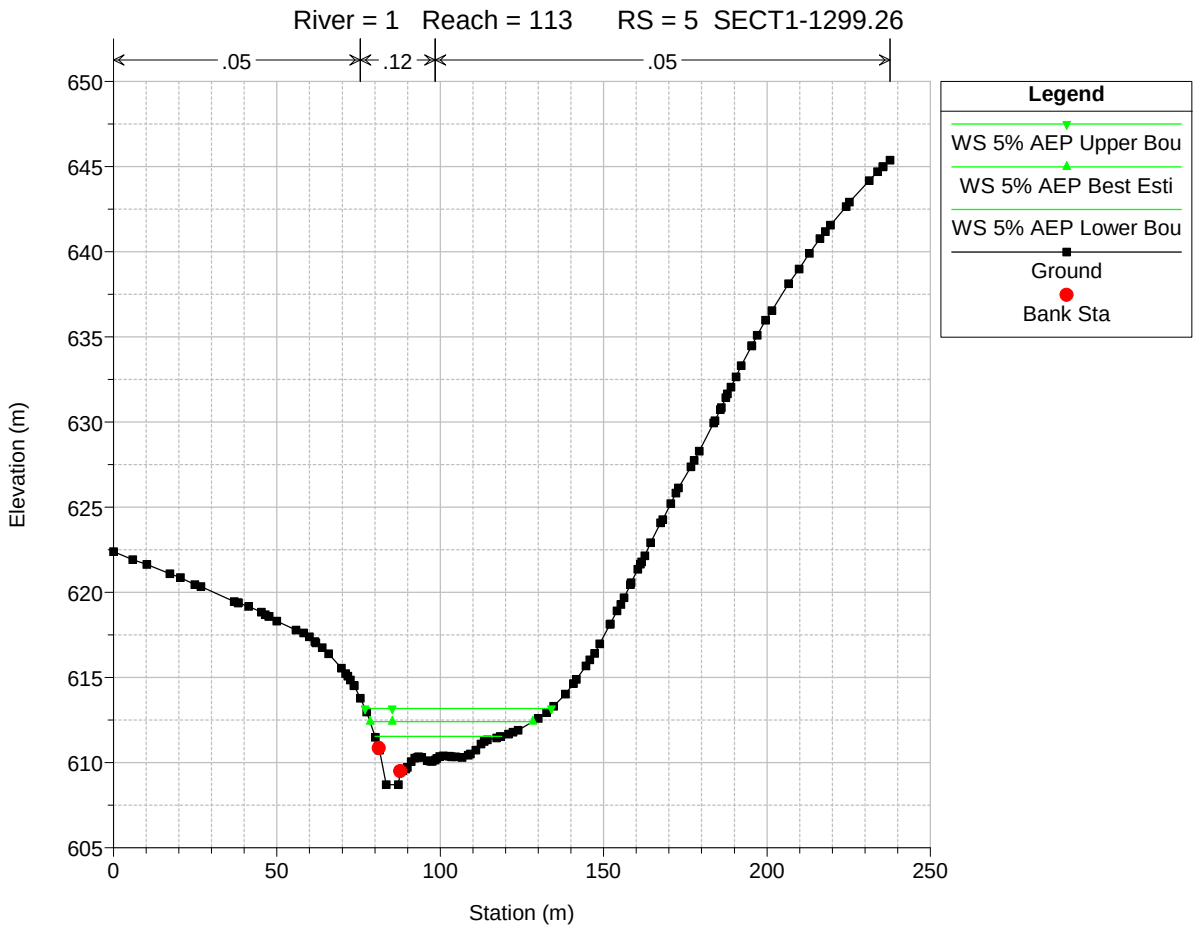
WS 5% AEP Best Esti
WS 5% AEP Lower Bou
Ground
Bank Sta
Elevation (m)
Station (m)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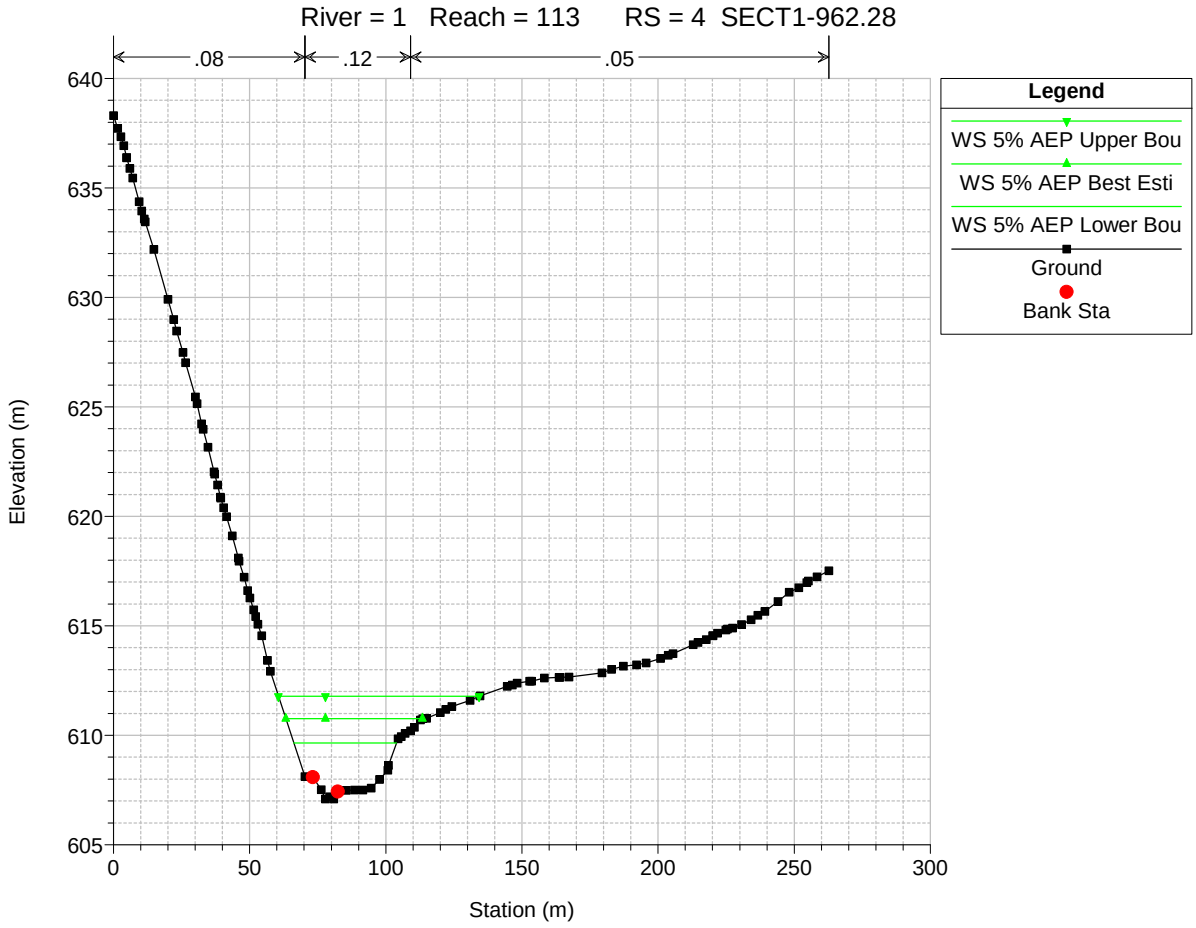
Station (m)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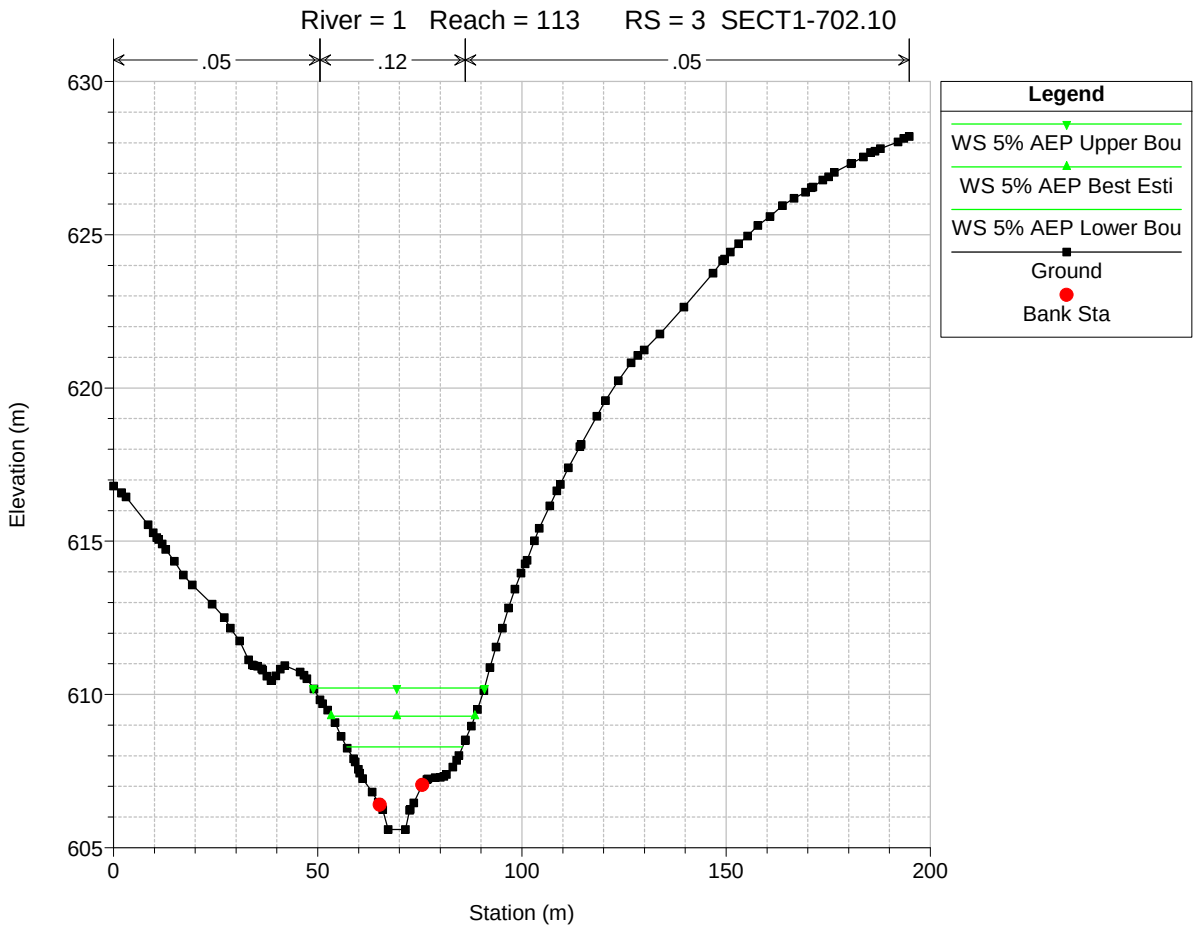
Station (m)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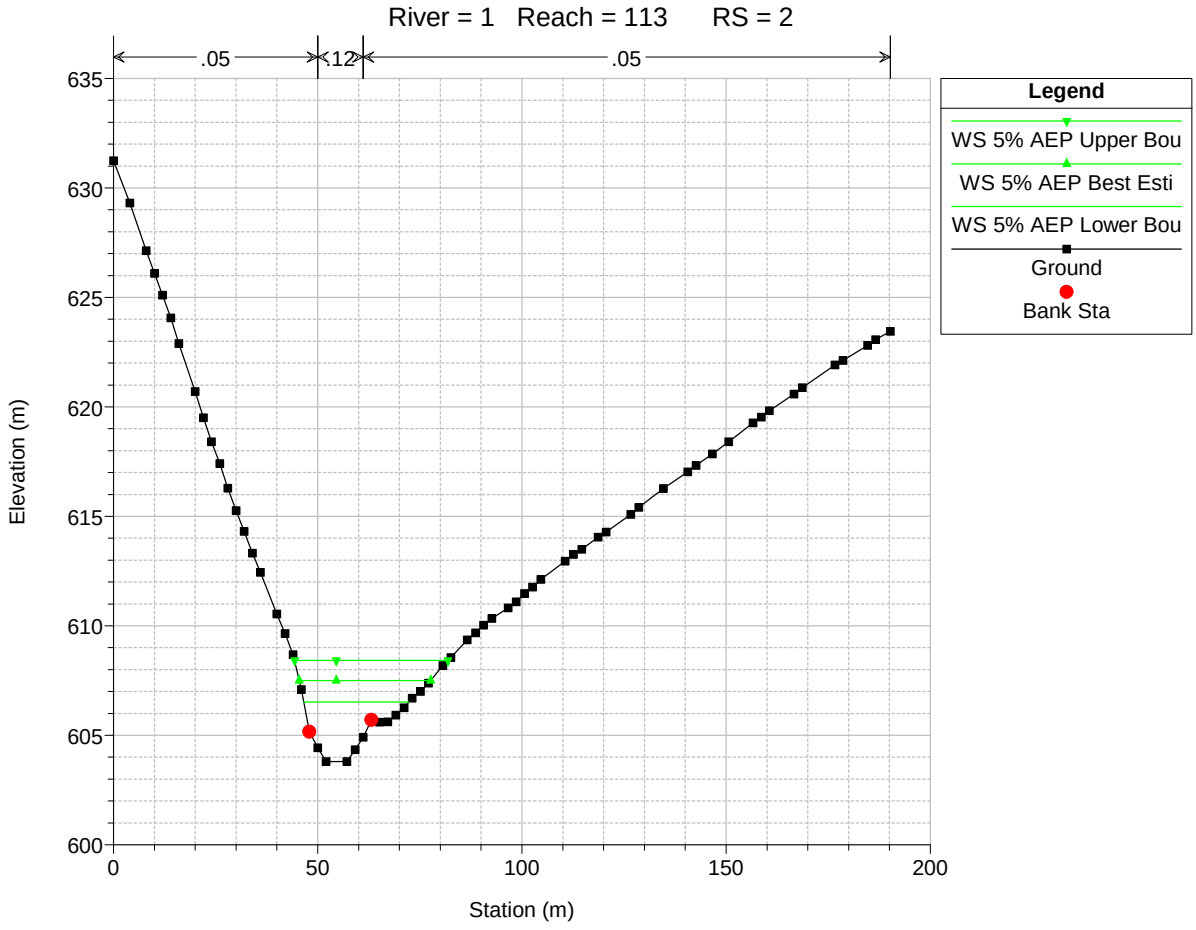
Ground
Bank Sta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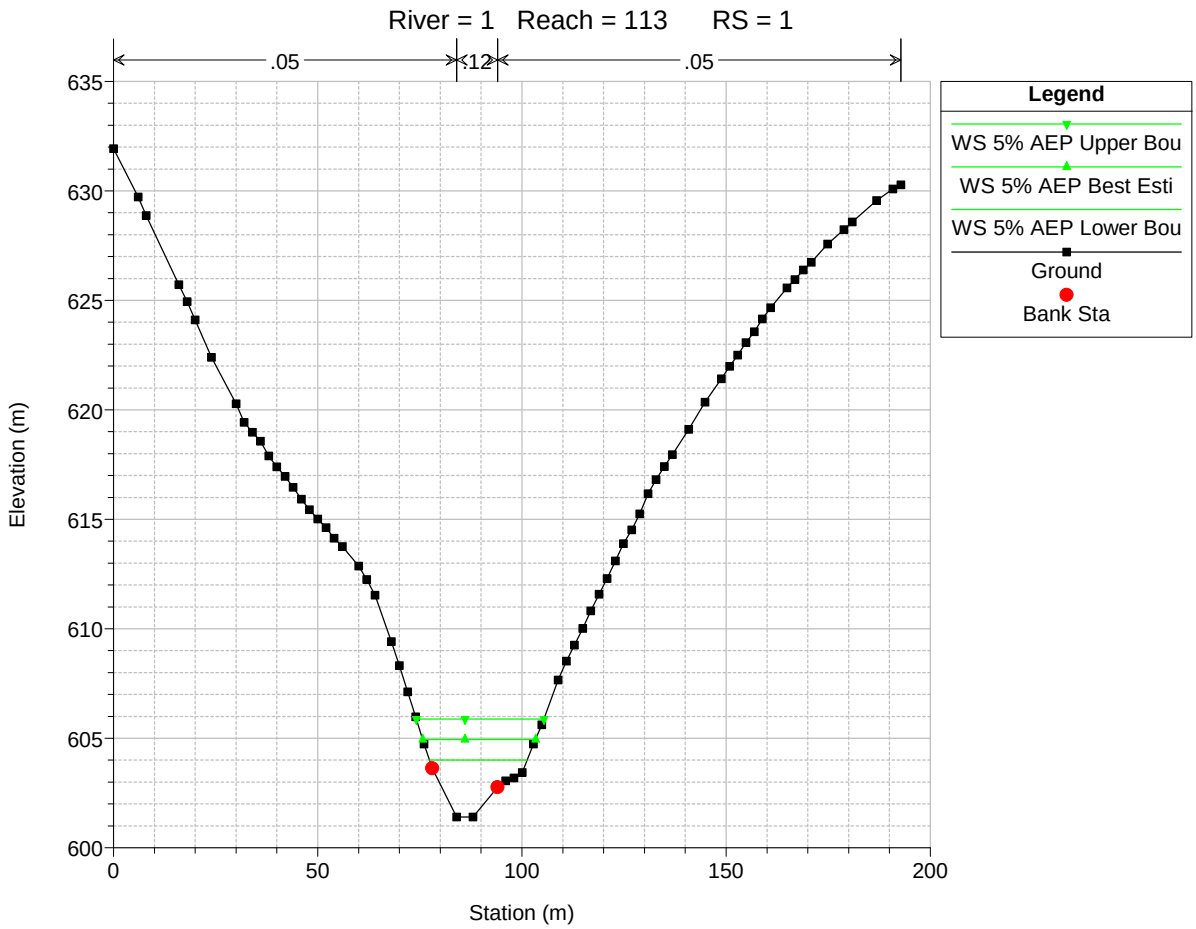
Bank Sta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Elevation (m)
Station (m)
Legend
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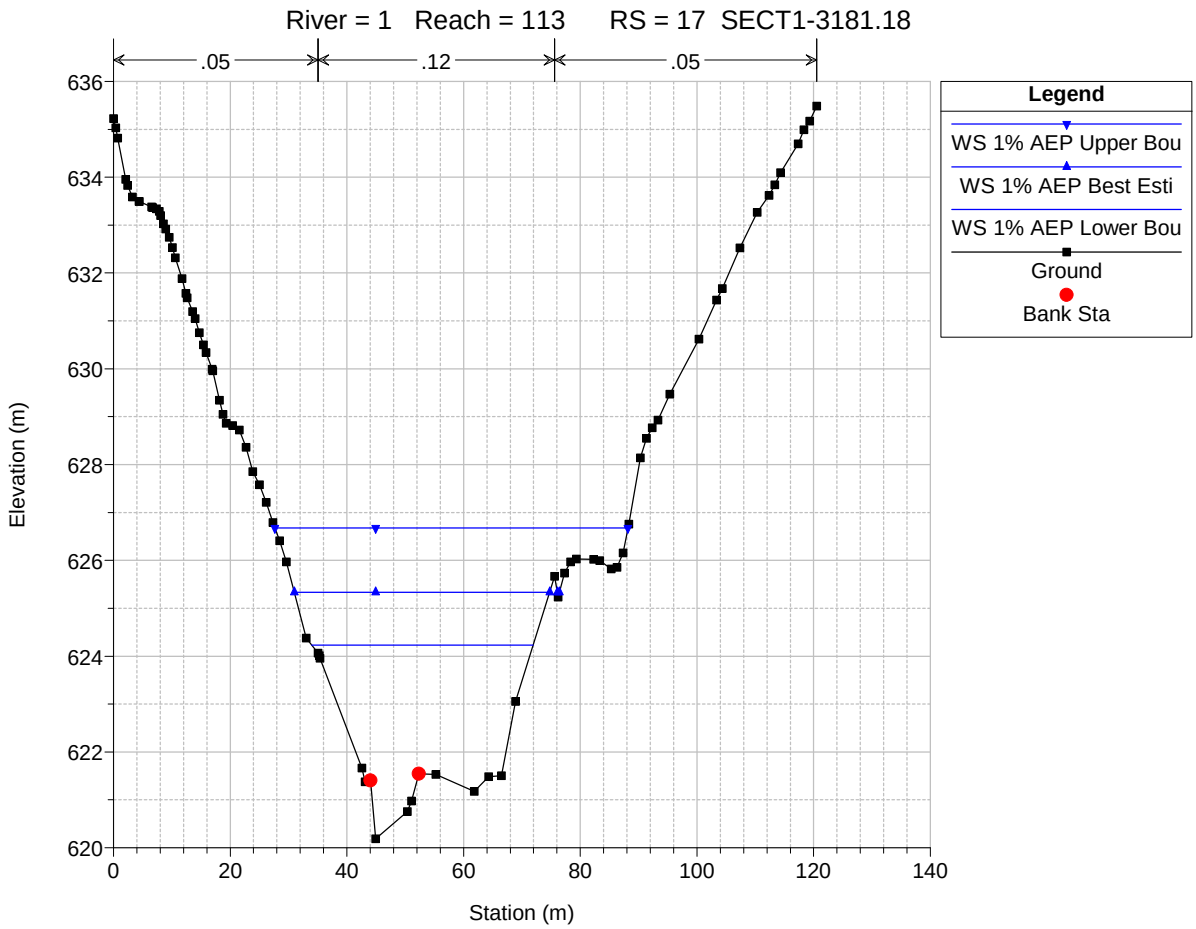
WS 5% AEP Lower Bou
Ground
Bank Sta

ANNEXURE D

HEC-RAS MODEL CROSS SECTIONS – 1% AEP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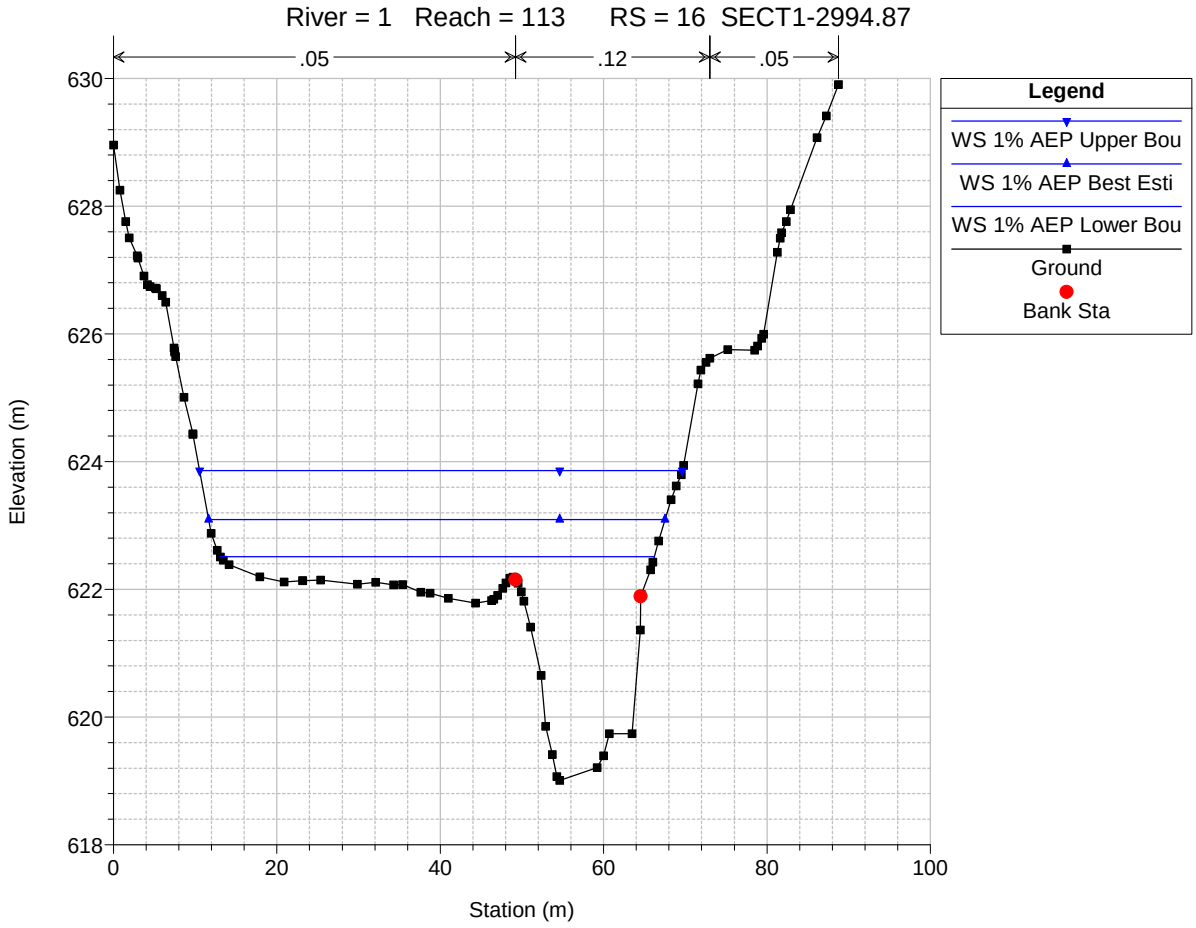
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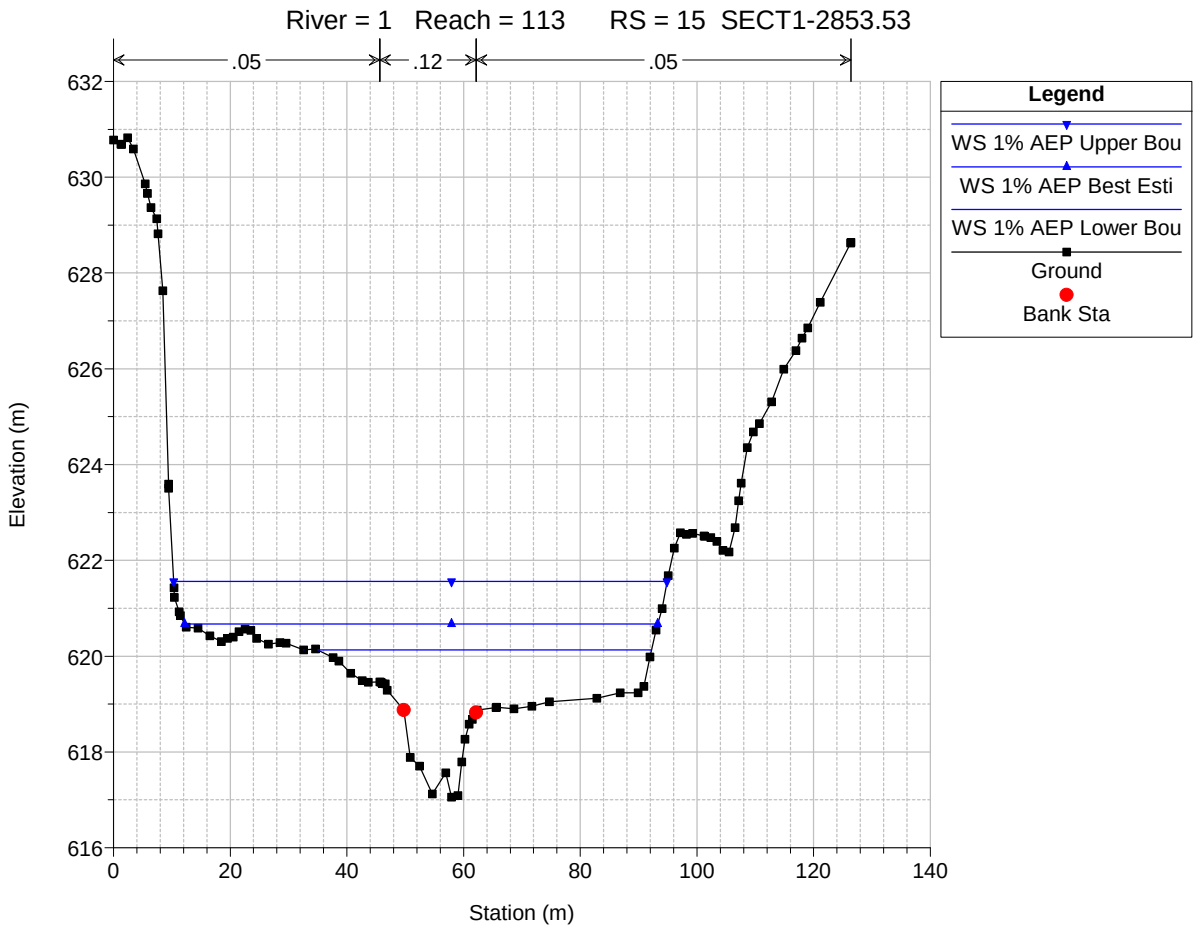
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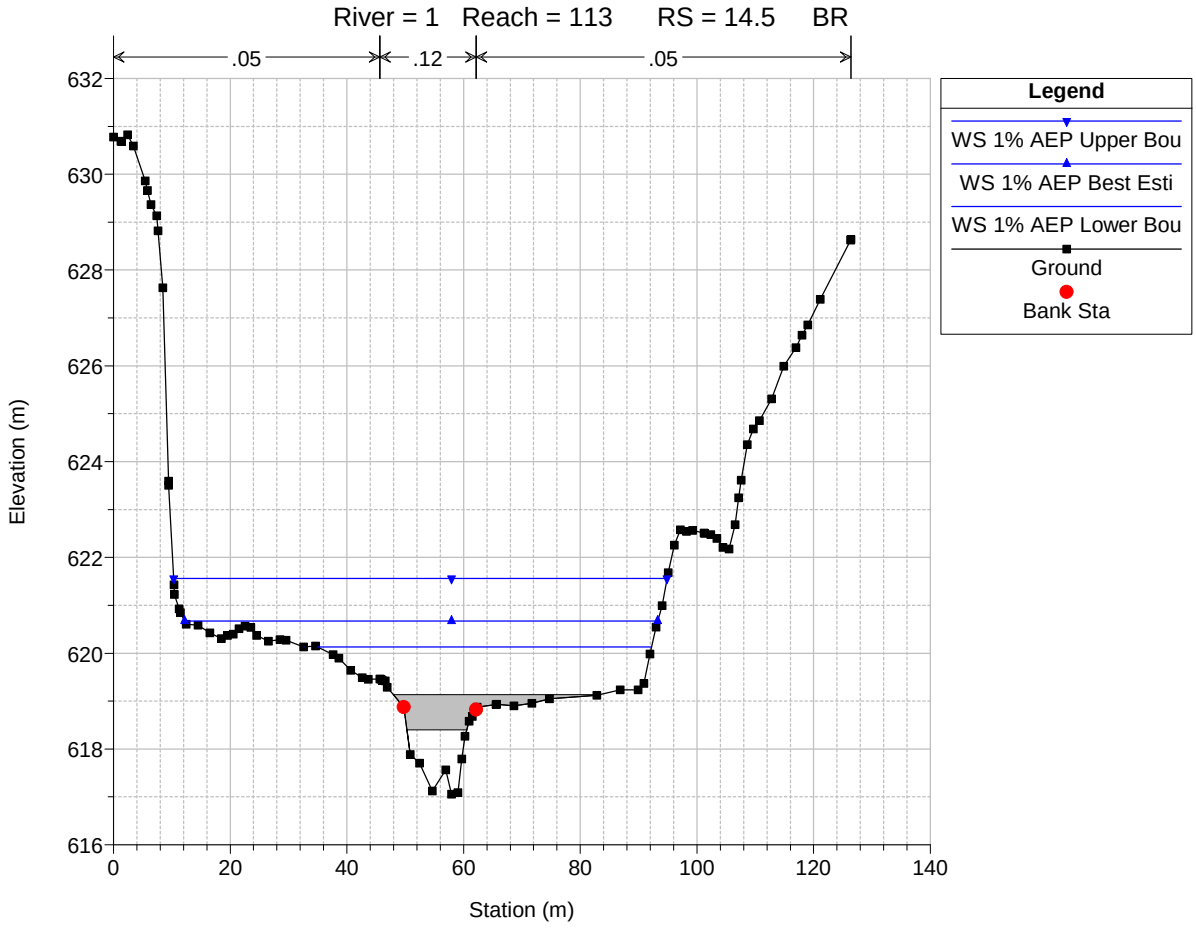
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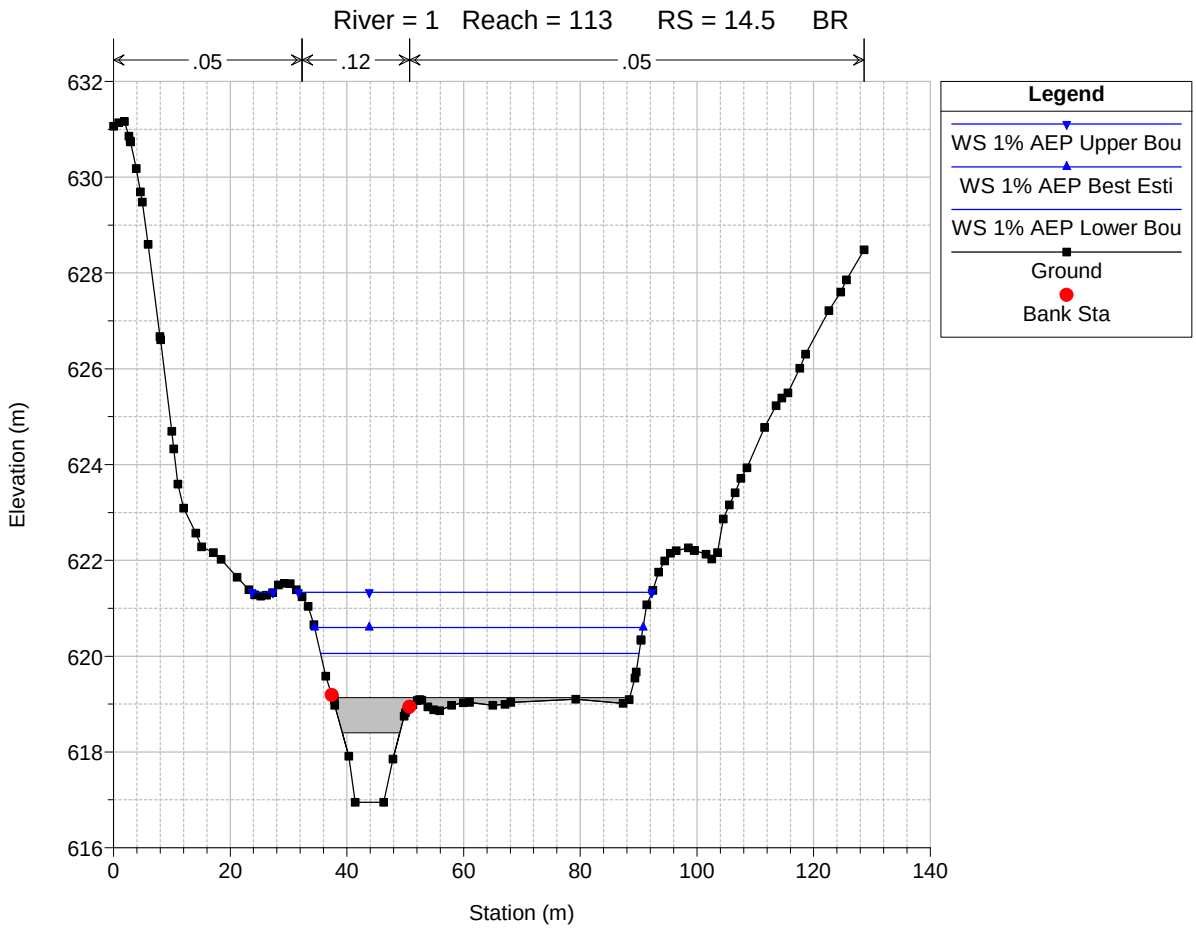
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Bank Sta
Elevation (m)
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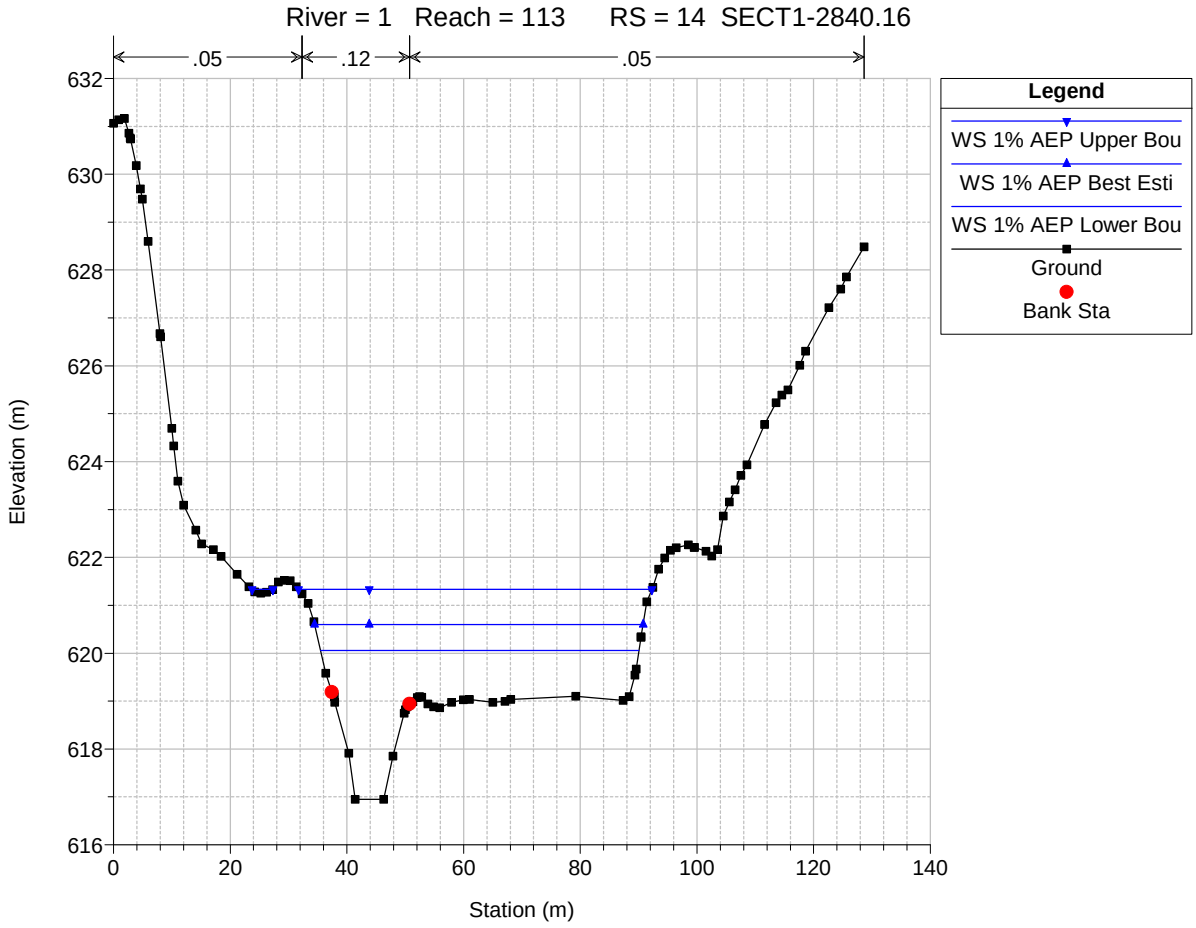
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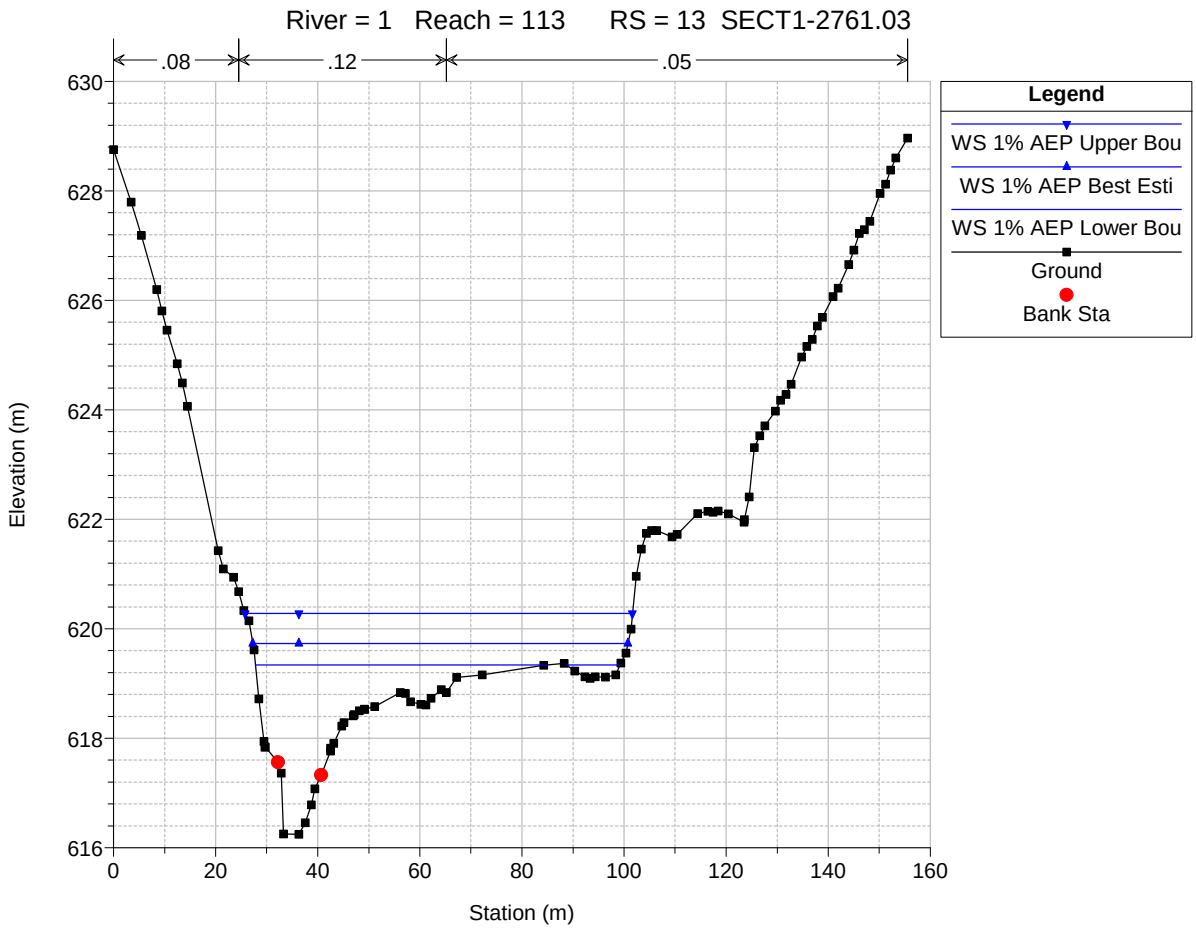
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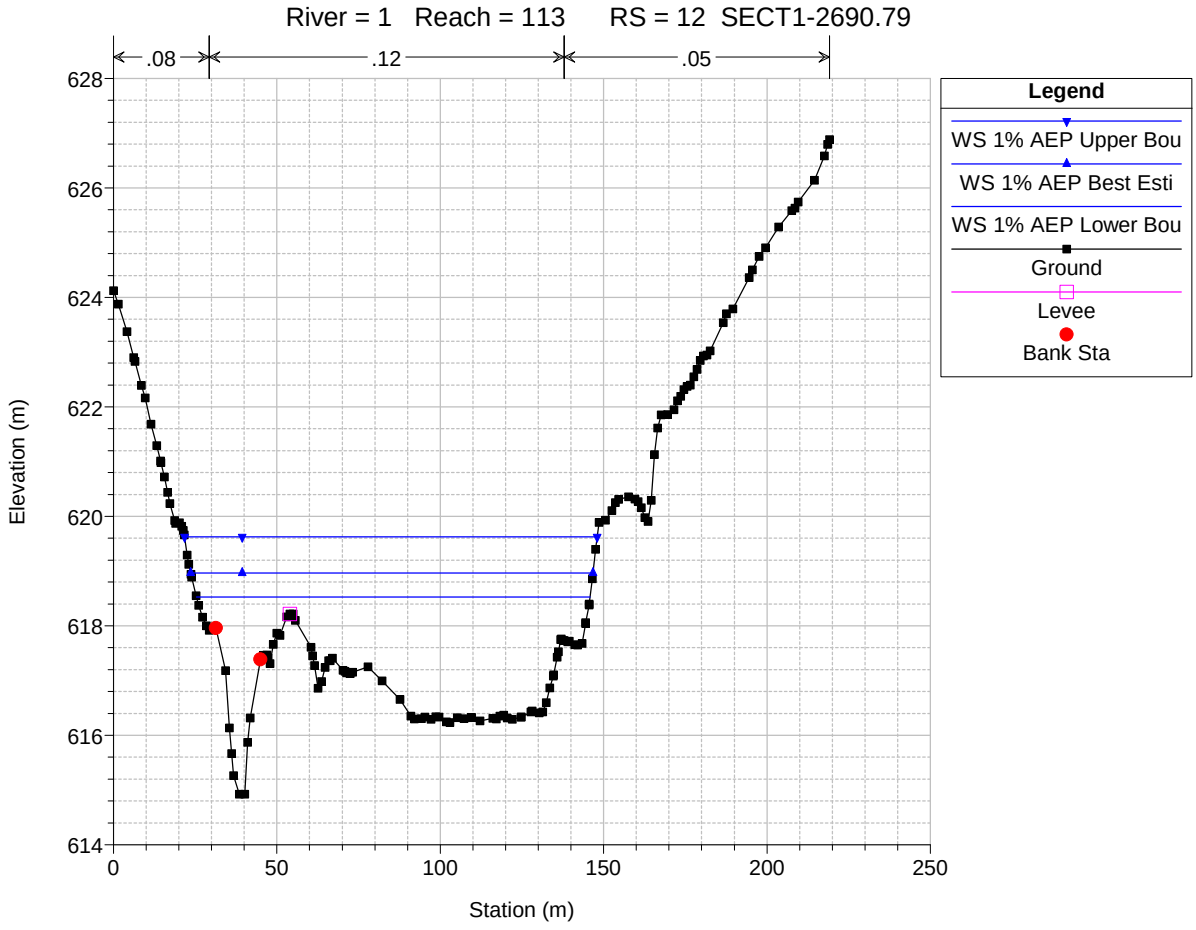
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Levee
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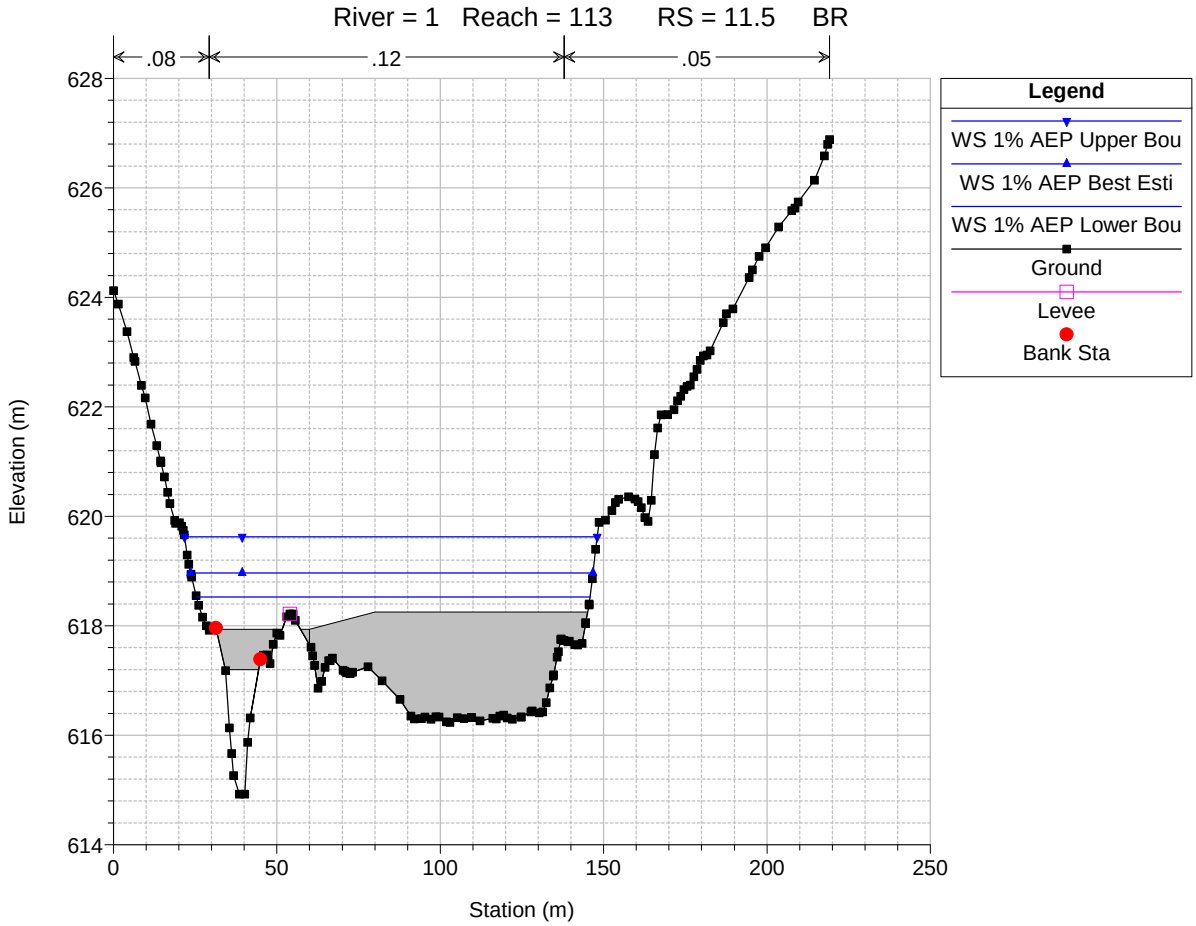
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Levee
Bank Sta
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Station (m)
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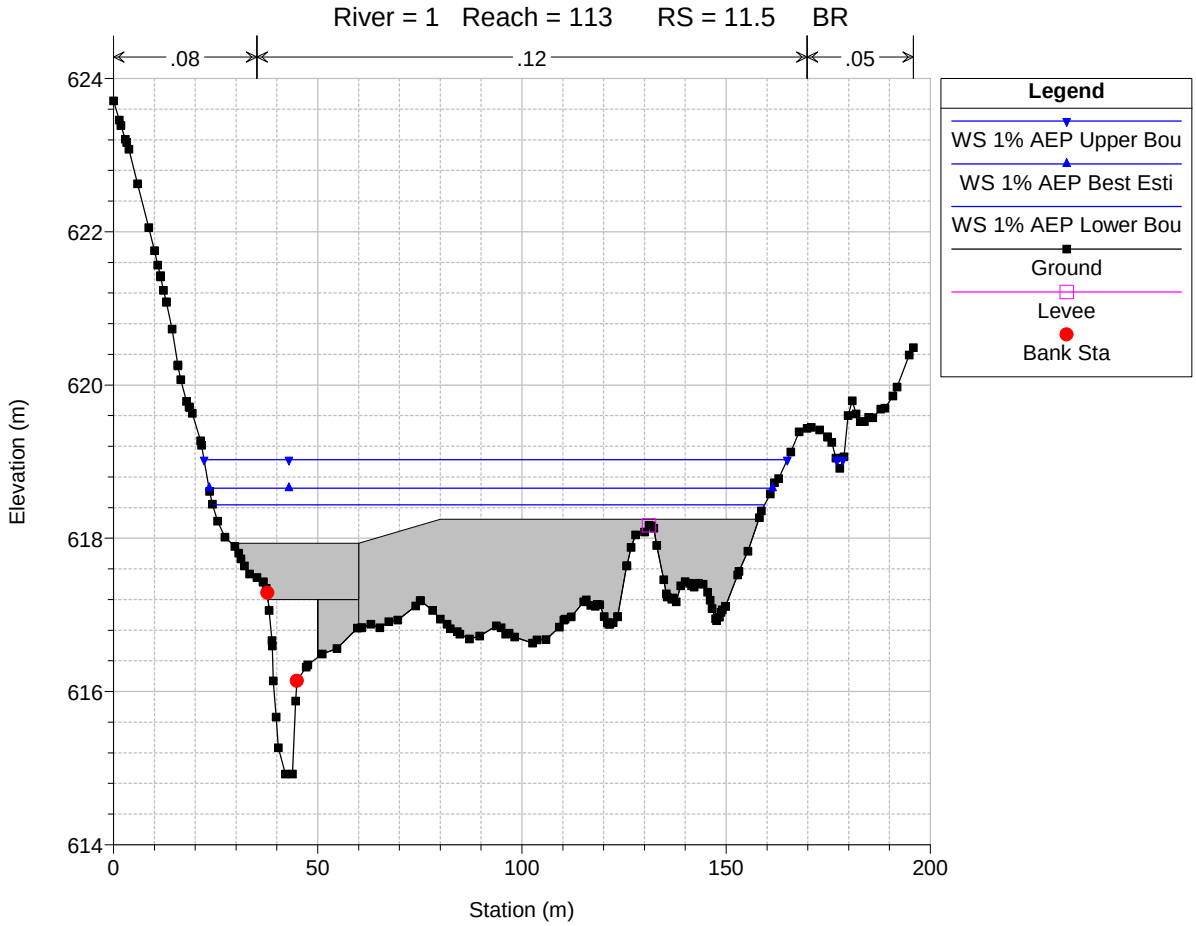
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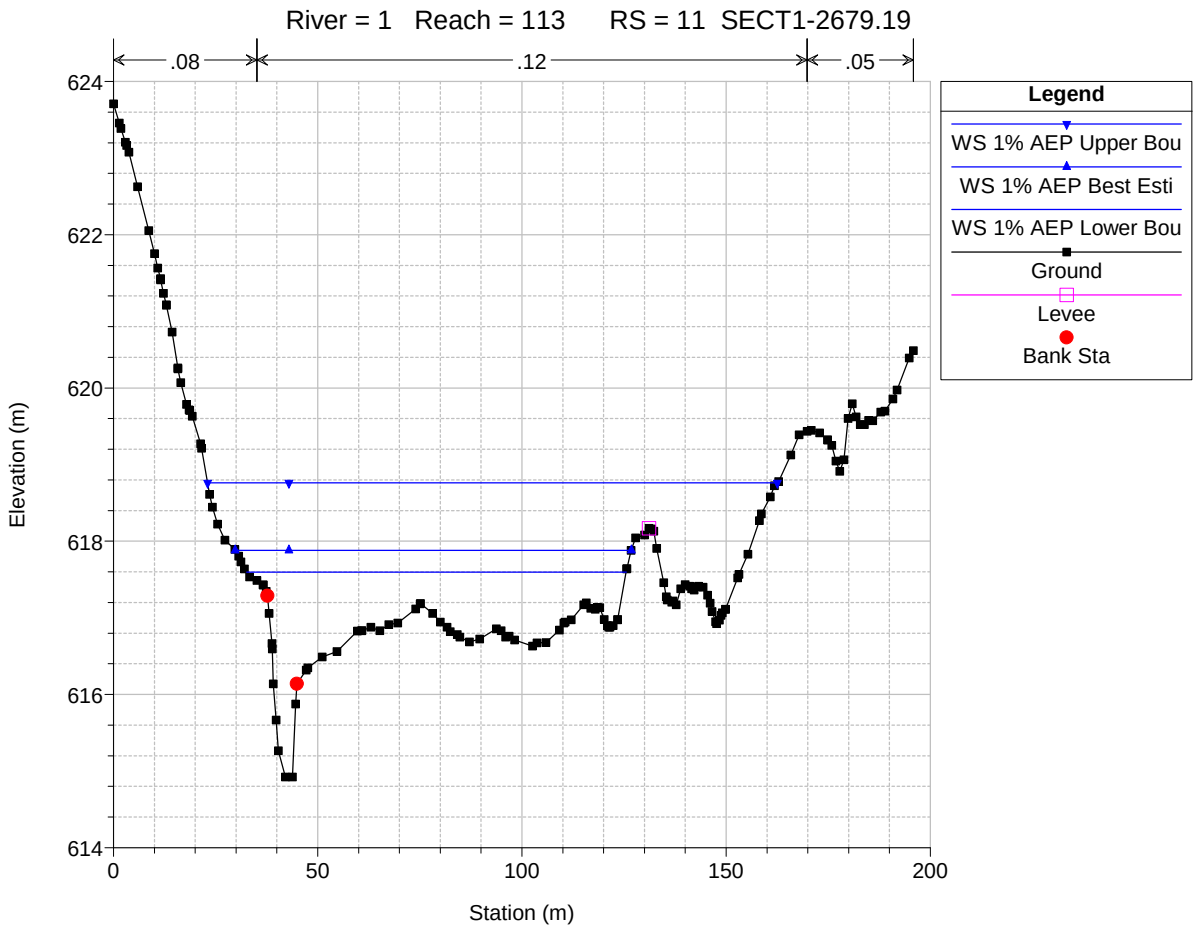
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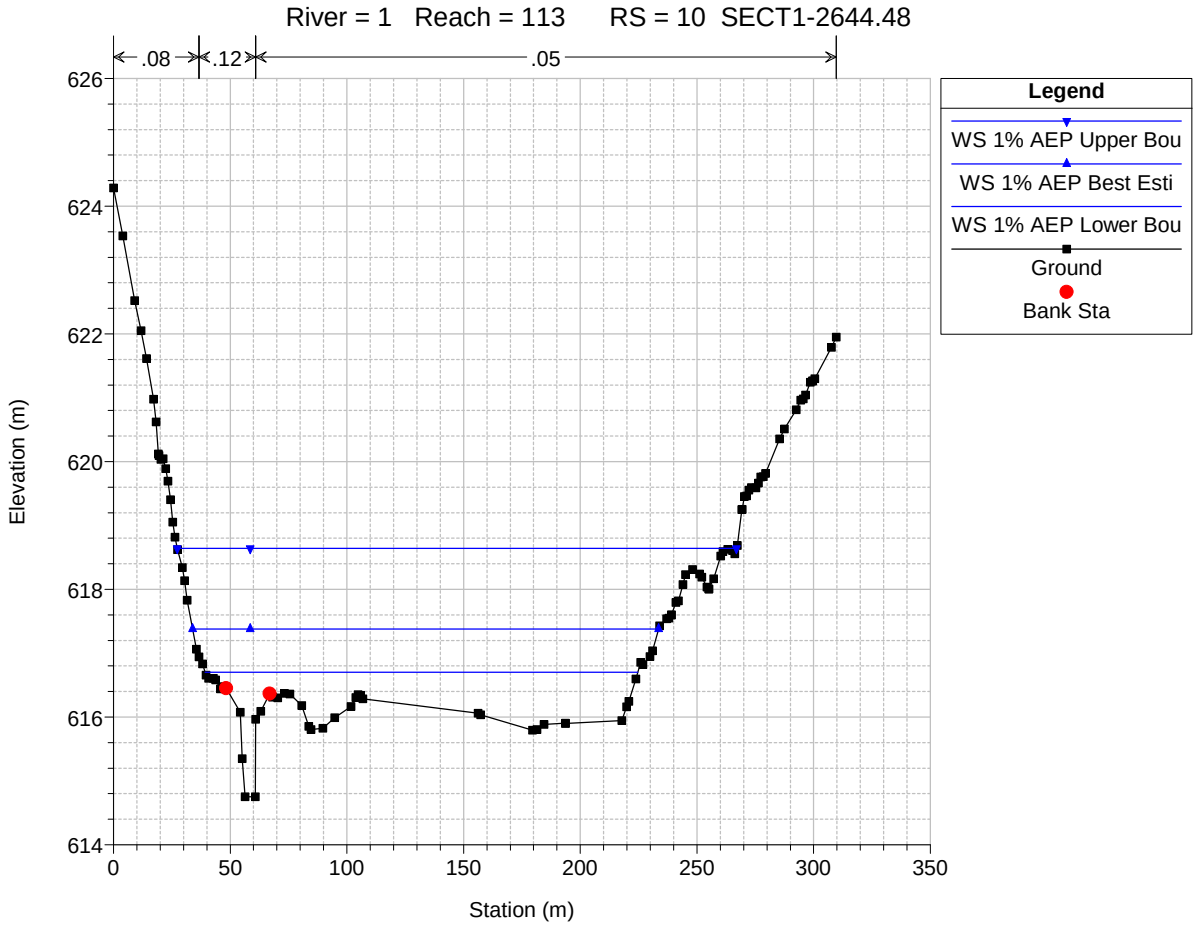
Ground
Levee
Bank Sta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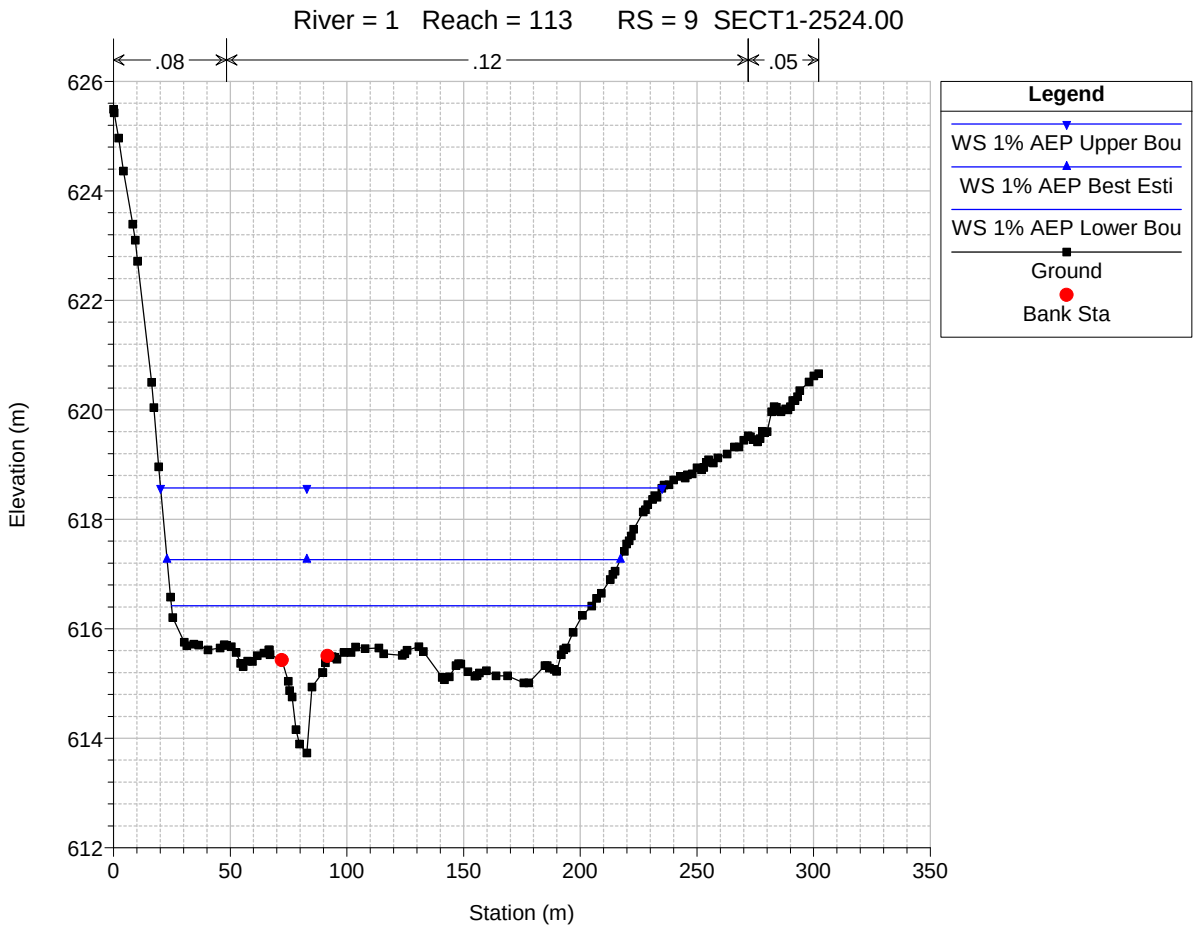
Bank Sta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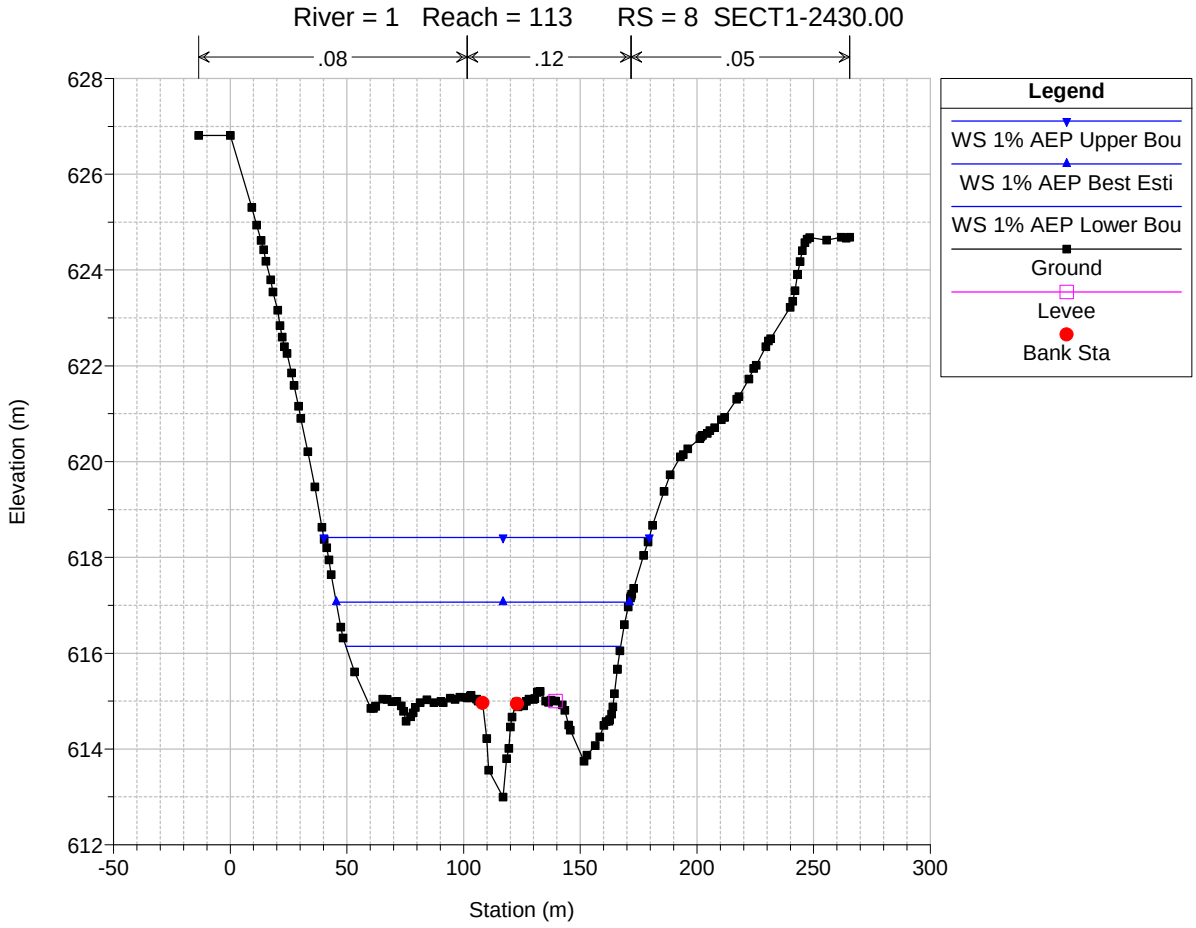
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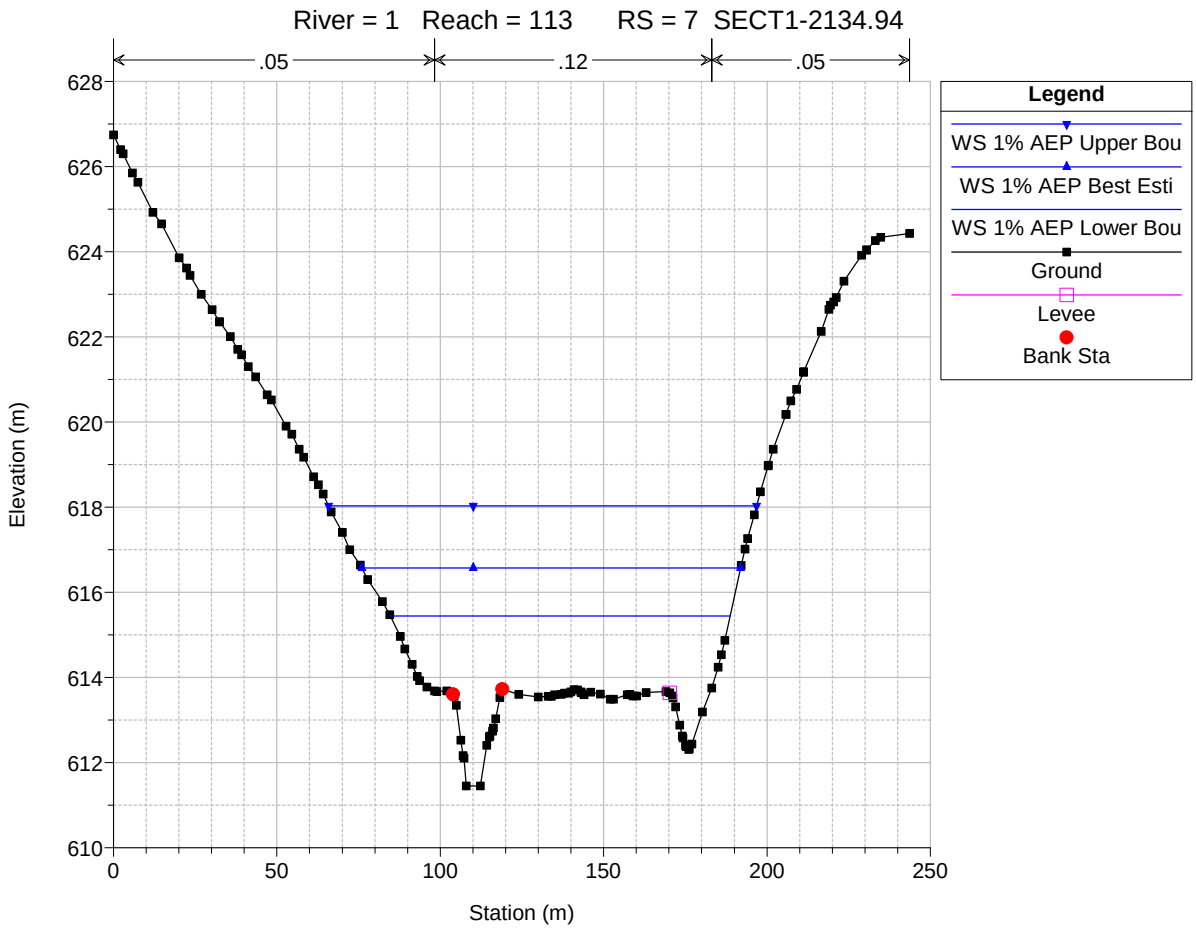
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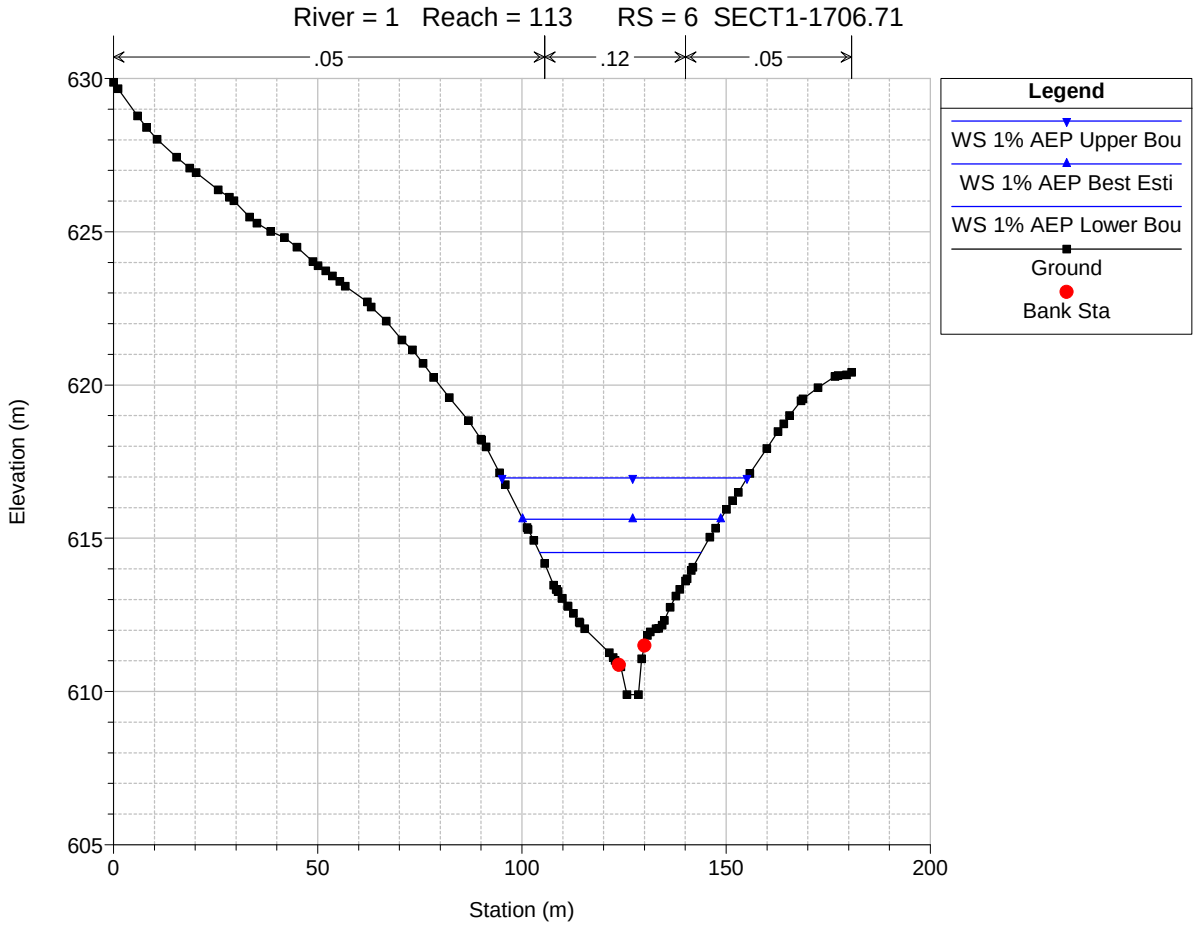
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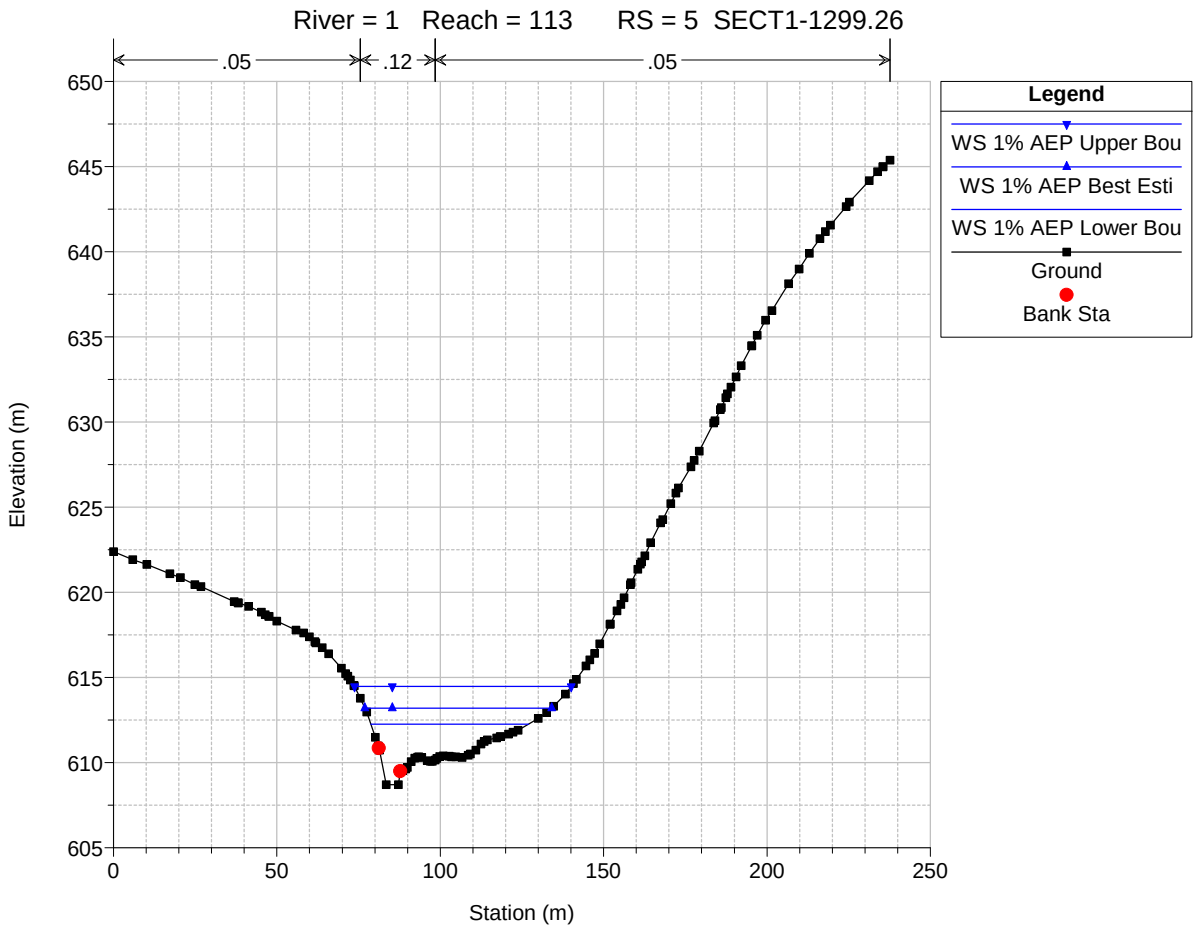
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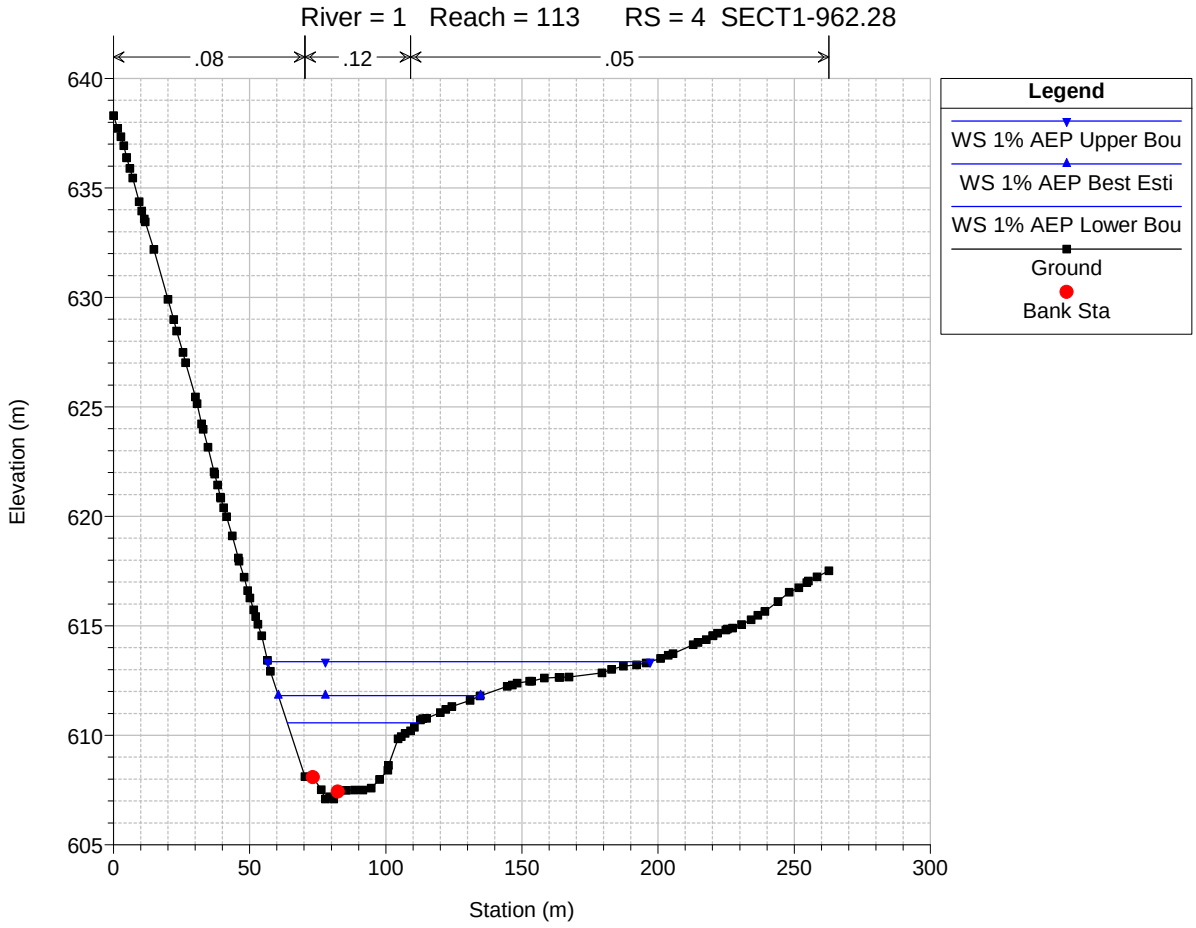
Station (m)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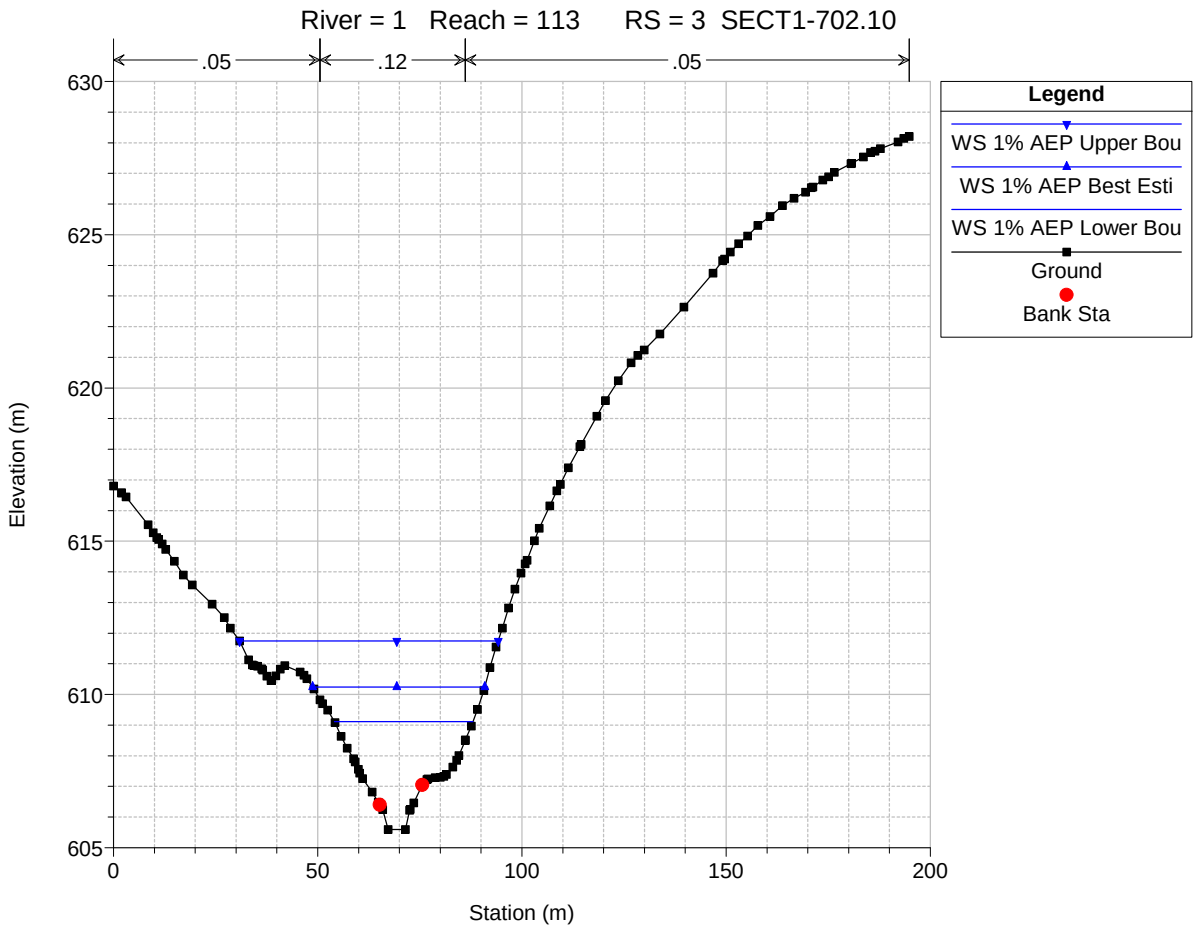
Station (m)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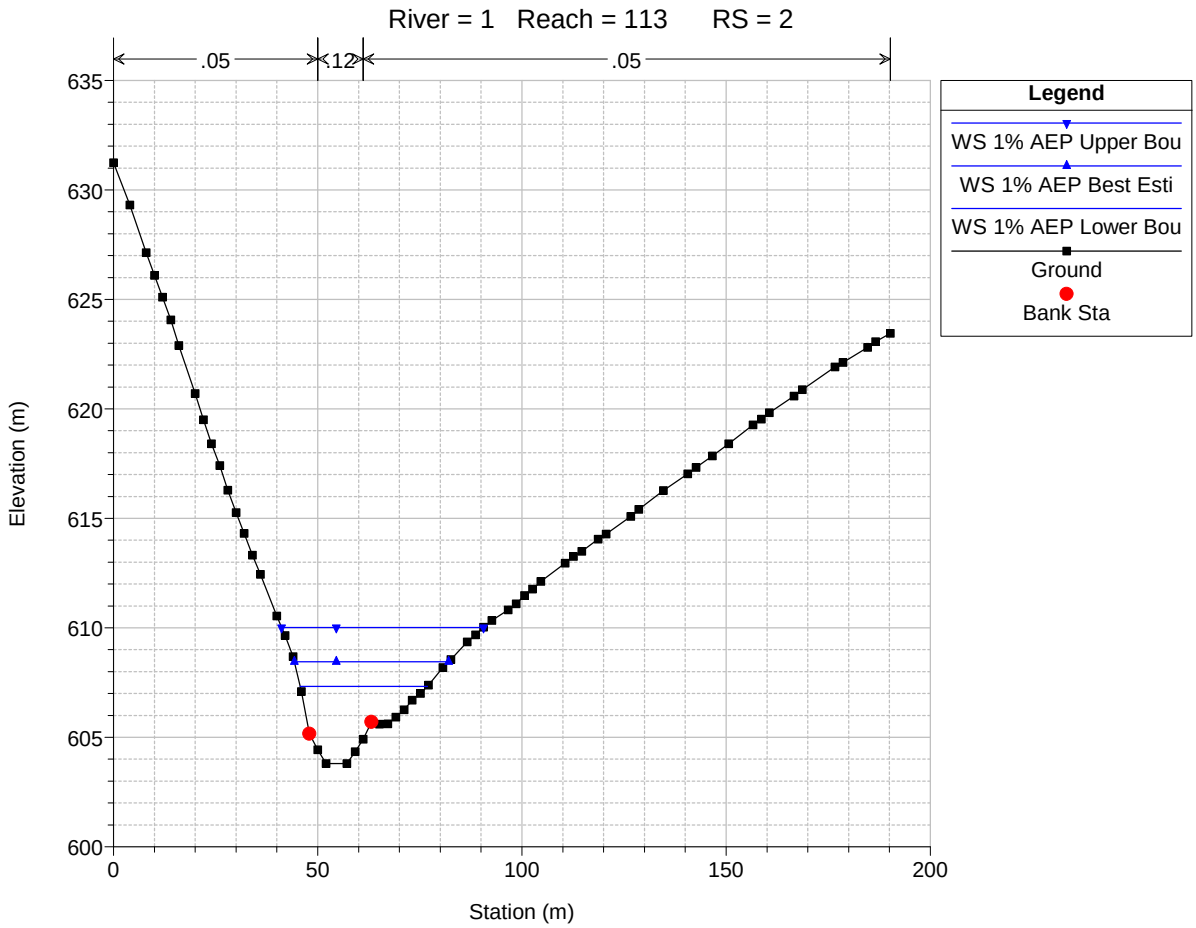
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WS 1% AEP Best Esti
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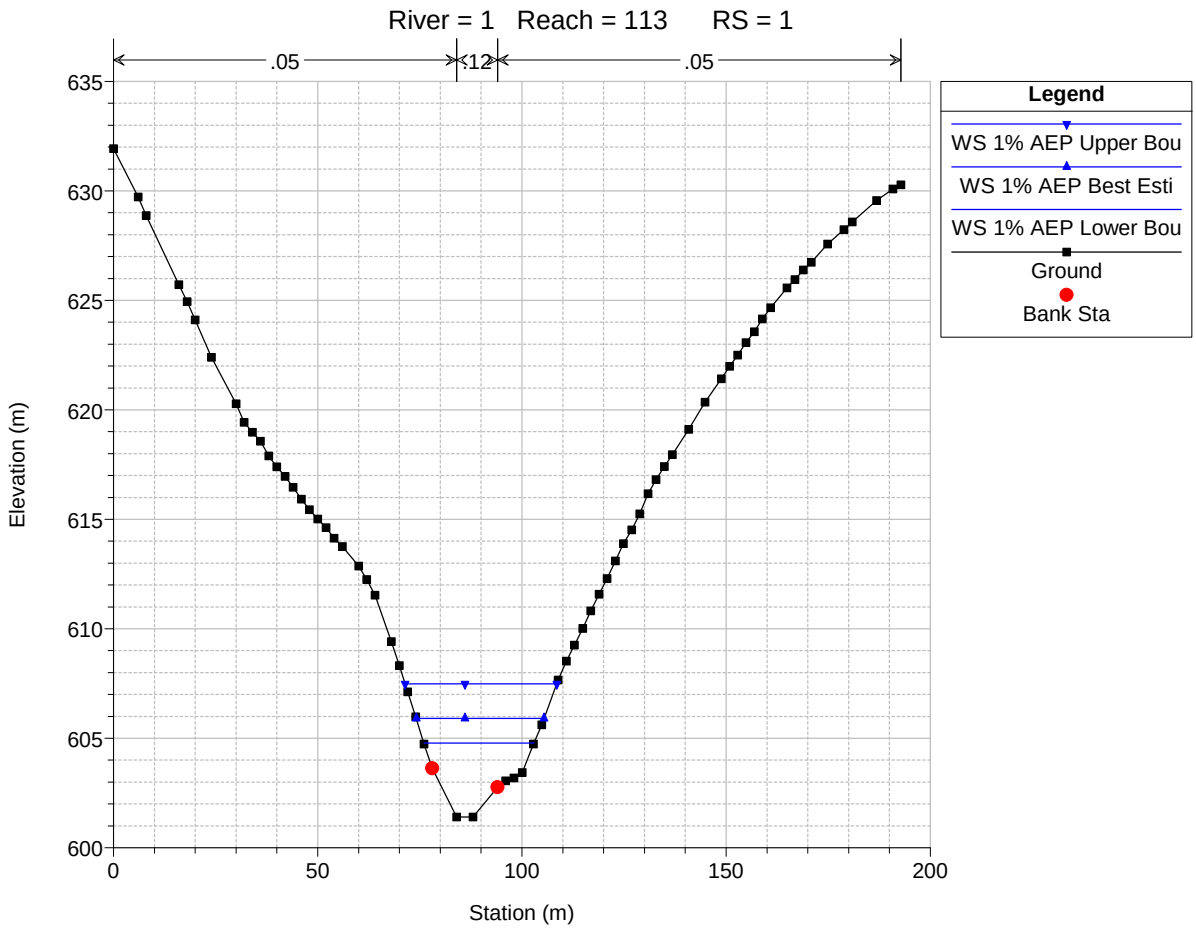
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Bank Sta
Elevation (m)
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Station (m)

Appendix L Noise and Blasting Assessment

MURRAYS CROSSING QUARRY EXPANSION

Noise and Blasting Assessment

Prepared for:

NGH Pty Ltd
35 Kincaid Street
Wagga Wagga NSW 2650

SLR Ref: 640.30286.00100-R01
Version No: -v2.0
April 2022

PREPARED BY

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BASIS OF REPORT

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

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

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

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
640.30286.00100-R01-v2.0	28 April 2022	Matthew Bryce / Aaron MacKenzie	Aaron Miller	Matthew Bryce
640.30286.00100-R01-v1.0	7 April 2022	Matthew Bryce / Aaron MacKenzie	Aaron Miller	Matthew Bryce

CONTENTS

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has considered noise and vibration emissions associated with the proposed extension of the existing quarry at 71 Murrays Crossing Road ("the Project"), operated by Bald Hill Quarry Pty Ltd (BHQ) near Tumbarumba in New South Wales (NSW).

This assessment addresses the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of the Environmental Impact Statement (EIS) for the Project, issued by the NSW Department of Planning, Industry and Environment (DPIE) on 6 April 2021 (Ref: SEAR 1549).

Noise and Blasting and Vibration is identified in the SEARs document as a key issue and states the assessment must address the following specific issues:

- *Noise – including a quantitative assessment of potential:*
  - *construction and operational noise and off-site transport noise impacts of the development in accordance with the Interim Construction Noise Guideline, NSW Noise Policy for Industry and NSW Road Noise Policy respectively;*
  - *reasonable and feasible mitigation measures to minimise noise emissions; and*
  - *monitoring and management measures;*
- *Blasting & Vibration –*
  - *proposed hours, frequency, methods and impacts; and - an assessment of the likely blasting and vibration impacts of the development, having regard to the relevant ANZEC guidelines and paying particular attention to impacts on people, buildings, livestock, infrastructure and significant natural features*

Noise and vibration emissions associated the proposed quarry operations have been considered with regard to the SEARs requirements:

- Construction noise – *Interim Construction Noise Guideline* (ICNG) (DECCW, 2009)
- Quarry noise – *Noise Policy for Industry* (NPfI) (EPA, 2017)
- Product despatch vehicles – *Road Noise Policy* (RNP) (DECCW, 2011)
- Blasting Emissions – Australia and New Zealand Environment and Council (ANZEC) *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*. (the "ANZEC Guidelines) (ANZEC, September 1990).

2 Project Overview

2.1 Project Location

The Project is located 2 km south of Tumbarumba, NSW (**Figure 1**).

2.2 Background

Quarrying of blue metal and road base material on the Crown Quarry Reserve has been evident since the 1940's. BHQ have been operating the Crown Quarry Reserve for 12 years under an existing land use rights agreement with the Snowy Valley Council (SVC).

BHQ would like to amalgamate the current operations at Murray's Crossing Quarry in Tumbarumba (the Project) and combine all disturbance areas under one approval. BHQ currently operates the crown quarry reserve located on Lot 732 and Lot 623 DP 755892, reserve number 81837. Lot 623 will not be impacted by the proposal.

BHQ also own the surrounding land which currently has approval under DA 91/23 granted in March 1992. In addition to these areas there are also stockpiles from the quarry located on Travelling Stock Route (TSR) (51191) on Lot 7028 DP 96852 however this does not form part of this Development Application.

The objective of the proposal is to:

- Further establish a known high quality rock resource in the region for construction materials road base and aggregates.
- To utilise already existing disturbance and continuation of this resource into the future for council and local businesses in the region.
- To ensure long-term employment in the area; and
- Supply material locally to state significant development projects such as Snowy Hydro 2.0.

2.3 Project Description

Currently the site extracts and transports approximately 80,000 tonnes per annum (tpa), which has been from the Crown Quarry Reserve to date. The current Development consent for the BHQ land approves BHQ to extract and transport 150,000 tpa.

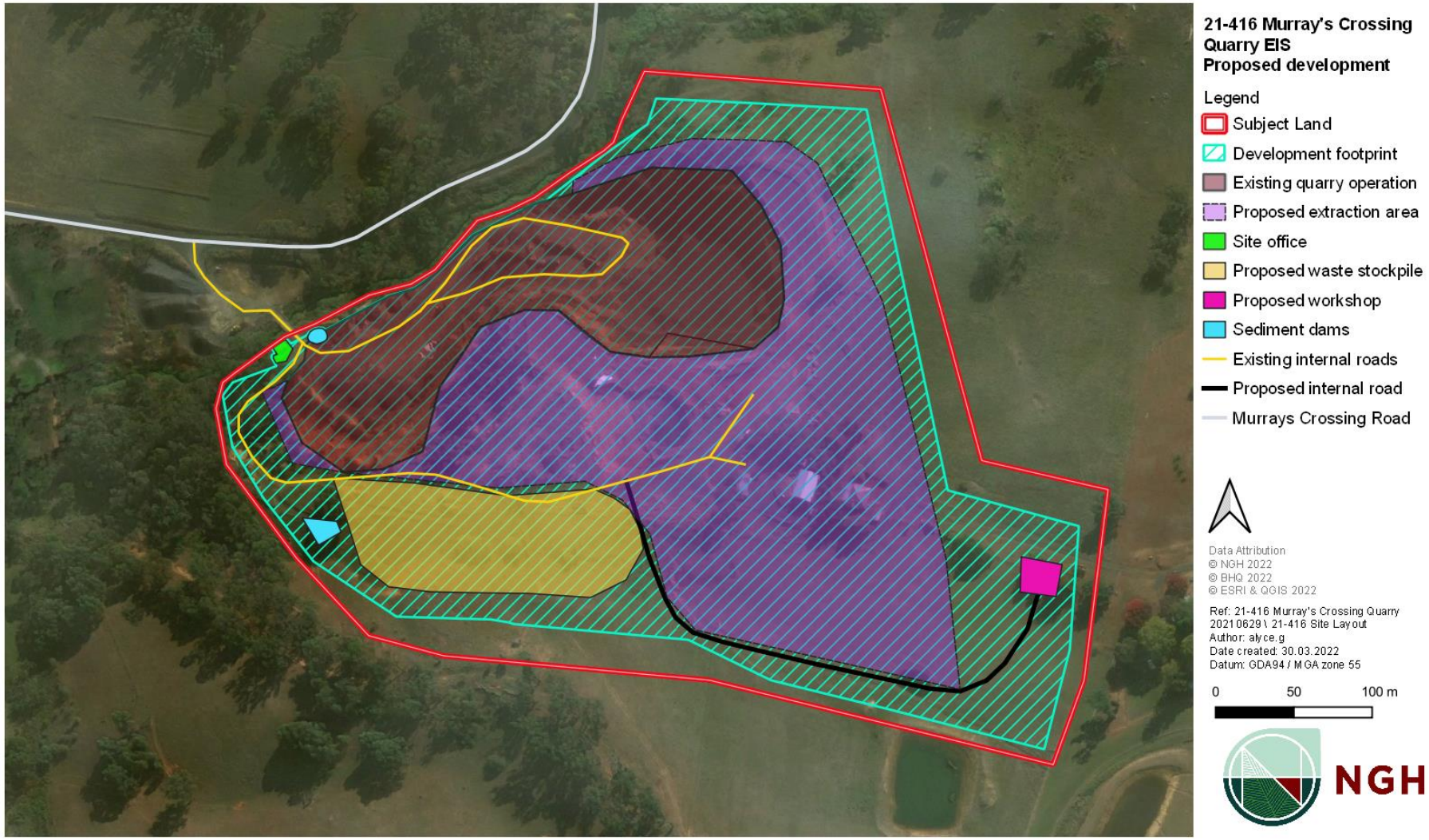
BHQ plan to expand the operations to the east and south onto BHQ owned land. Access will remain through Murrays Crossing Road. The plan is to continue the open cut towards to East and South as shown in **Figure 2**.

The site will operate from 7:00 am to 6:00 pm Monday to Friday and 8:00am to 4:00 pm Saturday and Sunday as required.

The proposal does not require additional infrastructure or work areas to be constructed. Therefore consideration of noise and/or vibration associated with construction works does not require further consideration.

Figure 1 Location of Project

Figure 2 Site Layout – Future Plan



2.4 Sensitive Receptors

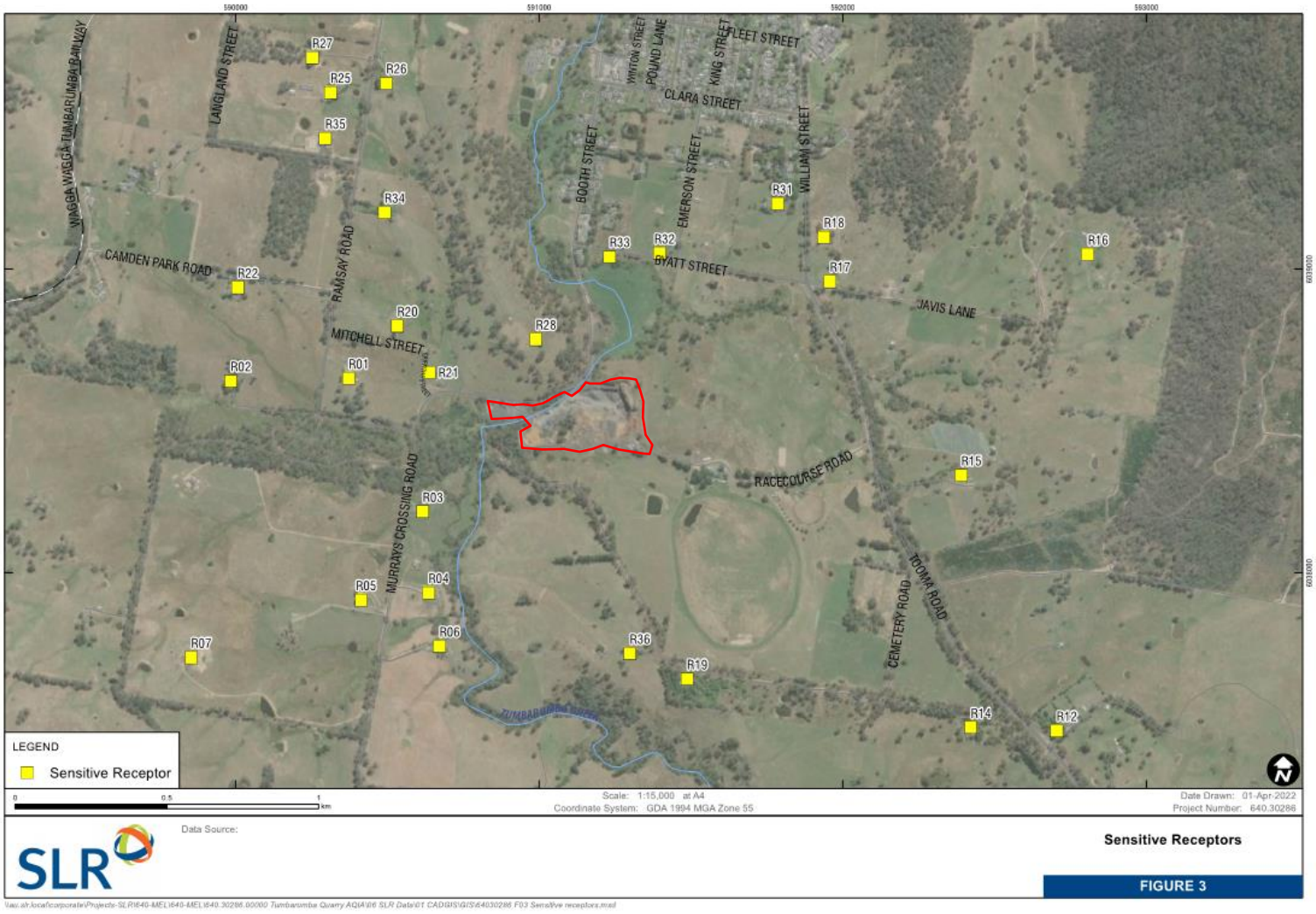
The Site is situated in a rural environment surrounded by farming properties with a number of residential dwellings in the vicinity. The closest receptor (R28) is located approximately 240 m north of the project site, however that location is not used a residence.

A list of sensitive receptors in the immediate vicinity of the Site is described in **Table 1** and shown in **Figure 3**.

Table 1 Details of Identified Sensitive Receptors

Receptor ID	Receptor Type	Location (m, UTM)	
		Easting	Northing
R1	Residence	590,373	6,038,641
R2	Residence	589,984	6,038,633
R3	Residence	590,617	6,038,202
R4	Residence	590,636	6,037,935
R5	Residence	590,414	6,037,911
R6	Residence	590,672	6,037,759
R7	Residence	589,854	6,037,722
R12	Residence	592,705	6,037,481
R14	Residence	592,423	6,037,492
R15	Residence	592,391	6,038,322
R16	Residence	592,807	6,039,049
R17	Residence	591,958	6,038,960
R18	Residence	591,939	6,039,106
R19	Residence	591,487	6,037,652
R20	Residence	590,533	6,038,813
R21	Residence	590,637	6,038,660
R22	Residence	590,007	6,038,940
R25	Residence	590,313	6,039,582
R26	Residence	590,497	6,039,613
R27	Residence	590,253	6,039,697
R28 (unoccupied)	Residence (unoccupied)	590,989	6,038,770
R31	Residence	591,786	6,039,216
R32	Residence	591,397	6,039,053
R33	Residence	591,233	6,039,041
R34	Residence	590,491	6,039,187
R35	Residence	590,296	6,039,431
R36	Residence	591,299	6,037,735

Figure 3 Sensitive Receptors



3 Assessment Criteria

The site does not operate under an Environment Protection Licence (EPL), and the SEARs requires that operational noise levels for the Project are assessed in accordance with the NSW *Noise Policy for Industry 2017* (NPfI), which sets out the requirements for the assessment and management of operational noise from industry in NSW.

3.1 Industrial Noise Trigger Levels

The NPfI defines how to determine 'trigger levels' for noise emissions from industrial developments. Where a development is likely to exceed the trigger levels at existing noise sensitive receivers, feasible and reasonable noise management measures are required to be considered to reduce the impacts.

There are two types of trigger levels – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses:

- The **intrusiveness** of an industrial noise source is generally considered acceptable at residential receptors if the L_{Aeq} noise level of the source, measured over a period of 15-minutes, does not exceed the representative background noise level by more than 5 dB.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended **amenity** levels specified in the NPfI for that particular land use.

For this assessment, the area surrounding the Project is considered to be 'rural' as per the NPfI definitions.

3.1.1 Project Noise Trigger Levels

This assessment has adopted the minimum Rating Background Level (RBL) values described in the NPfI, based on the high likelihood that the ambient background noise levels would be 'low' in the context of the NPfI, as is common in rural environments with few sources of noise-generating infrastructure.

The trigger level for industrial noise from the Project are summarised in **Table 2**. The Project Noise Trigger Level (PNTL) is the most stringent of the intrusiveness and amenity trigger level for the daytime operational period and is highlighted below.

Table 2 Project Noise Trigger Levels – All Receptors

Period	Recommended "Rural" Amenity Noise Level, dBA L_{Aeq}	Minimum Noise Level, dBA		Project Noise Trigger Levels, dBA $L_{Aeq(15minute)}$	
		RBL[1]	$L_{Aeq(period)}$	Intrusiveness	Amenity[2, 3]
Daytime[4]	50	35	40	**40**	48

1. RBL = Rating Background Level.
2. No other sources of industrial noise are present in the area and are not likely to be in the future. As such, the recommended amenity noise levels have been taken as the project amenity noise levels, as outlined in the NPfI.
3. The project amenity noise levels have been converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.
4. Day – the period from 7:00 am to 6:00 pm Monday to Saturday or 8:00 am to 6:00 pm on Sundays and public holidays.

3.1.2 Modifying Factors

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, intermittency or significant low-frequency content. The NPfI specifies the following modifying factors, shown in **Table 3**, applicable to the Project and which are to be applied to the received noise level where annoying characteristics are present.

Table 3 NPfI Modifying Factors

Factor	Assessment/Measurement	When to Apply	Correction[1]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by the levels defined in the NPfI.	5 dB[2]
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements	Measure/assess source contribution C and A weighted $L_{eq,t}$ levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and the level to which the thresholds defined in the NPfI are exceeded.	2 or 5 dB[2]
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated.	Maximum correction 10 dB[2] (excluding duration correction)

1. Corrections to be added to the predicted levels.
2. Where a source emits tonal and low-frequency noise, only one 5 dB correction must be applied if the tone is in the low-frequency range (≤ 160 Hz).

3.2 Project Traffic on Surrounding Roads

When trucks and other vehicles are operating within the boundaries of the Project site, noise contributions are included in the predicted noise emissions.

When Project-related (construction and operations) traffic moves onto the public road network a different noise assessment methodology is common and appropriate, as vehicle movements are regarded as 'additional road traffic' rather than as part of the works and are assessed in accordance with the NSW *Road Noise Policy*.

An initial assessment is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2 dB (ie equates to an increase in traffic volumes of approximately 60%) due to construction traffic.

Where noise levels increase by more than 2 dB (ie 2.1 dB or greater) further assessment is required using the criteria presented in the RNP, as shown in **Table 4**.

Table 4 RNP Criteria for Assessing Project-Related Traffic on Public Roads

Road Category	Type of Project/Land Use	Daytime Assessment Criteria, dBA (7:00 am – 10:00 pm)
Freeway / arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)

3.3 Blasting Emissions

The blast noise and vibration emission criteria have been adapted from the ANZEC *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* ("the ANZEC Guidelines") as follows:

3.3.1 Airblast Overpressure

The recommended maximum level for airblast overpressure is 115 dB Linear Peak.

That may be exceeded for up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dB Linear Peak at any time.

3.3.2 Ground Vibration

The recommended maximum level for ground vibration is 5 mm/s (peak particle velocity, PPV). It is recommended that a level of 2 mm/s be considered as a long term regulatory goal.

The PPV level of 5 mm/s may be exceeded for up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time.

3.3.3 Times and Frequency of Blasting

Blasting should only occur during the hours of 9:00 am to 5:00 pm Monday to Saturday and should generally take place no more than once per day.

The proposed blasting times between 10:00 am and 3:00 pm occur within that time period.

4 Noise Modelling

In order to predict noise levels associated with the Proposal at nearby receptors, a SoundPLAN computer model was developed. SoundPLAN is a software package which enables compilation of a computer model comprising a digitised ground map (containing ground contours and significant structures, where appropriate), the location and acoustic power levels of significant noise sources, and the location of sensitive receptors.

4.1 Noise Prediction Standard

The Conservation of Clean Air and Water Europe (CONCAWE) prediction methodology was utilised within SoundPLAN. This prediction method was specially designed for industrial facilities and incorporates the influence of wind and the stability of the atmosphere on the propagation of noise.

4.2 Modelling Inputs

The computer model generates noise emission levels taking into account such factors as the source sound power levels, distance attenuation, ground absorption, air absorption and shielding attenuation, as well as meteorological conditions.

The topography of the site land and surrounds was provided to SLR. The ground within the quarry was modelled as hard compact earth that mostly reflects noise, while all ground between the quarry boundary and the receptors was modelled as "soft ground" that mostly absorbs noise.

4.2.1 Project Operations and Plant Equipment

The quarry will utilise conventional extraction and processing methods which includes the following:

- Blasting is used to loosen rock material
- The loosened material is fed directly into a primary impact crusher and secondary crusher
- The material then feeds into a screen to sort the various products.
- The screened and sorted material is stockpiled on site using a front-end loader, which is also used to load the delivery trucks (eg “dog and trailer”).

4.2.2 Dispatch Road

The length of the route between the public road between the stockpile areas is described in **Table 5**.

Table 5 Dispatch Roads

Road	Length, m
Access road from Murrays Crossing Road – Processing area	490

4.2.3 Noise Sources

The acoustically significant plant/equipment associated with the quarrying operations has been shown in **Table 6** for each activity.

The SWL information for most plant items has also been sourced from comparable equipment described in the CNVS. The SWL for the crusher and screen has been sourced from SLR’s in-house database of measurements of comparable noise sources.

The duration of each of the activities, the emission height and the base sound power level (SWL) have been shown in **Table 6**.

The sources were modelled relative to the existing local ground height at the new pit and haul road locations at the Project commencement in order to represent a “worst case” situation. The noise sources will gradually lower into the pit as the quarry progresses.

Table 6 Quarrying Activities

Activity	Plant	Number (Description)	Source Height, m	Speed, km/h		SWL (per item), dBA Lw	
				Steady	Accelerating[1]	Steady	Accelerating[1]
Processing materials	Loading hopper	1	3.5	--	--	104	--
	Primary crusher	1	2.0	--	--	107	--
	Secondary crusher	1	2.0	--	--	107	--
	Tertiary crusher	1	2.0	--	--	107	--
	Processing screen	1	2.0	--	--	104	--
	Front-end loader	1	2.5	--	--	107	--
Stockpiling	Front-end loader	1	2.5	20	10	107	97
Product Dispatch (from Processing area)	Front-end Loader	1	2.5	--	--	107	--
	Truck	1 (idling being loaded)	2.5	--	--	105	--
	Truck & dog	1 (on site access road)	2.5	40	10	110	115
Quarrying	30t Excavator	1	2.5	--	--	112	--
	Front-end Loader	1	2.5	--	--	107	--
Maintenance	Water truck	1 (on site access road and between stockpile and quarry pit/processing area)	2.5	20	5	100	105

1. Mobile plant are assumed to accelerate 20% of the time.

5 Noise Assessment

5.1 Operational Noise Assessment

Similar to construction activities, noise levels at the receptors would be highest when quarrying and landfill plant/equipment operates in the nearest part of the site to a receptor.

5.1.1 Weather Conditions

Noise assessments must include consideration of the weather conditions for the project area and their effect on noise propagation from the site activities.

Certain weather conditions can increase noise levels by enhancing the propagation of noise towards receivers. Noise-enhancing weather conditions occur where light wind (0.5 m/s – 3 m/s) blows from the source to the receiver, or where temperature inversions occur. Such conditions are considered prevalent to the area where the frequency of occurrence exceeds 30% of the time.

The NPfI "Fact Sheet D: Accounting for noise-enhancing weather conditions" states:

> *Two options are available to a proponent to consider meteorological effects:*
>
> 1. *Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F-class temperature inversions with wind speeds up to 2 m/s at night.*
>
> *Or*
>
> 2. *Determine the significance of noise enhancing conditions.*

Option 2 allows analysis of historical weather data to establish the prevalence of noise-enhancing meteorological conditions.

Noise emissions from the Project have been modelled in accordance with NPfI Option 1 using the 'default' noise enhanced meteorological parameters. Consequently, this may result in a conservative assessment, and where compliance under noise-enhancing conditions, ie where wind and atmospheric conditions would assist noise propagation from the site towards the receptors, is predicted, then compliance during other meteorological conditions would also be expected.

The modelled meteorological conditions are provided in **Table 7**.

Table 7 Meteorological Conditions

Parameter	Daytime Operations, Enhanced Propagation[1]
Temperature	20°C
Humidity	70%
Pasquill Atmospheric Stability Class	D
Wind Speed (source-receptor)	3 m/s

1. Often referred to as the "worst-case" situation.

5.1.2 Modelling Results

The results of the noise modelling for each of the project activities and the overall predicted noise level (ie all activities operating simultaneously) are shown in **Table 8**, together with the applicable Project PNTL.

Exceedances of the PNTL have been bolded for each activity and shaded for the overall predicted noise level.

Table 8 Predicted Noise Levels – All Operations (Daytime)

Receptor	NPfI Daytime PNTL dBA $L_{Aeq(15min)}$	Predicted Noise Level, dBA $L_{Aeq(15minute)}$					
		Quarrying	Processing	Stockpiling	Maintenance	Product Dispatch	Total
R01	40	40	**42**	25	26	**41**	46
R02	40	35	37	20	20	36	41
R03	40	26	35	25	24	34	38
R04	40	21	26	21	10	25	29
R05	40	21	31	20	16	27	33
R06	40	19	23	19	< 10	23	27
R07	40	19	34	10	13	30	36
R12	40	11	12	< 10	< 10	10	16
R14	40	13	14	< 10	< 10	12	18
R15	40	17	18	< 10	< 10	15	22
R16	40	12	13	< 10	< 10	15	19
R17	40	21	21	16	13	25	28
R18	40	20	22	19	15	35	35
R19	40	20	20	14	< 10	15	24
R20	40	**42**	35	27	28	**43**	46
R21	40	**44**	**47**	30	33	**47**	51
R22	40	35	37	20	20	35	41
R25	40	21	21	17	12	21	27
R26	40	19	21	19	< 10	19	25
R27	40	20	19	16	10	19	25
R28 (unoccupied)	40	**51**	**55**	35	37	**52**	58
R31	40	21	32	22	17	35	37
R32	40	27	**45**	25	24	36	45
R33	40	28	**46**	27	24	30	46
R34	40	33	24	22	20	29	35
R35	40	35	22	17	15	29	36
R36	40	22	17	< 10	< 10	15	24

It can be seen in **Table 8** that noise levels from the quarry operations are predicted to exceed the NPfI PNTLs at several receptors, particularly for quarrying, processing and product despatch.

The predicted exceedances of the daytime PNTL were up to 11 dBA for all activities occurring at the same time – which may be relatively unlikely – at the nearest occupied receptor (R21). An exceedance of that magnitude would be considered significant. The predicted exceedance at R28, which is unoccupied, was 18 dBA.

Noise from the activities is not expected to contain any 'annoying' characteristics (described in **Table 3**) including a substantial low frequency component, when observed at the surrounding receptors, and therefore no modifying factor is required for the predicted noise levels.

It is generally the quarrying and processing that generates the highest predicted noise levels, in particular at receptors that are not shielded by the quarry benches. This is also the case for product despatch which is also done with line-of-sight to the nearest receptors to the northwest.

5.1.3 Ongoing Mitigation for Minimising Noise Emissions from the Project

It is important to note that the quarrying activities have been located at the highest point on the site. As quarrying progresses, the noise levels would be likely to reduce at several receptors as activities are shielded by the quarry benches that are formed.

Acoustic screening was investigated for the fixed activities to reduce noise to potentially affected receivers. The topography of the surrounds does not suit the use of acoustic screening as many receptors to the north and northwest are at higher elevation meaning that the effectiveness of the screen is easily diminished. Nonetheless, some reduction benefit (albeit relatively small) may be obtained from judicious positioning of stockpiles relative to fixed plant.

The predicted noise levels suggest that the level of noise from the current quarry operations exceed the minimum PNTLs established as part of this assessment. It is understood that noise-related complaints have not received by the operators.

It is also possible that the level of quarry noise received at most receptors is not dominant in the context of the ambient environment which may be influenced by natural or other noise sources and potentially 'mask' quarry noise. This would be confirmed during the proposed monitoring program.

The following mitigation and management controls are recommended to ensure that site noise is minimised, and not increased, as a result of the project where practicable, to reduce the likelihood of noise-related complaints.

The following controls are recommended:

- Undertake a monitoring programme to establish/confirm:
  - the noise level and characteristics of the current quarry activities;
  - the sound emission of quarry plant/equipment items; and
  - actual ambient background noise levels (to be used as a basis for the PNTLs and update this assessment as appropriate).
- Locate product stockpiles to the northwest of fixed plant where possible.
- Further investigate all reasonable and feasible mitigation measures including:

- Relocation of processing plant to afford screening due to quarry benches and local topography
- Purpose-built noise reduction bunds/barriers (where local topography allows)

- Confine works to the daytime period only where possible.
- The DA consent conditions should include the expanded site operations and reflect the current NPfI requirements described in this assessment, ie
  - Noise at any receptor must not exceed the PNTLs described in **Table 2** (unless the PNTLs are increased as a result of actual background noise monitoring as described above);
  - The PNTLs apply under the weather conditions described in **Table 7** (unless long-term meteorological conditions indicate that noise-enhancing conditions do not apply); and
  - Maintain a noise complaint register including any complaints received, investigation and follow up.
- Implement a quarry noise management plan to reflect this assessment and any DA Consent Conditions, including:
  - Undertake routine noise monitoring (eg annual or bi-annual) to confirm compliance with the PNTLs established as part of this assessment (or updated assessment as appropriate) and any applicable DA Consent Conditions; and
  - Maintain equipment in accordance with manufacturers requirements to avoid excess noise emissions.

5.2 Project-Related Road Traffic Noise Assessment

Although the amount of material extracted annually will increase, it is understood that the rate of material processed at the quarry would not increase following the expansion of the quarry. Therefore, it is expected that additional trucks to dispatch product would not be required and the number of operations-related trucks using the surrounding road network would not significantly change.

The number of trucks required will be low relative to the total number of existing vehicles on Murray's Crossing Road.

Therefore, it is expected that the Project would not noticeably increase the traffic volume on the local road network, so the RNP +2 dB criterion would not be exceeded.

5.3 Blasting Assessment

It is understood that a Blast Management Plan (BMP) is currently implemented at the site.

Airblast overpressure and ground vibration levels for the project have been considered based on the methodology contained within Australian Standard (AS) 2187.2-2006 "*Explosives - Storage and use, Part 2: Use of explosives*" (AS 2187.2).

Site constants representative of site-specific conditions of the Project were developed from monitoring data collected from blasting for the existing operations. The monitoring location was approximately 500 m north of the Tumbarumba quarry on the corner of Byatt and Booth Streets. It is noted that some residences will be closer to the blast positions than the monitoring location.

5.3.1 Airblast Overpressure

To assess potential airblast overpressure levels at nearby receptors, the following site law formula was adopted from AS 2187.2:

$$\mathrm{P} = K_a \left(\frac{R}{(Q^{1/3})} \right)^a$$

Where:

P = Pressure (kilopascals)

Q = Maximum Instantaneous Charge (effective charge mass per delay), in kg. Explosive loading/detonation sequence/effective charge mass per delay. The maximum charge, in kilograms, initiated at any instant of time

R = Distance from charge (m)

Ka = Site constant

a = Site exponent, a value of -1.45 was adopted as per AS 2187.2

The conversion of the 'P' pressure unit to linear decibels (dBZ) is completed using the following formula:

$$\mathrm{SPL} = 10\, x \log \left(\frac{P}{P_0} \right)^2$$

An indicative airblast overpressure site constant (Ka) of 10.9 was derived based on the available blast data for current operation of the quarry.

5.3.2 Ground Vibration

To assess potential blasting vibration levels at nearby sensitive receptors, the following site law formula was adopted from AS 2187.2:

$$\mathrm{V} = K_g \left(\frac{R}{(Q^{1/2})} \right)^{-B}$$

Where:

V = ground vibration as vector peak particle velocity (mm/s)

R = distance between charge and point of measurement (metres)

Q = Maximum Instantaneous Charge (effective charge mass per delay), in kg. Explosive loading/detonation sequence/effective charge mass per delay. The maximum charge, in kilograms, initiated at any instant of time.

Kg = a constant related to site and rock properties for estimation purposes

B = a constant related to site and rock properties for estimation purposes, a value of 1.6 was adopted.

The ground vibration site constant (Kg) of 2,200 was derived was derived based on the available blast data for current operation of the quarry.

5.3.3 Blasting Predictions

Based on the formulas and derived site constants presented above, predictions were made for airblast overpressure and ground vibration at the nearest receivers to the quarry. Results are presented in the **Table 9** at the nearest site sensitive receivers.

Table 9 Calculated Blasting Impacts for MIC of 40 kg – 150 kg

Receptor	Description	Direction and Distance	Predicted Vibration (mm/s PPV) at MIC			Overpressure (dB linear peak) at MIC		
			40 kg	70 kg	140 kg	40 kg	70 kg	140 kg
R28	Residential (not occupied)	NW, 300 m	4.6	7.2	13.2	118.4	120.7	123.7
R21	Residential	WNW, 620 m	1.4	2.2	4.1	109.2	111.6	114.5
R03	Residential	WSW, 700 m	1.2	1.8	3.4	107.7	110.1	113.0
Racecourse	Buildings	E, 270 m	5.4	8.5	15.6	119.7	122.1	125.0

Airblast overpressure is not expected to exceed the ANZEC guideline criteria of 115 dBL at the nearest residential receivers R21 and R03 up to an MIC of approximately 140 kg.

If the unoccupied dwelling R28 is occupied in future, there would be risk of exceeding the ANZEC Blast overpressure value at MIC of 40 kg. Vibration levels would also be below the ANZEC annoyance criteria of 5 mm/s PPV.

At the closest unoccupied receiver R28 and the Racecourse buildings, a maximum MIC of approximately 140 kg is predicted not to exceed the AS 2187.2 cosmetic damage criteria.

Notwithstanding the above assessment, it is recommended that blasting noise and vibration monitoring be continued at the quarry, to further develop the 'Site Law' for the quarry. The purpose of the Site Law is to refine the efficiency of each blast whilst maintaining compliance with the applicable limits.

It should be noted that the maximum MIC calculations above are provided as a guide only and individual blast designs should be based on meeting the criteria rather than restrictions on MIC, noting that the blast design includes a number of variables including location, aspect if near an open face, etc.

The blasting variables are readily managed through good blasting practices and the continuation of the current BMP should ensure the potential for impacts are minimised such that adverse effects are fully avoided.

5.3.4 Blasting Recommendations

Based on the results and findings discussed above, blasting recommendations are provided below:

- All blasts should be monitored (preferably at the nearest sensitive receivers in **Table 9**) to obtain data which can be used to confirm site constants and compliance with blasting criteria.
- Blast monitoring must continue to take place in accordance with EPL requirements.
- The BMP should continue to be updated to incorporate proposed operations of the quarry and detail the mitigation and management procedures for minimising potential impacts.

6 Conclusions

SLR has undertaken an assessment of operations noise and vibration associated with the proposed expansion of the existing BHQ Murray's Crossing Quarry at Tumbarumba, NSW.

Project specific noise management and trigger levels have been established in accordance with guidelines and policies applicable to the assessment of industrial/extractive industry operations noise in NSW.

Noise modelling based on the topography and layout of the Project site and surrounds, together with construction and operational scenarios and likely plant/equipment, has been undertaken. "Noise enhancing" meteorological conditions have been incorporated into the noise modelling in accordance with NPfI methodology.

Operational noise levels were predicted to exceed the daytime PNTLs, with the magnitude of exceedance dependent on the combination of activities occurring at the site and line-of-sight exposure to the site.

It is recommended to:

- Undertake measurements of current quarry plant and activities, actual ambient background noise levels, and update this noise assessment as necessary.
- Locate product stockpiles to the northwest of fixed plant where possible.
- Include the expanded site operations and the NPfI requirements in DA Consent Conditions.
- Implement a quarry noise management plan to reflect this assessment (or updated assessment as appropriate), and applicable DA Consent Conditions.

The number of trucks and other vehicles associated with operations at the Project will be low relative to the existing traffic volumes on the surrounding road network. Road traffic noise associated with the project operations is not considered to be of acoustical significance.

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Appendix M Resource assessment

GEOCHEMPET SERVICES

ABN 25 065 630 506
PETROGRAPHIC, GEOLOGICAL & GEOCHEMICAL CONSULTANTS

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Clontarf, QLD 4019

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PETROGRAPHIC REPORT ON AN AGGREGATE SAMPLE (BHQ-T01) FROM TUMBARUMBA QUARRY

prepared for

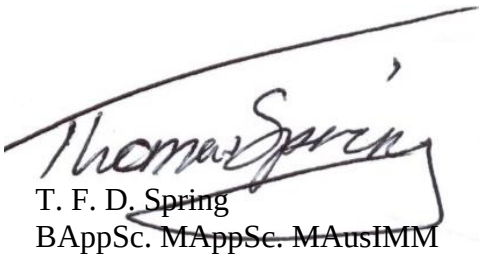
BALD HILL QUARRY PTY LTD
JUGIONG, NSW

Purchase Order: 5928-T01

Invoice Number: G2109570

Client Ref: Angela Grogan

Issued by



T. F. D. Spring
BAppSc. ~~MAppSc.~~ MAusIMM
30 September 2020

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GEOCHEMPET SERVICES, BRISBANE

Sample Number: BHQ-T01 **Date Sampled**: 03/09/2020

Product Type: Aggregate **Date Received**: 09/09/2020

Source: Tumbarumba Quarry

Work Requested Petrographic analysis in relation to suitability for use concrete aggregate, and asphaltic/sealing aggregate: petrographic assessment of potential for alkali-silica reactivity

Methods Account taken of ASTM C295 Standard Guide for *Petrographic Assessment of Aggregates for Concrete*, the AS2758.1 – 2014 *Aggregates and rock for engineering purposes part 1; Concrete aggregates (Appendix B),* the AS1141 Standard Guide for the *Method for sampling and testing aggregates* and of the content of the 2015 joint publication of the Cement and Concrete Association of Australia and Standards Australia, (HB 79-2015) entitled *Alkali Aggregate Reaction - Guidelines on Minimising the Risk of Damage to Concrete Structures in Australia*

Identification: Olivine basalt

Description:

The sample consisted of 2 kg of robust, hard angular fragments of essentially unweathered, dark grey, fine-grained basic igneous rock. The rock is lightly coated by an easily removed fine dust.

Figure 1: Image of washed sub sample form supplied aggregate product.

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A thin section was prepared from 8 randomly selected fragments to allow detailed microscopic examination in transmitted, polarized light. An approximate composition of the rock, expressed in volume percent and based on a brief count of 100 widely spaced observation points in sectioned fragments, is:

Primary components

29%	plagioclase feldspar
40%	clinopyroxene
4%	brown glass
11%	olivine
7%	opaque oxide

Secondary minerals

8%	colourless to green clay of smectite style (nontronite)
1%	iddingsite

In thin section the rock displays typical textures ranging from porphyritic, hypidiomorphic, finely crystalline and intersertal, volcanic textures of basaltic style. The phenocrysts are about 0.5 to 2.5 mm in size. The framework of the rock is formed by randomly orientated to faintly flow-aligned feldspar laths about 0.05 to 0.2 mm long and smaller pyroxene grains. Interstitial brown glass is patchy in occurrence and does not form a connected network.

The phenocrysts and disseminated groundmass grains are mainly fresh euhedral and subhedral olivine, but some are partly or completely altered to green clay of smectite style (nontronite). Other irregular and interstitial green smectite clay appears to be replacing late glass. All other primary components remain quite fresh. They comprise twinned laths of plagioclase feldspar, small grains and prisms of faintly brown clinopyroxene, equant grains of opaque oxide (magnetite and/or ilmenite) and interstitial pale brown glass (dusted with tiny microlites of opaque oxide).

Comments and Interpretations:

This supplied nominal aggregate sample from Tumbarumba Quarry is identified as olivine basalt. Its textures are consistent with a basic volcanic rock probably from a lava flow. The basalt has experienced light alteration of deuteric style (i.e alteration during initial cooling), resulting in selective, but variable alteration of its disseminated olivine grains and interstitial late glass to nontronitic, green smectite clay (a water-sensitive, swelling type of clay).

For engineering purposes, the rock in the supplied aggregate sample may be summarised as:

- **olivine basalt** (a basic igneous volcanic rock)
- finely crystalline and variably glassy
- non-porous
- essentially unweathered
- lightly altered
- secondary minerals amount of 9% (specifically carrying 8% of secondary colourless to green smectite clay and 1% iddingsite)
- **hard**
- **strong**

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The rock is expected to be **durable**.

The basalt lacks free silica: consequently, it is predicted to be innocuous in relation to alkali-silica reactivity in concrete. The observed brown glass is a common basaltic type which is considered to be undersaturated in silica and consequently innocuous. The rock is predicted to be **innocuous in relation to alkali-silica reactivity in concrete**.

In short, aggregate of the type represented by the supplied sample is predicted to be **suitable for use as concrete aggregate and asphaltic/sealing aggregate** (subject to bitumen stripping and polishing tests).

Free Silica Content

Apparently Nil

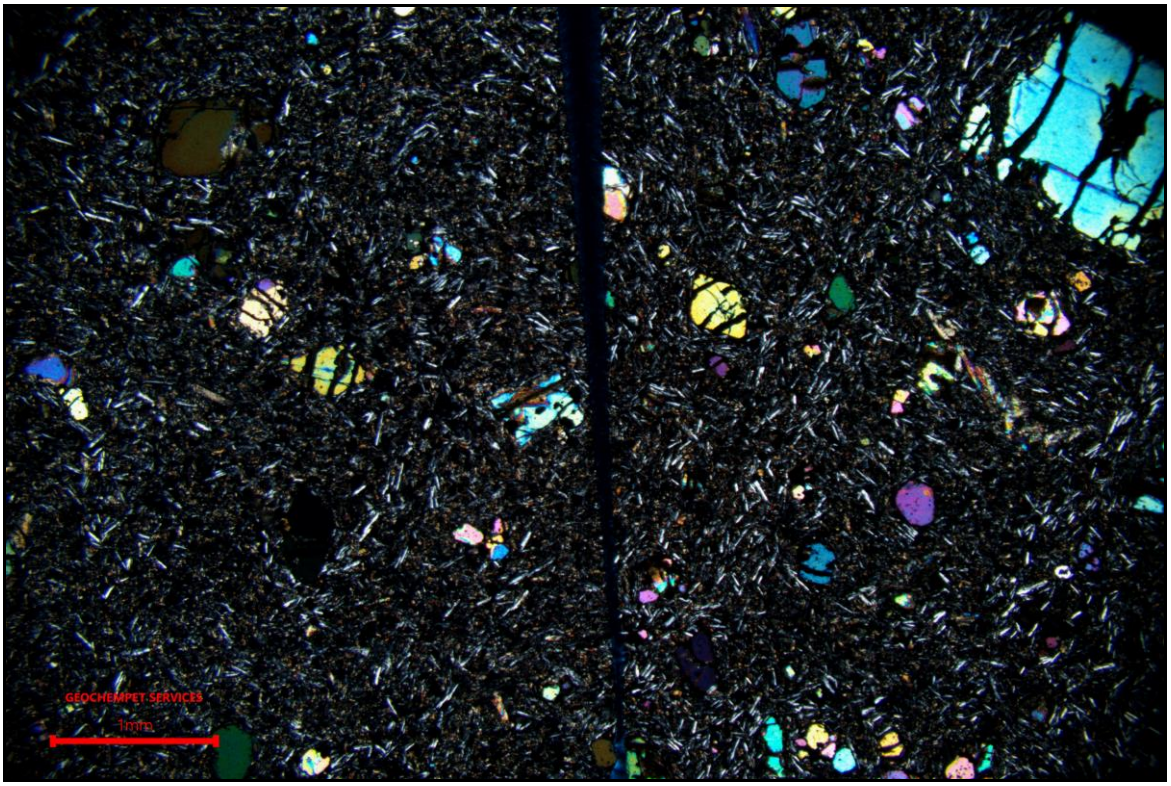

Figure 2: Micrograph of two fragments selected for petrographic analysis, taken at low magnification in transmitted cross polarised light. The fragments are similar in texture and contain the same basic mineral assemblage dominated by clinopyroxene, plagioclase and olivine.

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Appendix N Pit Sequencing Plans

BALD HILL QUARRY EXPANSION
MURRAYS CROSSING ROAD
TUMBARUMBA, NSW 2653
REF: 210864
FOR: BALD HILL QUARRY PTY LTD

GENERAL REVISION

CIVIL DRAWINGS

DRAWING INDEX	
PROJECT No.: 210864	REVISION No.: C
SHEET C1	DISTURBED AREA PLAN
SHEET C2	STAGE–1 PLAN: 3–5 YEARS
SHEET C3	STAGE–1 SECTION: 3–5 YEARS
SHEET C4	STAGE–2 PLAN: 7–12 YEARS
SHEET C5	STAGE–2 SECTION: 7–12 YEARS
SHEET C6	STAGE–3 PLAN: 15–20 YEARS
SHEET C7	STAGE–3 SECTION: 15–20 YEARS
SHEET C8	SIMPLIFIED STAGE SECTIONS 1/2
SHEET C9	SIMPLIFIED STAGE SECTIONS 2/2
SHEET C10	CONCEPT REHABILITATION PLAN
SHEET C11	TYPICAL SECTIONS

XEROS PICCOLO
CONSULTING ENGINEERS

LEGEND

MARK	ITEM
	PROPOSED DISTURBED AREA
	EXISTING BUILDING
	EXISTING DISTURBED AREA
	AREA OF AUXILLIARY ACTIVITY
	BOREHOLES
	EXISTING CREEK BED
	SITE ACCESS TRACK
	EXISTING FENCE LINE
	EXISTING MAJOR CONTOURS AT 5.0m INCREMENTS
	EXISTING MINOR CONTOURS AT 1.0m INCREMENTS
	EXISTING BOUNDARY LINE

N

0 10 20 50 75 100
SCALE 1:1000 (A1) METRES

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C	15.07.2022	GENERAL REVISION	A.X
B	14.07.2022	GENERAL REVISION	A.X
A	8.07.2022	ISSUED FOR COUNCIL APPROVAL	A.X
P5	30.06.2022	ISSUED FOR PRELIMINARY REVIEW	A.X

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Project:
BALD HILL QUARRY EXPANSION
LOT 20,172,452 & 732, DP755892
MURRAYS CROSSING RD
TUMBARUMBA NSW 2653

Sheet Title: DISTURBED AREA PLAN
Client: BALD HILL QUARRY PTY LTD
Checked: A.X
Scale: 1:1000 (A1) 1:2000 (A3)
Approved:
Design: A.X
Drawn: N.T
Date: MAR 2021

Project Number: 210864
Sheet Number: C1
Revision Number: C
Sheets in Set: 11

LEGEND

MARK	ITEM	AREA (m^2)
	STAGE–1 EXTENTS	14698
	AREA OF AUXILLIARY ACTIVITY	71520
	AREA OF REHABILITATION	507
	ACTIVE WASTE AREA	1533
	EXISTING BUILDING	
	BOREHOLES	
	EXISTING CREEK BED	
	PROPOSED DEFLECTION BANK	
	SITE ACCESS TRACK	
	EXISTING FENCE LINE	
	EXISTING MAJOR CONTOURS AT 5.0m INCREMENTS	
	EXISTING MINOR CONTOURS AT 1.0m INCREMENTS	
	EXISTING BOUNDARY LINE	

N

0 10 20 50 75 100
SCALE 1:1000 (A1) METRES

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Project:
BALD HILL QUARRY EXPANSION
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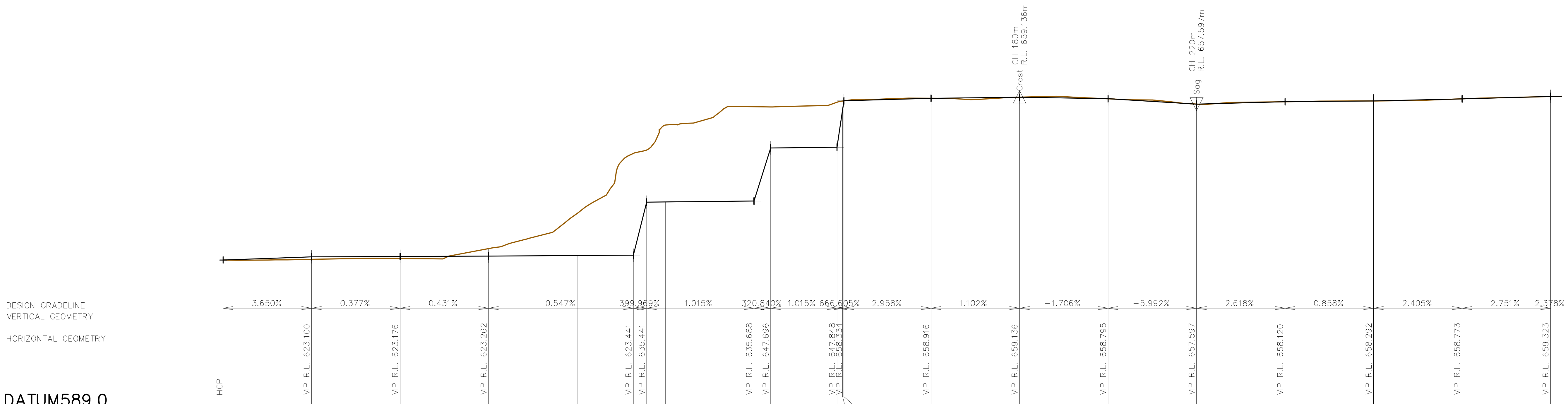
MURRAYS CROSSING RD
TUMBARUMBA NSW 2653

Sheet Title: STAGE–1 PLAN: 3–5 YEARS
Client: BALD HILL QUARRY PTY LTD
Checked: A.X
Scale: 1:1000 (A1) 1:2000 (A3)
Approved:
Design: A.X
Drawn: N.T
Date: MAR 2021

Project Number: 210864
Sheet Number: C2
Revision Number: C
Sheets in Set: 11



DATUM589.0

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DEPTH ABOVE/BELOW EXISTING SURFACE	0	0.579	0.481	−1.7	−9.505	−23.002	−11.783	−17.378	−21.331	−9.256	−10.18
CHAINAGE	0	20	40	60	80	92.739	95.739	100	120	123.743	138.744

DESIGN LINE GRADING	656.218	658.334	658.916	659.136	658.795	657.597	658.12	658.292	658.773	659.323
EXISTING SURFACE	658.295	658.334	658.916	659.136	658.795	657.597	658.12	658.292	658.773	659.323
DEPTH ABOVE/BELOW EXISTING SURFACE	−2.077	0	0	0	0	0	0	0	0	0
CHAINAGE	140	140.317	160	180	200	220	240	260	280	300

LONGITUDINAL SECTION – Stage 1 Profile

HORIZONTAL SCALE 1:500 (A1)
VERTICAL SCALE 1:500 (A1)

SECTION S1 / C2

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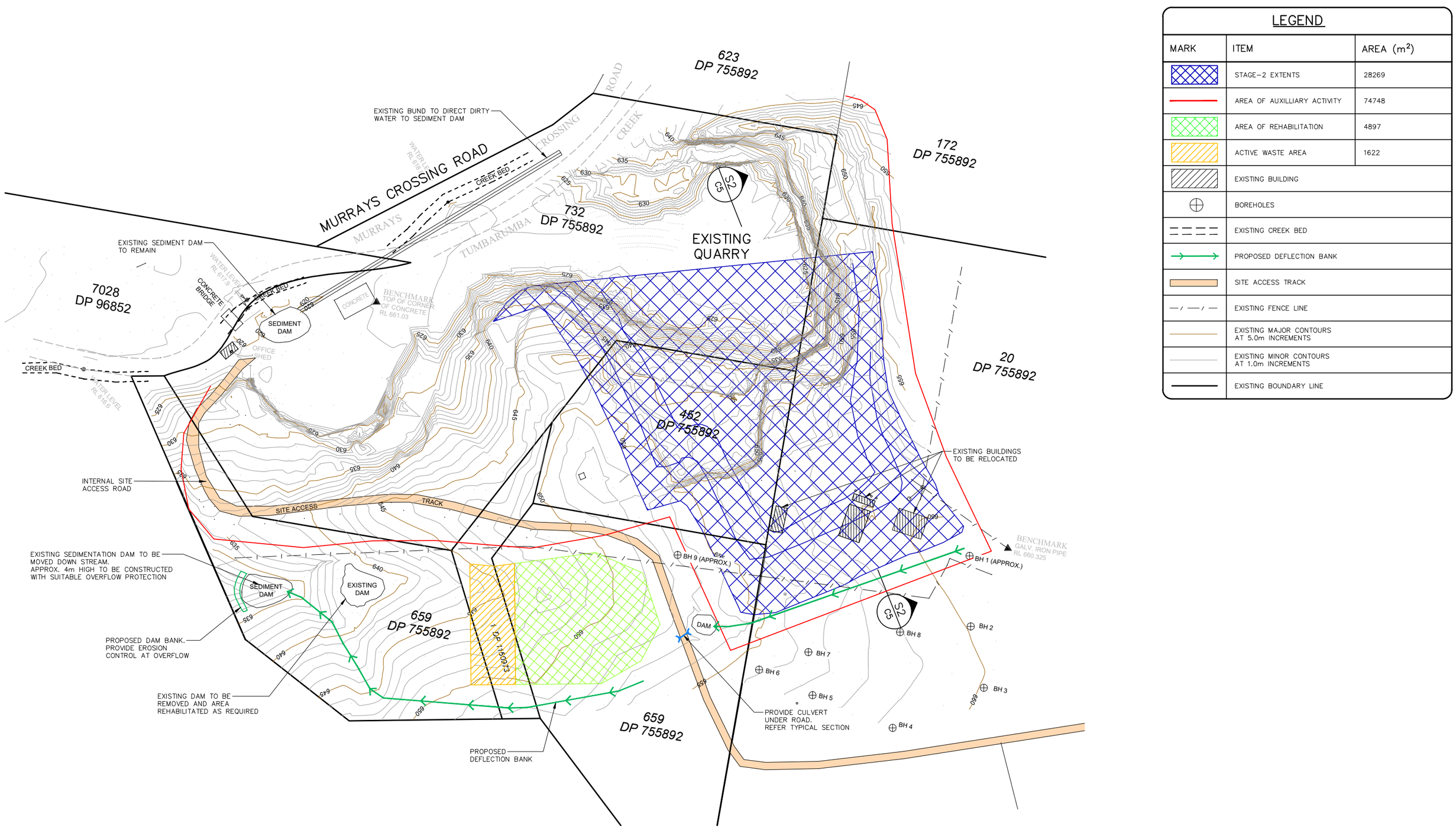
MURRAYS CROSSING RD
TUMBARUMBA NSW 2653

Sheet Title: STAGE–1 SECTION: 3–5 YEARS
Client: BALD HILL QUARRY PTY LTD
Checked: A.X
Scale: AS SHOWN
Approved:
Design: A.X Drawn: N.T Date: MAR 2021
Project Number: 210864
Sheet Number: C3 Revision Number: C Sheets in Set: 11



LEGEND

MARK	ITEM	AREA (m^2)
	STAGE–2 EXTENTS	28269
	AREA OF AUXILLIARY ACTIVITY	74748
	AREA OF REHABILITATION	4897
	ACTIVE WASTE AREA	1622
	EXISTING BUILDING	
	BOREHOLES	
	EXISTING CREEK BED	
	PROPOSED DEFLECTION BANK	
	SITE ACCESS TRACK	
	EXISTING FENCE LINE	
	EXISTING MAJOR CONTOURS AT 5.0m INCREMENTS	
	EXISTING MINOR CONTOURS AT 1.0m INCREMENTS	
	EXISTING BOUNDARY LINE	

N

0 10 20 50 75 100
SCALE 1:1000 (A1) METRES

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Project:
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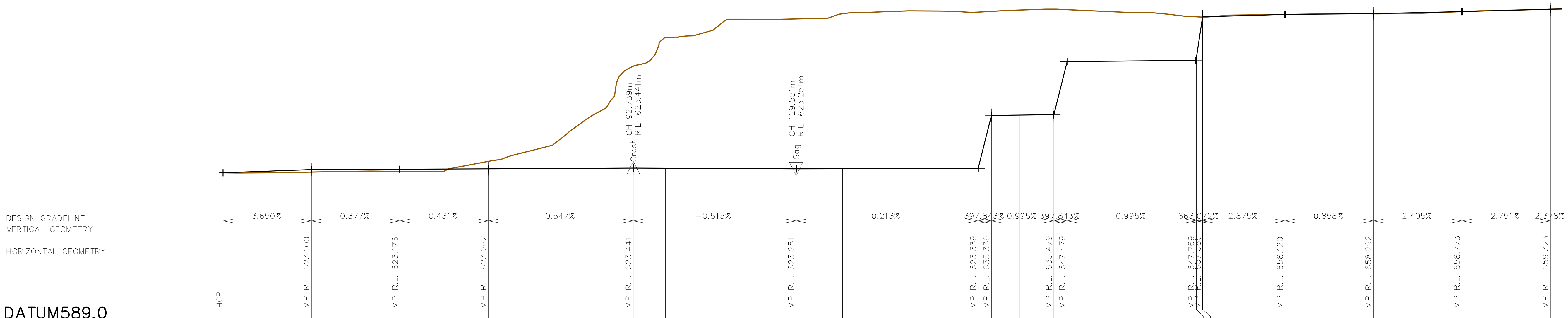
LOT 20,172,452 & 732, DP755892
MURRAYS CROSSING RD
TUMBARUMBA NSW 2653

Sheet Title: STAGE–2 PLAN: 7–12 YEARS
Client: BALD HILL QUARRY PTY LTD
Scale: 1:1000 (A1) 1:2000 (A3)
Design: A.X | Drawn: N.T | Date: MAR 2021
Checked: A.X
Approved:

Project Number: 210864
Sheet Number: C4 | Revision Number: C | Sheets in Set: 11



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EXISTING SURFACE	622.37	622.521	622.695	624.962	632.876	646.443	652.863	657.019	657.111	658.295	658.916	658.647	658.832	659.136	659.338	659.219	658.795	657.601	657.597	657.515	658.12	658.292	658.773	659.323
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LONGITUDINAL SECTION – Stage 2 Profile

HORIZONTAL SCALE 1:500 (A1)
VERTICAL SCALE 1:500 (A1)

SECTION S2 / C4

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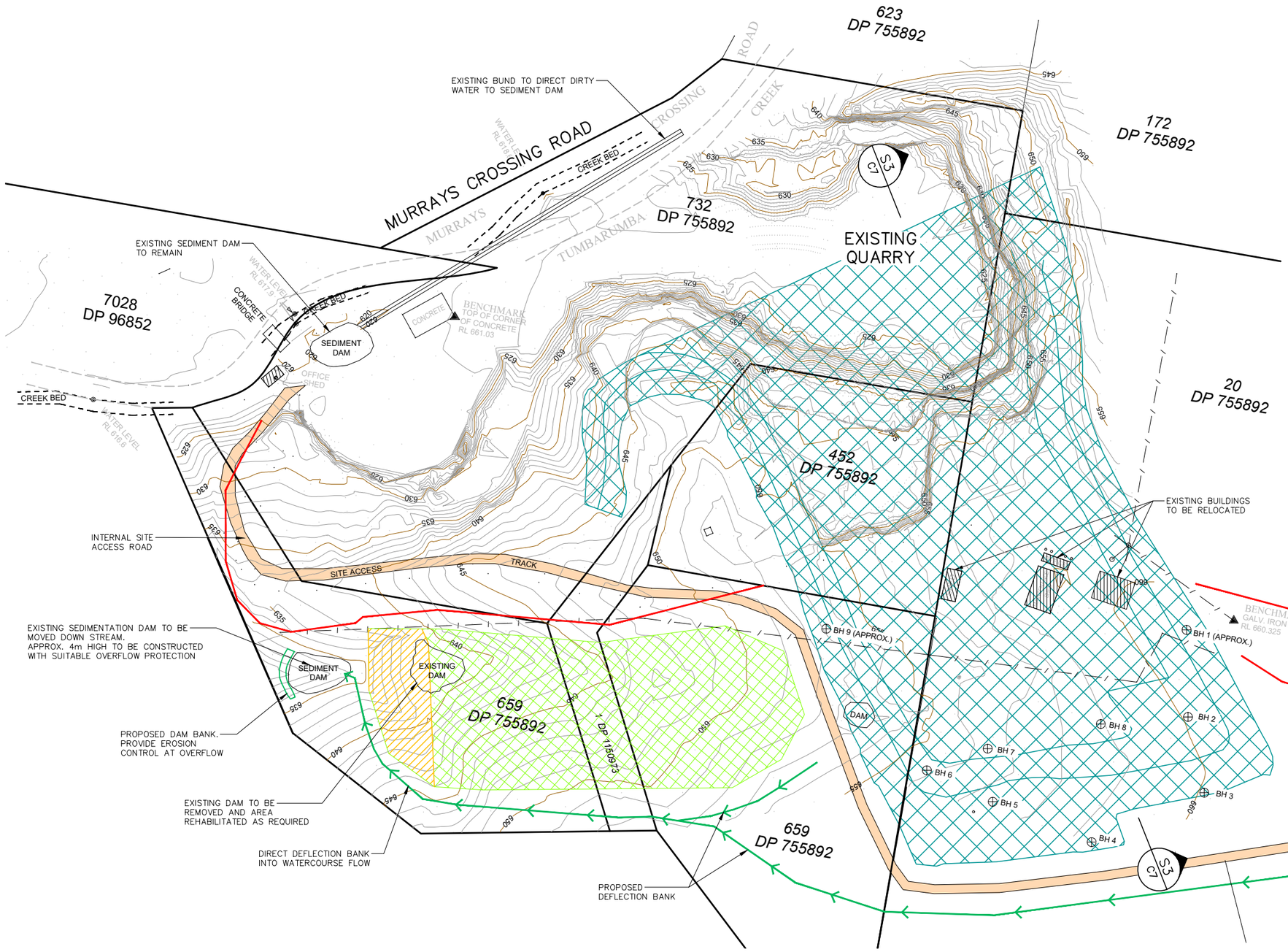
TUMBARUMBA NSW 2653

Sheet Title: STAGE-2 SECTION: 7-12 YEARS
Client: BALD HILL QUARRY PTY LTD
Checked: A.X
Scale: AS SHOWN
Approved:
Design: A.X
Drawn: N.T
Date: MAR 2021
Project Number: 210864
Sheet Number: C5
Revision Number: C
Sheets in Set: 11



LEGEND

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	STAGE-3 EXTENTS	46843
	AREA OF AUXILLIARY ACTIVITY	16779
	AREA OF REHABILITATION	10844
	ACTIVE WASTE AREA	1550
	EXISTING BUILDING	
	BOREHOLES	
	EXISTING CREEK BED	
	PROPOSED DEFLECTION BANK	
	SITE ACCESS TRACK	
	EXISTING FENCE LINE	
	EXISTING MAJOR CONTOURS AT 5.0m INCREMENTS	
	EXISTING MINOR CONTOURS AT 1.0m INCREMENTS	
	EXISTING BOUNDARY LINE	

N

0 10 20 50 75 100
SCALE 1:1000 (A1) METRES

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Sheet Title: STAGE-3 PLAN: 15-20 YEARS
Client: BALD HILL QUARRY PTY LTD
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Scale: 1:1000 (A1) 1:2000 (A3)
Approved:
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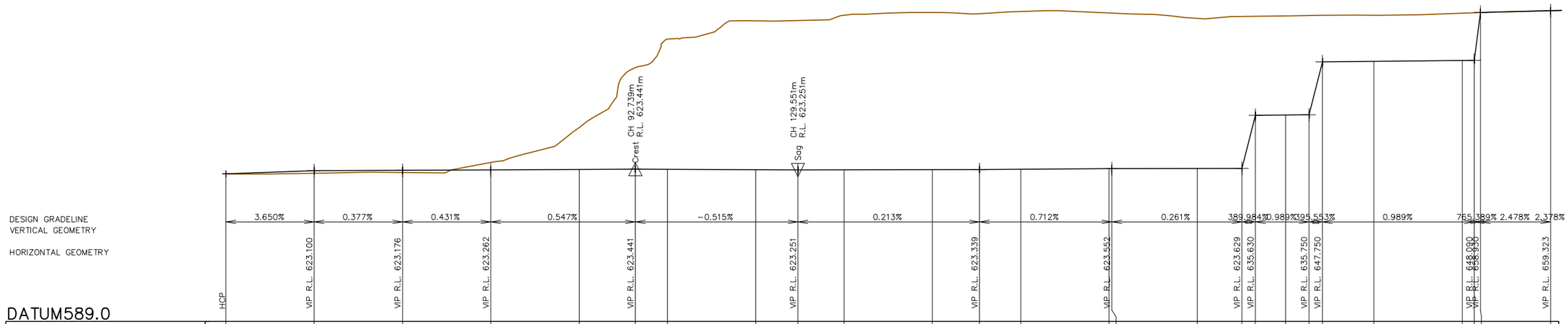
Date: MAR 2021

Project Number: 210864
Sheet Number: C6
Revision Number: C
Sheets in Set: 11



DESIGN GRADELINE
VERTICAL GEOMETRY

HORIZONTAL GEOMETRY

DATUM589.0

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EXISTING SURFACE	622.37	622.521	622.695	624.962	632.876	646.443	652.863	657.019	657.111	658.295	658.916	658.647	659.136	658.795 658.767	657.597	658.002	658.038	658.12	658.217	658.271	658.292	658.773	658.876	658.93	659.323
DEPTH ABOVE/BELOW EXISTING SURFACE	0	0.579	0.481	−1.7	−9.505	−23.002	−29.459	−33.718	−33.859	−35.021	−35.6	−35.308	−35.731	−35.247 −35.214	−33.994	−34.372	−22.409	−22.423	−22.467	−10.521	−10.427	−10.71	−10.787	0	0
CHAINAGE	0	20	40	60	80	92.739	100	120	129.551	140	160	170.658	180	200 200.647	220	230.084	233.162	240	245.296	248.33	260	280	282.712 284.129	284.129	300

LONGITUDINAL SECTION – Stage 3 Profile

HORIZONTAL SCALE 1:500 (A1)
VERTICAL SCALE 1:500 (A1)

SECTION S3 / C6

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LOT 20,172,452 & 732, DP755892
MURRAYS CROSSING RD
TUMBARUMBA NSW 2653

Sheet Title: STAGE–3 SECTION: 15–20 YEARS
Client: BALD HILL QUARRY PTY LTD
Checked: A.X
Scale: AS SHOWN
Approved:
Design: A.X
Drawn: N.T
Date: MAR 2021

Project Number: 210864
Sheet Number: C7
Revision Number: C
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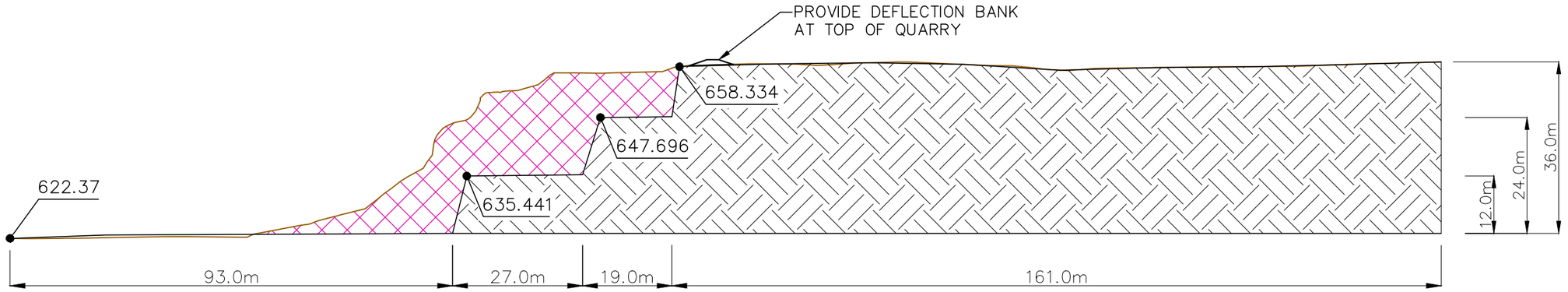
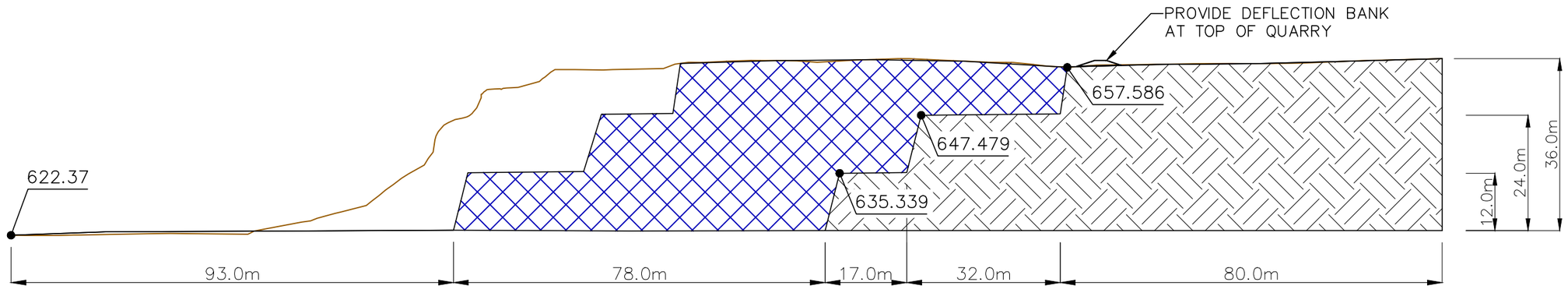
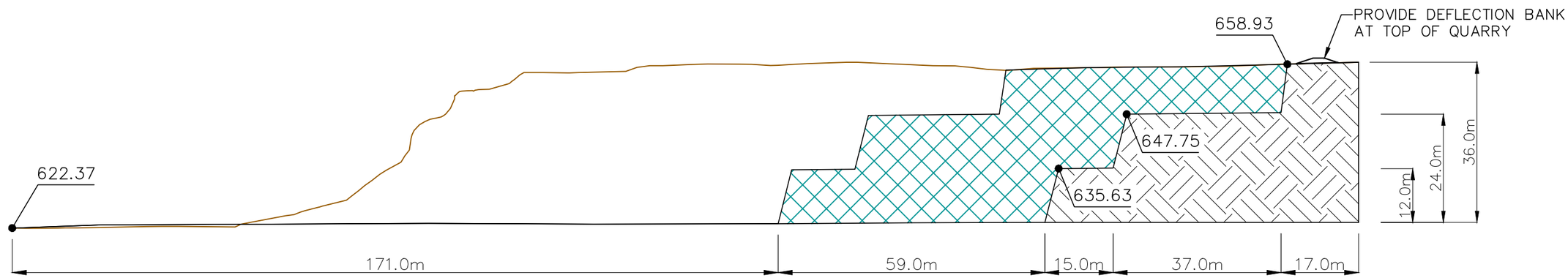


STAGE–1
CROSS SECTION: 3–5 YEARS
SCALE: 1:500 (A1) 1:1000 (A3)



STAGE–2
CROSS SECTION: 7–12 YEARS
SCALE: 1:500 (A1) 1:1000 (A3)



STAGE–3
CROSS SECTION: 15–20 YEARS
SCALE: 1:500 (A1) 1:1000 (A3)

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TUMBARUMBA NSW 2653

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Design: A.X
Drawn: N.T
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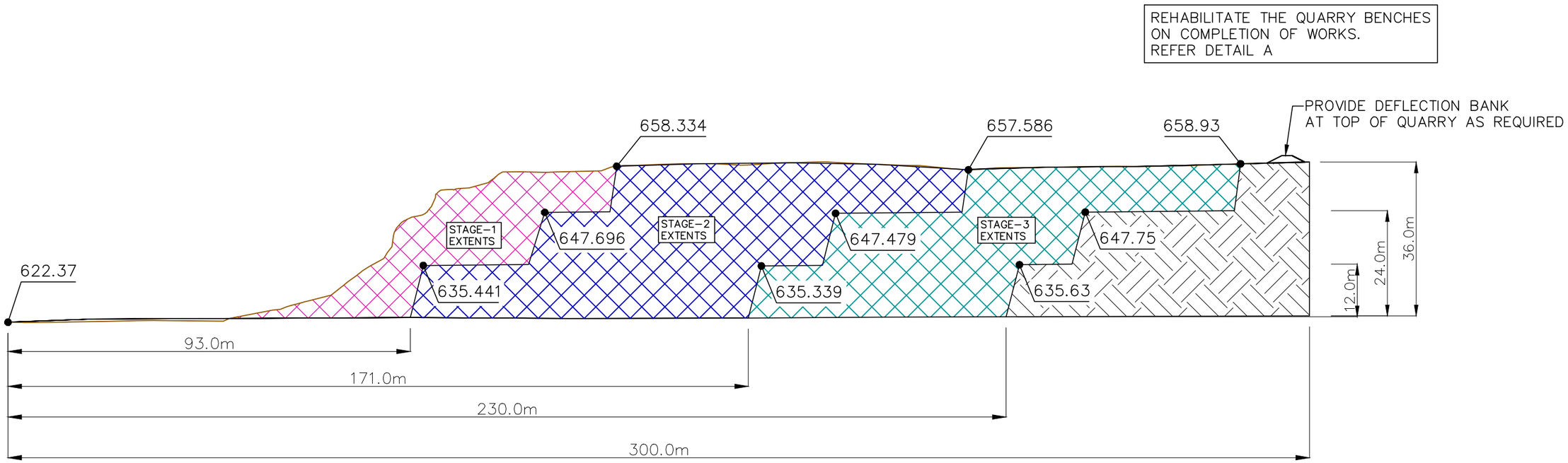

SECTION A–A
PROPOSED QUARRY 3 STAGE
LAYOUT CROSS SECTION
SCALE: 1:200 (A1) 1:400 (A3)

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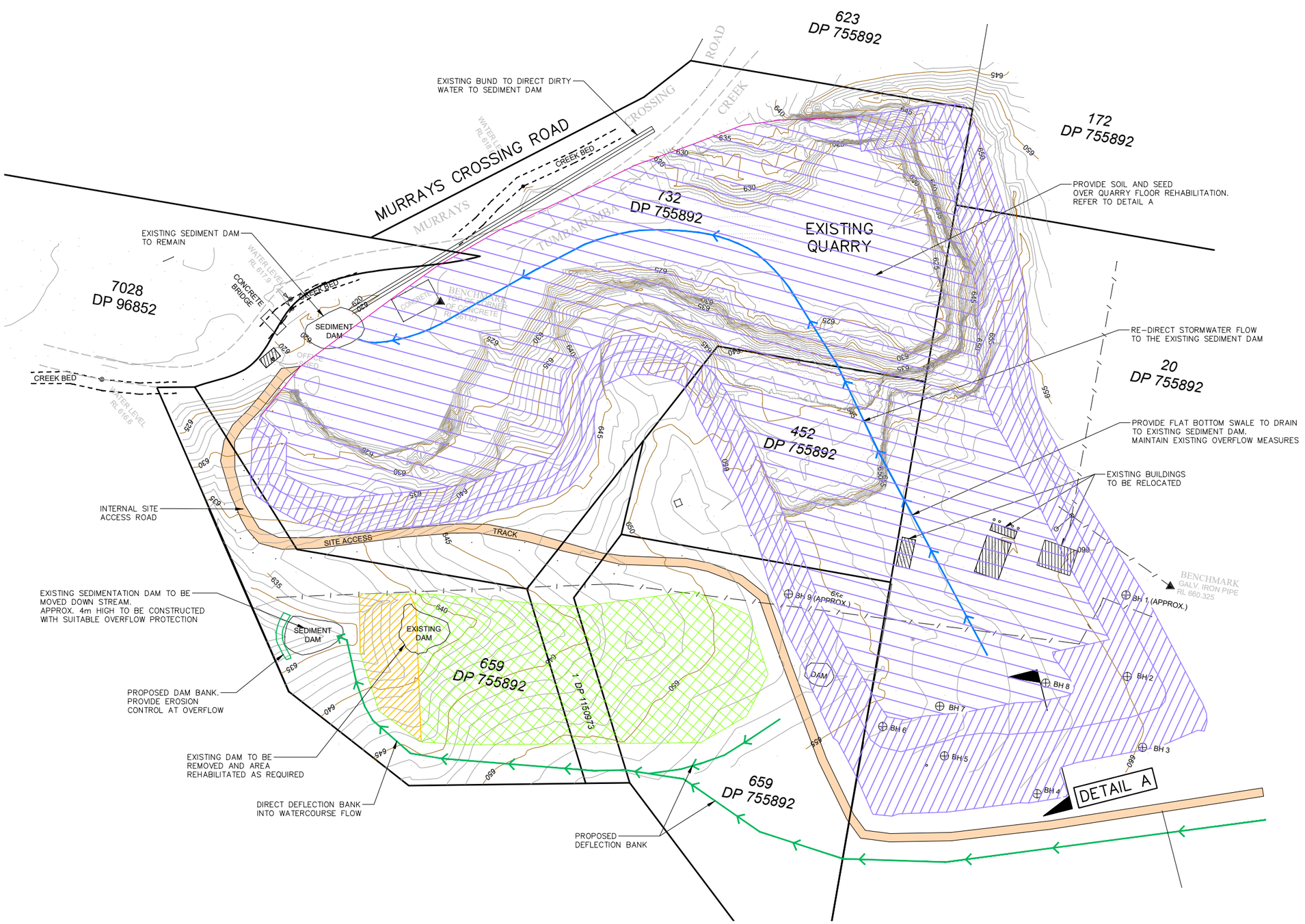

LEGEND

MARK	ITEM	AREA (m^2)
	AREA OF REHABILITATION	10844
	ACTIVE WASTE AREA	1550
	FINAL REHABILITATION AREA	
	FINAL REHABILITATION AREA. PROVIDE SOIL AND SEED. REFER TO TYPICAL SECTION	
	EXISTING BUILDING	
	BOREHOLES	
	EXISTING CREEK BED	
	PROPOSED DEFLECTION BANK	
	PROPOSED STORMWATER PATH	
	SITE ACCESS TRACK	
	EXISTING FENCE LINE	
	EXISTING MAJOR CONTOURS AT 5.0m INCREMENTS	
	EXISTING MINOR CONTOURS AT 1.0m INCREMENTS	
	EXISTING BOUNDARY LINE	

QUARRY FLOOR REHABILITATION TREATMENT

1) ONCE A STABLE LANDFORM HAS BEEN CREATED, RESPREAD STOCKPILED MATERIAL UNIFORMLY TO ENHANCE DEEP ROOT GROWTH.
2) SPREAD TOPSOIL TO MINIMUM 100mm THICK WHERE SUITABLE.
3) RE-ESTABLISH NATIVE TREE/SHRUB/GROUND AND VEGETATE RESHAPED AREAS.
4) EXISTING SEDIMENT DAM AND DRAINAGE SYSTEM TO BE MAINTAINED.

N

0 10 20 50 75 100
SCALE 1:1000 (A1) METRES

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Sheet Title: CONCEPT REHABILITATION AREA PLAN
Client: BALD HILL QUARRY PTY LTD
Scale: 1:1000 (A1) 1:2000 (A3)
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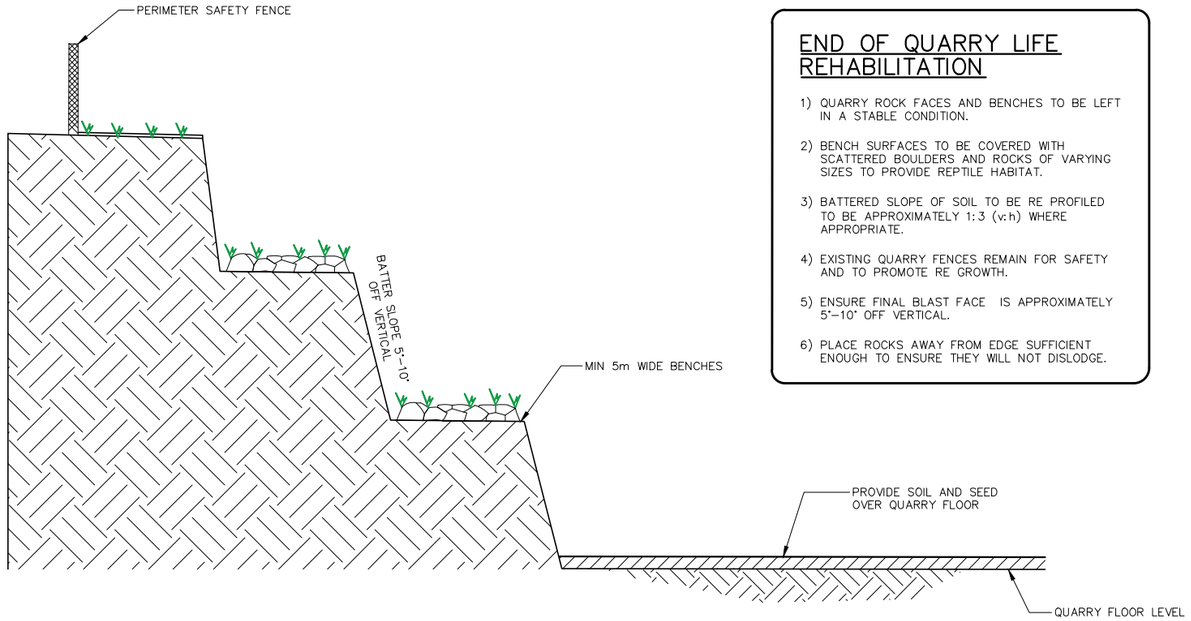
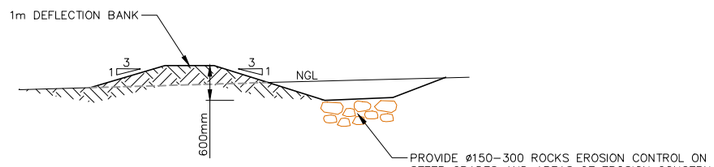


END OF QUARRY LIFE REHABILITATION

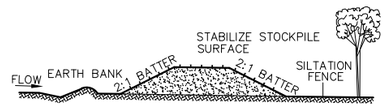
1) QUARRY ROCK FACES AND BENCHES TO BE LEFT IN A STABLE CONDITION.
2) BENCH SURFACES TO BE COVERED WITH SCATTERED BOULDERS AND ROCKS OF VARYING SIZES TO PROVIDE REPTILE HABITAT.
3) BATTERED SLOPE OF SOIL TO BE RE PROFILED TO BE APPROXIMATELY 1:3 (v:h) WHERE APPROPRIATE.
4) EXISTING QUARRY FENCES REMAIN FOR SAFETY AND TO PROMOTE RE GROWTH.
5) ENSURE FINAL BLAST FACE IS APPROXIMATELY 5°–10° OFF VERTICAL.
6) PLACE ROCKS AWAY FROM EDGE SUFFICIENT ENOUGH TO ENSURE THEY WILL NOT DISLODGE.

DETAIL A
TYPICAL SECTION
QUARRY REHABILITATION TREATMENT
NOT TO SCALE



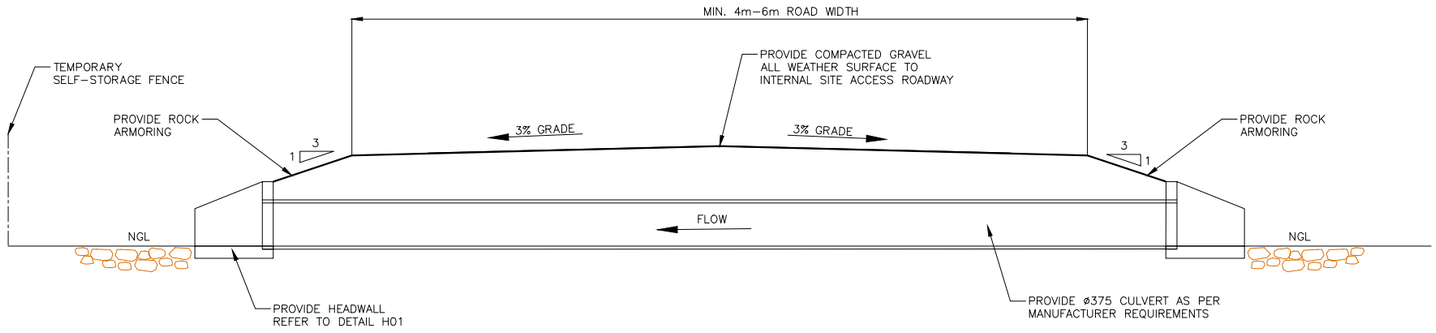
NOTE: TOPSOIL AND SEED BANK UPON COMPLETION

DETAIL B
TYPICAL SECTION DEFLECTION/CONTOUR BANK
NOT TO SCALE

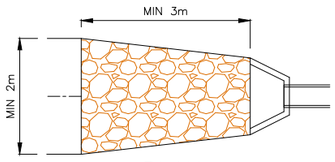


TOPSOIL STOCKPILE TYPICAL
NOT TO SCALE

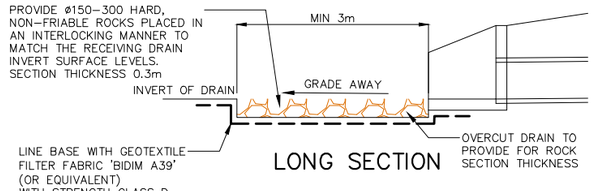
CONSTRUCTION NOTES
1. LOCATE STOCKPILE AT LEAST 5 METRES FROM EXISTING VEGETATION, CONCENTRATED WATER FLOWS, ROADS & HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS A LOW, FLAT, ELONGATED MOUND.
3. WHERE THERE IS SUFFICIENT AREA TOPSOIL STOCKPILES SHALL BE LESS THAN 2 METRES IN HEIGHT.
4. REHABILITATE IN ACCORDANCE WITH THE SWMP/ESCP.
5. CONSTRUCT EARTH BANK (STANDARD DRAWING 5–2) ON THE UPSLOPE SIDE TO DIVERT RUN OFF AROUND THE STOCKPILE & A SEDIMENT FENCE (STANDARD DRAWING 6–8) 1 TO 2 METRES DOWNSLOPE OF STOCKPILE.



TYPICAL SECTION
THROUGH ROAD GENERAL
SCALE 1:25 (A1) 1:50 (A3)



PLAN



LONG SECTION

DETAIL H01
TYPICAL CULVERT HEADWALL OUTLET
ROCK RIP RAP DETAIL
NOT TO SCALE

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Appendix O Background Searches

Search results

Your search for:LGA: SNOWY VALLEYS COUNCIL

Matched 1 notice relating to 1 site.

Search Again

Refine Search

Suburb	Address	Site Name	Notices related to this site
TALBINGO	Off Snowy Mountains HIGHWAY	T3 Spoil dump and adjoining river sediments	1 former

Page 1 of 1

12 January 2022

com	COURABYRA	Erosional

Landscape

Landscape summary	Gently undulating low hills on basalt in the highlands below 1000 m, in the east of the catchment area around Tumbarumba. Moderately inclined slopes with narrow drainage lines. Slopes to 10%, local relief to 30 m, elevation 500-1040 m. Rock outcrop is absent. Extensively cleared montane forest and dry sclerophyll forest.
Soils	Red and Brown Ferrosols (Krasnozems and Chocolate Soils).
Geology and regolith	Unnamed Tertiary basalts (Tbm).
Land degradation	Degradation is limited to where soils have been disturbed, e.g., farm trails. Moderately steep slopes present opportunity for sheet, rill and gully erosion to occur.

Scale	1:100,000 reconnaissance	**Confidence**	low

Limitations

Landscape

Steep slopes	localised	**Mass movement hazard**	not observed

Soils

Shallow soils	not observed	**Non-cohesive soils**	not observed

Erosion

Sheet erosion hazard	localised	**Gully erosion hazard**	localised
Wind erosion hazard	not observed		

Hydrology

Seasonal waterlogging	not observed	**Flood hazard**	not observed

Salinity

Recharge zone	widespread	**Discharge zone**	not observed
Salinity hazard	not observed		

Notes

(1) This report describes soil landscape information mapped at a regional scale and does not negate the need for site assessment at a scale suitable to the land use or development under consideration.

(2) 'Not observed' means unlikely to be found. 'Localised' means observed to a level considered significant for land management. 'Widespread' means prevalent and significant over most of the landscape. 'None recorded' means no occurrence has been recorded. 'Not assessed' means no result has been recorded for this attribute and it may or may not be present in the soil landscape.

(3) Status refers to both the scale of mapping and accuracy of linework, whilst Confidence refers to the quality and density of supporting data collected in-the-field. The two scales used are 1:100,000 scale (in which 1 cm on map equates to 1 km on ground) and 1:250,000 scale (in which 1 cm on map equates to 2.5 km on ground). Values for Confidence are:

High: detailed mapping with comprehensive soil profile and laboratory testing of major soil types and soil materials;

Moderate: detailed mapping with comprehensive supporting soil profile data but no laboratory testing;

Low: moderately detailed mapping with limited soil profile data (2 or more soil profiles) and no laboratory testing;

Very low: broad mapping, landscape and soil properties estimated, minimal soil profile data (less than 2 soil profiles) and no laboratory data.

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nnwa	NACKI NACKI VARIANT A	Residual

Landscape

Landscape summary Undulating rises on granodiorite and minor granite. Local relief 20-50 m, slopes 3-10%, elevation 300-1000 m. Crests are rounded and sideslopes are maximal. Springs in the mid- to lower slopes are locally common. Few rock outcrops occur as tors or clusters of tors. Extensively cleared dry sclerophyll forest with some dry montane forest in upland areas.

Soils Deep Red Chromosols (Red Podzolic Soils/Structured Red Earths) occur on gentle crests and upper slopes, with mottled red and brown Chromosols (Red and Brown Podzolic Soils) on slopes grading into bleached mottled yellow and brown Chromosols (Solodic Soils) on lower slopes. Stratic Rudosols (Alluvial Soils) occur along drainage lines.

Geology and regolith Medium to coarse-grained granodiorite and minor granite of the Green Hills Granodiorite (Sgtg) and Mundaroo Granodiorite (Dgmz). Bedrock ranges from moderately weathered to structured saprolite.

Land degradation No gully or sheet erosion was observed, however rilling of batters and evidence of sodic subsoils occur on lower slopes and poorly drained areas.

Scale	1:100,000	**Confidence**	low

Limitations

Landscape

Steep slopes	not observed	**Mass movement hazard**	not observed

Soils

Shallow soils	not observed	**Non-cohesive soils**	localised

Erosion

Sheet erosion hazard	localised	**Gully erosion hazard**	localised
Wind erosion hazard	not observed		

Hydrology

Seasonal waterlogging	localised	**Flood hazard**	not observed

Salinity

Recharge zone	widespread	**Discharge zone**	localised
Salinity hazard	not observed		

Notes

(1) This report describes soil landscape information mapped at a regional scale and does not negate the need for site assessment at a scale suitable to the land use or development under consideration.

(2) 'Not observed' means unlikely to be found. 'Localised' means observed to a level considered significant for land management. 'Widespread' means prevalent and significant over most of the landscape. 'None recorded' means no occurrence has been recorded. 'Not assessed' means no result has been recorded for this attribute and it may or may not be present in the soil landscape.

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Legend | About | Layers

Legend

Naturally Occuring Asbestos in NSW

POINT OCCURRENCE DATA

Mineral Occurences - Asbestos Sites

- VLGE
- LGE
- MED
- OCC
- SML

BROKEN HILL - GEOLOGICAL UNITS WITH ASBESTOS POTENTIAL

Retrograde Ultrabasic Dykes with MEDIUM asbestos potential

Dykes with HIGH asbestos potential

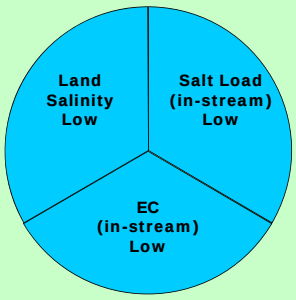
Geological Units with HIGH asbestos potential

STATEWIDE - GEOLOGICAL

Naturally Occurring Asbestos in NSW

31. Nine Mile Hydrogeological Landscape

LOCALITIES	**The Nine Mile, The Sisters**
MAP SHEET	**Wagga Wagga 1:250 000**
CONFIDENCE LEVEL	**Low**



OVERVIEW

The Nine Mile Hydrogeological Landscape (HGL) has a patchy distribution within the upland areas of the Murray CMA near to The Nine Mile, Paddys River, The Racecourse and The Sisters (Figure 1). The HGL covers a combined area of 108 km^2 and receives 1000 to 1600 mm of rain per annum.

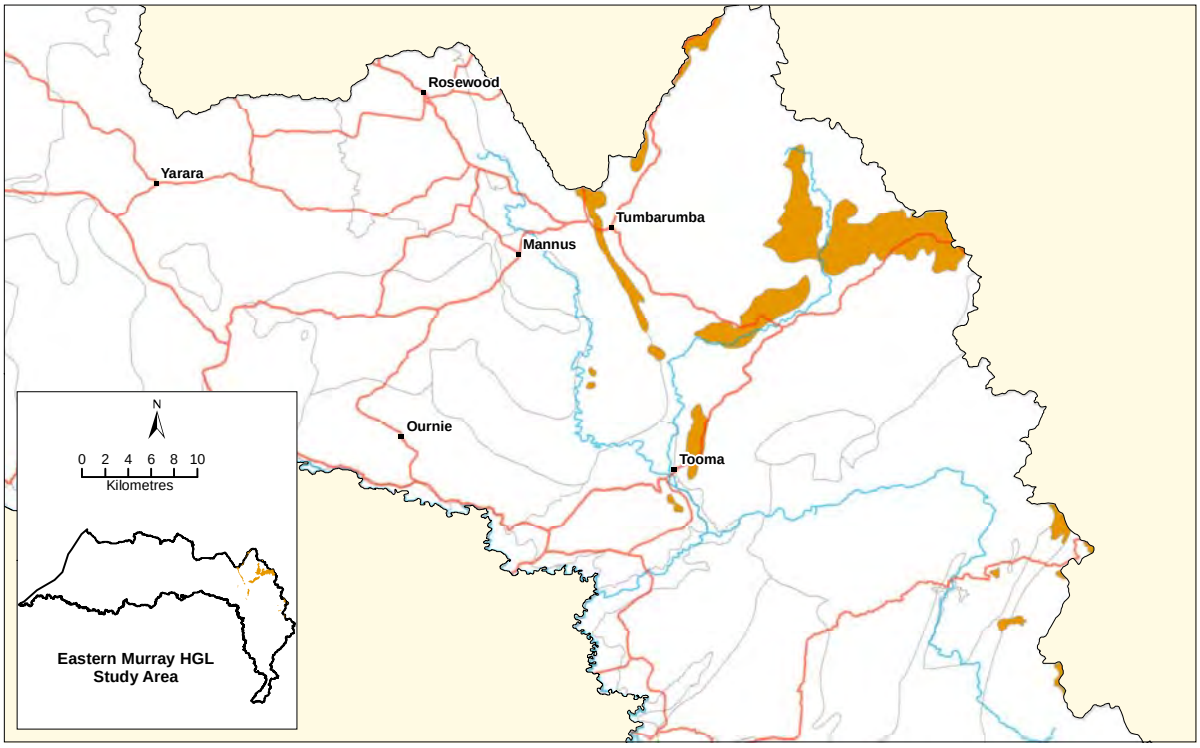


Figure 1: Nine Mile HGL distribution map.

Nine Mile HGL is an erosional landscape characterised by flat topped basalt hills and moderately inclined slopes (Figure 2). Undulating to rolling low hills, undulating rises and plateaus are typical. Alpine vegetation occurs where native trees remain uncleared. This HGL comprises consolidated volcanic rocks from the Cenozoic era. This HGL contains a number of soil landscapes of basaltic origin and some derived from the underlying country rock (mainly granite). Minimal land degradation is apparent as soils are very stable.

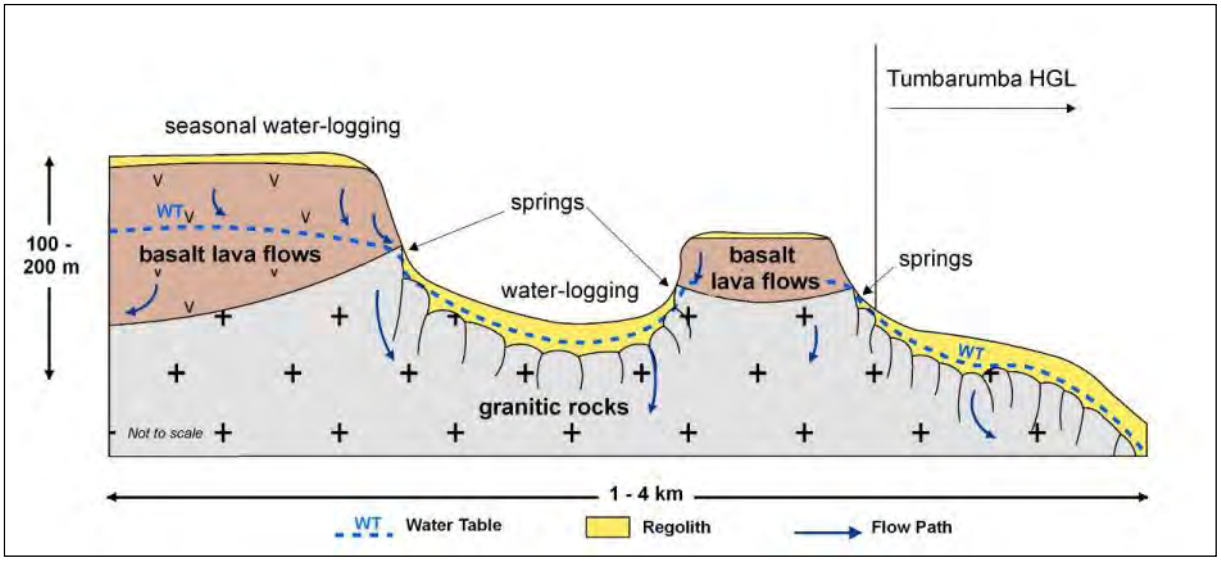


Figure 2:Conceptual cross-section for Nine Mile HGL showing the distribution of regolith and landforms, salt sites if present, and flow paths of water infiltrating the system.

Outbreaks of land salinity were not observed. Minor salinity may be found at the boundaries between Cenozoic basalt flows and underlying geology. Water in Nine Mile HGL is generally fresh (Table 1).

Table 1: Nine Mile HGL salinity expression.

SALINITY EXPRESSION	
Land Salinity (Occurrence)	Low – no salt sites or seeps observed
Salt Load (Export)	Low – high rainfall and high quality runoff
EC (Water Quality)	Low water EC observed

Salt stored within the Nine Mile HGL has low mobility. There is a low salt store that has moderate availability (Table 2).

Table 2: Nine Mile HGL salt store and availability.

SALT MOBILITY			
	Low availability	**Moderate** availability	**High** availability
High salt store			
Moderate salt store			
Low salt store		**Nine Mile**	

The overall salinity hazard in the Nine Mile HGL is low. This is due to the moderate likelihood that salinity issues will occur that have potentially limited impacts (Table 3).

Table 3: Likelihood of salinity occurrence, potential impact and overall hazard of salinity for the Nine Mile HGL.

OVERALL SALINITY HAZARD			
	Limited potential impact	**Significant** potential impact	**Severe** potential impact
High likelihood of occurrence			
Moderate likelihood of occurrence	**Nine Mile**		
Low likelihood of occurrence			

LANDSCAPE FEATURES

The following photographs illustrate landscapes and specific features observed in this HGL. Information used to define the HGL is summarised in Table 4.

Photo 1: The Nine Mile HGL is characterised low rolling plateaus with steep slopes down to drainage lines (Photo: OEH/R Muller).

Photo 2: On the Great Dividing Range, the flat nature of the Nine Mile HGL lends itself to the formation of alpine meadows with broad drainage lines (Photo: OEH/R Muller).

Photo 3: The flat nature of plateaus and steep slopes in the Nine Mile HGL are well illustrated in the Tooma area (Photo: OEH/R Muller).

Photo 4: The deeply incised drainage lines the cut through the level basalt plateaus of the Nine Mile HGL can be clearly seen when looking south from Southern Cloud Lookout (Photo: OEH/R Muller).

Photo 5: The basalt flows that make up, the Nine Mile HGL, as seen at Paddy's River Falls, are thick and can form precipitous scarps around the edges of the HGL where erosional processes are active (Photo: University of Canberra/K Harvey).

Photo 6: Successive basalt lava flows with level surfaces and steep erosional slopes overly older granites in the Nine Mile HGL. This feature can be clearly seen to the west of Maragle (Photo: OEH/A Marchand).

Photo 7: The relatively flat landscape of the Nine Mile HGL at Southern Cloud Lookout drops away sharply into the Maragle valley (Photo: OEH/R Muller).

Photo 8: The flat nature of plateaus and steep slopes are a feature of the Nine Mile HGL in the Tooma area (Photo: OEH/R Muller).

Table 4: Summary of information used to define the Nine Mile HGL.

Lithology *(Raymond et al. 2007; Geoscience Australia 2011)*	This HGL comprises consolidated volcanic rocks from the Cenozoic era. The key lithology is: • unnamed mafic volcanic rocks – basalt, trachyte, trachybasalt, trachyandesite, leucitite, basanite, nephelinite, limburgite, rhyolite, tuff.
Annual Rainfall	1000–1600 mm
Regolith and Landforms	The Nine Mile HGL is slightly to moderately weathered and is characterised by rolling hills (90–200 m relief) and low hills (30–90 m relief), and undulating rises (20–30 m relief) and elevated elongate plateaus on Cenozoic basalt bedrock. Slopes are typically 3–15%, local relief is 20–200 m, and this HGL is between 1100–1660 m elevation. Regolith materials are derived from basalt and basaltic colluvium and are dominantly deep sandy clays and clays, with some lithic gravels in areas of outcrop.
Soil Landscapes *(DECCW 2010)*	This HGL contains a number of soil landscapes of basaltic origin and some derived from the underlying country rock (mainly granite). Kiandra soil landscape is the most prominent. Other soil landscapes include Courabyra, Pine View, McPhersons Plain, Cabramurra and Toolong. Soils for most of the HGL are derived from basalt and basaltic colluvium and include: Red and Brown Ferrosols (Kraznozems) over most of the landscape; Brown Dermosols and Chromosols (Chocolate Soils) generally in drier areas; and, Hydrosols (Wiesenboden) on the poorly-drained valley flats. Soils for the areas of granite include: Red Kandosols (Red Earths) with sandy loam and clay loam textures on upper slopes; and Red Kandosols (Red Earths) and Yellow Kandosols (Yellow Earths) on lower slopes. Minimal land degradation, as soils are very stable. Minor salinity may be found at the boundaries between flows and geology.
Land and Soil Capability *(OEH 2012)*	Class 4
Land Use	State forest, grazing and national park
Key Land Degradation Issues	• minimal land degradation as soils are very stable.

Native Vegetation *(Stelling 1998; Keith 2004)*	Native vegetation of Nine Mile HGL follows a transect across the slopes and tops of the plateau landforms. Pockets on slopes with different aspects may contain discreet vegetation communities however the general vegetation communities contain *E. pauciflora* (snow gum) forest on the plateau top (where trees are shorter in the exposed, crest areas), *E. rubida* (candle bark), and *E. mannifera* (brittle gum) in association with *E. pauciflora* where soils are shallow and potentially stony. *Eucalyptus dalrympleana* (mountain gum) and *E. camphora* (mountain swamp gum) have also been observed at high elevations, and *E. delegatensis* (alpine ash) can be found on eastern facing slopes in moist pockets. *Eucalyptus blakelyi* (Blakely's red gum) tends to feature on slopes or plateau tops at lower altitudes, such as at The Sisters.

HYDROGEOLOGY

Aquifers in this HGL are unconfined, with flow along structures (basalt flow boundaries, joints, faults) in fractured basaltic rocks. Minor flow occurs through unconsolidated colluvial and alluvial sediments on lower slopes and along flow lines. Springs occur at contacts between the basalt flows and underlying bedrock. These result in wet or waterlogged areas. Localised perching of watertables occur above clay lenses during wetter periods. Hydraulic conductivity is moderate to high and transmissivity is moderate. Groundwater recharge rates are estimated to be moderate.

Groundwater systems are typically local with short flow lengths. Water quality within these systems is fresh. Watertable depths are shallow to intermediate, with seasonal localised perching.

Residence times are short to medium. These landscapes have a medium to fast response time to changes in land management.

Typical values for the hydrogeological parameters of this HGL are summarised in Table 5.

Table 5: Summary of values for typical hydrogeological parameters of the Nine Mile HGL.

Aquifer Type	Unconfined in fractured rock Minor flow through unconsolidated colluvial and alluvial sediments on lower slopes and along flow lines Local perching above clay-rich layers (seasonal)
Hydraulic Conductivity	Moderate to high Range: 10^{-2}–>10 m/day
Aquifer Transmissivity	Moderate Range: 2–50 m^2/day
Specific Yield	Moderate Range: 5–15%

Hydraulic Gradient	Moderate Range: 10–30%
Groundwater Salinity	Fresh Range: <800 µS/cm
Depth to Watertable	Shallow to intermediate (seasonal localised perching) Range: <2–8 m
Typical Sub-Catchment Size	Small (<100 ha)
Scale (Flow Length)	Local Flow length: <5 km (short)
Recharge Estimate	Moderate
Residence Time	Short to medium (months to years)
Responsiveness to Change	Fast to medium (months to years)

MANAGEMENT OPTIONS

Overarching salinity management strategies have specific biophysical outcomes. These are achieved by implementing a series of targeted land management actions that take into account the opportunities and constraints of the particular HGL. The actions recognise the need for diffuse and specific activities within the landscape to impact on salinity. Further explanation of land management functions, strategies and actions can be found in Wooldridge *et al.* (2015).

Salinity is driven by interactions between water-use capacity of vegetation, physical soil properties and hydrogeological processes within the HGL.

Actions that influence the way water is used by vegetation or stored in the soil profile will have impacts on recharge. The influence of both continual and episodic recharge and the impacts of extreme weather events need to be considered when deciding on appropriate management actions. Short and long-term climate cycles also need to be considered as they have a bearing on salinity processes, particularly salt load and land salinity.

Landscape Salinity Functions – Nine Mile HGL

Functions this landscape provides within a catchment scale salinity context:

- **A.** The landscape provides fresh water runoff as an important water source
- **B.** The landscape provides fresh water runoff as an important dilution flow source
- **C.** The landscape provides important base flows to local streams.

Management Strategy Objectives – Nine Mile HGL

Appropriate strategies pertinent to this landscape:

- **Maintain or maximise runoff (10):** The landscape receives very high amounts of rainfall and generates significant fresh water runoff as a dilution flow to the system. The fresh runoff mitigates the salt load in the local streams and the broader catchment.
- **Discharge rehabilitation and management (4):** The springs and waterlogged sites can be readily targeted. Discharge management will reduce any salt discharge to local streams when vegetation is matched to conditions.

Key Management Focus – Nine Mile HGL

Grazing management is the key focus. This includes management of pasture systems based on perennial plants in waterlogged areas and the recharging landscape. Grazing management and infrastructure should consider wet areas as sensitive to grazing.

This landscape also provides high volumes of water and is an important fresh water source. Management of current and future land use should consider the impacts of action on water runoff.

Specific Land Management Opportunities

Specific opportunities for this HGL:

- The landscape contains soils which are stable and reasonably fertile. These “better soils” support pasture production.
- This landscape contains significant areas of native grass pastures. These provide an excellent base to build better management of native pastures into the future.

Specific Land Management Constraints

Constraints for land management in this HGL include:

- Climate conditions will restrict pasture growth – cold climate and high rainfall will influence the ability of pasture systems to reduce recharge and manage discharge.

Specific Targeted Actions

Management areas for this HGL are illustrated in Figure 3. The specific management actions for these areas are described in Table 6.

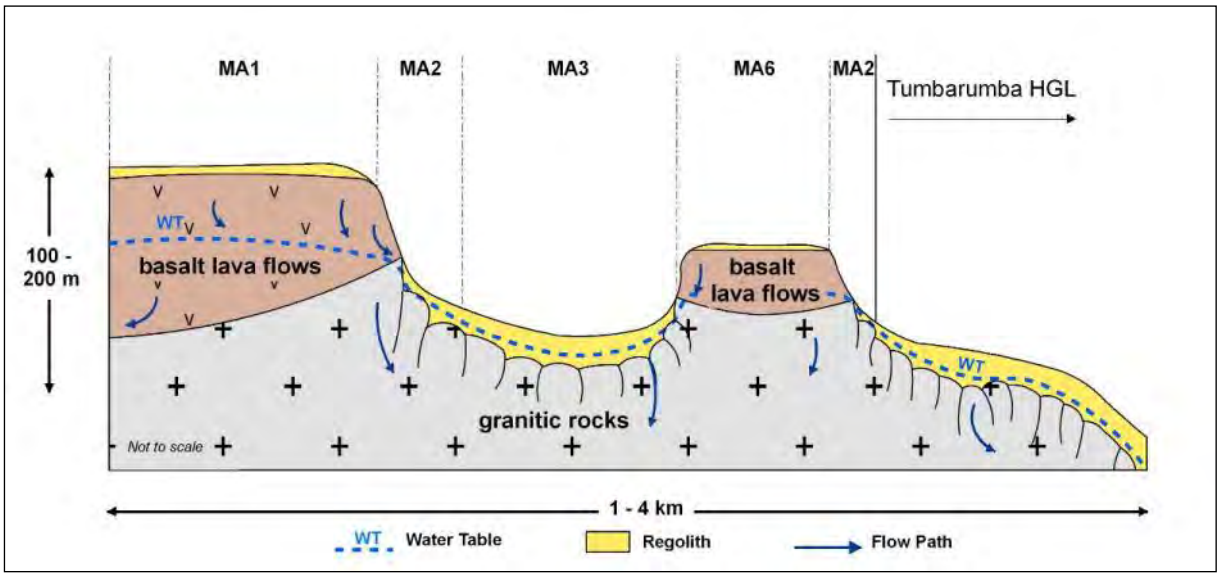


Figure 3: Management cross-section for Nine Mile HGL showing defined management areas.

Table 6: Specific management actions for management areas within the Nine Mile HGL.

Management Area (MA)	Action
MA1 & MA6 (RIDGES & RISES) AND MA2 & MA3 (UPPER SLOPES – EROSIONAL & COLLUVIAL)	**Vegetation for ecosystem function** Maintain and improve existing native woody vegetation to reduce discharge **(VE3).** **Vegetation for production** Improve grazing management of existing perennial pastures to manage recharge **(VP1).** Improve grazing management to improve or maintain native pastures to manage recharge **(VP5).**

High Hazard Land Use

There are some management actions that should be discouraged in this HGL as they will have negative impacts on salinity (Table 7).

Table 7: Management actions having negative salinity impacts in the Nine Mile HGL.

At Risk Management Areas	Action
MA1,2,3 & 6	Clearing and poor management of native vegetation **(DLU4).** Reducing runoff from fresh surface water catchments **(DLU6).**

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NSW SOIL AND LAND INFORMATION SYSTEM

Soil Profile Report

SITE DETAILS

Site Location:	100M PAST CEMETERY ROAD (WEST OF ROAD)
Profile Details:	OBSCRAS - YARRANGOBILLY Survey (1003656), Profile 6, collected from a batter by Ms Janet Wild on 09 March, 1999
Map Reference:	MGA Grid Reference: Zone 55, 592363E, 6037684N. 8526 YARRANGOBILLY (1:100000) map sheet.
Physiography:	footslope under dry sclerophyll forest on granite lithology and used for volun./native pasture. Slope 8.0% (measured), aspect north east. Surface condition is firm, profile is imperfectly drained, erosion hazard is moderate, and no salting evident
Vegetation/Land Use:	extensive clearing at the site, used for volun./native pasture, with volun./native pasture in the general area
Surface Condition:	firm when described, ground cover is 99%
Erosion/Land Degradation:	moderate; no salting evident
Soil Hydrology:	profile is imperfectly drained, no free water. Site is Sheltered, run on is high and runoff is moderate
Soil Type:	Bleached-Leptic Tenosol (ASC), Red Podzolic Soil (GSG)
Base of observation:	layer continues
Profile Field Notes:	R2. Coarse frags = fine gravel. 4phgrfootbz

SOIL DESCRIPTION

Layer 0		
0.00 - 0.00 m		
Layer 1	Horizon: A1	
0.00 - 0.15 m	Texture:	sandy loam
	Colour:	colour not recorded with no recorded mottles
	Structure:	massive (fabric is earthy)
	Soil fauna:	Activity is nil
	Cracks/Macropores:	Cracks are nil, macropores are nil
	Moisture/Consistence:	moderately moist,
	Field chemical tests:	Field pH is 6.0 (Raupach),
Layer 2	Horizon: A2e (conspicuously bleached)	
0.15 - 0.60 m	Texture:	coarse loamy sand
	Colour:	colour not recorded with no recorded mottles

	Structure:	massive (fabric is earthy)
	Soil fauna:	Activity is nil
	Cracks/Macropores:	Cracks are nil, macropores are nil
	Moisture/Consistence:	dry,
	Field chemical tests:	Field pH is 6.0 (Raupach),
Layer 3	Horizon: C	
0.60 - 1.20 m	Texture:	coarse sandy clay loam
	Colour:	colour not recorded with no recorded mottles
	Structure:	massive (fabric is earthy)
	Soil fauna:	Activity is nil
	Cracks/Macropores:	Cracks are nil, macropores are nil
	Moisture/Consistence:	dry,
	Field chemical tests:	Field pH is 6.0 (Raupach),
	Layer Notes:	Weathered granite (red).

LABORATORY TESTS

None available

For information on laboratory test data and units of measure, please see: Soil survey standard test methods

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toq	TOOMA	Alluvial

Landscape

Landscape summary	Small narrow, upper floodplains of Tumbarumba Creek and Tooma River. Slopes <5%, local relief <10 m, elevation 500-670 m. Extensively cleared montane moist forests.
Soils	Stratic Rudosols and Tenosols (Alluvial Soils), formed on unconsolidated alluvium from mixed sources.
Geology and regolith	Unconsolidated Quaternary Alluvium (Qa) from various provenances including granodiorite and basalt.
Land degradation	Minimal erosion providing good ground cover is maintained.

Scale	1:100,000 reconnaissance	**Confidence**	very low

Limitations

Landscape

Steep slopes	not observed	**Mass movement hazard**	not observed

Soils

Shallow soils	not observed	**Non-cohesive soils**	localised

Erosion

Sheet erosion hazard	not observed	**Gully erosion hazard**	localised
Wind erosion hazard	not observed		

Hydrology

Seasonal waterlogging	widespread	**Flood hazard**	widespread

Salinity

Recharge zone	not observed	**Discharge zone**	not observed
Salinity hazard	not observed		

Notes

(1) This report describes soil landscape information mapped at a regional scale and does not negate the need for site assessment at a scale suitable to the land use or development under consideration.

(2) 'Not observed' means unlikely to be found. 'Localised' means observed to a level considered significant for land management. 'Widespread' means prevalent and significant over most of the landscape. 'None recorded' means no occurrence has been recorded. 'Not assessed' means no result has been recorded for this attribute and it may or may not be present in the soil landscape.

(3) Status refers to both the scale of mapping and accuracy of linework, whilst Confidence refers to the quality and density of supporting data collected in-the-field. The two scales used are 1:100,000 scale (in which 1 cm on map equates to 1 km on ground) and 1:250,000 scale (in which 1 cm on map equates to 2.5 km on ground). Values for Confidence are:

High: detailed mapping with comprehensive soil profile and laboratory testing of major soil types and soil materials;

Moderate: detailed mapping with comprehensive supporting soil profile data but no laboratory testing;

Low: moderately detailed mapping with limited soil profile data (2 or more soil profiles) and no laboratory testing;

Very low: broad mapping, landscape and soil properties estimated, minimal soil profile data (less than 2 soil profiles) and no laboratory data.

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