APPENDIX A

DA Application, Plans

SNOWY MONARO REGIONAL COUNCIL

Development Application

made under the Environmental Planning and Assessment Act 1979 Section 78A

Office Use Only

DA Number 10

PLEASE COMPLETE ALL SECTIONS

APPLICANT

Name/Company	Outline Planning Consultants Pty Ltd	Phone	02 9262 3511
Contact Name (if Company)	Gary Peacock, Director	Fax	
Postal Address	Suite 18, Pittwater Business Park, No. 5 Vuko Place	Mobile	0418242762
Town	Warriewood State: NSW Postcode: 2102	Email	gpeacock@outline.com.au

OWNER

Name/Company	Peter Devereux	Phone	
Contact Name (if Company)		Fax	
Postal Address	[redacted]	Mobile	
Town	Cooma State: NSW Postcode: 2630	Email	

Is the subject land Crown Land NO [X] YES ☐ → Please attach Authority

OFFICE USE ONLY NAR Numbers

LAND TO BE DEVELOPED (Please attach additional sheet if inadequate space provided)

No. 278 Street Springs Road Town Rock Flat

Lot	Section	DP/SP	Lot	Section	DP/SP
62		750540	106		750540
76,78		750540	120		750540

OFFICE USE ONLY Parcel Numbers

PROPOSED DEVELOPMENT

Description of development: Proposed quarry- refer to accompanying EIS for details

- ☐ Erect, alter or add to a building or structure
- ☐ Change the use of land or building (or classification under the BCA)
- ☐ Carry out a work
- ☐ Subdivide land or building
- ☐ Demolition
- ☐ Signage/Advertising
- ☐ Other (specify)

TYPE OF DEVELOPMENT (tick all that apply)

☐ Single dwelling	☐ Storage Shed	☐ Tourist
☐ Residential alterations/additions	☐ Garage	☐ Subdivision
☐ Multi-Unit	☐ Industrial	☐ Infrastructure
☐ Second Occupancy	☐ Commercial/Business	☐ Community/Education Facilities
☐ Seniors Living	☐ Retail	☐ Education Facility
☐ Other residential	☐ Office	☐ Event
☐ Mixed	☐ Food Premises	☑ Other (Quarry)

COST (including materials and labour)

This is the estimated total cost of any construction, internal fit-out and demolition, including GST and labour. Council checks your estimate against current building cost indices. Developments with no construction work such as subdivisions or change of uses have a separate standard fee and no estimated cost is required.

COST (including materials and labour): $1,600,000

STAGED DEVELOPMENT

Are you lodging a Staged Development Application? ☐ YES ☒ NO

Section 83B of the *Environmental Planning and Assessment Act 1979* defines a staged Development Application (DA) as one which sets out concept proposals for the development of a site, and for which detailed proposals for separate parts of the site are to be the subject of subsequent DAs. The application may set out detailed proposals for the first stage of development

INTEGRATED DEVELOPMENT (Approvals from State Agencies)

Is this application for Integrated Development? ☐ YES ☐ NO

Please tick which other approvals are required. If yes Council requires an additional set of plans, a Statement of Environmental Effects (SEE) and a fee for each relevant government agency. Please check with Council for current applicable fee

Roads Act 1993 ☒ s138

Heritage Act 1977 ☐ s58

National Parks and Wildlife Act 1974 ☐ s90

Rural Fires Act 1997 ☐ s100B

Petroleum (on shore) Act 1991 ☐ s9

Fisheries Management Act 1994
☐ s144 ☐ s201 ☐ s205 ☐ s219

Mine Subsidence Compensation Act 1961 ☐ s15

Protection of the Environment Operations Act 1997
☐ s43(a) ☒ s43(b) ☐ s43(d) ☐ s47 ☒ s48 ☐ s55 ☐ s122

Water Management Act 2000
☐ s89 ☐ s90 ☐ s91

Mining Act 1992 ☐ s63 ☐ s64

Integrated Development is defined by the Environmental Planning and Assessment Act 1979 as development which needs a Development Consent and one or more additional approvals under the Acts mentioned above in order to be legally carried out. Further explanatory notes are available from Council on request

IS/DOES THE PROPOSED DEVELOPMENT

IS/DOES THE PROPOSED DEVELOPMENT	YES	NO
Designated Development ▲?	☒	☐
Likely to significantly affect a threatened species, population or ecological community, or it's habitat?	☐	☒
Involve the use of or work on a Crown Road Reserve or other land owned by the Crown?	☒	☐
Development by the Crown? (Part 5A of the Act applies to development by the Crown)	☐	☒
On land which is also subject to a Property Vegetation Plan under the *Native Vegetation Act 2003*?	☐	☒
Development which requires a Site Compatibility Certificate from the Department of Planning prior to lodgement in accordance with *State Environmental Planning Policy (Infrastructure) 2007, State Environmental Planning Policy (Housing for seniors or people with a disability) 2004* or any other State Environmental Planning Policy?	☐	☒
Development which requires a BASIX Certificate?	☐	☒
Involve land which has easements or restrictions on the Title? (If yes, please specify the nature of these easements or restrictions in your Statement of Environmental Effects)	☐	☒
Likely to affect a threatened species, population or ecological community protected under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*?	☐	☒
Require an approval under Section 68 of the *Local Government Act 1993* for any of the activities listed on the next page?	☐	☒
Biodiversity compliant development✣? If yes, please specify the reason in your Statement of Environmental Effects	☒	☐
Require *Concurrence* ✧ from any authorities?		
Is the proposal *State significant development*? If yes, please provide (a) a list of authorisations and the applicable Act (b) the capital investment value of the development	☐	☒
Is the land the subject of this application critical habitat?	☐	☒

ATTACHMENT 2

AGENCIES' CORRESPONDENCE

	BioBanking Assessment Methodology and Credit Calculator Manual (DECC) 2008
	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
	Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DP&E)
	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 Industrial Noise Policy (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
Public Safety	
	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
Resource	
	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (JORC)
Waste	
	Waste Classification Guidelines (DECC)
	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)

APPROVALS UNDER SECTION 68 – LOCAL GOVERNMENT ACT 1993

Do you wish to carry out any S68 activities (listed below) ☒ NO ☐ YES – Complete details below

If you wish to carry out one of the following activities, you need the approval of Council. Identify the activities you propose to carry out, and the relevant documents you need to include in your Application, by placing a cross in the appropriate boxes. Please include the relevant documents as detailed in the Section 68 Checklist with your Application. Note: Alternatively these can be applied for separately using 'Section 68 Application' form

Under Section 78A of the *Environmental Planning and Assessment Act 1979* a person can apply to Council for both a development consent and a S68 Approval in the one Development Application. In determining the Development Application, Council may apply any of the provisions under the Local Government Act 1993 that it could apply if the Development Application were an application under that Act for the relevant approval. In particular, if the Development Consent is granted, Council may impose a condition that is authorised under that Act to be imposed as a condition of consent

In granting a Development Consent in which a Section 68 approval is also contained, Council may, (without limiting any other condition in the Consent) impose in relation to the approval taken to have been granted under Section 68, either or both of the following conditions

(a) A condition that the approval is granted only to the applicant and does not attach to or run with the land to which it applies

(b) A condition that the approval is granted for specific time

A Structures

☐ A1 Installing a manufactured home, moveable dwelling or associated structure on land

B Water supply, wastewater and stormwater drainage work

☐ B1 Carrying out water supply work
Please choose
☐ Install/alter private * water system
☐ Install/alter public infrastructure
☐ Other: ____________________

☐ B2 Draw water from a Council water supply or a standpipe or sell water so drawn.

☐ B3 Install, alter, disconnect or remove a meter connected to a service pipe.
☐ Establish new water service/meter connection
☐ Other: ____________________

☐ B4 Carry out wastewater drainage work
☐ Establish new wastewater consumer service
☐ Install/alter internal wastewater drainage
☐ Other ____________________

☐ B5 Carry out stormwater drainage work

☐ B6 Connect a private drain or wastewater drain with a public drain or wastewater drain under the control of a Council or with a drain or sewer which connects with such a public drain or wastewater drain

C Management of waste

☐ C1 For fee or reward, transport waste over or under a public place

☐ C2 Place waste in a public place

☐ C3 Place a waste storage container in a public place

☐ C4 Dispose of waste into a wastewater drain of the council

☐ C5 Install, construct or alter a waste treatment device or a human waste storage facility or a drain connected to any such device or facility (eg Install Septic System, AWTS etc)
Please choose
☐ Aerated Waste Treatment System (AWTS)
☐ Dry Composting System
☐ Septic Tank
☐ Wet Composting System
☐ Other: ____________________

☐ C6 Operate a system of wastewater management (within the meaning of Section 68A)

D Community Land

☐ D1 Engage in a trade or business

☐ D2 Direct or procure a theatrical, musical or other entertainment for the public

☐ D3 Construct a temporary enclosure for the purpose of entertainment

☐ D4 For fee or reward, play a musical instrument or sing

☐ D5 Set up, operate or use loudspeaker or sound amplifying device

☐ D6 Deliver a public address or hold a religious service or public meeting

E Public roads

☐ E1 Swing or hoist goods across or over any part of a public road by means of a lift, hoist or tackle projecting over the footway

☐ E2 Expose or allow to be exposed (whether for sale or otherwise) any article in or on or so as to overhang any part of the road or outside a shop window or doorway abutting the road, or hang an article beneath an awning over the road

F Other activities

☐ F1 Operate a public car park

☐ F2 Operate a caravan park or camping ground

☐ F3 Operate a manufactured home estate

☐ F4 Install a domestic oil or solid fuel heating appliance, other than a portable appliance

☐ F5 Install or operate amusement devices (within the mean of the Construction Safety Act 1912)

☐ F6 Use a standing vehicle or any article for the purpose of selling any article in a public place

☐ F7 Carry out an activity prescribed by the regulations or an activity of a class or description by the regulations

Note:

* *Private* means work/infrastructure that will be the responsibility of landowners, usually all development from the water meter or sewer tapping point back to the dwelling/building
* *Public* means work/infrastructure that will be handed over for the responsibility of Council, eg. Council mains work/extensions etc

REQUIRED ATTACHMENTS

☒ 1 copy of the relevant Council checklist/s applying to the proposed development

☒ All plans/reports/documentation required by the above checklist.

☒ 1 copy of directional map/details to the site for remote rural properties

POLITICAL DONATIONS AND GIFTS DISCLOSURE STATEMENT [Sec (4) EP&A Act]

Have you or any person with a financial interest in this development application made a political donation or gift within the last 2 years?

☒ No ☐ Yes – please complete and attach a Political Donations and Gifts Disclosure Statement (available from Council's website)

Applica[redacted]	Name Gary Peacock Director	Date 3 2 2018

CONSENT OF ALL OWNERS

All owners must sign this application form or provide written authority for the lodgement of the application

Note: Company Ownership

In the case of a company ownership, in accordance in s127 of the *Corporations Act 2001*, please state in the signature/name area the authority of each signatory (Director/Secretary etc) (eg as *Director of ABC Holdings Pty Ltd*) OR attach further documentation as required.

☐ Owners consent attached OR ↓

As the owner/s of the above property described in this application I/we consent to its lodgement. I/we hereby permit any duly authorised officer of Snowy Monaro Regional Council to enter the land or premises to carry out inspections and surveys or take measurements or photographs as required for the administration the Act(s), Regulations, or Planning Instruments. We advise that as landowners we are not aware of any known hazards that may be of harm to officers visiting the site.

Signature [redacted]	Name PETER DEVEREUX	Date 13-12-17
Signature	Name	Date

DECLARATION AND SIGNATURE OF APPLICANT

I/we the undersigned hereby apply for approval of the development proposal as described and as per the plans and specifications and documents accompanying the Application. I/we undertake to develop in accordance with any approval granted by Council and conform with the provisions of the relevant Act(s), Regulations, codes and the Local Environmental Plan. I/we further undertake to pay any fee or charge assessed by Council in connection with development and indemnify Snowy Monaro Regional Council against all claims arising from negligence (or otherwise) resulting from work carried out in connection with the development within the road reserve.

Signature [redacted]	Name Gary Peacock Director Outline Planning Consultants Pty Ltd	Date 17 2 2018
Signature	Name	Date

SITE WORKS MUST NOT COMMENCE WITHOUT COUNCIL APPROVAL

Construction materials purchased/work done/arrangements made prior to consent are at the owner/applicants' risk.

* Designated Developments are listed in Schedule 3 of the *Environmental Planning and Assessment Regulations 2000*. Special procedures apply to the notification and assessment of Designated Development under the Act)

Development that requires Concurrence is listed in 79B of the Environmental Planning and Assessment Act 1979

❖ ***biodiversity compliant development*** *means*

(a) development proposed to be carried out on biodiversity certified land within the meaning of Part 7AA of the Threatened Species Conservation Act 1995, or

(b) development in respect of which a biobanking statement has been issued in respect of the development under Part 7A of the Threatened Species Conservation Act 1995, or

(c) development to which the biodiversity certification conferred by Part 7 of Schedule 7 to the Threatened Species Conservation Act 1995 applies, or

(d) development for which development consent is required under a biodiversity certified EPI (within the meaning of Part 8 of Schedule 7 to the Threatened Species Conservation Act 1995)

SQ Licences Pty Ltd
Capital Expenditure Budget
Mt Mary Quarry

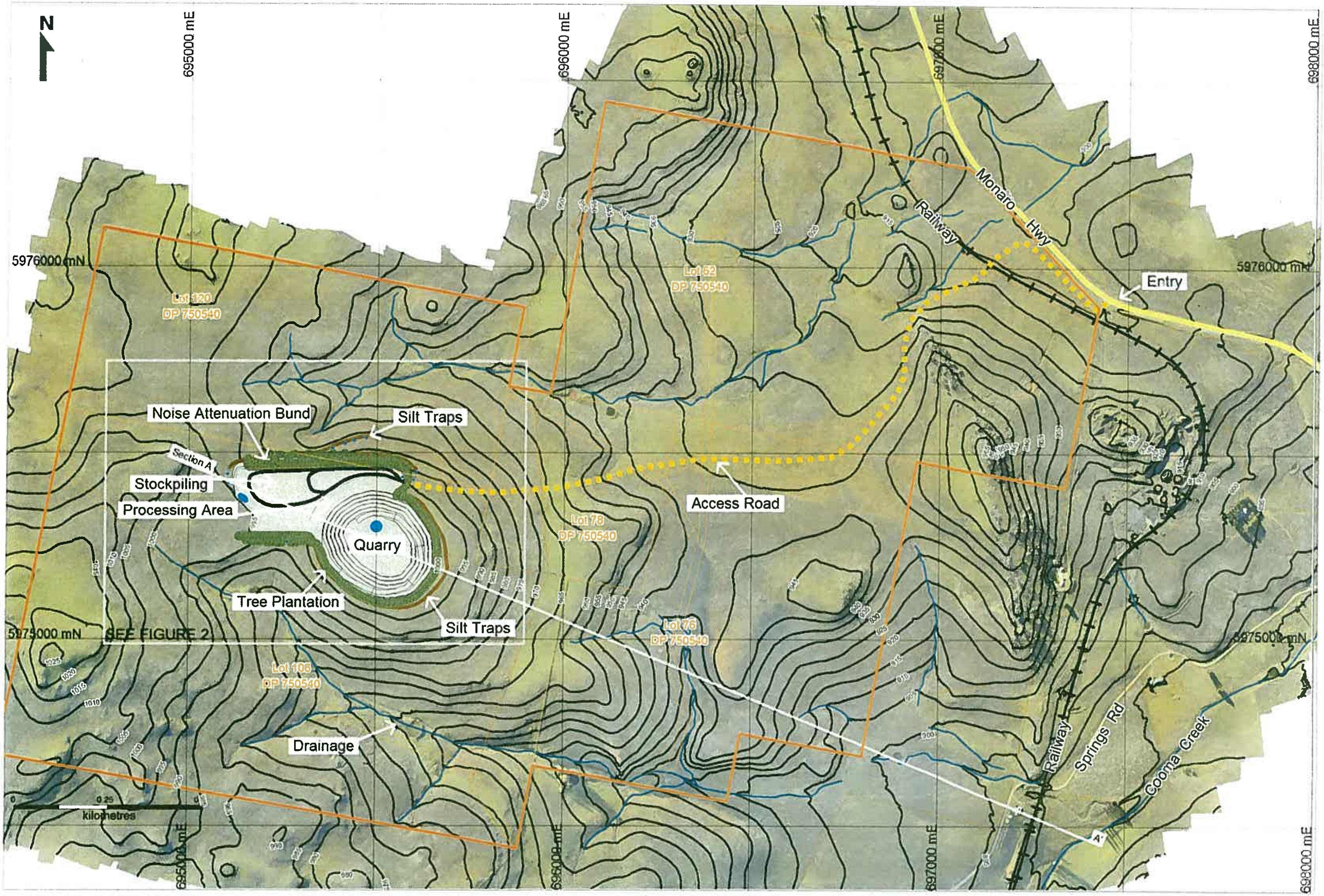
EIS, Technical Reports and DA lodgement	$200,000
Roadworks Access Road & I/S	$300,000
Site Infrastructure and sediment controls	$100,000
Crushing and Loading Equipment	$1,000,000
Total Value	**$1,600,000**

The above estimate has been prepared by the operator Schmidt Quarries on behalf of the Applicant SQ Licences Pty Ltd.

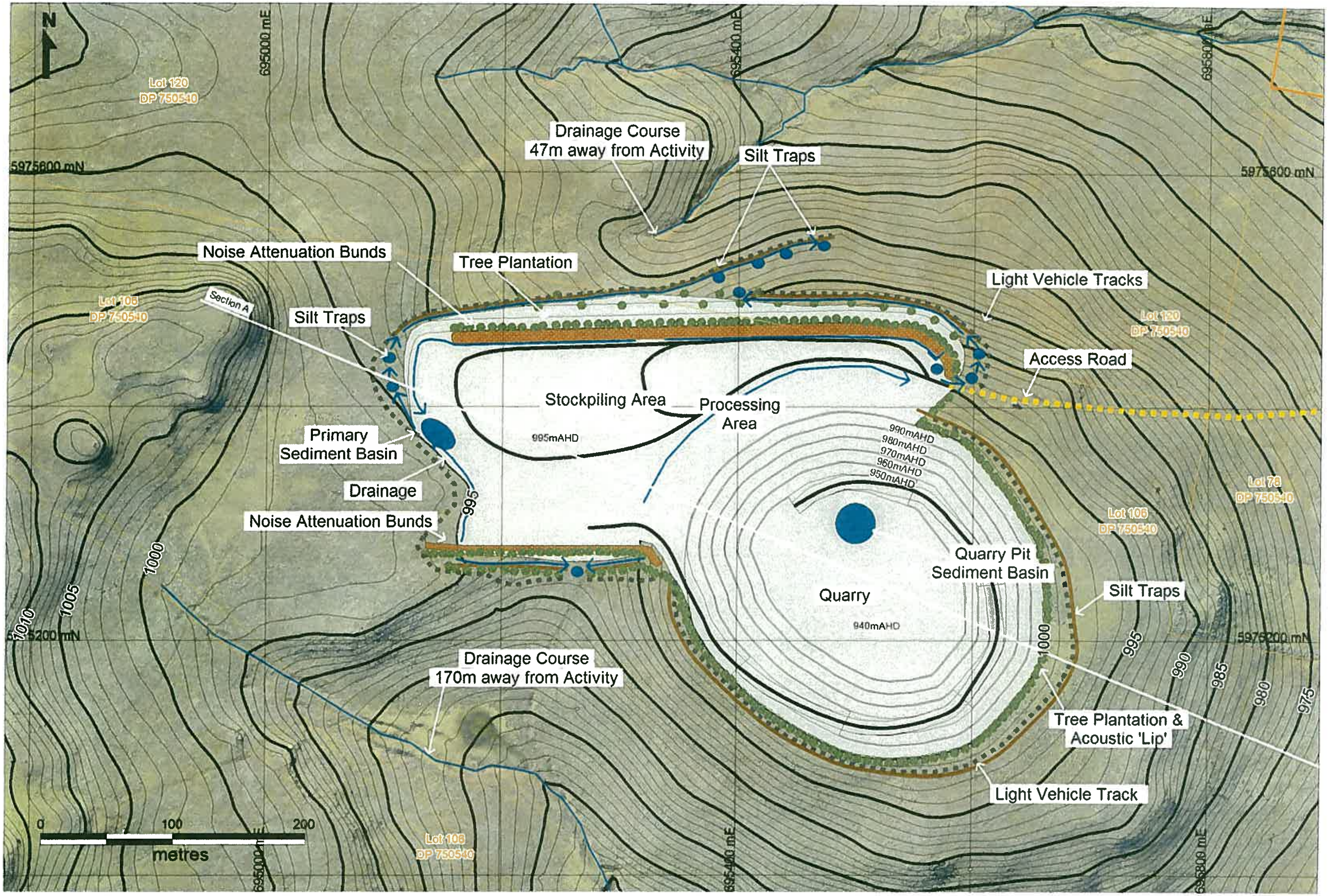
PO BOX 2232
QUEANBEYAN NSW 2620
AUSTRALIA

ABN 34 071 292 441
PH 02 6298 1355
FAX 02 6298 1921

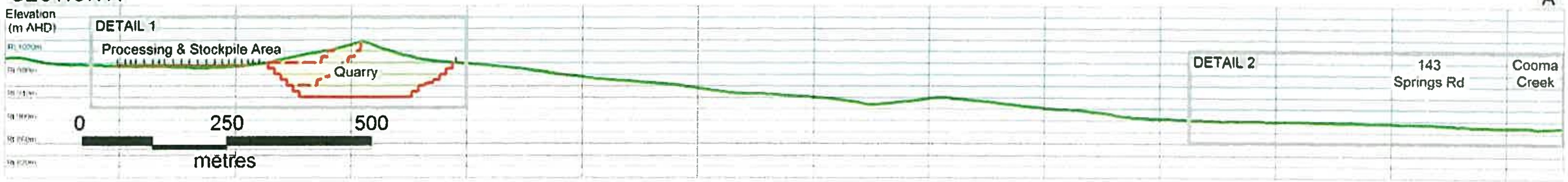
EMAIL admin@schmidtquarries.com.au
WEB www.schmidtquarries.com.au



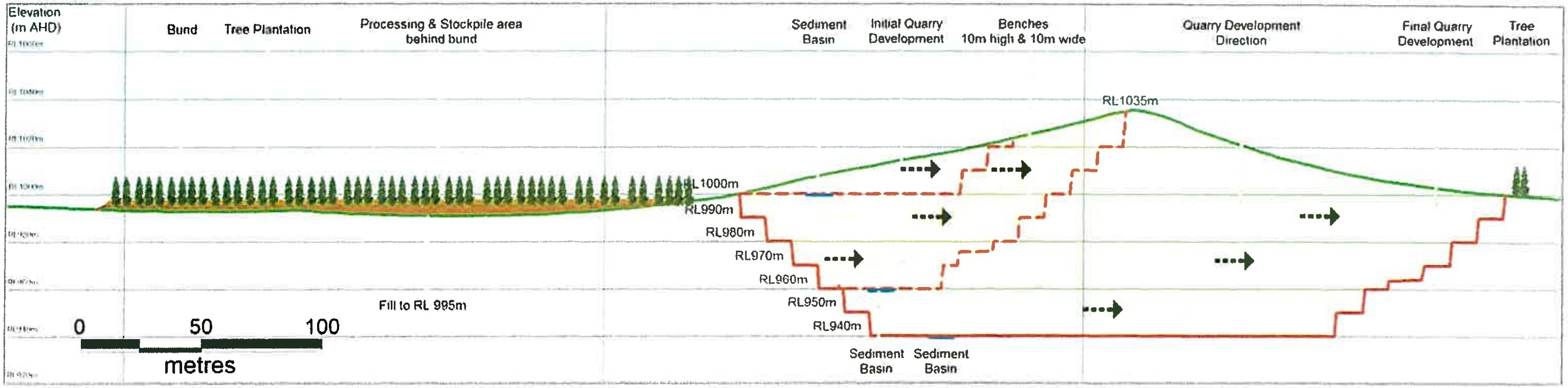
N
695000 mE
696000 mE
697000 mE
698000 mE
5976000 mN
5975000 mN
Monaro Hwy
Railway
Entry
Lot 62
DP 750540
Lot 120
DP 750540
Lot 78
DP 750540
Lot 76
DP 750540
Lot 108
DP 750540
Access Road
Noise Attenuation Bund
Silt Traps
Section A
Stockpiling
Processing Area
Quarry
Tree Plantation
Silt Traps
SEE FIGURE 2
Drainage
Springs Rd
Cooma Creek
A'
0
0.25
kilometres


N
Lot 120
DP 750540
695000 mE
695400 mE
695800 mE
5975800 mN
5976200 mN
Drainage Course
47m away from Activity
Silt Traps
Noise Attenuation Bunds
Tree Plantation
Light Vehicle Tracks
Lot 108
DP 750540
Section A
Silt Traps
Lot 120
DP 750540
Access Road
Stockpiling Area
Processing
Area
Primary
Sediment Basin
995mAHD
990mAHD
980mAHD
970mAHD
960mAHD
950mAHD
Drainage
995
Noise Attenuation Bunds
Lot 78
DP 750540
Lot 108
DP 750540
1000
Quarry Pit
Sediment Basin
1005
Quarry
Silt Traps
1010
940mAHD
1000
995
990
985
980
975
Drainage Course
170m away from Activity
Tree Plantation &
Acoustic 'Lip'
Light Vehicle Track
0
100
200
metres
Lot 108
DP 750540

SECTION A



DETAIL 1



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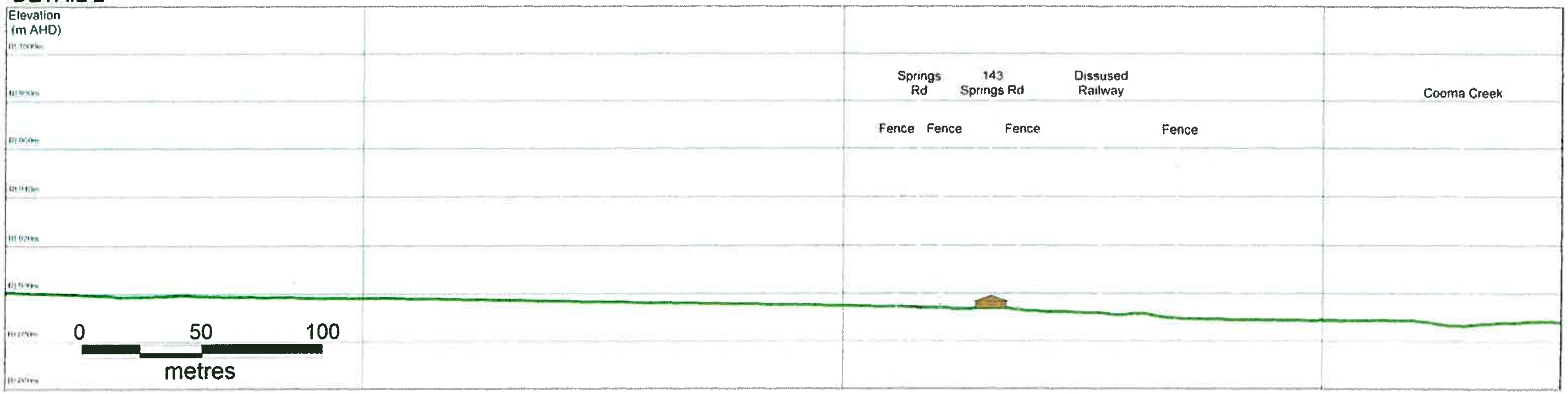

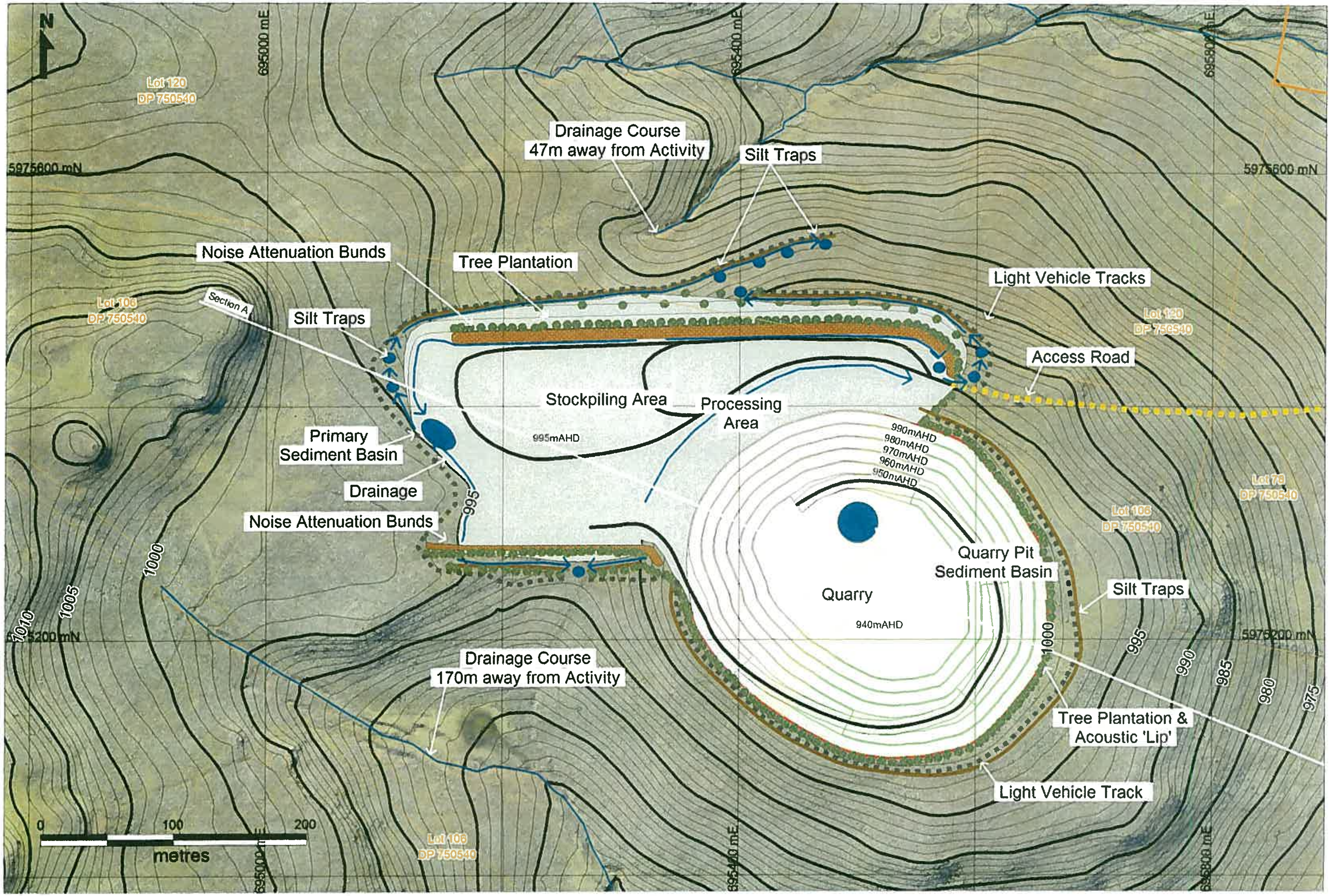
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Drainage Course
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Tree Plantation
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Sediment Basin
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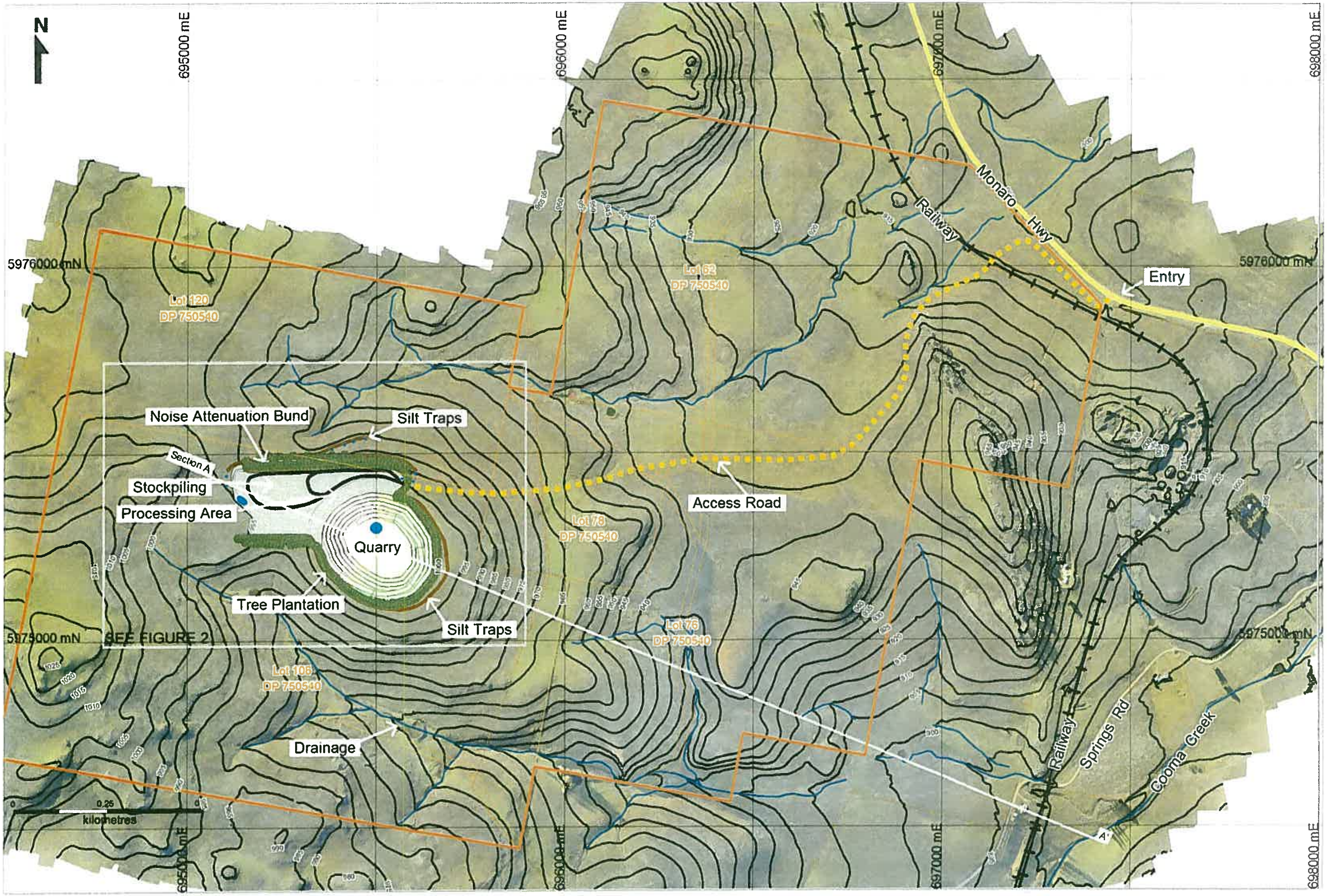
990mAHD
980mAHD
970mAHD
960mAHD
950mAHD
Drainage
995
Noise Attenuation Bunds
Lot 78
DP 750540
Lot 106
DP 750540
Quarry Pit
Sediment Basin
Quarry
940mAHD
Silt Traps
1000
1005
1010
995
990
985
980
975
Drainage Course
170m away from Activity
Tree Plantation &
Acoustic 'Lip'
Light Vehicle Track
0
100
200
metres
Lot 106
DP 750540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695000 mE
696000 mE
697000 mE
698000 mE
5976000 mN
5975000 mN
Monaro Hwy
Railway
Entry
Lot 62
DP 750540
Lot 120
DP 750540
Lot 78
DP 750540
Lot 76
DP 750540
Lot 106
DP 750540
Access Road
Noise Attenuation Bund
Silt Traps
Section A
Stockpiling
Processing Area
Quarry
Tree Plantation
SEE FIGURE 2
Drainage
Springs Rd
Cooma Creek
A'
0.25
kilometres

APPENDIX B

SEARS

NSW GOVERNMENT | Planning & Environment

Planning Services
Resource Assessments
Contact: Sarah Fabian
Phone: 9274 6252
Email: Sarah.fabian@planning.nsw.gov.au

David Schmidt
Schmidt Quarries
12 Bass Street
Queanbeyan NSW 2620

Dear Mr Schmidt

Secretary's Environmental Assessment Requirements
Rock Flat Quarry (EAR 1129)

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

I have attached a copy of the EARs for the Environmental Impact Statement (EIS) for the development. These requirements have been prepared in consultation with relevant government agencies and are based on the information your company has provided to date. I have also attached the agencies' input into the EARs, which you are also advised to consider closely when preparing the EIS. You must have regard to these comments in the preparation of the EIS.

In your request for EARs, you have also indicated that the proposal is classified as integrated development under section 91 of the EP&A Act. You are encouraged to consult with the Environment Protection Authority and the Mine Subsidence Board 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.

When you lodge your DA with the consent authority, you must provide:

- one hard and one electronic copy of the EIS to the Department;
- one hard and one electronic copy of the EIS to any identified integrated approval authority; and
- a cheque for $320 to each identified integrated approval authority, to offset costs involved in the review of the DA and EIS. No cheque is required for the Department as it is not an approval authority.

If your proposal contains any actions that could have a significant impact on matters of National Environmental Significance, then it will also require approval under the Commonwealth's *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). This approval is in addition to any approvals required under NSW legislation. If you have any questions about the application of the EPBC Act to your proposal, you should contact the Department of the Environment in Canberra (6274 1111 or www.environment.gov.au).

You should contact the local Mine Safety Operations Branch of the NSW Department of Industry, Division of Resources and Energy 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 Sarah Fabian on the details listed above.

Yours sincerely

Howard Reed

20.3.17

Howard Reed
Director
Resource Assessments
As the Secretary's delegate

Secretary's Environmental Assessment Requirements

Section 78A(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 1129
Proposal	Establishment of a hard rock quarry to extract and process a maximum of 3.75 million tonnes at a rate of up to 200,000 tonnes per annum over a 25 year period.
Location	278 Springs Road, Rock Flat (Lots 62, 76, 78, 106 and 120 of DP750540)
Applicant	Schmidt Quarries
Date of Issue	20 March 2017
Date of Expiry	20 March 2019
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 or transport infrastructure; - a list of any other approvals that must be obtained before the development may commence; - the permissibility of the development, including identification of the land use zoning of the site; - identification of sensitive receivers likely to be affected by the development using clear maps/plans, including key landform areas, such as conservation areas and waterways; • a conclusion justifying why the development should be approved, taking into consideration: – 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 Industrial Noise Policy 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 operational 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;
  - 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; and
  - an assessment of whether a Species Impact Statement is required;
- **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 or waste 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.
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 Cooma-Monaro Local Environmental Plan 2013 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

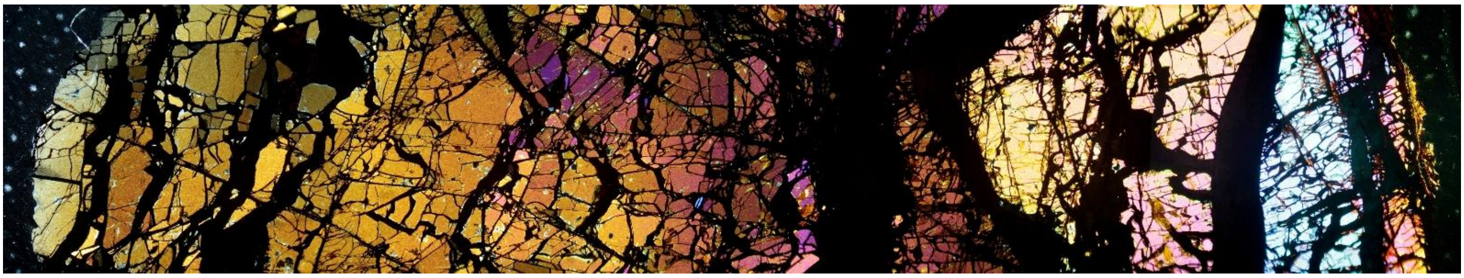
Environmental Planning Instruments, Policies, Guidelines & Plans

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
	Cooma-Monaro Local Environmental Plan 2013
Risk Assessment	
	AS/NZS 4360:2004 Risk Management (Standards Australia)
	HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)
Land	
	State Environmental Planning Policy No. 55 – Remediation of Land
	Agricultural Land Classification (DPI)
	Rural Land Capability Mapping (OEH)
	Soil and Landscape Issues in Environmental Impact Assessment (NOW)
	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC)
	Guidelines for Consultants Reporting on Contaminated Sites (EPA)
	Agricultural Issues for Extractive Industry Development (DPI)
Water	
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)
Flooding	Floodplain Development Manual (OEH)
	Floodplain Risk Management Guideline (OEH)
Biodiversity	
	BioBanking Assessment Methodology (OEH 2014)

	BioBanking Assessment Methodology and Credit Calculator Manual (DECC) 2008
	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
	Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DP&E)
	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 Industrial Noise Policy (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
Public Safety	
	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
Resource	
	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (JORC)
Waste	
	Waste Classification Guidelines (DECC)
	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



Geochempet Services

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PETROGRAPHIC REPORT
ON A DRILL CHIP SAMPLE (HOLE #4)
FROM MT MARY QUARRY, NIMMITABEL

prepared for

SCHMIDT QUARRIES

Purchase Order: 3127

Invoice Number: 00007449

Client Ref: David Schmidt

Issued by

K. E. Spring B.Sc.(Hons), MAppSc
30 January 2017

Sample Label:	Hole #4	**Date Sampled**:	19/12/17
Sample Type:	Drill Chips	**Date Received**:	22/12/17
Sample Source:	Mt Mary Quarry, Nimmitabel		

Work Requested Petrographic analysis in relation to suitability for use as concrete aggregate; petrographic assessment of potential for alkali-silica reactivity

Methods Account taken of ASTM C 295 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*, of the content of the 2015 joint publication of the Cement and Concrete Association of Australia and Standards Australia, entitled (HB 79-2015) *Alkali Aggregate Reaction - Guidelines on Minimising the Risk of Damage to Concrete Structures in Australia*

Identification Olivine basalt

Description

The sample consisted of robust, hard, angular drill chips of medium dark-grey, unweathered and less commonly slightly weathered basalt.

Plate 1: Image of a sib-sample of the supplied drill chip sample.

A thin section was prepared to permit detailed examination in transmitted polarised light of many drill chips. An approximate average composition of the rock, expressed in volume percent and based on a brief count of 100 random points falling within the sectioned random chips, is:

Primary minerals

42%	clinopyroxene
7%	olivine
20%	plagioclase feldspar
7%	opaque oxides (magnetite &/or ilmenite)
2%	feldspathoid (probably analcime)
2%	glassy mesostasis

Secondary minerals

10%	yellowish-brown smectite clay
8%	iddingsite
2%	zeolite
<1%	calcite

Microscopically, the sectioned chips are seen to represent a few different styles of basalt, and with significant variation in the intensity of alteration of olivine and plagioclases to smectite clay and iddingsite. The dominant fragments are less altered, finely crystalline basalt but some fragments are almost completely altered with poor durability with only fresh pyroxenes remaining and a very few others are quite glassy but durable.

The rock mainly displays porphyritic, hypidiomorphic, finely holocrystalline textures of basaltic style. The phenocrysts are about 0.1 to 1.5 mm and the groundmass has grains about 0.005 to 0.1 mm in size. Variation in textures includes sub-ophitic intergrowths of pyroxene and plagioclase, presence of black glassy mesostasis and amygdules along with variations in intensity of alteration probably due to degree of weathering.

The phenocrysts are mainly subhedral grains of olivine: in some aggregate fragments they are fresh, but in others they show rim and internal alteration to complete alteration to yellowish-brown smectite clay and/or iddingsite. Additional olivine, similarly variably altered occurs as groundmass grains. Sparse other, quite small phenocrysts comprise fresh opaque oxide. The groundmass is dominated by tiny prisms of brown to mauve, fresh clinopyroxene (titaniferous augite) in most fragments but some show sub-ophitic intergrowths of complex-shaped pyroxene with plagioclase laths. It also carries tiny laths of mostly fresh plagioclase feldspar but in more weathered, altered fragments the plagioclase cam be heavily altered to smectite clay and iddingsite, smaller equant and platy grains of fresh opaque oxide (probably magnetite and ilmenite) and inconspicuous, anhedral grains of analcite along with very minor calcite alteration.

In amygdaloidal fragments, the spherical amygdules are filled variously by zeolite, smectite clay and calcite. A few veins seen in the slide are filled by similar minerals.

Comments and Interpretations

The supplied drill chip sample (labelled Hole #4) from Mt Mary Quarry, Nimmitabel is considered to consist of a range of drill chips with differences in texture and degree of weathering and alteration; it essentially consist of unweathered and weathering, porphyritic, holocrystalline olivine basalt, a basic volcanic rock. The differences in texture and glassy content indicating either a series of narrow flows or a thick flow with variations from edges of flow to centre of flow. The degree of alteration varies within the drill chips indicating sampling from weathered into unweathered basalt with durability variations and hydrothermal alteration indicated by presence of veining.

For engineering purposes the rock represented by the supplied drill chip sample may be summarised as:

- **olivine basalt**, a basic volcanic rock
- finely holocrystalline
- non-porous
- unweathered to slightly weathered
- variably altered
- average secondary mineral content of about 20% consisting of 10% smectite clay, 8% iddingsite, 2% zeolite and <1% calcite
- **moderately hard to hard**
- **moderately strong to strong**

The basalt chips are predicted to be **moderately durable to durable**.

The basalt lacks free silica: thus, it is predicted to be **innocuous in relation to alkali-silica reactivity in concrete**.

Fresh and less altered basalt represented in the supplied drill sample is predicted to be **suitable for use as concrete aggregate**. The more altered and weathered basalt has poor durability and should be scalped from any resultant quarry product.

Free Silica Content

Apparently nil.

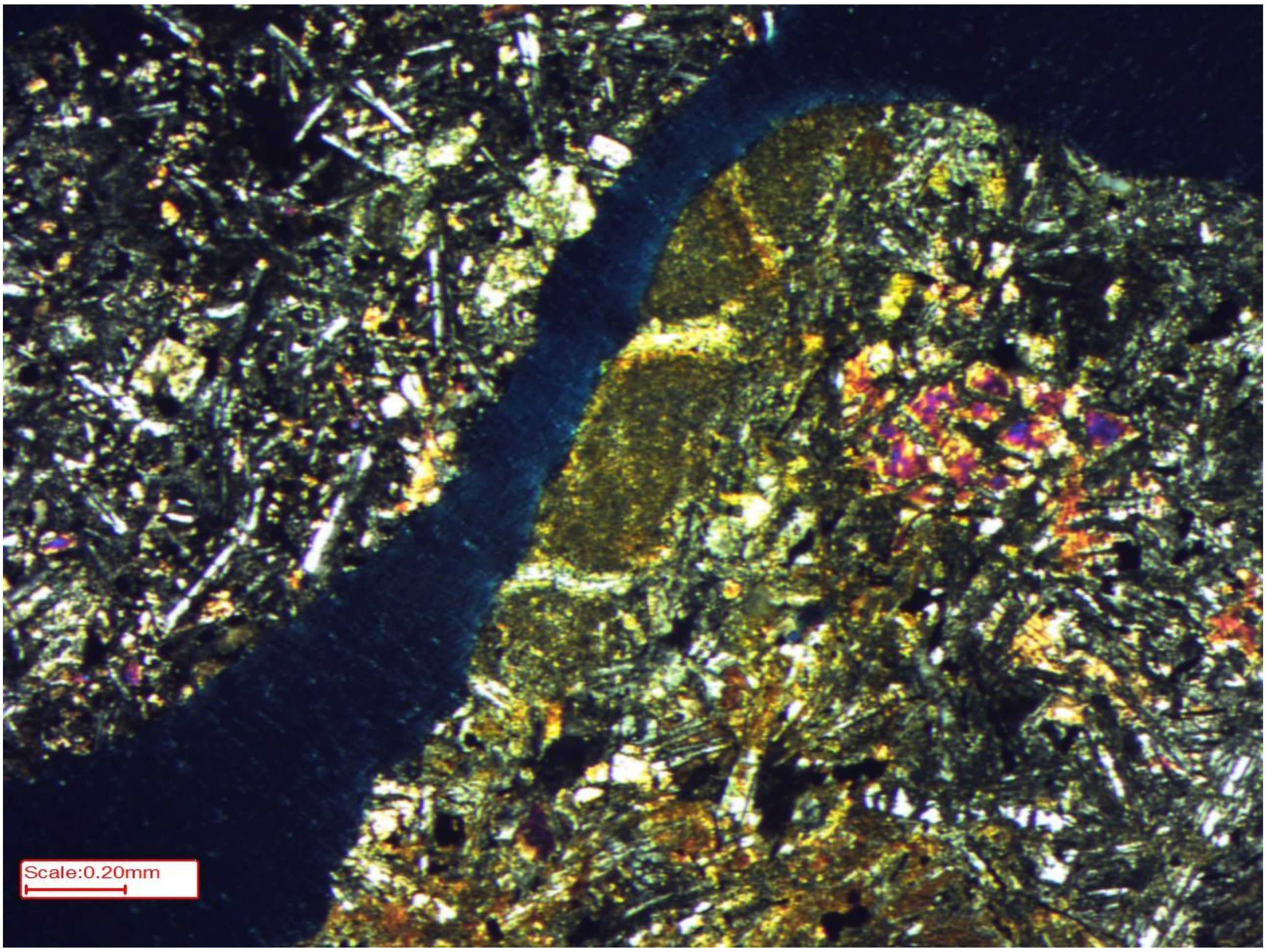

Plate 2: Image at low magnification in cross polarised transmitted light of a relatively unaltered (left) and altered chip. The groundmass is dominantly pyroxene with less common plagioclase laths. Scattered olivines are observed. Note the variation in degree of smectite-alteration between rock chip examples.

APPENDIX D

Quarry Fact Sheet

SCHMIDT QUARRIES SINCE 1974

FACT SHEET: PROPOSED HARD ROCK QUARRY, DEVEREUX PROPERTY, No. 278 SPRINGS ROAD, (ACCESS FROM MONARO HIGHWAY), ROCK FLAT NSW

INTRODUCTION

This Fact Sheet has been prepared to summarise some of the main features of a hard rock quarry proposed on a small knoll on the property owned by Peter Devereux.

The applicant proposing the quarry is Schmidt Quarries, a local company that operates other quarries in the region, including a hard rock quarry at Nimmitabel.

The Nimmitabel quarry will be closing in a few years time and a new quarry needs to be established. The proposed quarry, like the Nimmitabel quarry, is a volcanic plug containing quality hard rock material.

WHAT IS BEING PROPOSED?

An Environmental Impact Statement (EIS) is currently being prepared to accompany a development application to Snowy Monaro Regional Council for the extraction and processing of up to 280,000 tonnes per annum of quarry material from a small knoll on top of a hill on the Devereux property.

The proposed quarry will also guarantee the ongoing employment of 6 staff, currently working at the Nimmitabel quarry site.

The volcanic plug would be extracted, in the main, by blasting. A quarry processing plant is proposed on site, to crush hard rock won from the extraction area.

Importantly, all quarrying activities are to be sited behind the knoll, out of sight of neighbours, with quarrying progressively lowering the knoll before extraction goes deeper.

Perimeter landscaping of the land around the knoll is proposed early on, so that plantings become well established.

At initial commencement of quarrying, a mobile plant will be used. Hours of operation are to be restricted to 7am to 6pm Monday to Fridays and 9am to 2pm Saturday.

No quarry operations are proposed on Sundays or public holidays, except for quarry maintenance activities.

PROPOSED QUARRY- DETAILS

In addition to the above, some further details are provided of the proposed quarry.

- Quarrying operations have been designed to comply with all relevant environmental safeguards and guidelines. Acceptable noise and vibration impacts are predicted.

- Transportation of quarry products is proposed using truck and trailer ("truck and dog") style vehicles. At maximum production up to 8 trucks per hour are expected (or a maximum of 64 loaded trucks over a peak day) . Most other times, traffic levels will average about 27 trucks per day.

WILL THE QUARRY AFFECT LOCAL AMENITY?

❑ *Dust Management*

The operation of the quarry and associated haulage of quarry products can be carried out in conformity with relevant air quality/dust guidelines.

Potential emissions of dust can be controlled through the implementation of on site environmental management and pollution control techniques, including dust suppression through regular watering of the internal access route. This will ensure that there will be no significant adverse or nuisance dust impacts on people living in or using the surrounding local area as a result of the proposed quarry.

❑ *Noise, Vibration*

The quarry is well set back from other rural dwellings in the locality.

The proposal can proceed within acceptable noise guidelines, with no adverse impacts on local housing.

Blasting and noise from proposed quarrying and truck haulage will have acceptable impacts on the surrounding local environment.

❑ *Water Management*

The proposed quarry will implement a range of on site controls to ensure that there will be minimal potential for impacts on local water resources or water quality beyond the quarry site. Runoff from disturbed areas of the site is to be controlled and collected within a sediment basin within the quarry pit itself.

❑ *Visual Environment*

The nearest residence with unobstructed views back towards the knoll is on Springs road, some 1.69km away. Another residence on the other side of the Monaro Highway, some 2.7km away, has views of the peak only of the knoll. **Refer Figures**.

Quarrying activities will occur behind the knoll, out of sight of nearby rural dwellings.

Additional plantings of trees are proposed on the hill to further screen potential views of quarrying activities outside of the quarry pit.

❑ *Small Quarry Footprint*

The quarry resource is a volcanic plug. The extraction of the volcanic rock is proposed over a relatively small footprint, with extraction to occur at depth, following the volcanic plug, with the quarry itself set back from local watercourses. The combined effect of this Project is to achieve maximum efficiency of extraction with least environmental disturbance.

❑ *A proven Track Record*

Schmidt Quarries' has the experience and good environmental track record in carrying out extraction operations from a volcanic plug resource at Nimmitabel, similar to that on the project site. Schmidt Quarries intend to apply similar sound, proven quarry management measures including the method of extraction of this existing volcanic plug resource, scale of quarrying operations, provision for landscaped buffer strip plantings in and around the active quarry area, control of dust emissions, provision for on site stormwater controls and sediment basins, traffic generation, and rehabilitation of the quarry once quarrying is completed.

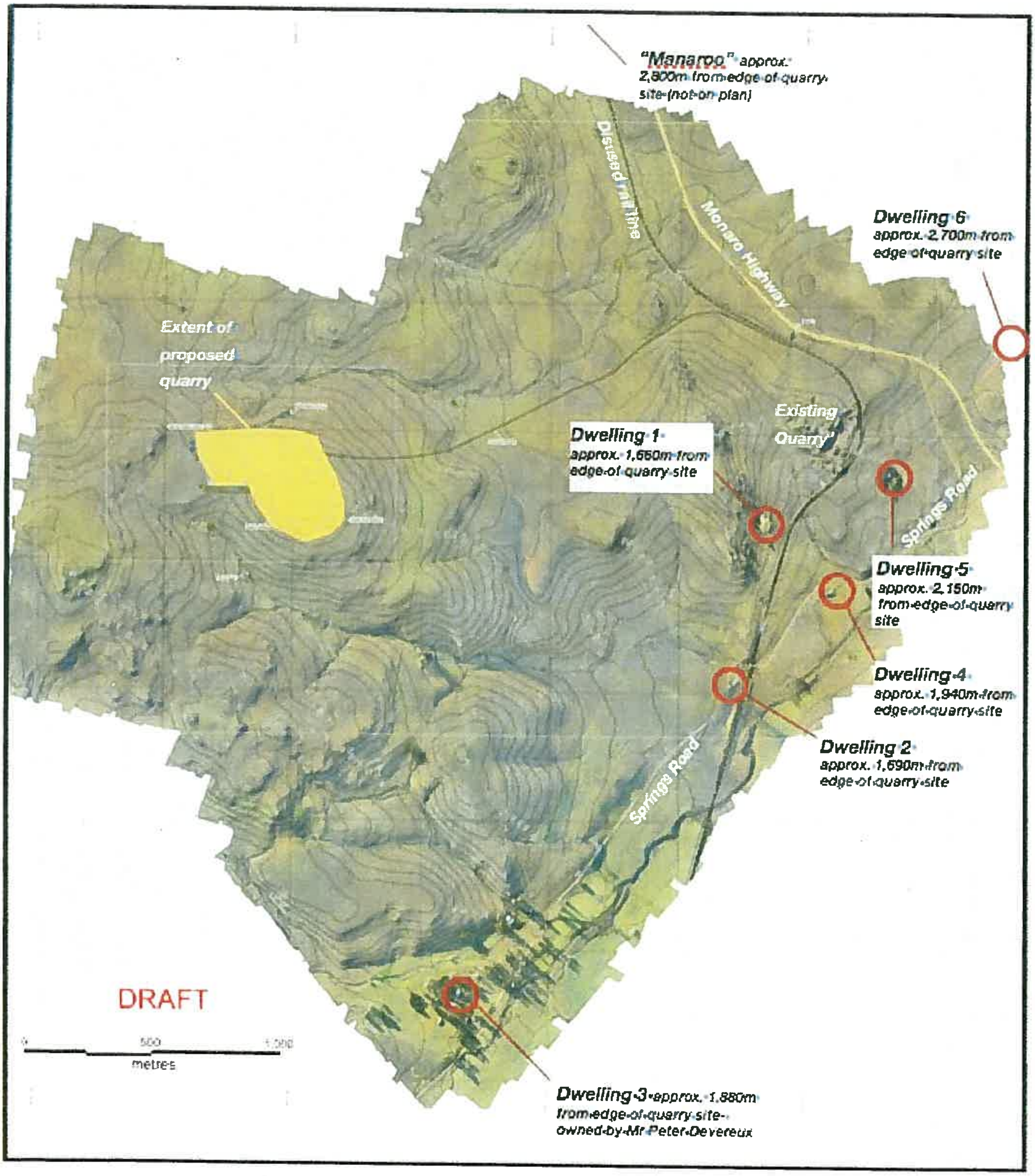

FIGURE 4.7: Aerial photo of nearest residences in vicinity of the Project Site

(Map Base Source: Aerial drone photography commissioned by Schmidt Quarries 2017

NOTE: Dwelling 6 just falls outside of the drone survey coverage area.)

SCHMIDT QUARRIES

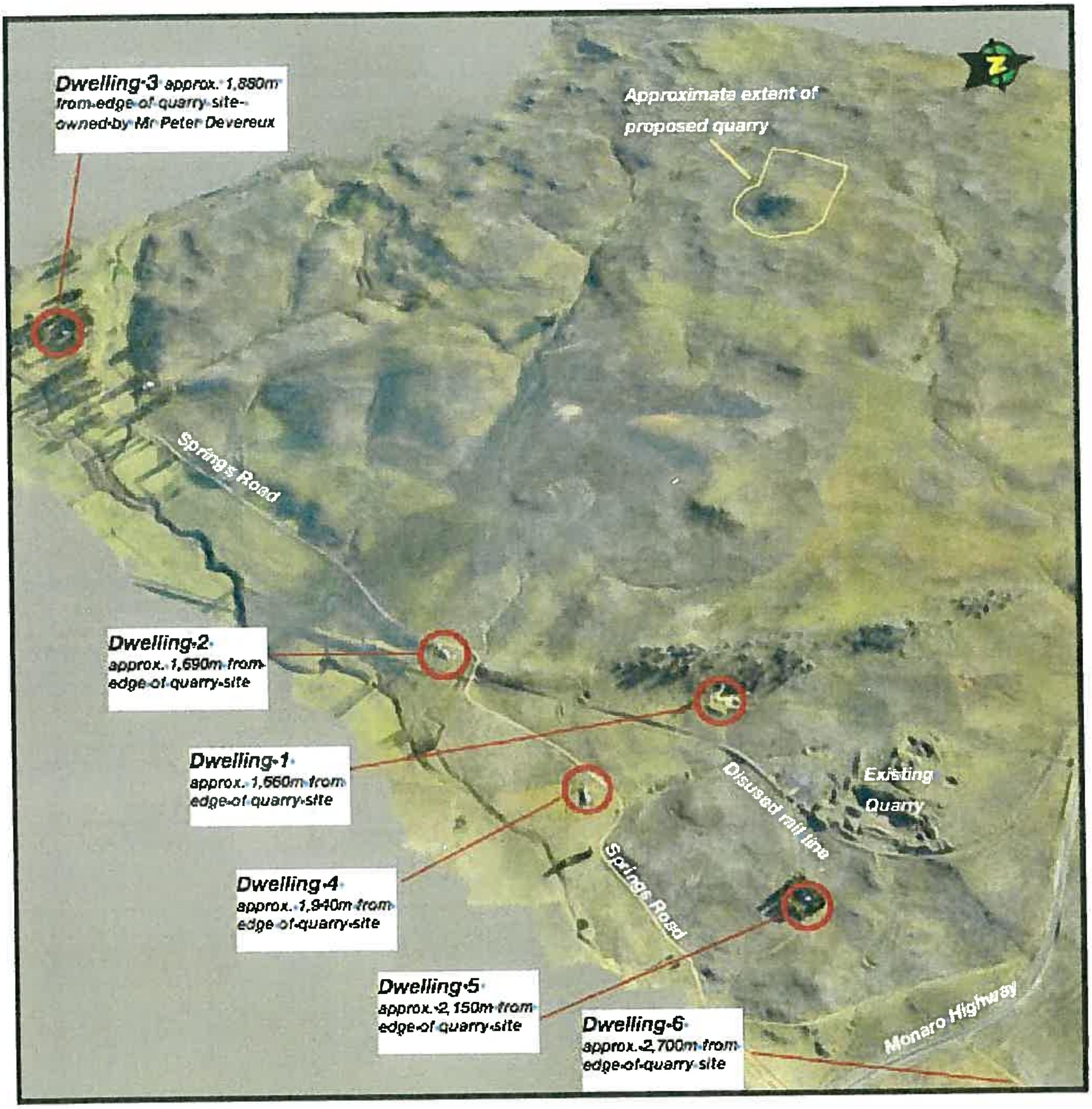

FIGURE 4.8: Oblique aerial photo of nearest residences in vicinity of the Project Site, viewed from the north-east looking back towards the proposed quarry site

(Map Base Source: Composite 3D aerial from drone photography commissioned by Schmidt Quarries 2017
NOTE: Dwelling 6 just falls outside of the drone survey coverage area.)

SCHMIDT QUARRIES SINCE 1974

HOW TO CONTACT US

Further information: Schmidt Quarries welcomes enquiries from interested neighbours and landowners.

Contact David Schmidt on 0407 033 521 or 02 6298 1355 (office) or by email David@schmidtquarries.com.au

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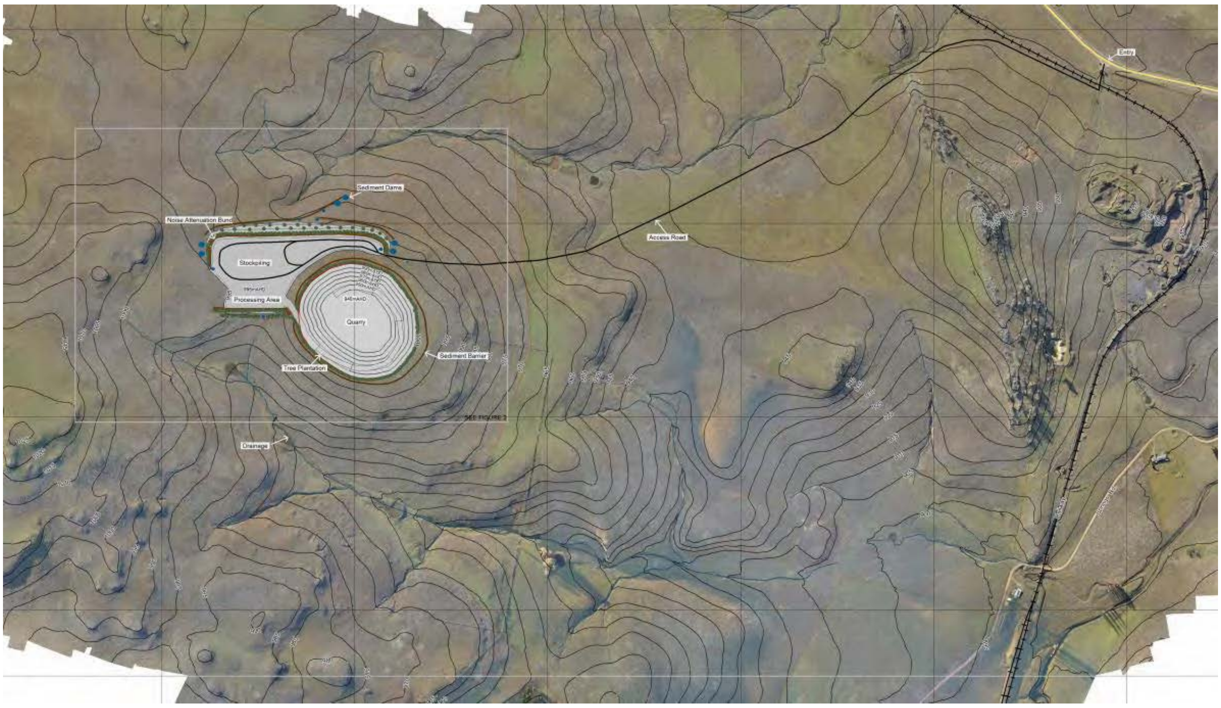
Vipac Engineers & Scientists

Outline Planning Consultants Pty Ltd

EIS new Quarry at Cooma

Noise Impact Assessment



20E-17-0083-TRP-458491-4-draft

05 Feb 2018

Melbourne • Sydney • Adelaide • Perth • Brisbane • Tasmania

Report Title: Noise Impact Assessment **Job Title: EIS New Quarry, Cooma**		
DOCUMENT NO: 20E-17-0083-TRP-458491-4-draft **PREPARED FOR:** Outline Planning Consultants Pty Ltd Suite 18, Pittwater Business Park, 5 Vuko Place Warriewood, New South Wales, 2102, Australia **CONTACT:** Gary Peacock **Tel:** +612 9262 3511 **Fax:** +61 2 9970 6257	**REPORT CODE:** TRP **PREPARED BY:** Vipac Engineers and Scientists Limited 2 Sirius Road, Lane Cove West, NSW 2066, Australia **Tel:** +61 2 9422 4222 **Fax**: +61 2 9420 5911	
AUTHOR:	Minna Santaholma Project Engineer (Acoustics)	Date: 05 Feb 2018
REVIEWED BY:	Brian Mendieta Consultant Engineer (Acoustics)	Date: 05 Feb 2018
AUTHORISED BY:	Minna Santaholma Project Engineer (Acoustics)	Date: 05 Feb 2018
REVISION HISTORY		
Revision No.	Date Issued	Reason/Comments
0	06 Dec 2017	Initial Issue
1	08 Dec 2017	Revised Draft
2	20 Dec 2017	Revised Draft
3	17 Jan 2018	Noise Contour included
4	05 Feb 2018	Revised Stage 2 Prediction
KEYWORDS:		

TABLE OF CONTENTS

1 INTRODUCTION

Vipac Engineers and Scientists Ltd (Vipac) has been commissioned by Outline Planning Consultants Pty Ltd to conduct a Noise Impact Assessment for the proposed new Cooma Quarry, at 278 Springs Road, Rock Flat, NSW.

The purpose of this noise assessment is to ensure the proposed development adheres to relevant acoustic requirements. This assessment will focus on:

- The establishment and recommendation of various noise criteria for the site. This includes maintaining satisfactory noise amenity for surrounding receivers.
- Operational Noise: Identifying the noise sources on the proposed quarry site and ensure noise emissions satisfy relevant noise standards.
- Road Traffic Noise: Assessing potential traffic generation from the development and determining the noise impact on the surrounding receivers.
- Construction Noise: Providing the relevant criteria and assessing the noise impact during the construction of the quarry.

The assessment has been carried out in accordance with the relevant Australian Standards and relevant publications of the NSW Office of Environment and Heritage (OEH) as listed in Appendix A. Acoustic terminologies can also be found in Appendix B.

2 PROJECT DESCRIPTION

The proposed hard rock quarry is located at 278 Springs Road, Rock Flat, which is a part of the Snowy Monaro Regional Council in southern New South Wales. It consists of the lots 62, 76, 78, 106 and 120 DP 75040 and is zoned as ‘Primary Production’. The site is found approximately 15km southeast of Cooma, and approximately 350km south of Sydney.

The current use of the site is for the grazing of stock. The general topography is undulating grassland with rocky hills and minor drainage lines. The nearest dwelling is found approximately 1.7 kilometres south-east from the site. The site is also situated north of an existing quarry located on the north side of Springs Road near the intersection with Monaro Highway.

The Quarry development proposes to extract 4.6 million tonnes of basalt over a 30 year period from a hill located within Lot 106. This results in average annual extraction of 150,000 tonnes and would require monthly blasting to dislodge and break hard rock. A production rate of up to 280,000 tonnes per annum is possible. The Quarry would operate from 7:00 am to 6:00 pm Monday to Friday, and from 7:00 am to 2:00 pm on Saturdays.

The extraction area is planned to be 300 metres of diameter, and it would be supported by facilities including processing plant, stockpiling and access road. The total area covered would be approximately 9 hectares. The access road would connect the site to the Monaro Highway, passing through State Rail owned Crown Land in Lot 1.

Figure 2-1 to Figure 2-4 illustrate the Quarry site and noise sensitive receivers that can be affected by the noise impact of the Quarry. The receivers are also outlined in Table 2-1. Any noise emissions associated with the Quarry on the site lots are assessable against occupational criteria to protect the health of employees.

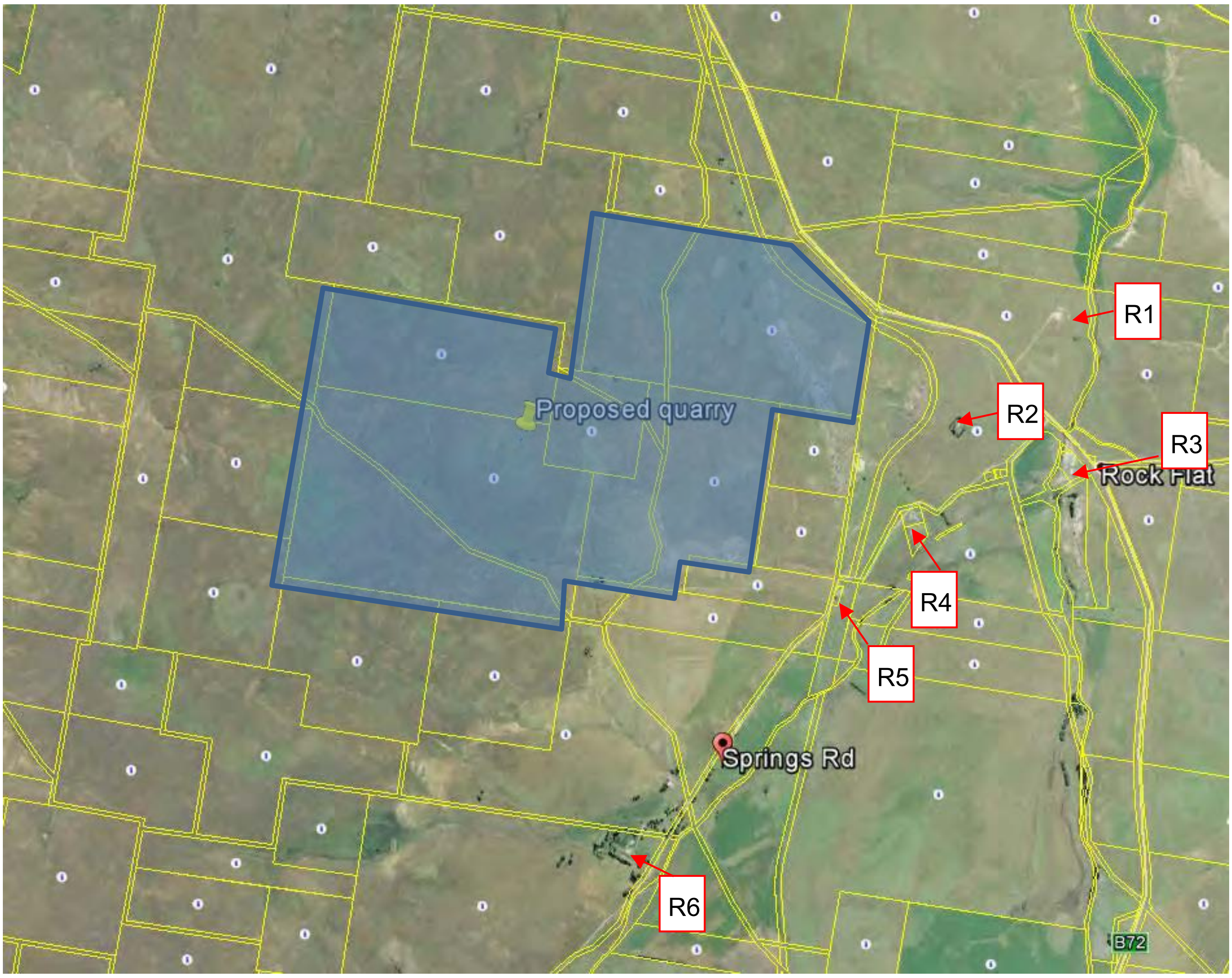


Figure 2-1: Location of Proposed Quarry and Noise Sensitive Receivers, Aerial Map Southeast

Figure 2-2: Location of Proposed Quarry and Noise Sensitive Receivers, Aerial Map Northwest

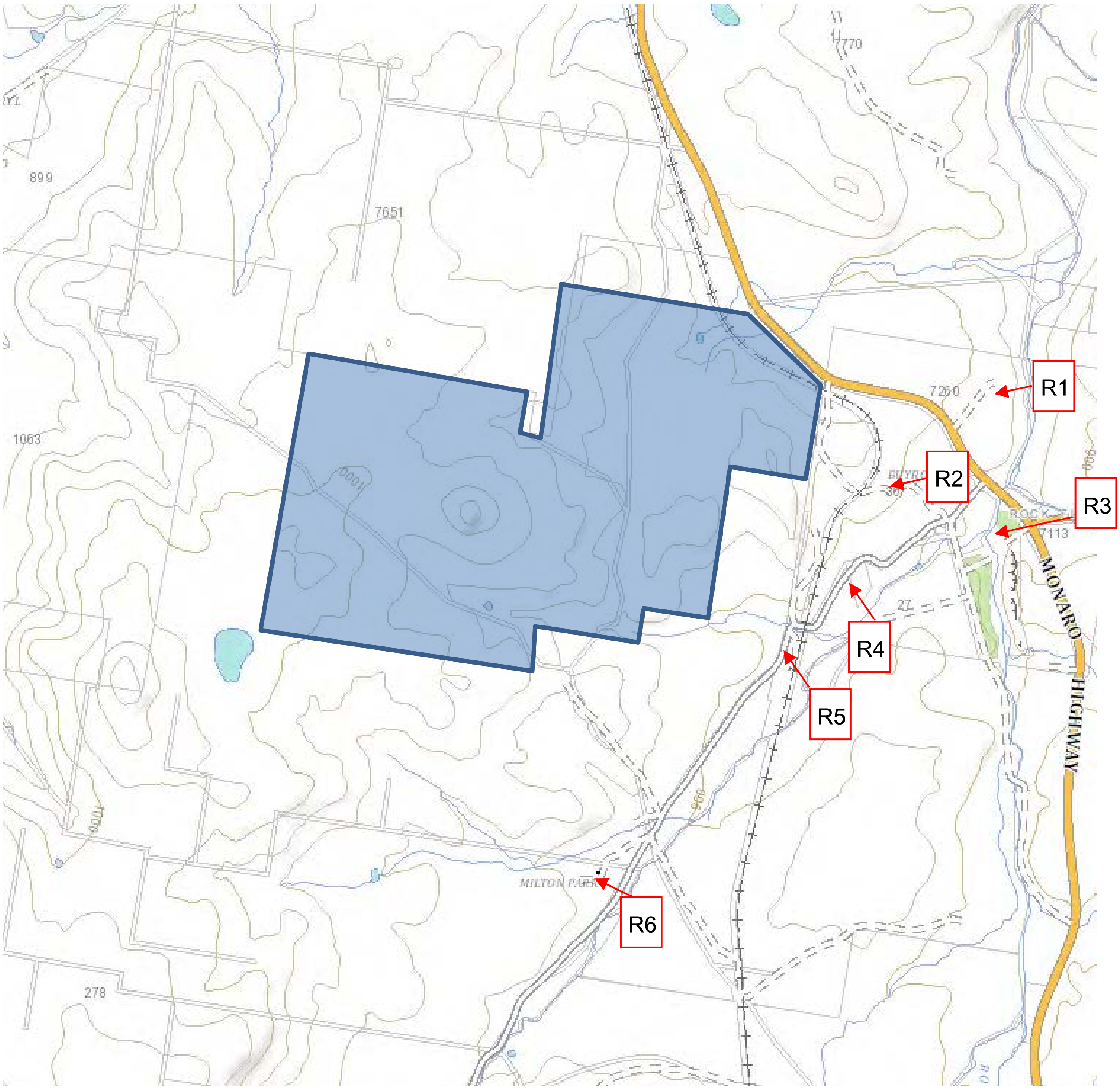


Figure 2-3: Location of Proposed Quarry and Noise Sensitive Receivers, Map Southeast

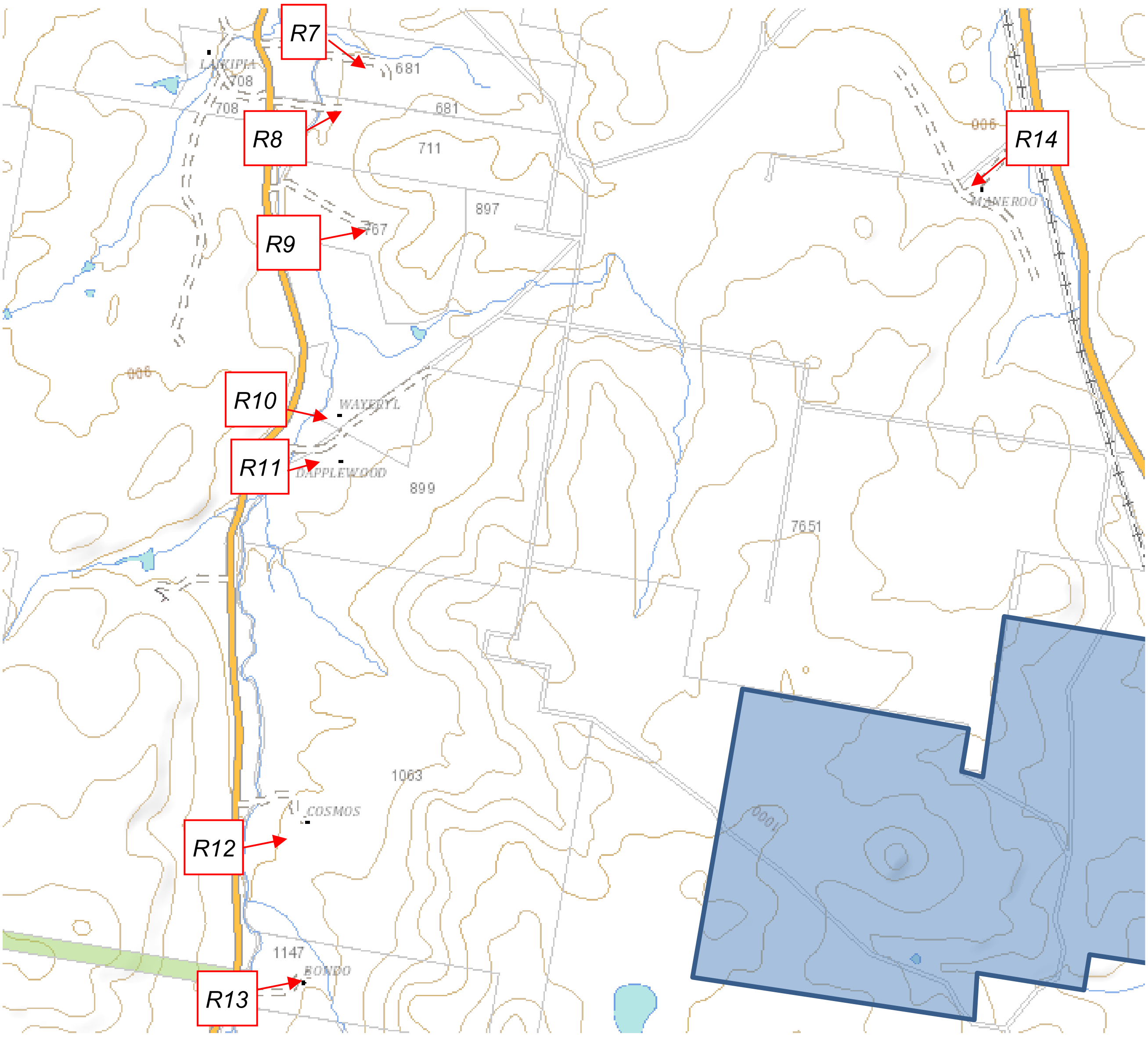


Figure 2-4: Location of Proposed Quarry and Noise Sensitive Receivers, Map Northwest

Table 2-1: Noise Sensitive Receivers

Location ID	Location/ Address	Lot		Orientation to Subject Site
		Lot	Plan	
R1	7260 Monaro Highway	3	DP 825408	East
R2	30 Springs Road	2	DP 825408	East
R3	7195 Monaro Highway	49	DP 750537	East
R4	89 Springs Road	3/3	DP 758883	Southeast
R5	143 Springs Road	1	DP 837551	Southeast
R6	278 Springs Road	6	DP 750540	South
R7	681 Myalla Road	102	DP 633967	Northwest
R8	711 Myalla Road	22	DP 631807	Northwest
R9	767 Myalla Road	1	DP 572661	Northwest
R10	897 Myalla Road	3	DP 572661	Northwest
R11	899 Myalla Road	4	DP 572661	Northwest
R12	1063 Myalla Road	56	DP 750540	West
R13	1147 Myalla Road	55	DP 750540	West
R14	7651 Monaro Highway	68	DP 750540	North

It should be noted, the quarry site is associated with the resident at R6 and is considered an extension of the quarry development. This noise assessment will determine the potential noise impact at R6; however, this receiver should not be considered to adhere to the relevant noise standards.

3 EXISTING NOISE ENVIRONMENT

3.1 INSTRUMENTATION

Vipac installed noise logging equipment at the site to measure baseline environmental noise levels in the area and the existing traffic noise from Monaro Highway. The measurements were conducted continuously for a period of eleven (11) days from 15th to 25th of August 2017 for baseline levels and for five (5) days from 3rd to 7th of November for traffic noise, with a 01dB Metravib Duo Type 1 environmental noise logger (Refer to Table 3-1). In addition, short-term operator attended noise measurements were conducted on 25th of August with the noise logger and 3rd of November with a Bruel & Kjaer Sound Level Meter at the noise logging locations. The locations of the loggers are listed in Table 3-2, and illustrated in Figure 3-1.

Table 3-1: Equipment List

Instrument	Serial Number	Calibration Due
01dB Metravib Duo (background)	10304	07/08/2019
01dB Metravib Duo (traffic)	10297	03/11/2018
Bruel & Kjaer 2250	2749871	17/02/2019
Rion NC-73	10834416	28/08/2018

Table 3-2: Monitoring Location

Location ID	Address	Details
NL1	143 Springs Road	Across the road from the receiver R6
NL2	278 Springs Road	Proposed Quarry Entry, Monaro Highway

The instruments were programmed to measure instantaneous noise levels with ‘Fast’ time weighting and ‘A’ frequency weighting. A field reference check was conducted for the microphones immediately before and after the measurement sequence and the microphone was appropriately fitted with a windshield.

Meteorological data during the noise logging survey period was obtained from the Bureau of Meteorology (BoM) Weather Station at Nimmitabel (Cottesloe) (070237) for rain, and at Cooma Airport (070217) and Cooma Visitors Centre (070278) for wind. Where adverse meteorological conditions such as wind exceeding 5m/s and/or rain were observed during the daily assessment period, the data were excluded. For traffic noise, data was collected from 3rd to 7th of November.

Figure 3-1: Noise Monitoring Locations

3.2 NOISE MONITORING RESULTS

Measurement results obtained from the instrumentation have been analysed in accordance with the procedures set out in the NSW Noise Policy for Industry (NPI) for determining existing background noise levels of the surrounding area, and subsequently determining operational noise criteria. Results of the long-term and short-term noise measurements are outlined in Table 3-3 to Table 3-5 and Table 3-6, respectively.

The L_{A90} was used to determine the Rating Background Level (RBL) for assessment purposes. This statistical measurement is the sound pressure level which is exceeded for 90% of the measurement period.

The L_{Aeq} was collected during the monitoring period and represents the equivalent continuous A-weighted sound pressure level of a continuous steady sound that has the same A-weighted sound energy as the actual time-varying sound.

Due to environmental conditions including winds of over 17 km/h, rain and possible cricket noise, only a part of the logging data could be used for the analysis. The weather was acceptable from the 20th to 23rd of August 2017 for the baseline noise survey and from 3rd to 5th of November 2017 for the traffic noise monitoring period. During the night time, parts of the traffic noise measurement were also affected by some varying environmental noise, which lead to excluding the respective results. The included data is marked with bold numbers in the tables.

Table 3-3: Background & Ambient Noise Monitoring Results dB(A) – NL1

Date	ABL (L_{A90}), dB(A)			$L_{Aeq,}$dB(A)		
	Day	Evening	Night	Day	Evening	Night
15/08/2017	N/A	26	25	N/A	52	42
16/08/2017	33	27	20	58	39	37
17/08/2017	31	28	23	57	45	48
18/08/2017	31	25	22	53	42	44
19/08/2017	30	19	18	49	46	34
20/08/2017	**21**	**22**	**17**	**43**	**42**	**34**
21/08/2017	**21**	**17**	**17**	**53**	**38**	**40**
22/08/2017	**24**	**18**	**17**	**47**	**37**	**37**
23/08/2017	**26**	**19**	**17**	**45**	**43**	**37**
24/08/2017	28	20	17	47	35	38
Median (RBL)	**30 (22) ***	**30 (19) ***	**30 (17) ***	**/**	**/**	**/**
Logarithmic Average	**/**	**/**	**/**	**45**	**40**	**37**

Note:
Day is defined as 0700 to 1800.
Evening is defined as 1800 to 2200
Night is defined as 2200 to 0700
N/A – Not available: Noise monitoring throughout the specific time period was incomplete.
*** –** The level has been adjusted to 30 dB(A) for day, evening and night time period, following the instructions in INP Section 3.1. The Standards states:

'Where the rating background level is found to be less than 30 dB(A), then it is set to 30dB(A).

According to the Noise Policy for Industry (NPI), any measured Rating Background level less than 30 dB(A) should be adjusted to different values. The standards states:
'Where the rating background noise level is found to be less than 30dB (A) for the evening night periods, then it is set to 30dB(A) for the evening and night periods, then it is set to 30dB(A); where it is found to be less than 35db(A) for the daytime period, then it is set to 35db(A).'

Table 3-4: Background & Ambient Noise Monitoring Results dB(A) – NL2

Date	ABL (L_{A90}), dB(A)			L_{Aeq}, dB(A)		
	Day	Evening	Night	Day	Evening	Night
03/11/2017	**41**	**22**	**16**	**60**	**55**	48
04/11/2017	**29**	**16**	**15**	**55**	**53**	51
05/11/2017	**28**	**26**	**19**	**57**	**55**	51
06/11/2017	36	35	29	58	55	50
07/11/2017	-	-	-	-	-	-
Median (RBL)	**36**	**35**	**30 (29) ***	**/**	**/**	**/**
Logarithmic Average	**/**	**/**	**/**	**58**	**54**	**-**

Note:
Day is defined as 0700 to 1800.
Evening is defined as 1800 to 2200
Night is defined as 2200 to 0700
N/A – Not available: Noise monitoring throughout the specific time period was incomplete.
*** –** The level has been adjusted to 30 dB(A) for evening and night and 35dB(A) for the daytime period, following the instructions in NPI Section A1.2. The Standards states:

'Where the rating background level is found to be less than 30 dB(A) for the evening and night periods, then it is set to 30 dB(A); where it is found to be less than 35dB(A) for the daytime period, then it is set to 35 dB(A).'

Table 3-5: Road Traffic Noise Results, dB(A) – NL2

Date	Day		Night	
	$L_{Aeq-15hr}$	$L_{Aeq-Noisiest\ 1Hr}$	$L_{Aeq-9hr}$	$L_{Aeq-Noisiest\ 1Hr}$
03/11/2017	**59**	**62**	48	54
04/11/2017	**55**	**57**	51	58
05/11/2017	**57**	**59**	51	54
06/11/2017	57	59	50	52
Logarithmic Average	**57**	**59**	**-**	**-**

Note:
Day is defined as 0700 to 2200.
Nig is defined as 2200 to 0700

Table 3-6: Short-Term Attended Noise Monitoring

Location	Date/Time	Noise Descriptor, dB(A)				Observations
		L_{Aeq}	L_{A1}	L_{A10}	L_{A90}	
NL1	25/08/2017 13:00	39	50	41	29	**Consistent:** crickets **Intermittent:** sheep, cow, birds
NL2	03/11/2017 11:53	62	73	66	46	**Consistent:** birds **Intermittent:** cars passing by, medium to strong winds

4 CRITERIA

4.1 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS (SEARS)

A request for the Secretary's Environmental Assessment Requirements (SEARS) for the proposed Cooma quarry was submitted to the NSW Planning and Environment and the SEARS was provided to the client (EAR1129). According to the issued requirement, 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 noise emission from the development and must include a quantitative assessment of the following items:

- Construction and operational noise and off-site transport noise impacts of the development in accordance with the Interim Construction Noise Guideline, NSW Industrial Noise Policy and NSW Road Noise Policy respectively;
- Reasonable and feasible mitigation measures to minimise noise emissions; and
- Monitoring and management measures.

These items will be addressed within this assessment report.

4.2 NSW EPA INDUSTRIAL NOISE POLICY (INP)

The NSW Environmental Protection Authority (NSW EPA) Industrial Noise Policy (INP) sets limits on the noise that may be generated by facilities ranging from industrial premises/sites to processing plants and includes quarries such as the proposed Cooma Quarry operations. These limits are dependent upon the existing noise levels at the site and noise sensitive receptors located in the surrounding area and are implemented to ensure changes to the existing noise environment are minimised and deal with the intrusiveness of the noise and the amenity of the environment. The most stringent of the limits is taken as the limiting criterion for the noise source.

The intrusiveness noise criterion requires that the $L_{Aeq,15minutes}$ for the noise source, measured at the most sensitive receiver under worst-case conditions, should not exceed the Rated Background Level (RBL) by more than 5dB, represented as follows:

$$L_{Aeq,15minutes} < RBL + 5dB$$

The amenity criterion is based on noise criteria specific to land use and associated activities. It aims to maintain noise level amenity for residences and other land uses. To limit continuing increases in noise levels, the maximum ambient noise level within an area should not normally exceed the acceptable noise levels specified in Table 2.1 of the INP pursuant to any modifications that may be required subject to existing levels of industrial noise.

Noise levels associated with the proposed Quarry plan and potential impacts on nearby noise sensitive receptors (located in the surrounding area) will be required to comply with the Project Specific Noise Levels detailed in Table 4-1, which have been determined on the basis of the results of the baseline noise surveys.

Table 4-1: Project Specific Noise Levels for Industrial Noise at Noise Sensitive Receptors, dB(A) – Residential

Location	Period	L_{Aeq}	RBL	Recommended Acceptable L_{Aeq}	Intrusiveness Criteria Level	Project Specific Noise Level
R1-R3 (NL2)	Day	58	30	50	41	**41**
	Evening	54	30	45	35	**35**
	Night	-	30	40	35	**35**
R4-R16 (NL1)	Day	53	36	50	35	**35**
	Evening	45	30	45	35	**35**
	Night	42	30	40	35	**35**

4.3 NSW EPA ROAD NOISE POLICY

4.3.1 NOISE ASSESSMENT CRITERIA – RESIDENTIAL LAND USES

The requirements of the NSW Road Noise Policy are also applicable to this assessment due to the additional traffic produced by the quarry operations. The potential Quarry related traffic noise impacts have been assessed on Monaro Highway/Snowy Mountains Highway (B72), which is classified as arterial road. Table 4-2 (refer to Table 3 of the RNP) below presents the relevant road noise criteria.

Table 4-2: Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of project / land use	Assessment Criteria/ Target Noise Level, dB(A)	
		Day (7am-10pm) 15h	Night (10pm-7am) 9h
Arterial road	3. Existing residences affected by additional traffic on existing sub-arterial roads generated by land use developments.	L_{Aeq}, (15-hour) 60 (external)	L_{Aeq}, (9-hour) 55 (external)

Note: These criteria are for assessment against façade- corrected noise levels when measured in front of a building façade. Hence, a correction factor of 2.5 dB is added to the predicted noise levels

4.3.2 RELATIVE INCREASE CRITERIA

As outlined in Section 2.4 of the Road Noise Policy, in addition to the assessment criteria outlined in Table 4-2, any increase in the total traffic noise level at a location due to a proposed project or traffic-generating development must be considered. Residences experiencing increases in total traffic noise level above the relative increase criteria in Table 4-3 should be considered for mitigation (refer to Table 6 of the RNP).

Table 4-3: Relative increase criteria for residential land uses

Road Category	Type of project/development	Total traffic noise level increase dB(A)	
		Day (7am to 10pm) 15h	Night (10pm to 7am) 9h
Arterial roads	Land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq,15h}$ + 12dB (external)	Existing traffic $L_{Aeq,9h}$ + 12dB (external)

As stated in Section 3.4 of the RNP, where existing traffic noise levels are raised above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against the excessive decreases in amenity as the results of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person.

4.4 NSW DECCW INTERIM CONSTRUCTION NOISE GUIDELINE

The NSW Interim Construction Noise Guideline (ICNG) was developed by the NSW – Department of Environment & Climate Change (DECCW) and contains detailed procedures for the assessment and management of construction noise impacts.

The ICNG presents two ways of assessing construction noise impacts (initial development of the Quarry) – the quantitative method, which is generally suited to longer-term construction works; and the qualitative method, which is generally suited to short-term works (usually not more than 3 weeks), such as infrastructure maintenance.

It is expected that the length of the construction works associated with the quarry will be more than 3 weeks and therefore, a quantitative method has been used for this assessment.

Table 4-4 sets out the management levels for noise at residences. Restrictions to the hours of construction may apply to activities that generate noise at residences above the 'highly noise affected' noise management level. The resulting Project Specific Noise Management Levels associated with the initial development of the proposed Quarry are presented in Table 4-5 for the operations during standard construction hours.

Table 4-4: Noise at residence using Quantitative Assessment

Recommended Hours	Time of Day	Management level $L_{Aeq(15min)}$ [1]
Recommended standard hours	Monday to Friday - 7 am to 6pm Saturday - 8am to 1 pm No Work on Sundays or Public holidays	Noise affected RBL[2] + 10dB
		Highly noise affected [3] 75dB(A)
Outside recommended standard hours		Noise affected RBL[2] + 5dB

Note:

1. Noise levels apply at the boundary that is most exposed to construction noise and at a height of 1.5 m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise-affected residence.
2. RBL is the Rating Background Level as defined in the EPA NSW INP.
3. *$L_{Aeq\ 15\text{-}minute} \geq 75$ dB is highly likely to generate strong community reactions and should be avoided.*

Table 4-5: Project Specific Noise Levels for Construction Noise at Noise Sensitive Receptors, dB(A) – Residential

Location	Period	L_{Aeq}	RBL	Noise Management Levels
R1-R3 (NL2)	Day	58	36	46
	Evening	54	30	35
	Night	50	30	35
R5-R14 (NL1)	Day	53	30	40
	Evening	45	30	35
	Night	42	30	35

* In accordance with Section 2.2 of the NPI, the monitoring locations N02 and N03 have been classified as suburban residential locations on the basis of their proximity to Brandy Hill Drive and Clarence Town Road respectively and the increased contribution of traffic noise on these locations. This contrasts with the other monitoring locations classified as rural residential locations which were influenced to a greater extent by natural noise sources and experienced very little direct traffic noise exposure.

5 NOISE IMPACT ASSESSMENT

This section provides an outline of the methodology undertaken to establish the noise emission used for assessment purposes. All assumptions used in the modelling process have also been noted.

Noise generated from the proposed site has been predicted utilising NSW EPA recognised and approved SoundPLAN v7.1 computational noise prediction software package. SoundPLAN, a fully integrating software suite, specialises in computer simulations of noise situations incorporating over 50 calculation standards. The model calculates overall noise levels at receiver locations considering distance attenuation, atmospheric absorption, barriers, ground effects, weather conditions, source noise levels, source and receiver locations and topography. It has been used for numerous quarrying, mining and industrial noise impact assessments conducted both by Vipac and other Consultancy Practices.

5.1 GEOGRAPHICAL DATA

Table 5-1 below lists the drawings/information received and used in the noise model.

Table 5-1: List of Drawings

Description	Date	Provided by
5k site plan draft	8/11/2017	Outline Planning Consultants
Ground elevation of the study area	8/11/2017	SIX Maps, Spatial Services of NSW Government

5.2 NOISE SOURCES

A noise emissions survey of the Quarry infrastructure (mechanical plant & equipment) was conducted during typical operations on 15th August 2017 at an existing quarry near Nimmitabel. Subsequently, the sound pressure measurements taken of all major infrastructure components were analysed, and the calculated sound power levels were then derived for the machinery associated with the current quarry operations. The existing plant and equipment is expected to be used in the proposed Quarry, however, additional manufacturer and measurement data was sought based on the equipment schedule provided by Outline Planning Consultants (date 10/11/2017).

Table 5-2 details the calculated sound power levels of the current mechanical plant and equipment associated with the existing operations and activities at the Nimmitabel quarry site, whereas Table 5-3 lists the sound power levels implemented in the model.

Table 5-2: Quarry Operations – Measured Sound Power Levels (L_w), dB

Plant & Equipment	L_{WA}	Frequency- Linear									
		31.5	63	125	250	500	1k	2k	4k	8k	16k
C14 Screen/shaker	92	96	86	87	85	85	84	84	87	81	72
Screen/shaker	96	84	88	93	86	85	85	86	83	77	68
Jaw crusher	109	104	106	110	107	107	105	102	95	87	77
Secondary crusher	107	92	98	99	102	101	97	95	89	81	70
Excavator loading idling truck	108	103	108	106	96	101	96	94	90	80	65
Truck	101	97	93	102	99	99	95	93	87	79	69
8t dozer	88	88	96	91	84	85	84	79	72	63	53

Table 5-3: Noise Model –Sound Power Levels (L_w), dB

Plant & Equipment	L_{WA}	Frequency- Linear									
		31.5	63	125	250	500	1k	2k	4k	8k	16k
Tracked Fixed drilling rig, 23t	103	-	100	99	102	101	97	94	91	86	-
Excavator, 30t	103	-	100	99	102	101	97	94	91	86	-
Generator, 1000 kVA with an enclosure*	107	-	114	113	108	105	102	97	94	90	-
Wheel loader	105	-	-	-	-	108	-	-	-	-	-
Impact crusher	112	-	105	105	105	105	105	105	105	105	-
Fixed Screen, Chieftain 1400	106	99	102	107	101	100	100	101	98	92	83
Fixed Screen, Chieftain 2100X	110	103	106	111	105	104	104	105	102	96	87
Rigid dump truck, 40t	113	-	117	112	108	110	108	106	100	92	-
Water cart	107	-	-	-	-	110	-	-	-	-	-
Grader	110	-	-	-	-	113	-	-	-	-	-
Bulldozer	108	-	-	-	-	111	-	-	-	-	-
8t dozer	93	94	103	98	89	90	89	86	77	69	58

* Sound Power Level was extracted from previous Vipac Sound Power Measurement as of a 1000kVA Generator with an enclosure (reference: 30B-11-0366-TRP-604652-0).

5.3 WEATHER CONDITIONS

Two noise prediction modelling scenarios were run in the SoundPLAN program using CONCAWE algorithms in order to approximate the expected neutral and worst-case weather scenarios. It should be noted that sound will propagate further through the atmosphere under certain weather conditions. The ‘worst-case’ weather conditions chosen are those that are highly conducive to sound propagation.

The weather parameters used in the CONCAWE calculations to approximate expected neutral and worst-case weather situations at the quarry site are outlined in Table 5-4 below. As operations occur during daytime hours, this situation has been considered in the noise predictions. The weather parameters used in the noise predictions have been determined based on the annual data from the Bureau of Meteorology (BoM) Weather Station at Cooma Visitors Centre NSW (070278).

Table 5-4: Sound Plan Weather Parameters

Parameter	Day		Evening/Night	
	Neutral	Worst-Case	Neutral	Worst-Case
Pasquill Stability Category	B	D	D	F
Wind Speed (m/s)	0	3	0	3
Humidity (%)	54	54	79	79
Temperature (deg Celsius)	12	12	-2	-2
Met Category	3	5	4	6

5.4 NOISE MODELLING SCENARIOS

Vipac understands that the operation of the proposed quarry has been divided into 3 stages. The decommissioning stage has been excluded from this assessment. Table 5-5 sets out the activities and equipment associated with the noise sources during daytime for each stage. The difference between each stage in terms of noise emissions will primarily be associated with varying heights associated with the plant items operating in the processing area and in the quarry pit. A graphical layout of Stage 2 is presented in

Table 5-5: Quarry Activities during Daytime for Each Stage 1-3

Activities	Equipment
Stage 1	
• Remove surface rock, topsoil and overburden • Start extracting material from northeast side of hill, progressively lowering the profile • Process material into forms suitable for constructing quarry site • Construct quarry site, including internal haul road, staff facilities and processing areas • Construct bunding along the northern and southern sides of the processing and stockpiling area, plant screening • Generators producing electricity	• Tracked fixed drilling rig, 23t • Excavator, 30t • Wheel loader • Jaw crusher • Secondary crusher • Fixed screen, Chieftain 1400 • Fixed screen, Chieftain 2100X • Rigid dump truck, 40t • Grader • Bulldozer
Stage 2	

• Continue extracting material until the hill is levelled down to the height of 1000 m AHD • Start quarrying pit • Process material and transport it off the quarry site • Plant screening trees around the pit area • Generators continue to provide electricity	• Tracked mobile drilling rig, 23t • Excavator, 30t • Generator, 1000 kVA with an enclosure • Wheel loader • Jaw crusher • Secondary crusher • Mobile screen, Chieftain 1400 • Mobile screen, Chieftain 2100X • Rigid dump truck, 40t • Water cart • Bulldozer
Stage 3	
• Extract material from the pit, continue deeper in the hill • Process material and transport it off the quarry site • Progressively enlarge processing plant and stockpile area	• Tracked mobile drilling rig, 23t • Excavator, 30t • Generator, 1000 kVA with an enclosure • Wheel loader • Jaw crusher • Secondary crusher • Impact crusher • Mobile screen, Chieftain 1400 • Mobile screen, Chieftain 2100X • Rigid dump truck, 40t • Water cart • 8t dozer

5.5 NOISE IMPACT FROM GENERATED TRAFFIC

The Calculation of Road Traffic Noise (CoRTN) method of traffic noise prediction was used, which is a method approved by the EPA. The traffic data presented in the report entitled Proposed Mount Mary Hard Rock Quarry Traffic Impact Assessment (by StreetWise Road Safety & Traffic Services (StreetWise) dated 17 October 2017) was used to calculate the traffic noise generation.

Vipac has been advised by Outline Planning Consultants that there will be an internal quarry haul route used to give access to and transport material off the quarry site. The haul route connects directly to Monaro Highway, which makes the highway the only road to be considered for potential road traffic noise impacts associated with the quarry.

StreetWise obtained the 2016 traffic volumes from the historical traffic data (2007-2016) outside Nimmitabel provided by RMS. The average growth per annum during the observation period was approximately 1.5 %, and in the StreetWise report similar annual increase was assumed to continue. In addition, StreetWise conducted traffic counts during the afternoon period on 16th and the morning period on 17th August 2017, which confirmed that the RMS traffic data is applicable at the proposed quarry site. Heavy vehicles formed approximately 11 % of the traffic during these counts, and their share is expected to remain constant in the future. Table 5-6 presents the existing and expected weekday traffic volumes on Monaro Highway for years 2016, 2017 and 2027. The speed limit of the section considered is 100 km/h.

The potential traffic generated from the proposed Quarry has been estimated to include 64 haul trucks per day, the peak hours being in the morning. The peak hour traffic is estimated to be 8 vehicles per morning peak hour, whereas in the afternoon 3 trips per hour are expected. 65 % of these truck movements are likely to be south and the rest (35 %) to north. Additionally, traffic will be generated by the 5 full time and 4 part time staff members commuting to and from the site at 6-9am and mid-afternoon, at a rate of about 5 per hour. The resulting hourly vehicle trips are illustrated in Figure 5-1, extracted from the StreetWise report, and the daily traffic details are outlined in Table 5-7. The traffic noise impact of these vehicles is determined and the overall road traffic noise levels are compared against the applicable noise criteria at the noise sensitive receivers located along Monaro Highway.

Table 5-6: Traffic Volumes 2016, 2017 and 2027 – Monaro Highway

Year	Southbound (to Nimmitabel)			Northbound (to Cooma)			Total
	Cars	Heavy	Total	Cars	Heavy	Total	
2016	999	123	1122	1008	125	1133	2255
2017	1014	125	1139	1023	126	1150	2289
2027	1176	145	1322	1188	147	1335	2656

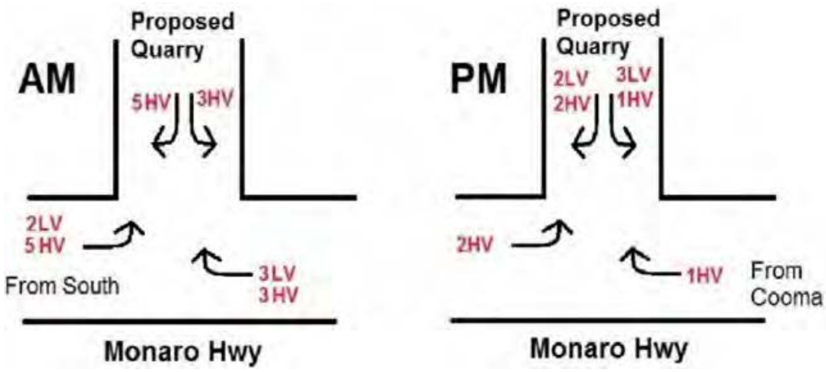


Figure 5-1: Estimated Hourly Vehicle Trips Generated by Development

Table 5-7: Daily Traffic Details of Quarry Operations

	Cars		Trucks	
	%	#	%	#
Southbound (to Nimmitabel)	40	7.2	65	41.6
Northbound (to Cooma)	60	10.8	35	22.4
Total	100	18	100	64

6 RESULTS

6.1 STAGE 1 INITIAL DEVELOPMENT (CONSTRUCTION) OF THE PROPOSED QUARRY

The activities associated with the initial development of the Quarry will comprise of excavators removing overburden material, a drill extracting material required for the site construction, trucks moving the material, a bulldozer and a grader working on the road and processing area, and generators providing electricity.

Noise modelling has been undertaken to assess the potential noise impacts associated with the initial development phase of the proposed Quarry. The results are presented in Table 6-1, and noise contour graphs can be found in Appendix E.

Table 6-1: Initial Development (Construction) of Proposed Quarry– Predicted Noise Impact

Receiver ID	Neutral	Worst	Noise Management Levels (Standard Construction Hours)
R1	23	34	40
R2	25	35	40
R3	22	32	40
R4	23	33	40
R5	21	31	40
R6	12	22	40
R7	7	17	40
R8	1	11	40
R9	5	14	40
R10	22	32	40
R11	10	19	40
R12	8	18	40
R13	5	15	40
R14	13	23	40

The predicted results associated with the initial development phase of the proposed Quarry indicate that the noise levels are within the applicable Noise Management Level criteria at all of the noise sensitive locations. Therefore, there is no mitigation measures required in association with the construction stages of the quarry.

Regardless, in accordance with standard practice at operational quarries and mines throughout NSW, it is recommended that a Noise Compliance Management Strategy should be implemented for the Quarry. This should comprise of a noise monitoring programme whereby the Quarry operational phase noise emissions are assessed at the nearest noise sensitive receptors by way of an attended environmental noise monitoring survey at a frequency to be determined in consultation with NSW EPA.

6.2 STAGES 2-3 OF PROPOSED QUARRY

Noise prediction modelling has been carried out to identify the potential impact associated with the proposed Quarry on the existing noise environment at the nearest noise sensitive receptors. The predicted noise levels representative of the two active operational stages of the Quarry are presented in Table 6-2 for both neutral weather conditions and worst-case weather conditions for both active stages during the daytime, noise contour graphs can be found in Appendix E. The Stage 2 work site will be in accordance with the elevation/cross section plans as provided in Appendix C. Additionally the noise prediction will be assessed against the Industrial Noise Policy day time criterion and the Noise Policy for Industry (NPI) day time criterion.

Table 6-2: Stage 2 & 3 Active Phase - Predicted Noise Impact (Daytime), dB(A)

Receiver ID	Stage 2		Stage 3		Noise Criteria Day INP	Noise Criteria Day NPI
	Neutral	Worst	Neutral	Worst		
R1	25	35	22	32	41	41
R2	25	35	19	29	41	41
R3	24	34	19	29	41	41
R4	26	**36**	16	26	35	40
R5	28	**38**	19	29	35	40
R6	22	33	22	33	35	40
R7	6	15	1	10	35	40
R8	0	9	1	6	35	40
R9	3	13	1	9	35	40
R10	20	30	15	25	35	40
R11	7	17	2	12	35	40
R12	6	15	3	13	35	40
R13	4	14	1	11	35	40
R14	14	25	13	28	35	40

The predicted noise impact associated with the proposed quarry on the noise sensitive receivers during neutral weather conditions ranged from 3 to 30 dB(A) for Stage 2 and from 1 to 28 for Stage 3. These predicted noise levels during the daytime are within the applicable Project Specific Noise Level criteria.

In the worst case weather scenarios, an adverse wind of 3 m/s was assumed, resulting in noise levels approximately 10 dB higher than in neutral weather. The ranges were 9 to 38 dB(A) and 6 to 32 dB(A) for Stages 2 and 3, respectively. The Noise Criteria for daytime was exceeded at receivers R4 and R5 in Stage 2 by approximately 1-3dB. However, noise prediction values for stages 2 and 3 with neutral and worst weather conditions comply with the NPI.

The proposed screening bunds and sediment barriers can act as noise barriers, and their effect was thus also predicted. The locations and heights of the bunds and sediment barriers have been illustrated in Figure 6-1. The noise levels after introducing the barriers are listed in Table 6-3, and noise contour graphs can be found in Appendix E.

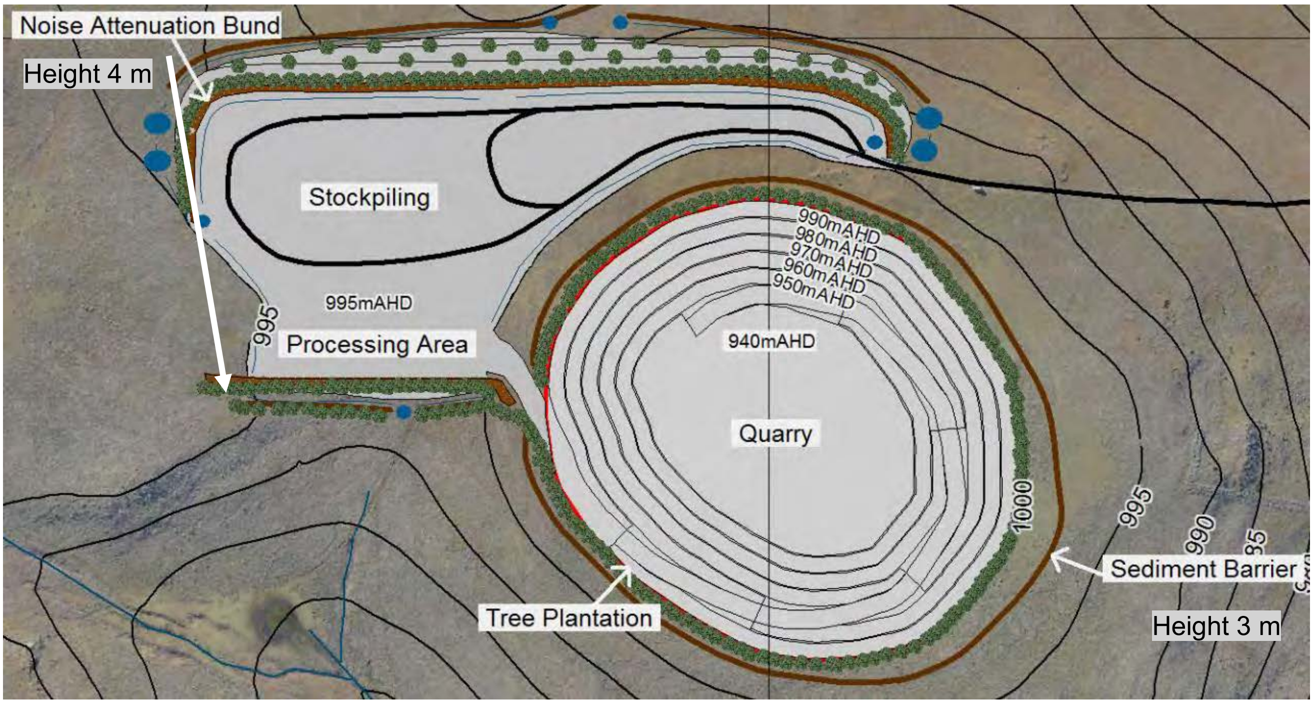


Figure 6-1: Locations and Heights of Screening Bunds

Table 6-3: Stage 2 & 3 Active Phase with Noise Barriers - Predicted Noise Impact (Daytime), dB(A)

Receiver ID	Stage 2		Stage 3		Noise Criteria Day INP	Noise Criteria Day NPI
	Neutral	Worst	Neutral	Worst		
R1	24	34	22	32	41	41
R2	24	34	18	26	41	41
R3	23	33	19	29	41	41
R4	20	30	15	25	35	40
R5	22	31	18	28	35	40
R6	17	27	17	27	35	40
R7	5	15	0	10	35	40
R8	0	9	0	5	35	40
R9	3	12	0	8	35	40
R10	19	30	14	24	35	40
R11	7	17	2	12	35	40
R12	6	15	3	13	35	40
R13	4	14	1	11	35	40
R14	14	24	12	23	35	40

The results in Table 6-3 indicate that after introducing the screening bunds and the sediment barrier, the noise levels comply with the INP and the NPI in both neutral and worst case weather scenarios.

6.3 TRAFFIC NOISE IMPACT

6.3.1 TRAFFIC NOISE MODEL CALIBRATION

The model was calibrated with the noise data from the traffic noise monitoring survey performed at location NL2. The predicted $L_{10,\ (18hrs)}$ was compared with the $L_{10,\ (18hrs)}$ calculated from logging data, and a calibration constant was determined. Table 6-4 provides the results of the measured and predicted $L_{10,\ (18hrs)}$ values used to calculate the calibration constants.

Table 6-4: Model Calibration – dB(A)

Period	Noise Parameter	Noise Level, NL2
Day Time	Predicted $L_{A10\ (18hr)}$	57.4
	Logging (measured) $L_{A10\ (18hr)}$	55.9
	Difference	-1.5

The model calibration is generally acceptable (within 2.5dB) and is representative of the traffic noise on Monaro Highway in the area during the daytime.

6.3.2 NOISE PARAMETER CONVERSION

To determine the other required noise parameters, logging data was used to calculate differences between the noise parameters. Correction factors are presented in Table 6-5. Only daytime was considered due to the Quarry operation hours being limited to standard construction hours.

Table 6-5: Parameters Calibration – dB(A)

Location ID	Noise Parameter	Measured (L_{Aeq})	Measured ($L_{A10,\ 18hr}$)	Difference
NL2	$L_{Aeq\ (15hr)}$	57.0	55.9	+1.1

The total noise source adjustment in the model to predict noise parameters, which include the model calibration and the noise parameter conversion, are shown in Table 6-6 below. The total adjustment is added to the predicted results to convert them to the $L_{Aeq\ (15hr)}$ values, which can then be compared to the relative noise criteria.

Table 6-6: Summary of Model Adjustments – dB(A)

Location ID	Noise Parameter	Model Cal	Parameter Cal	Total
NL2	$L_{Aeq\ (15hr)}$	-1.5	+1.1	-0.4

6.3.3 TRAFFIC NOISE IMPACT ASSESSMENT

Details of the traffic volumes in the noise predictions are outlined in Section 5.5. The existing traffic volumes on Monaro Highway were determined from RMS traffic data measured outside Nimmitabel. The traffic impact assessment conducted by StreetWise Road Safety & Traffic Services concluded that these volumes are applicable at the proposed Quarry site. The associated existing traffic noise levels in the area were determined during the noise logging survey by placing the logger in the immediate vicinity of the highway.

The results of the noise predictions associated with the existing traffic volumes, the future traffic on the highway, and the total traffic noise including the noise generated by the proposed quarry are presented in Table 6-7. The results only consider receivers close to the highway. The noise levels include the façade correction factor of 2.5 dB.

Table 6-7: Existing and Future Traffic Noise Levels, $L_{Aeq,\ 15hr}$ - dB(A)

Receiver ID	Existing	Future - 2027		Noise Criteria Day
		Highway	Total	
R1	40.8	41.4	41.7	60
R2	44.4	45.0	45.3	60
R3	46.5	47.1	47.4	60
R14	41.2	41.8	42.0	60

The results show that the predicted existing and future traffic noise levels at the receivers located off Monaro Highway satisfy the applicable noise criteria during daytime. The increase in traffic noise levels from the traffic generated by the proposed Quarry, 0.6-0.9 dB, is also expected to comply with the relative increase criteria requirements of the Road Noise Policy, whereby increases in road traffic noise levels should not exceed the existing road traffic noise levels by more than 12 dB.

It can be concluded that the traffic generated by the proposed Quarry would have very little effect on the current noise environment. This aspect was also discussed in the StreetWise traffic impact assessment noting that the traffic currently associated with the quarry operator's Nimmitabel quarry is expected to be transferred to the proposed Quarry when the operations in Nimmitabel cease. It states:

The proposed quarry will replace an existing quarry within the Cooma area, with staff, vehicles, plant and equipment being re-located to the new Mount Mary site. The haulage volumes generated by the proposed quarry will be similar to the existing to be closed, as will the size and type of truck and dogs. The new quarry will service existing or similar customers in the Cooma area. Therefore, there will be minimal net increase in traffic volumes or impacts on local roads generated by the proposed quarry.

7 CONCLUSION

Vipac Engineers & Scientists (Vipac) were commissioned by Outline Planning Consultants Pty Ltd to conduct a Noise Impact Assessment for the proposed new Quarry, at 278 Springs Road, Rock Flat, NSW. The assessment has been undertaken to determine the potential noise impact associated with the Quarry on noise sensitive receptors in the surrounding area.

Noise prediction modelling has been undertaken for each of the proposed three operational stages associated with the proposed quarry, taking into consideration both the neutral and worst case weather conditions during the day period. The noise reduction effect of proposed screening bunds and sediment barriers was also taken into account, resulting in predicted noise impact associated with the proposed Quarry on the noise sensitive receivers ranging between 1 and 34 dB(A).

The proposed Quarry thus satisfies the applicable Project Specific Noise Level criteria during the daytime. The results of the noise impact assessment for the construction phase of the proposed Quarry also indicate that the predicted noise levels will comply with the applicable noise criteria. It should also be noted, the noise prediction values for stages 2 and 3 of this project, including and excluding the bund scenarios, comply with the Noise Policy for Industry (NPI).

It should be noted, the NPI provide a 5dB increase in the day time noise criterion compared to the NSW INP for this particular project. The RBL was recorded below the standard's noise threshold and is adjusted to the recommended level, as noted in Section 3.2.

The predicted noise generated by the proposed Quarry operations and Quarry traffic on Monaro Highway would comply with the daytime noise criteria. The increase in traffic volumes by year 2027 resulted in less than 1 dB change in noise levels, thus not adversely affecting the current noise environment.

Based on the results above, it is Vipac's professional opinion that the proposed Quarry is acceptable from an acoustic point of view. While it is acknowledged that there are no specific mitigation measures required in conjunction with the proposed Quarry, it is nonetheless recommended that a Noise Compliance Management Strategy should be implemented for the Quarry. The Strategy should include provision for a noise monitoring programme to monitor operational phase noise emissions from the Quarry, in accordance with the requirements of NSW EPA. It has been advised by the client that this Strategy will be implemented in the Quarry Management Plan.

Appendix A : REFERENCES

[1]. Environmental Protection Authority (EPA) (Office of Environment and Heritage, OEH) NSW Industrial Noise Policy (INP), January 2000.

[2]. Environmental Protection Authority (NSW EPA) Office of Environment & Heritage (OEH): Road Noise Policy.

[3]. Department of Environment and Climate Change (DECC) NSW Interim Construction Noise Guideline, July 2009.

[4]. State Environmental Planning Policy (infrastructure) 2007 under the Environmental Planning and Assessment Act 1979

[5]. Australian Standard AS 2436-2010 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites.

[6]. RTA Guide to Traffic Generating Developments Oct 2002

[7]. Department of Transport (Welsh Office) CoRTN - Calculation of Road Traffic Noise (DoT Welsh Office HMSO) 1988.

[8]. Environmental Protection Authority (NSW EPA) Environmental Criteria for Road Traffic Noise, 1999.

[9]. Environmental Health Risk Assessment: Guideline for Assessing Human Health Risk from Environmental Hazard (2012).

[10]. Environmental Protection Authority (EPA) NSW Environmental Criteria for Road Traffic Noise, May 1999.

[11]. Roads and Maritime Services (RMS) (Roads and Traffic Authority (RTA)) Environmental Noise Management Manual, December 2001.

[12]. Roads and Maritime Services (RMS) Noise Criteria Guideline (RMS NCG), April 2015.

[13]. Roads and Maritime Services (RMS) Noise Mitigation Guideline (RMS NMG), April 2015.

[14]. Roads and Maritime Services (RMS) Procedure - Preparing an Operational Traffic and Vibration Construction Noise and Vibration Assessment Report, RMS, December 2014.

[15]. World Health Organisation (WHO) Guidelines for Community Noise, 1995.

Appendix B : NOISE LOGGER LOCATION

Figure 7-1: Noise Logger NL1 at 143 Springs Road, West View

Figure 7-2: Noise Logger NL2 at Monaro Highway, East View

Appendix C : STAGE 2 – CROSS SECTION DRAWING

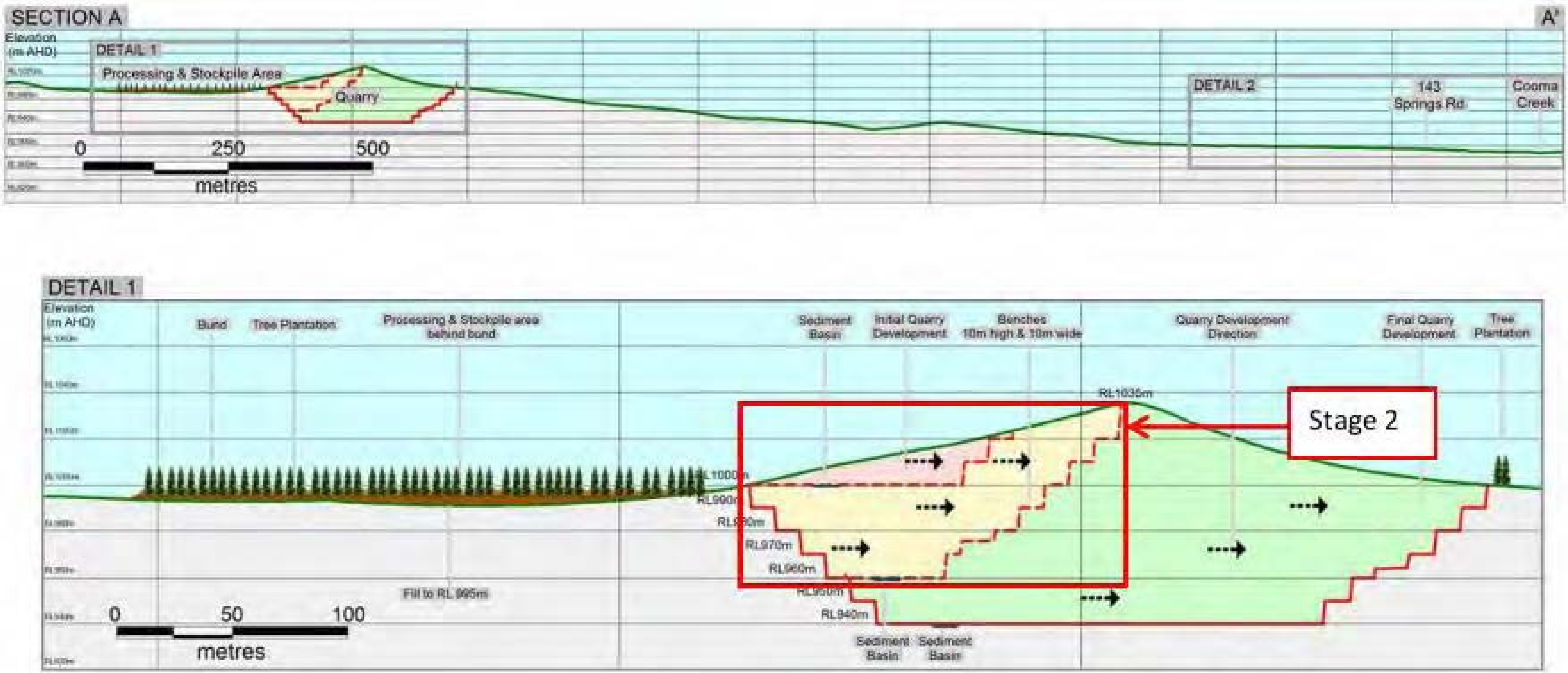
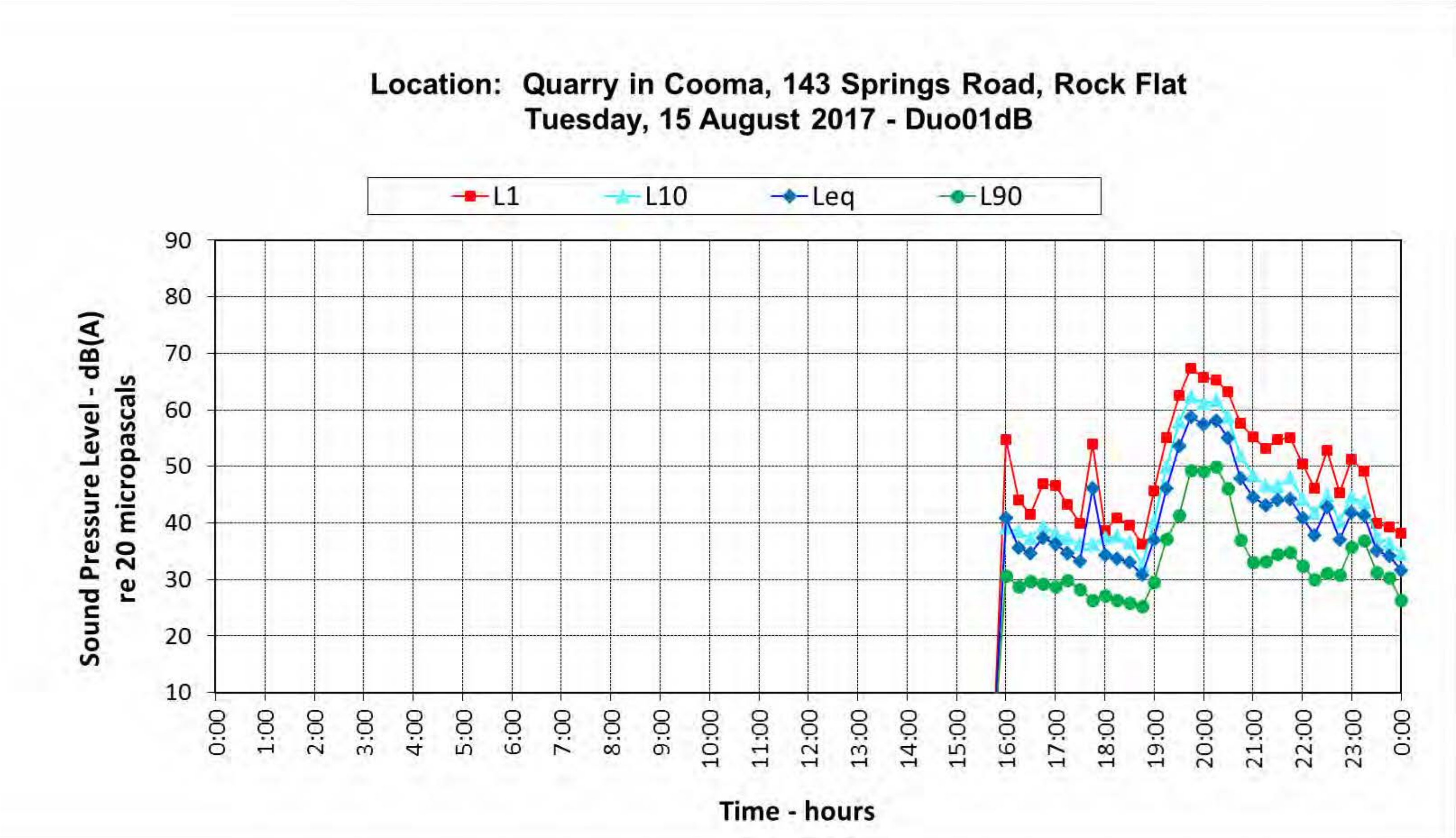
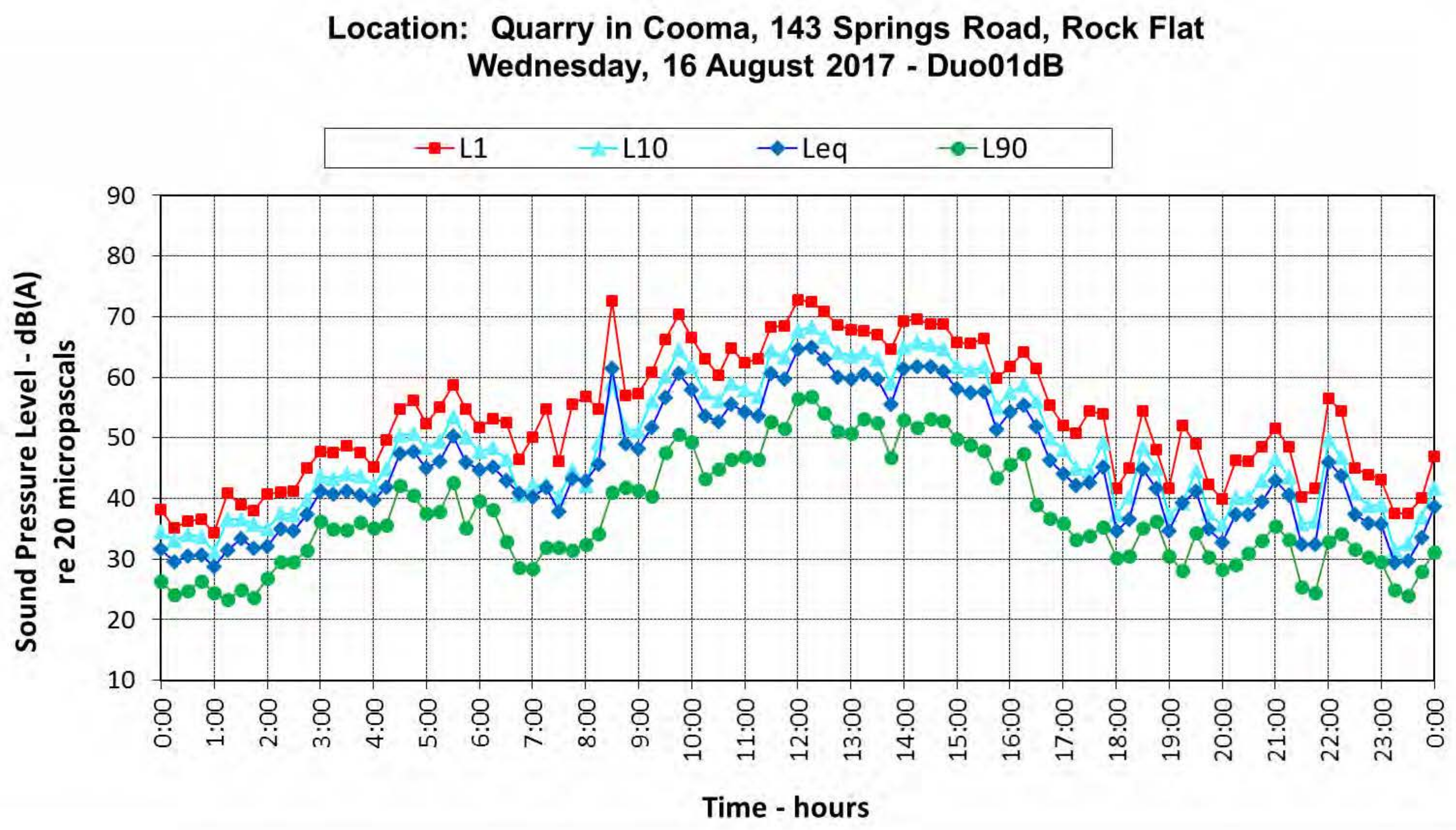


Figure 7-3: Stage 2 Cross Section Drawings

Appendix D NOISE GRAPHS

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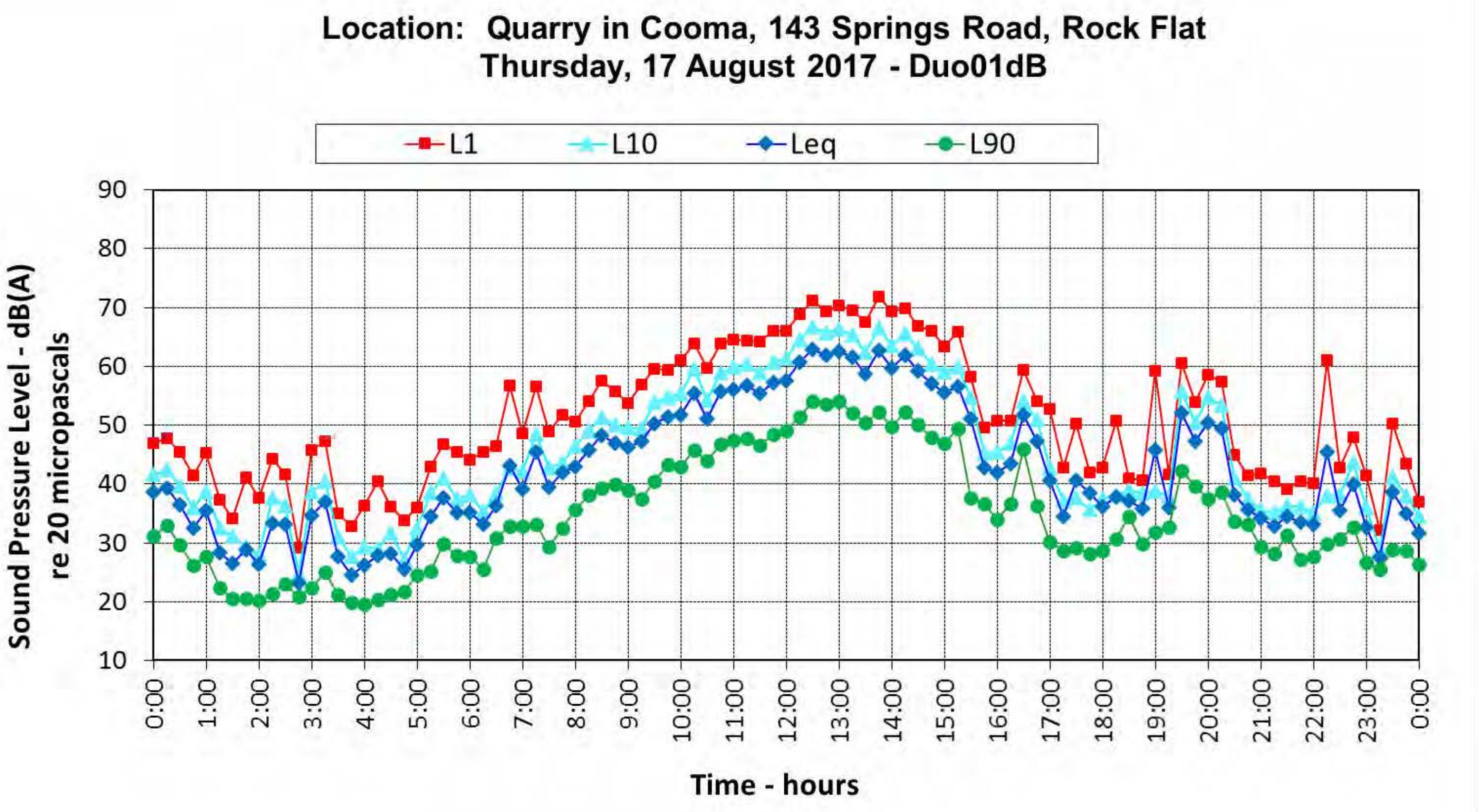
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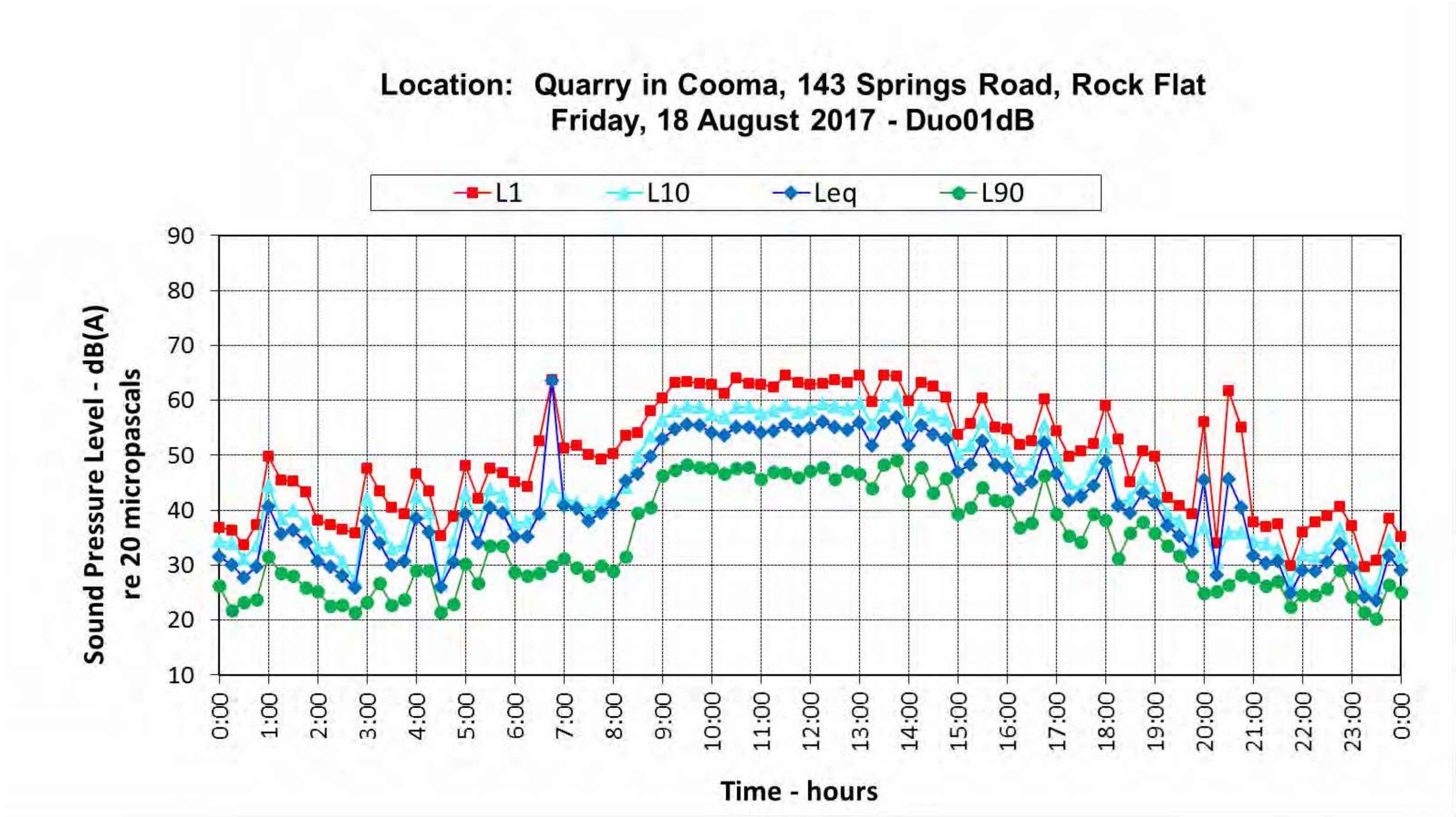
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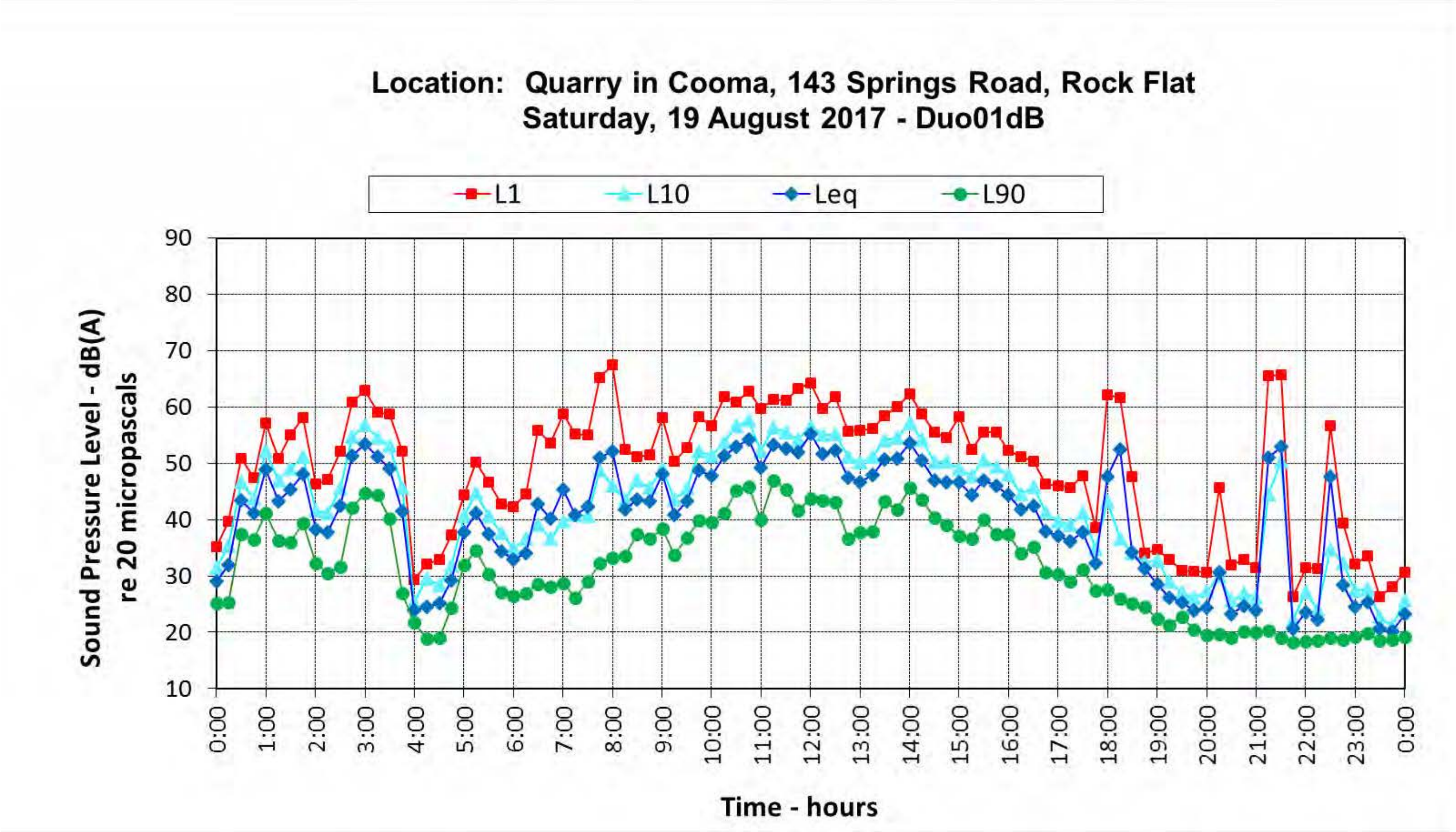
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Sound Pressure Level - dB(A) re 20 micropascals
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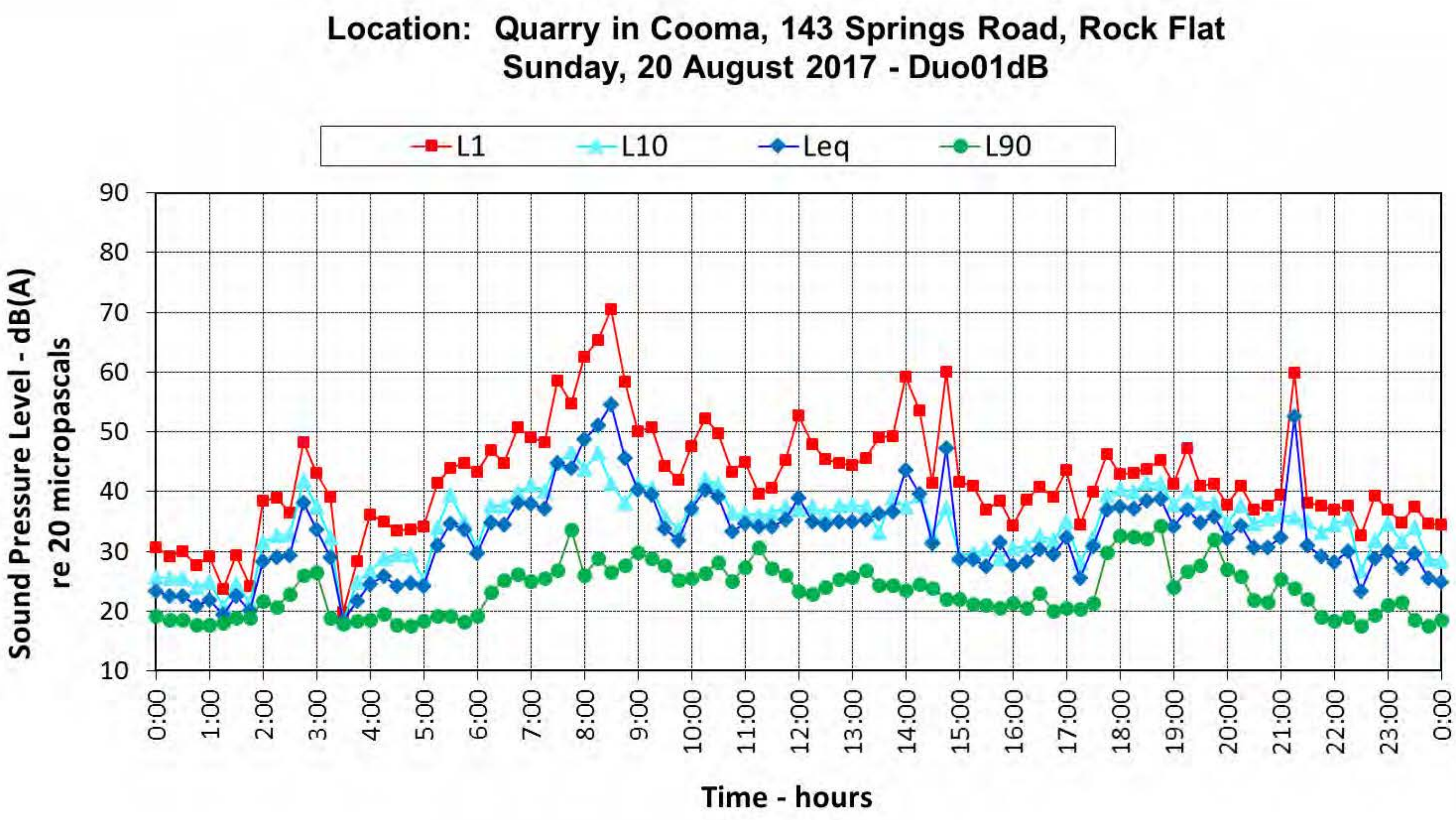
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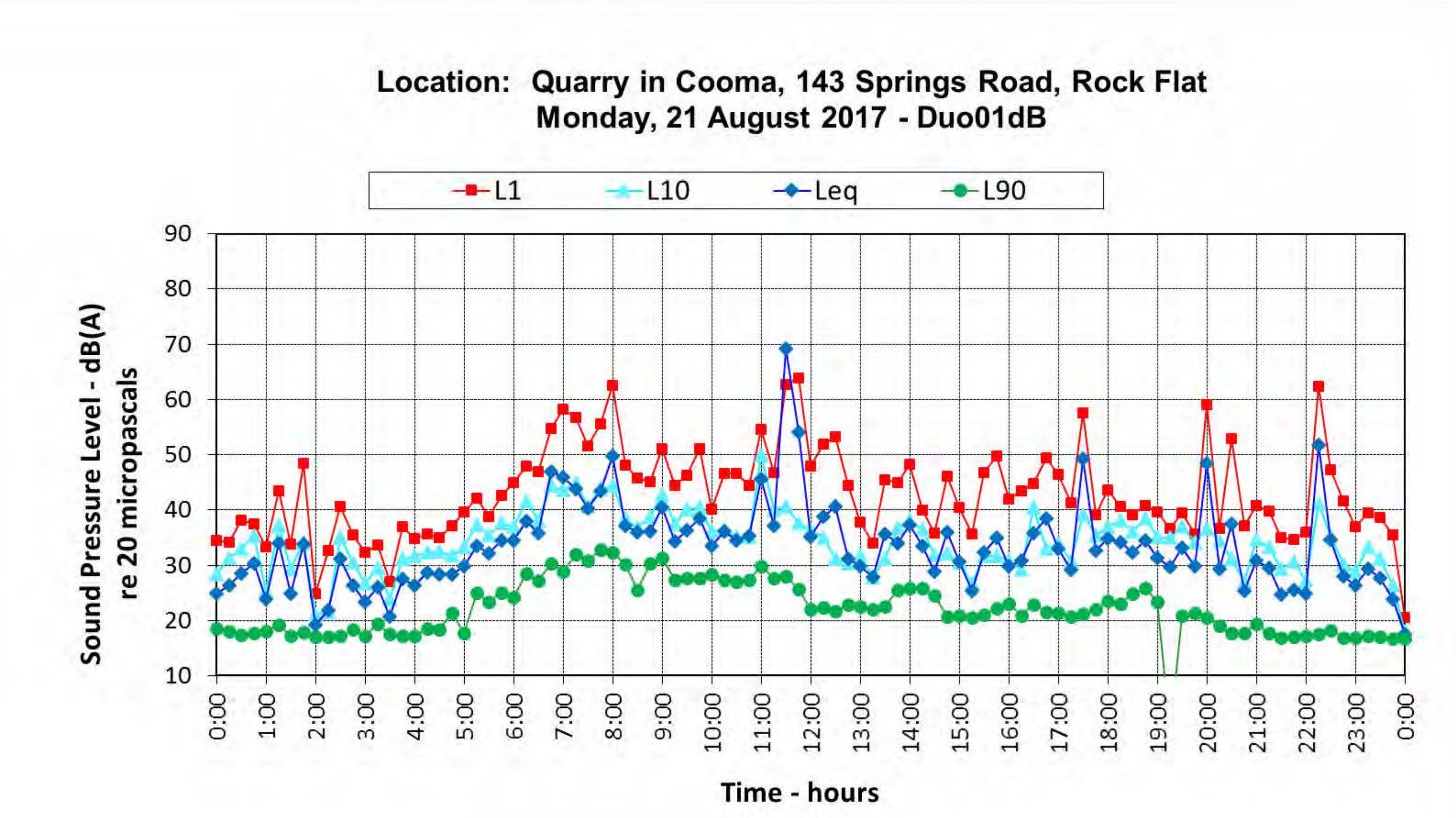
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Sound Pressure Level - dB(A) re 20 micropascals
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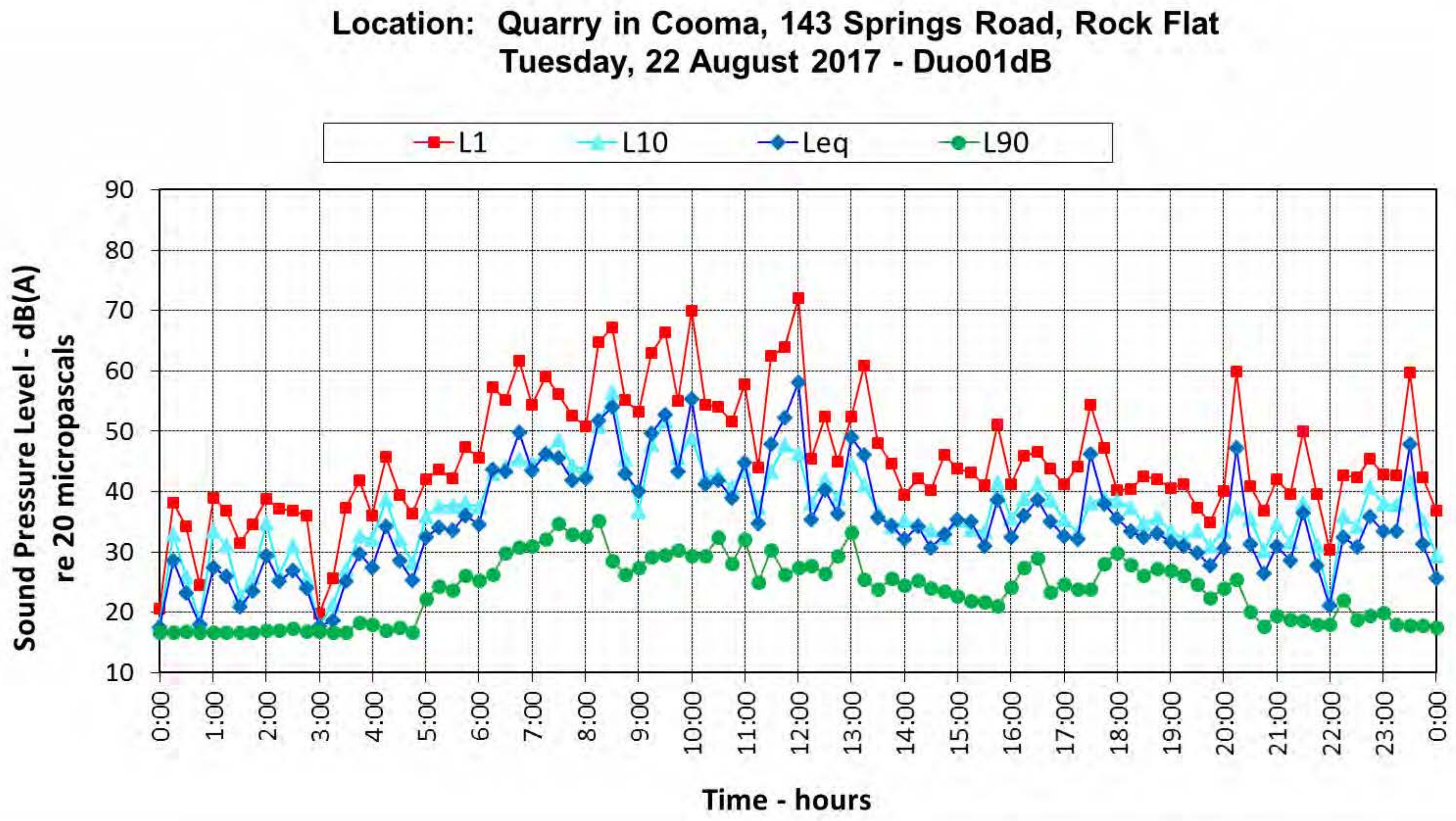
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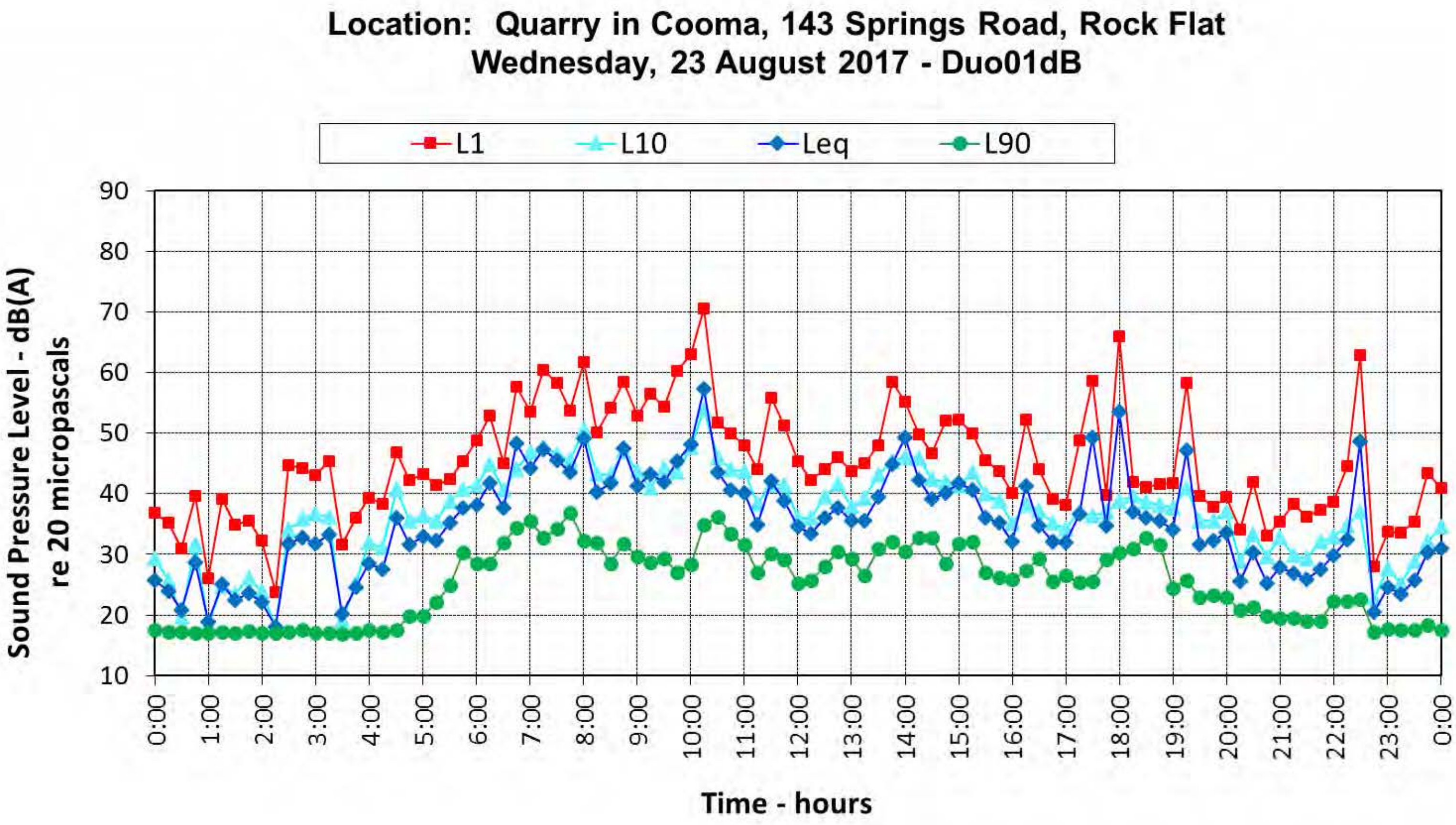
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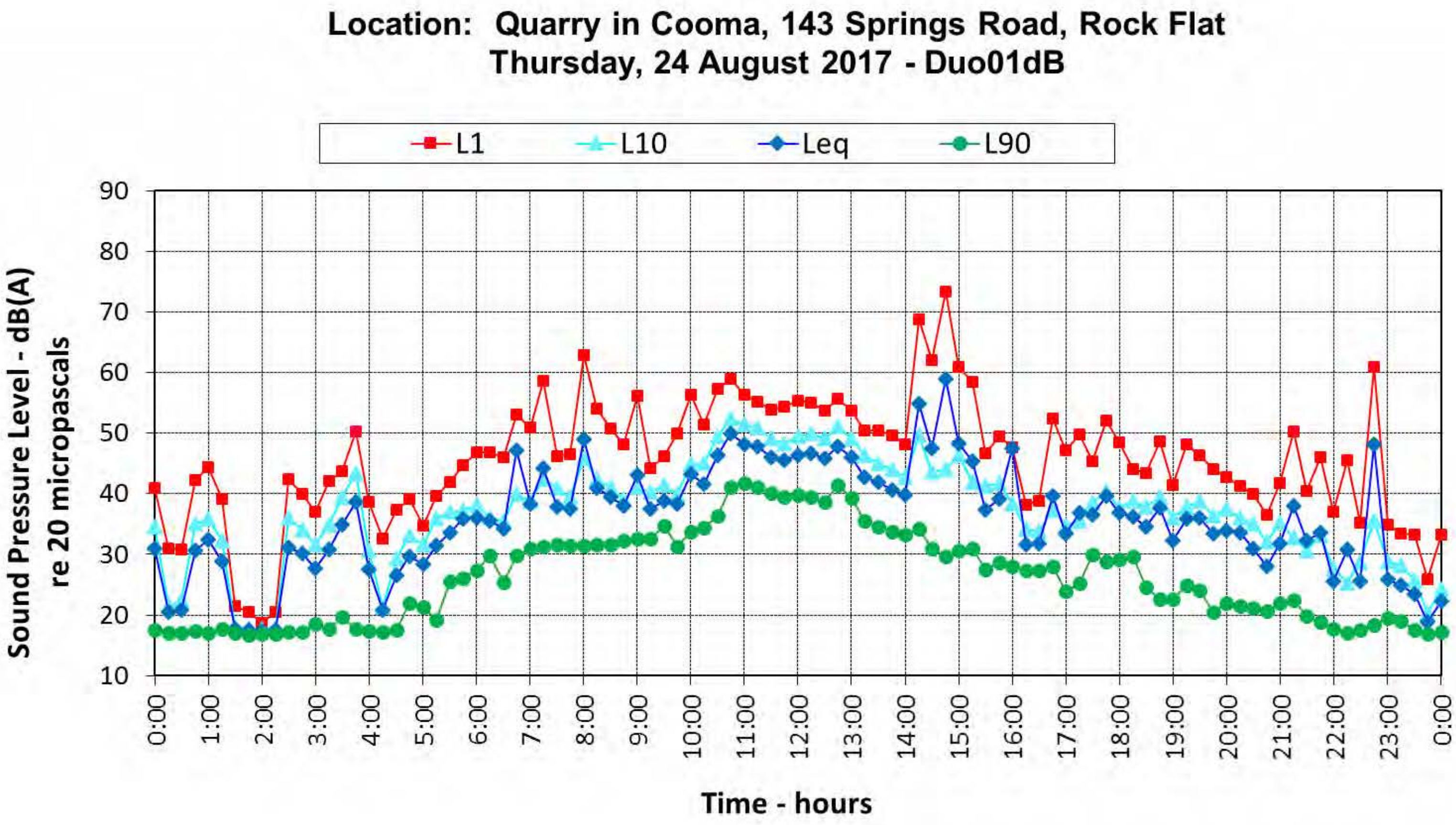
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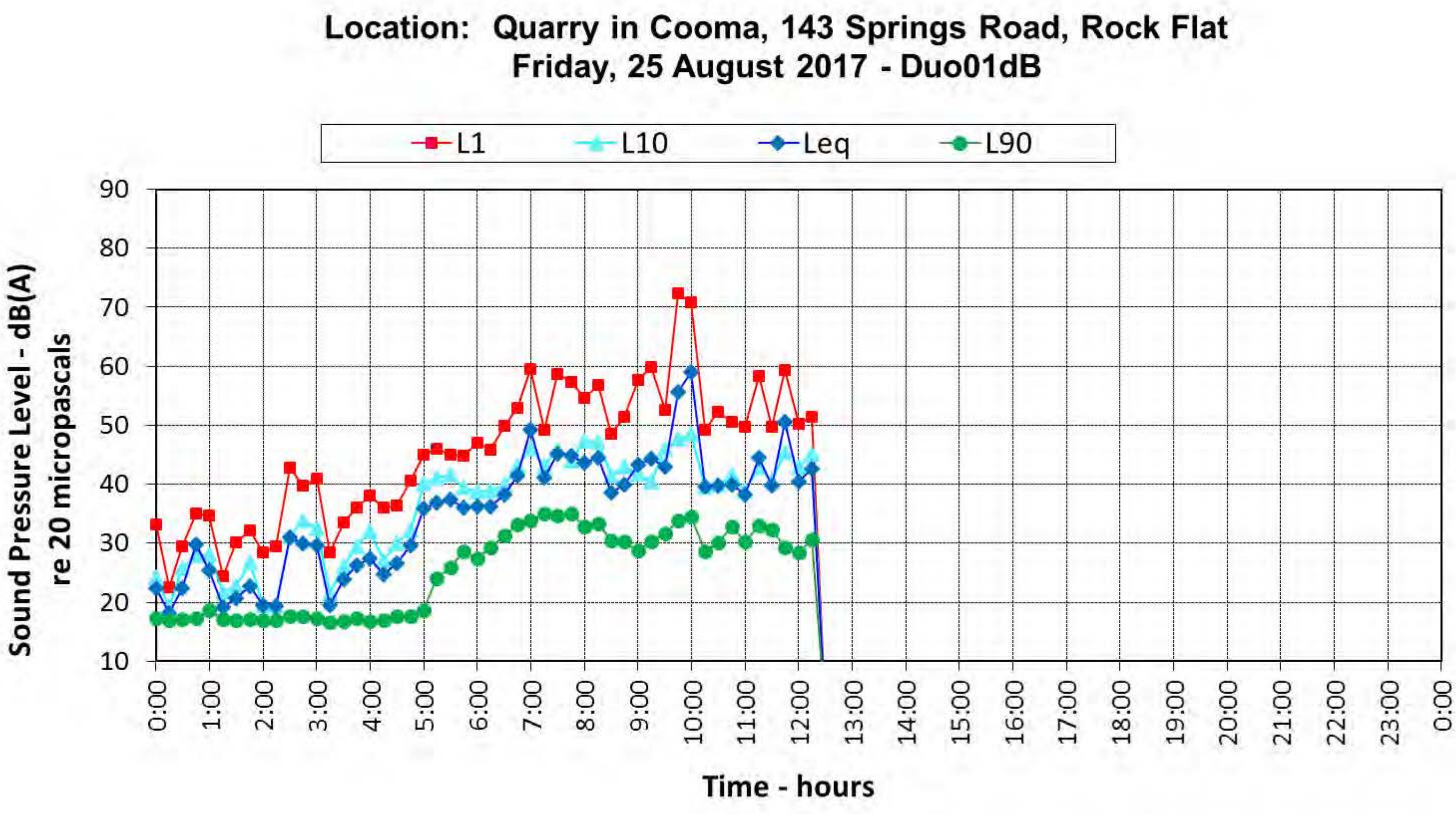
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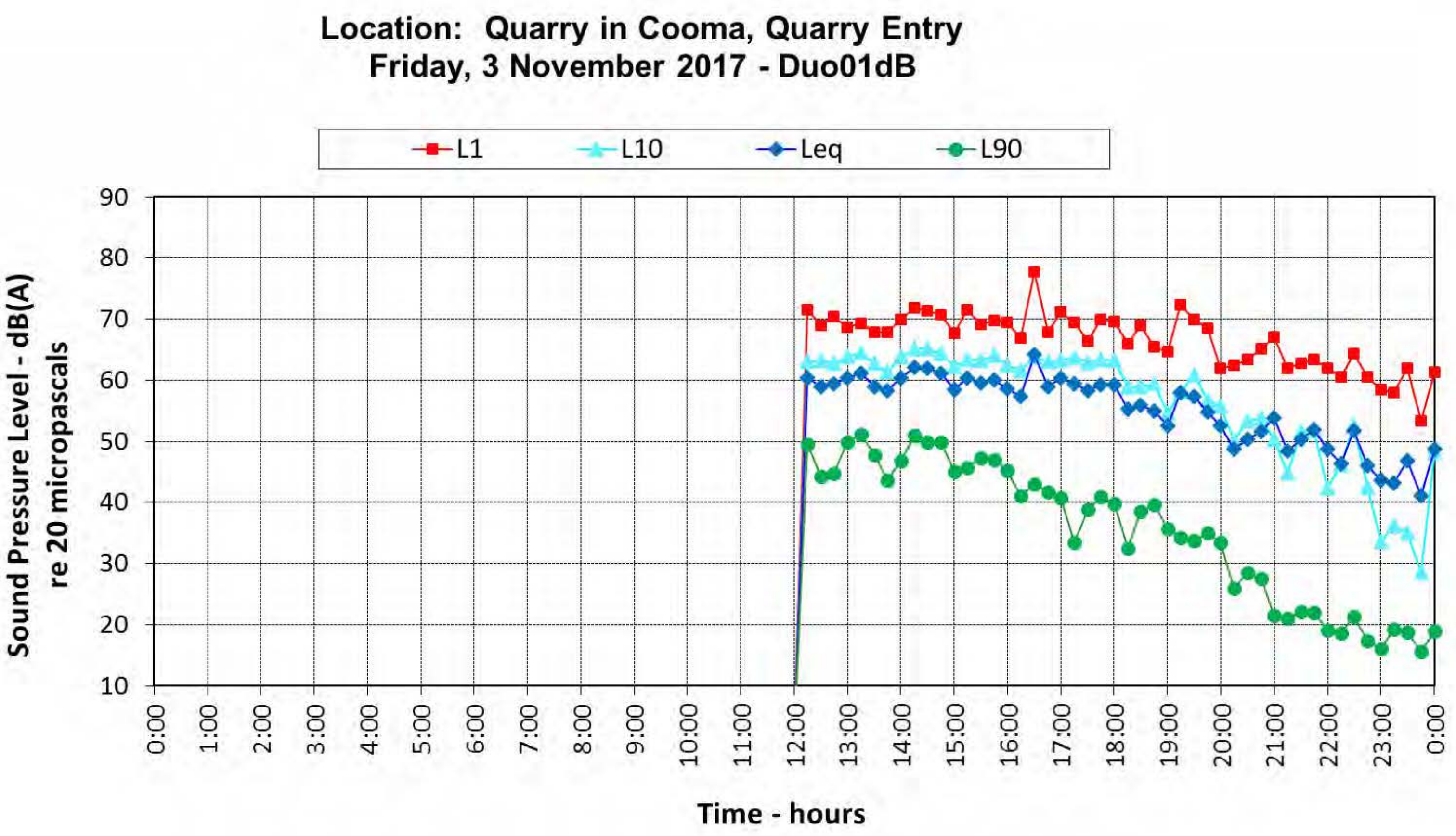
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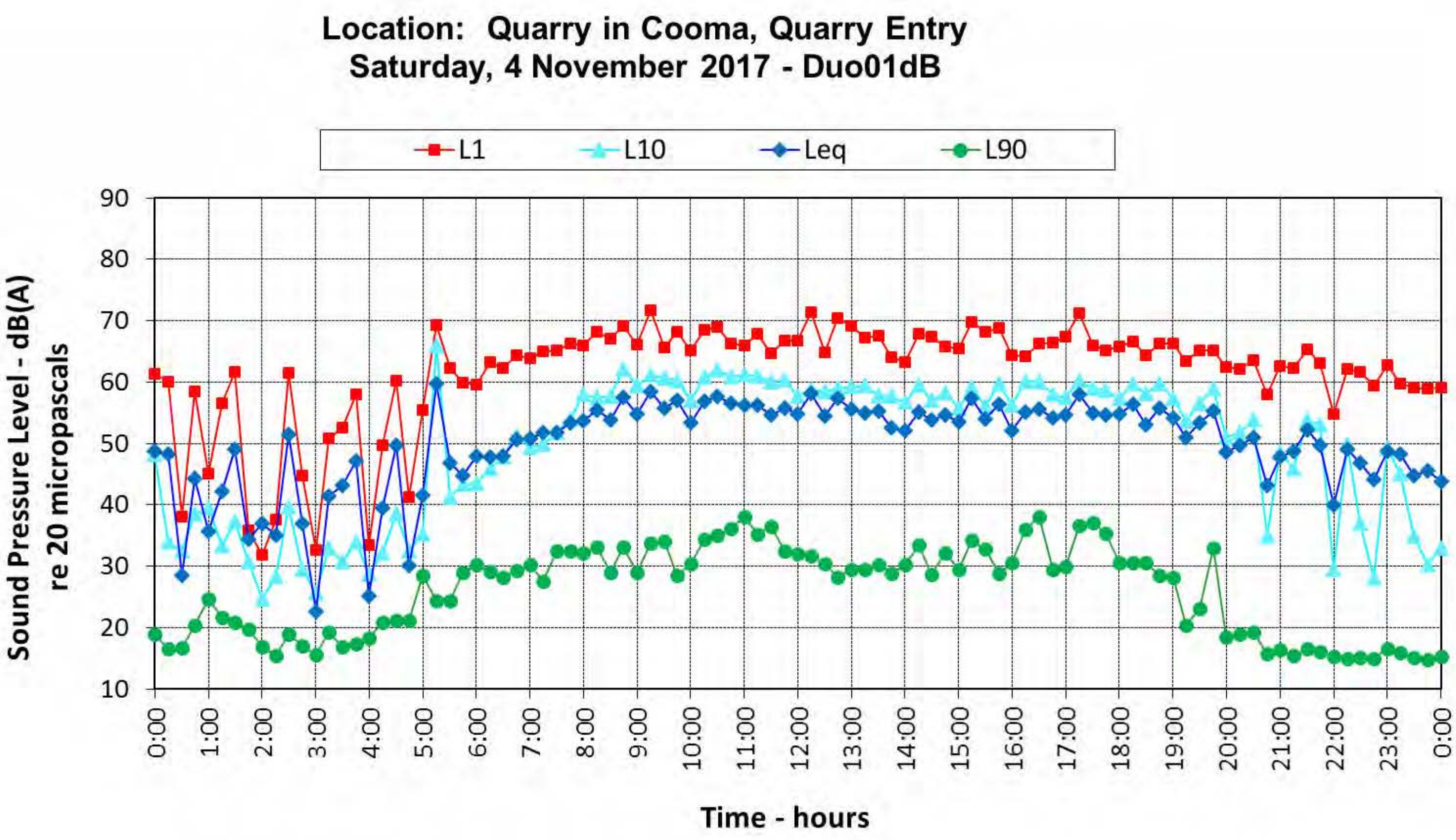
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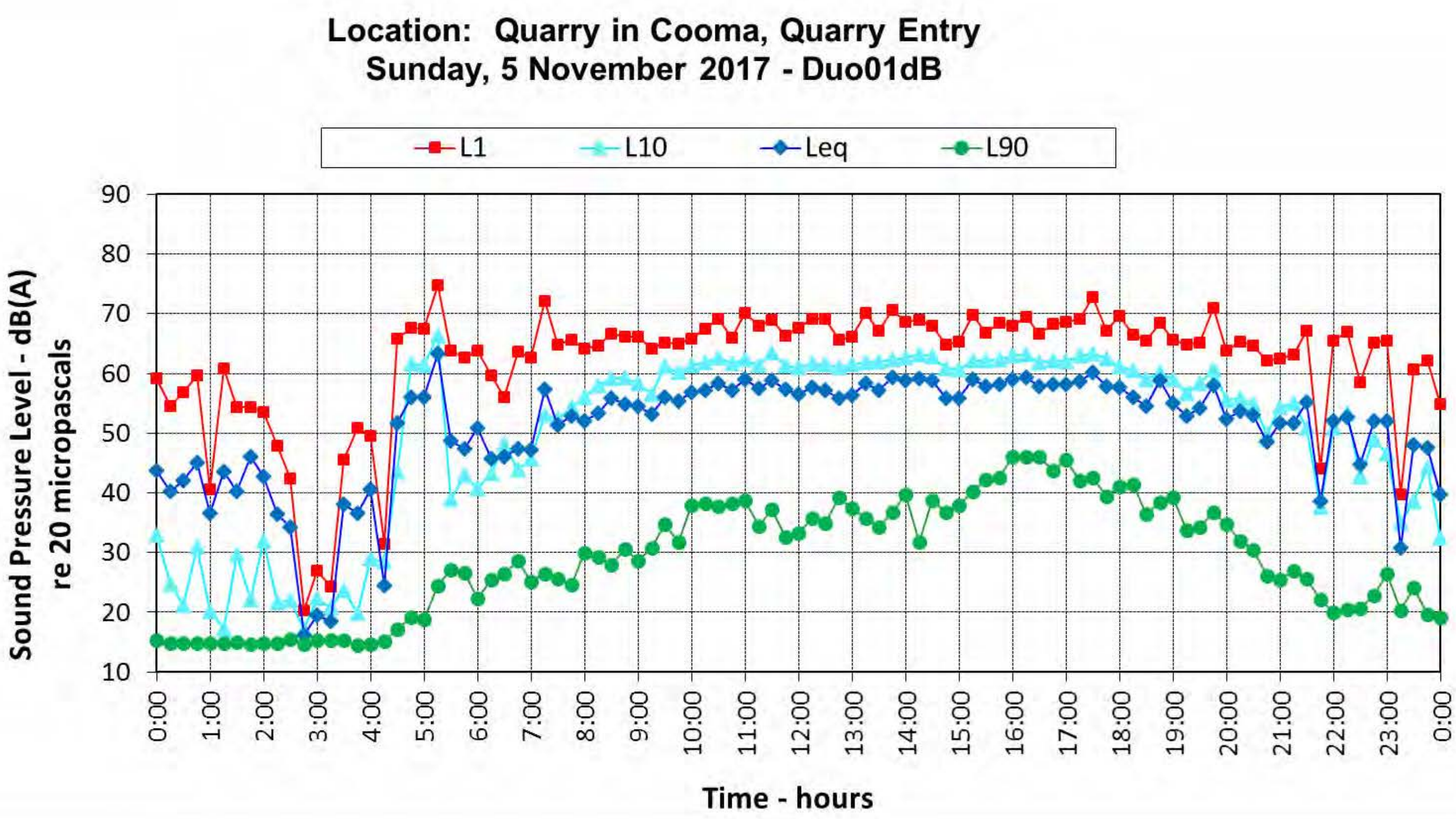
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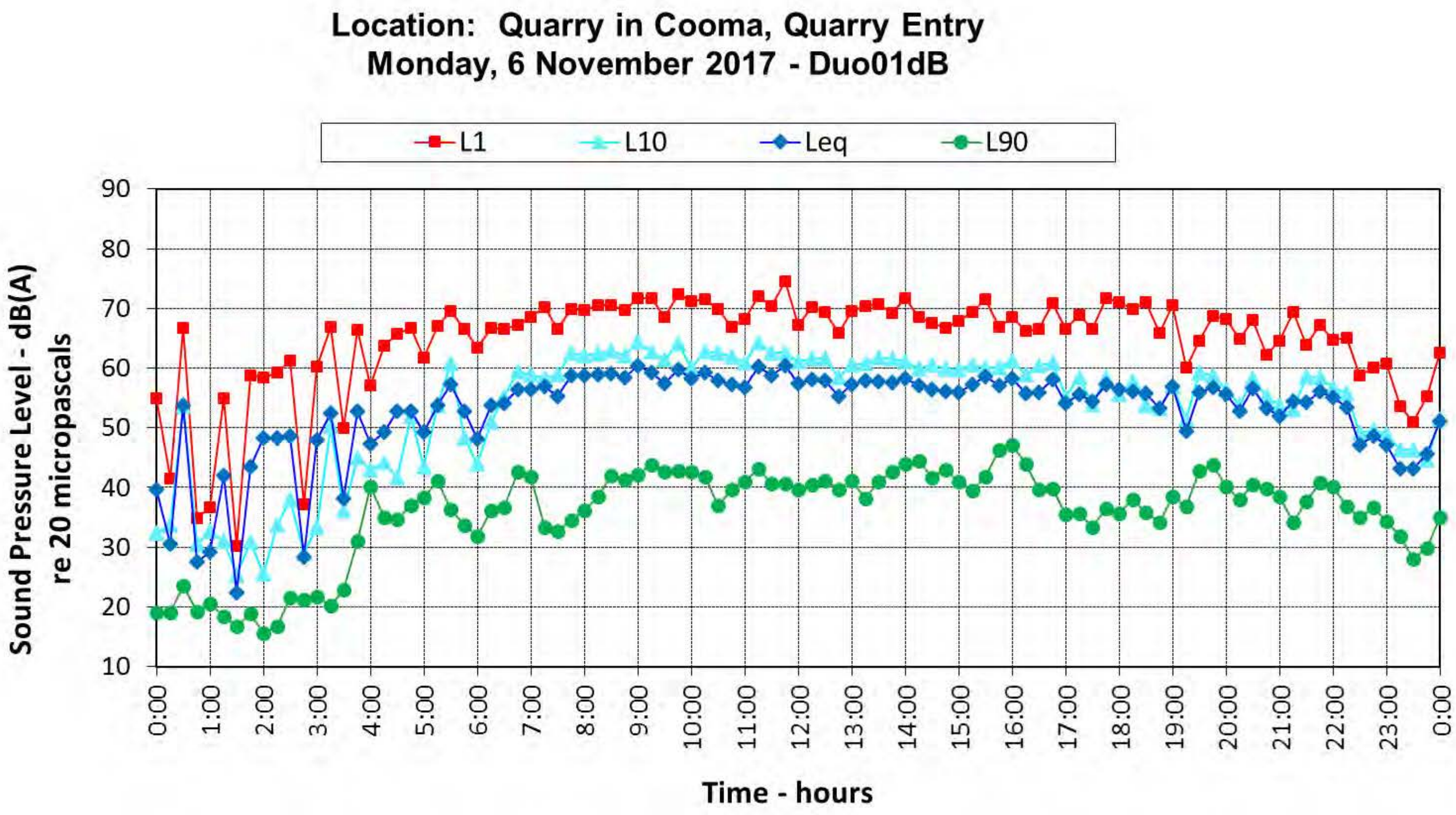
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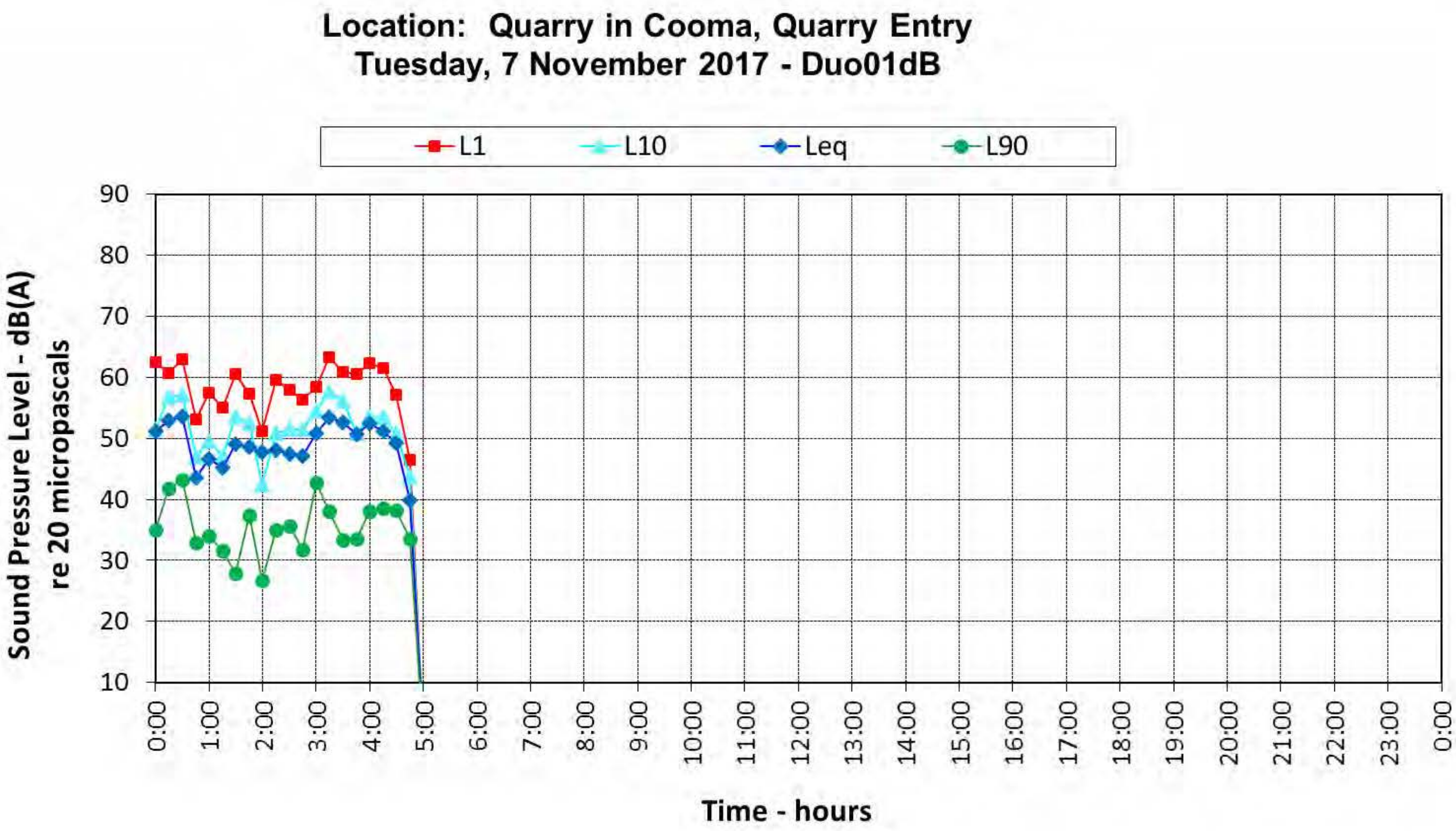
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Sound Pressure Level - dB(A) re 20 micropascals
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Appendix E : NOISE CONTOUR MAPS

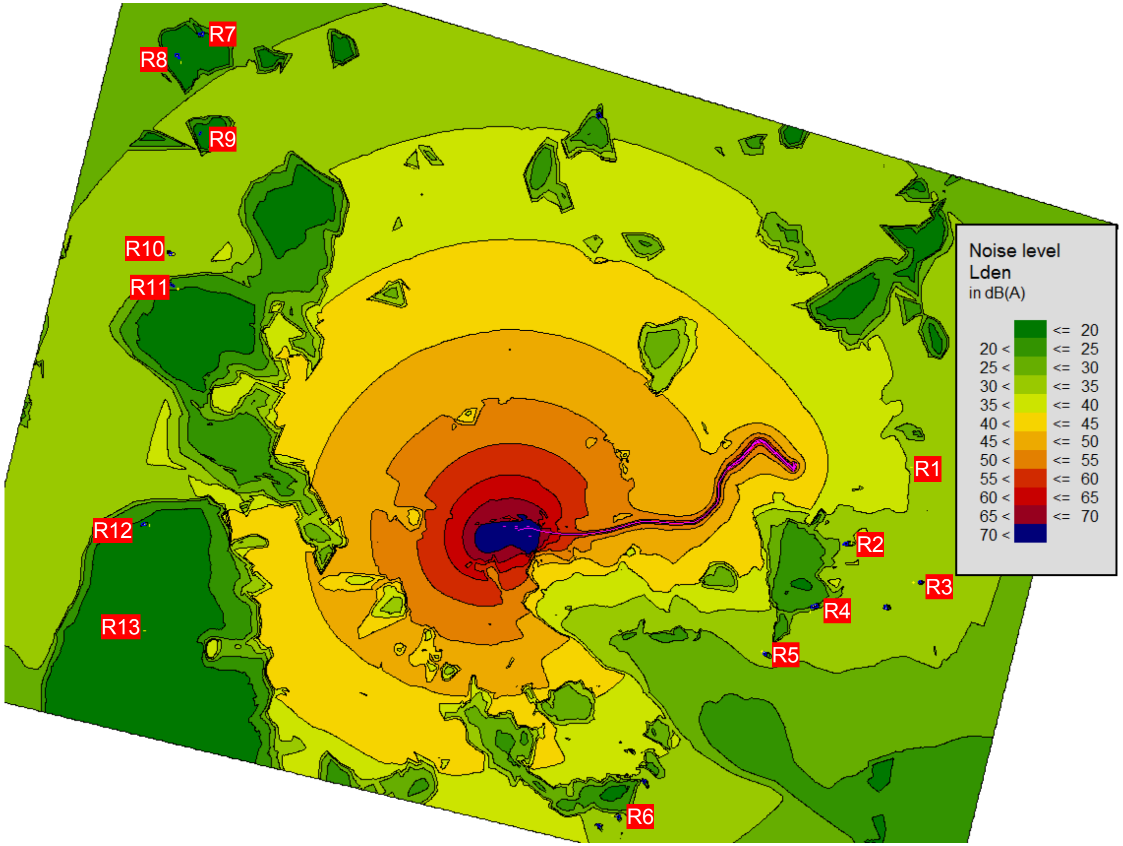

Figure 7-4: Noise Contour – Site Preparation (worst meteorological conditions)

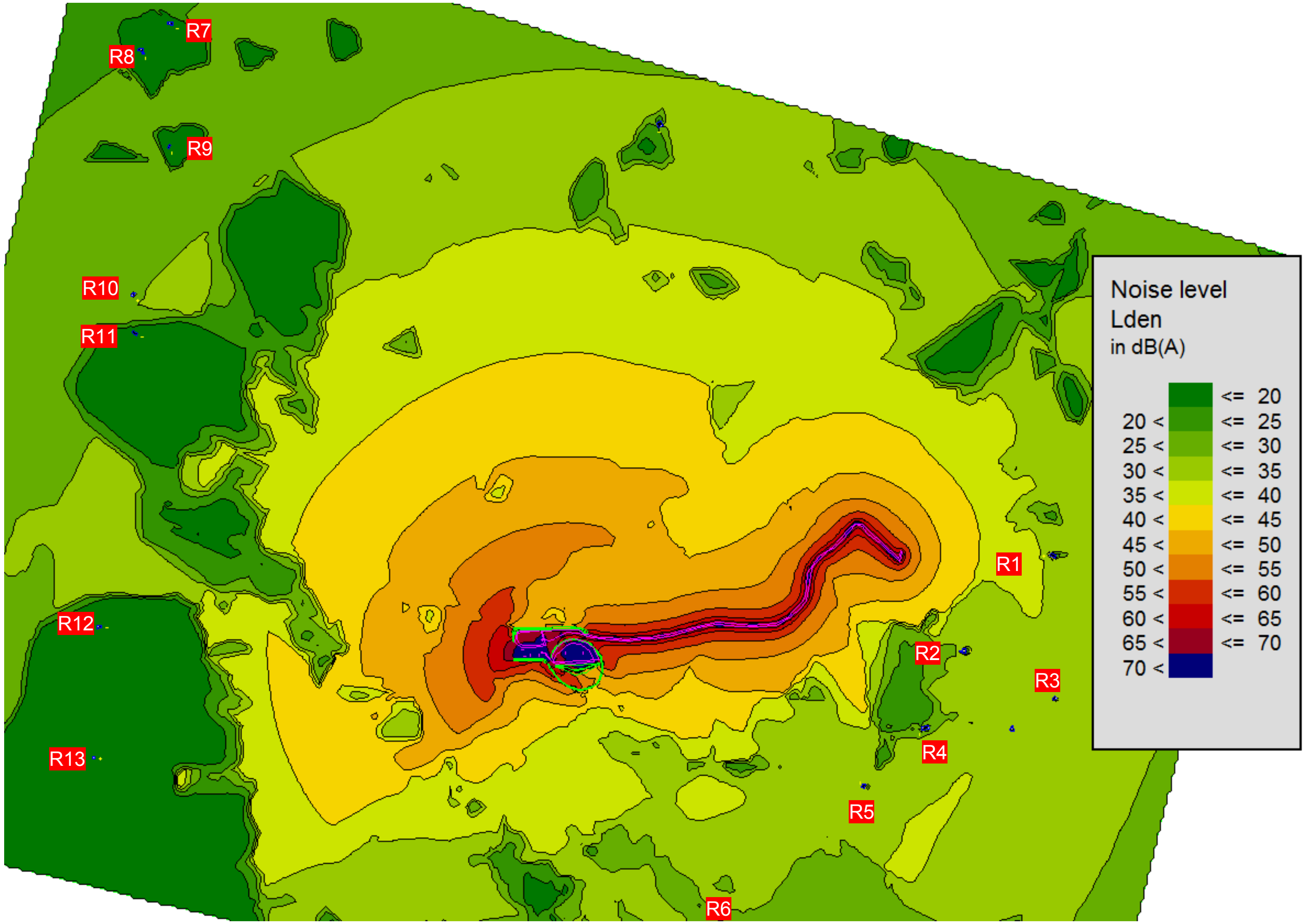

Figure 7-5: Noise Contour – Active Quarry start, with bund (worst meteorological conditions)

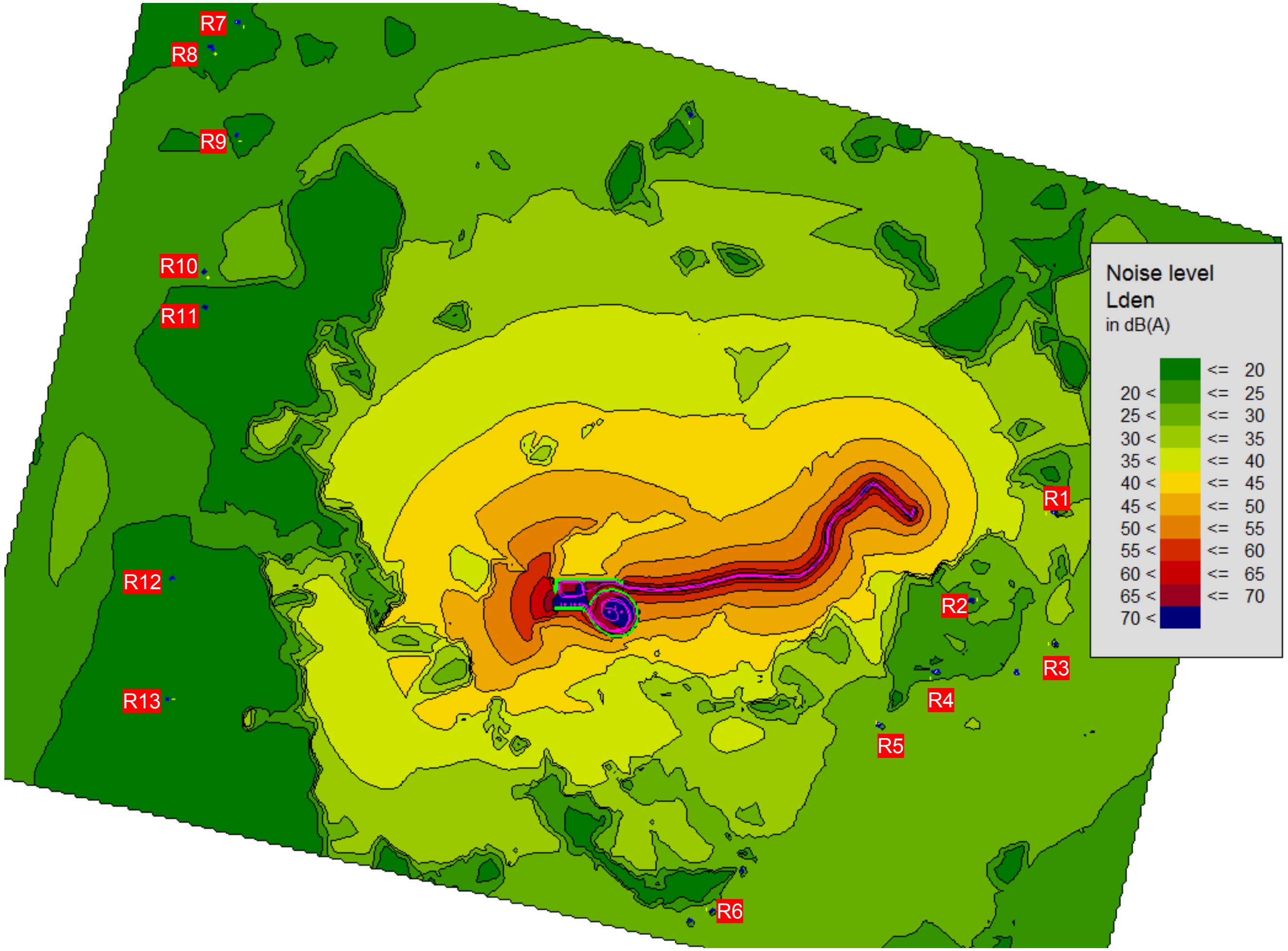

Figure 7-6: Noise Contour – Active Quarry Pit, with bund (worst meteorological conditions)

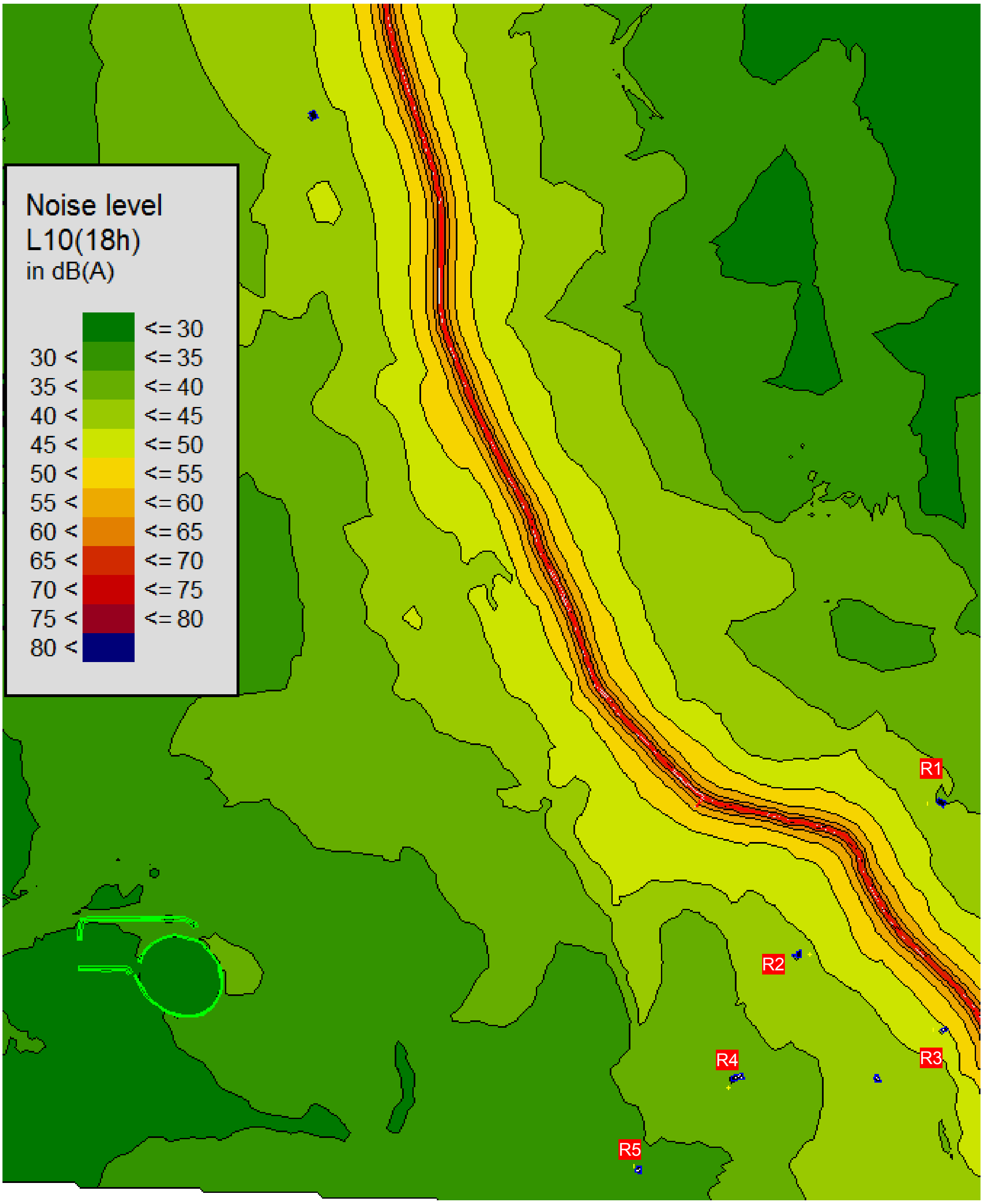

Figure 7-7: Noise Contour – Traffic 2027 + Quarry

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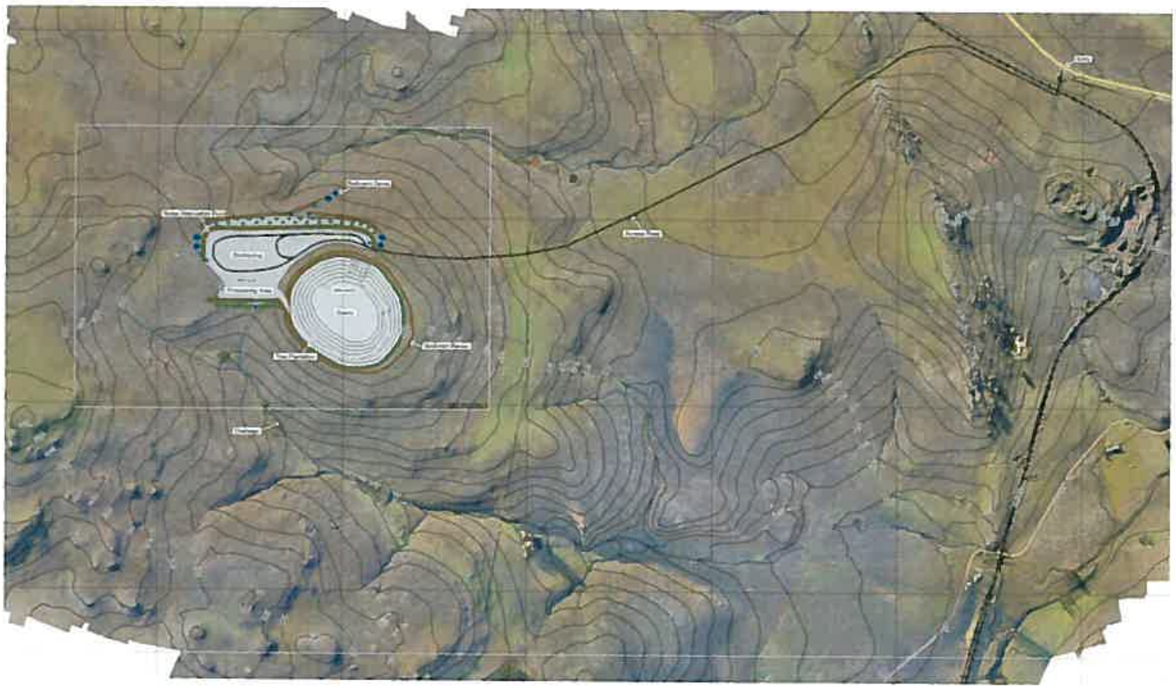
Vipac Engineers & Scientists

Outline Planning Consultants Pty Ltd

Rock Flat Quarry

Blast Impact Assessment



20E-17-0083-TRP-635854-2

28 March 2018

Blast Impact Assessment **Rock Flat Quarry**	
DOCUMENT NO: 20E-17-0083-TRP-635854-2 **PREPARED FOR:** Outline Planning Consultants Pty Ltd Suite 18, Pittwater Business Park, 5 Vuko Place Warriewood, New South Wales, 2102, Australia **CONTACT:** Gary Peacock **Tel:** +612 9262 3511 **Fax:** +61 2 9970 6257	**REPORT CODE:** TRP **PREPARED BY:** Vipac Engineers and Scientists Limited 2 Sirius Road, Lane Cove West, NSW 2066, Australia **Tel:** +61 2 9422 4222 **Fax:** +61 2 9420 5911

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EXECUTIVE SUMMARY

Vipac Engineers and Scientists Ltd (Vipac) was commissioned by Outline Planning Consultants Pty Ltd on behalf of Schmidt Quarries Pty Ltd to conduct a Blast Impact Assessment for the proposed new quarry at 278 Springs Road, Rock Flats, NSW. Ground vibration and airblast overpressure are two common environmental effects of blasting that can cause human discomfort.

The development proposes to extract 4.6 million tonnes of basalt over a 30 year period from a quarry pit measuring 300m in diameter. The average annual extraction is 150,000 tonnes and would require an average of 10 blasts per year. A production rate of up to 280,000 tonnes per annum is possible.

All noise sensitive receptors are located 1600m or more from the nearest future quarry pit boundary. Noise sensitive receptors are located in all directions from the proposed quarry. The closest dwellings are located in the quadrant south to east of the quarry.

This report presents conservative prediction methods for ground vibration and airblast overpressure, and provides worst case predictions for blasting at the proposed quarry based on these methods. The predicted blast impacts are assessed according to the ANZECC guidelines.

The assessment finds that blast impacts from the proposed quarry can be readily controlled within acceptable levels. This is because the minimum separation distance between the quarry pit and the nearest receptor is sufficient for adequate control of the propagation of ground vibration and airblast overpressure. Consideration of future blast impacts shows that acceptable levels can be achieved using typical blast designs and good blasting practice.

It is recommended that all blasting conducted at the proposed quarry site be monitored using best practices and permanent vibration monitoring pads as much as possible, with monitors located as close as practical to the sensitive receptors, between the blast and the receptor.

A Blast Management Plan should be produced and implemented to ensure compliance with regulatory authority conditions. It should include the use of routinely updated vibration and overpressure data in the design of blasts, which is a vital step in managing impacts in sensitive areas.

TABLE OF CONTENTS

1 INTRODUCTION

Vipac Engineers and Scientists Ltd (Vipac) was commissioned by Schmidt Quarries Pty Ltd to conduct a Blast Impact Assessment for the proposed new quarry at 278 Springs Road, Rock Flats, NSW. According to AS2187.2 (Explosives -Storage and use Part 2: Use of explosives), ground vibration and airblast overpressure are two common environmental effects of blasting that can cause human discomfort.

This report presents the upper limits for the expected propagation of ground vibration and airblast overpressure from the Rock Flats Quarry and provides worst case predictions for future blasting based on these limits. The future blast impacts are assessed according to the ANZECC guidelines. Conclusions and recommendations are provided within this report.

2 PROJECT DESCRIPTION

2.1 SITE LOCATION

The proposed Rock Flats Quarry is located on land covering Lot 62, 76, 78, 106 and 120 in Deposited Plan 750540, No. 278 Springs Road, Rock Flats, NSW (see Figure 2-1). The quarry site is located approximately 14km to the south of Cooma, on the Monaro Plain in the NSW Southern Tablelands. The site is about 350km south of Sydney.

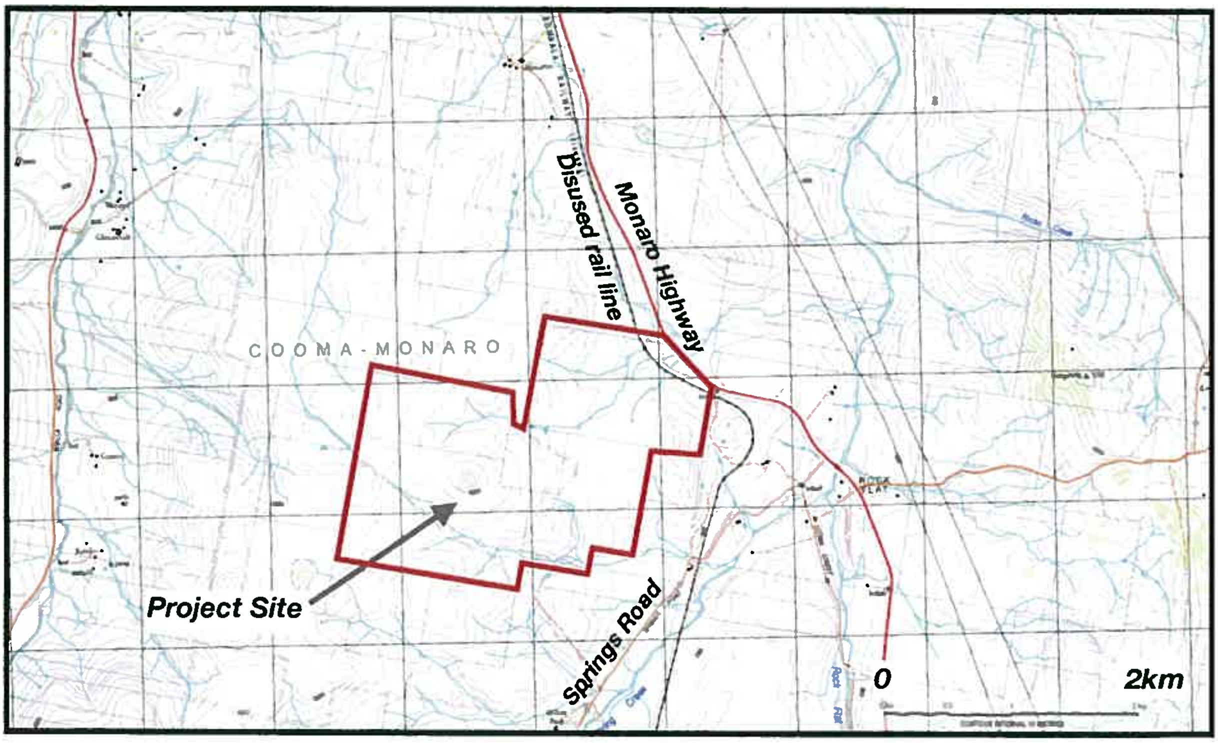

Figure 2-1: Project site showing the Monaro Highway and Springs Road

2.2 OPERATION

The proposed quarry forms a part of a larger rural holding totalling approximately 2000 hectares. The planned extraction area is approximately 300m in diameter. Resource extraction will be supported by facilities including a processing plant; stockpiling area and an access road (see Figure 2-2). The total area covered by the pit and support facilities is approximately 9 hectares. The access road would connect the site to the Monaro Highway; passing through State Rail owned Crown Land in Lot 1. The project site is zoned as "Primary Production" and the surrounding area is rural landscape.

The Quarry development proposes to extract 4.6 million tonnes of basalt over a 30 year period from a volcanic plug located within Lot 106. On this basis, the average annual extraction is 150,000 tonnes and monthly blasting would be required to dislodge and break hard rock. Overall, an average of 10 blasts per year is expected. A production rate of up to 280,000 tonnes per annum is possible.

The Quarry would operate from 7:00 am to 6:00 pm Monday to Friday, and from 7:00 am to 2:00 pm on Saturdays. Blasting would only occur between the hours of 9:00am and 3:00pm Monday to Friday.

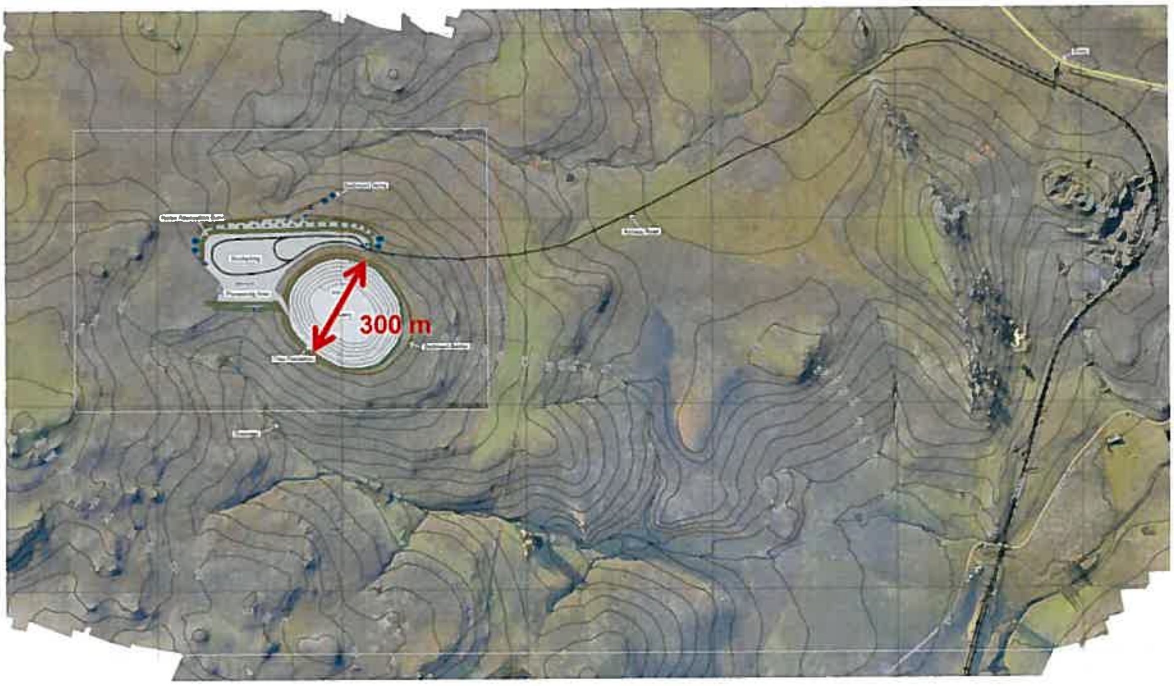

Figure 2-2: Site location of quarry pit

2.3 NOISE SENSITIVE RECEPTORS

Noise sensitive receptors (NSRs) are building occupants who may be affected by blast impacts including ground vibration and airblast overpressure. A list of the potentially affected noise sensitive receptors to the quarry is provided below in Table 2-1. This table lists the minimum distance from the residential structure to the maximum extent of the proposed quarry pit. All noise sensitive receptors are located 1600m or more from the future quarry pit boundary. A much lessor separation distance of 1000m is usually an acceptable buffer for blast impacts from quarries. The locations of the NSRs are illustrated in Figure 2-3 to Figure 2-6. NSRs are located in all general directions from the quarry, with the nearest dwellings located 1690m to 1940m in the quadrant south to east of the quarry (see Figure 2-5). The closest dwellings west of the quarry are 2600m to 2700m away from the future pit boundary.

The property boundary is a minimum distance of one kilometre from the limit of the quarry pit.

Livestock infrastructure or significant natural features that are in close proximity to the quarry have not been identified.

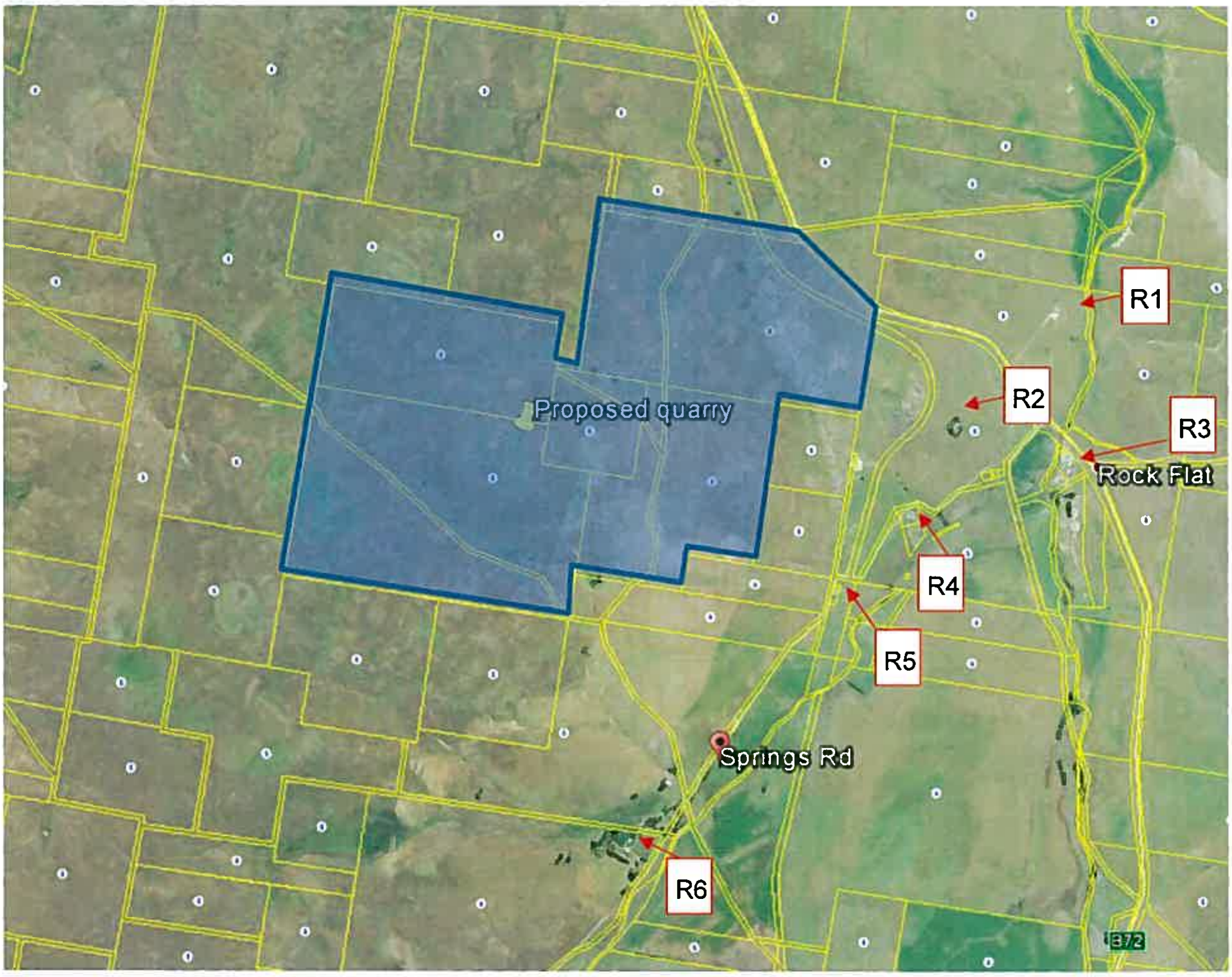

Figure 2-3: Location of proposed quarry and Noise Sensitive Receptors (Aerial Map, Southeast)

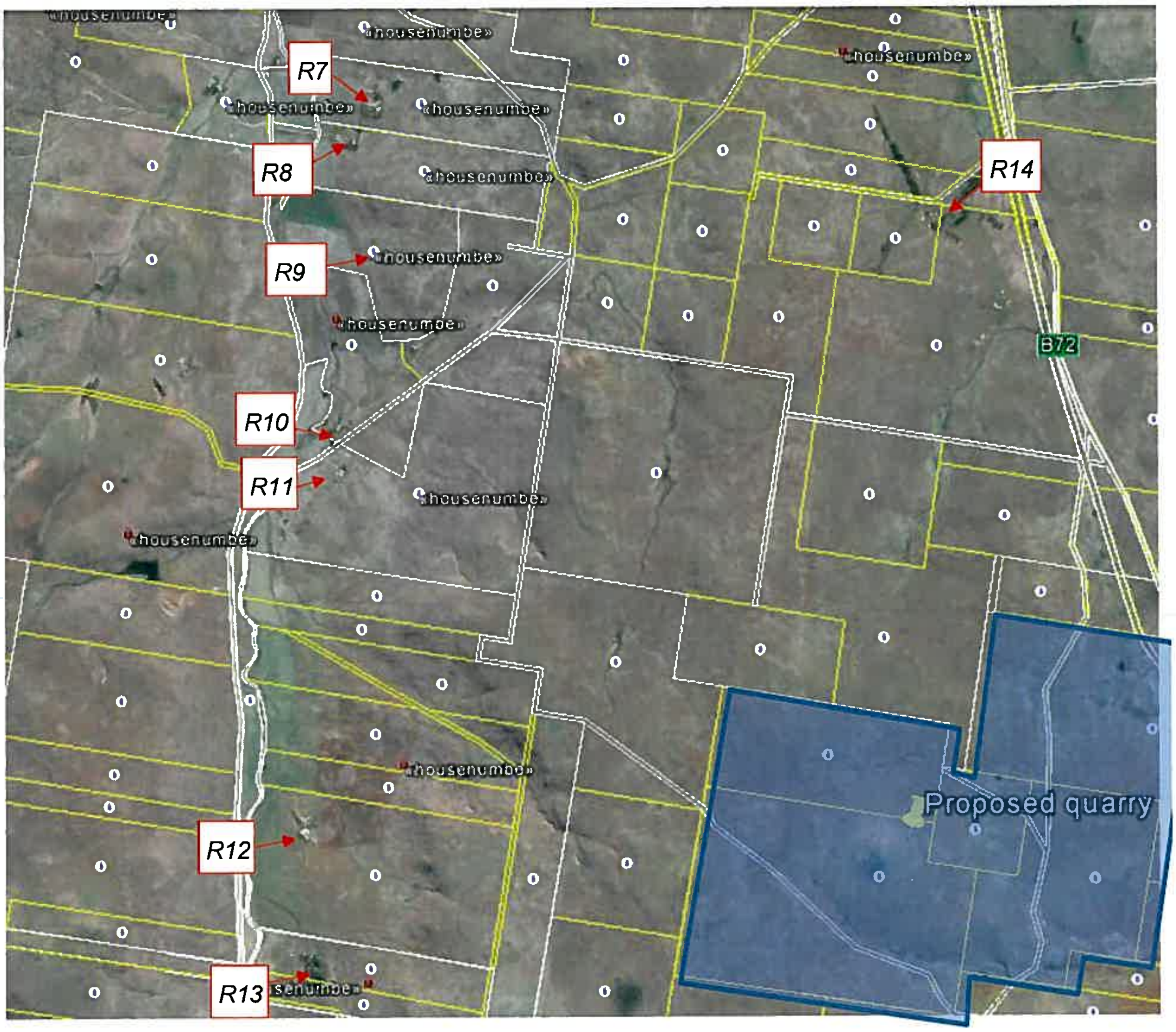

Figure 2-4: Location of proposed quarry and Noise Sensitive Receptors (Aerial Map, Northwest)

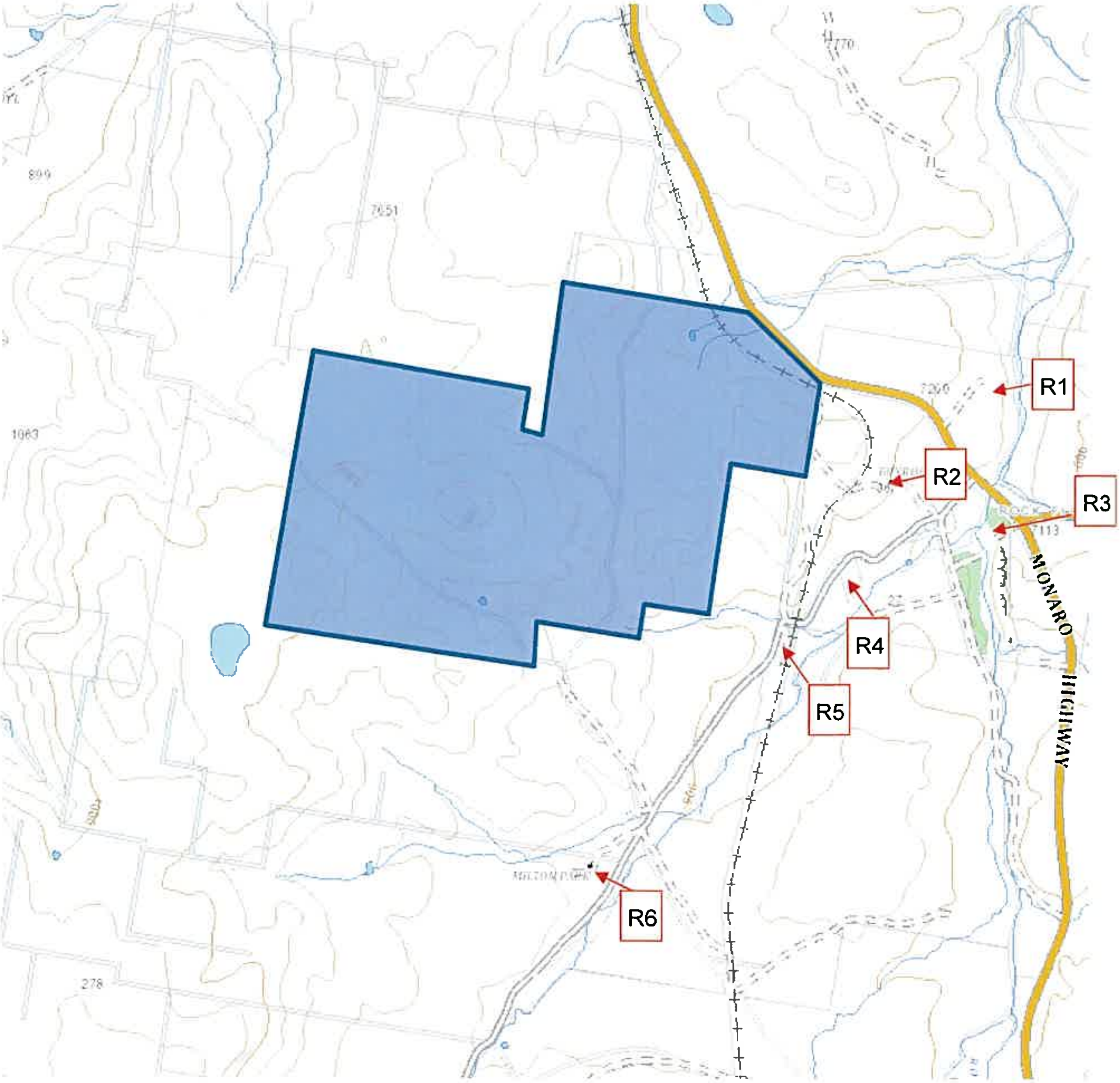

Figure 2-5: Location of proposed quarry and Noise Sensitive Receptors (Map, Southeast)

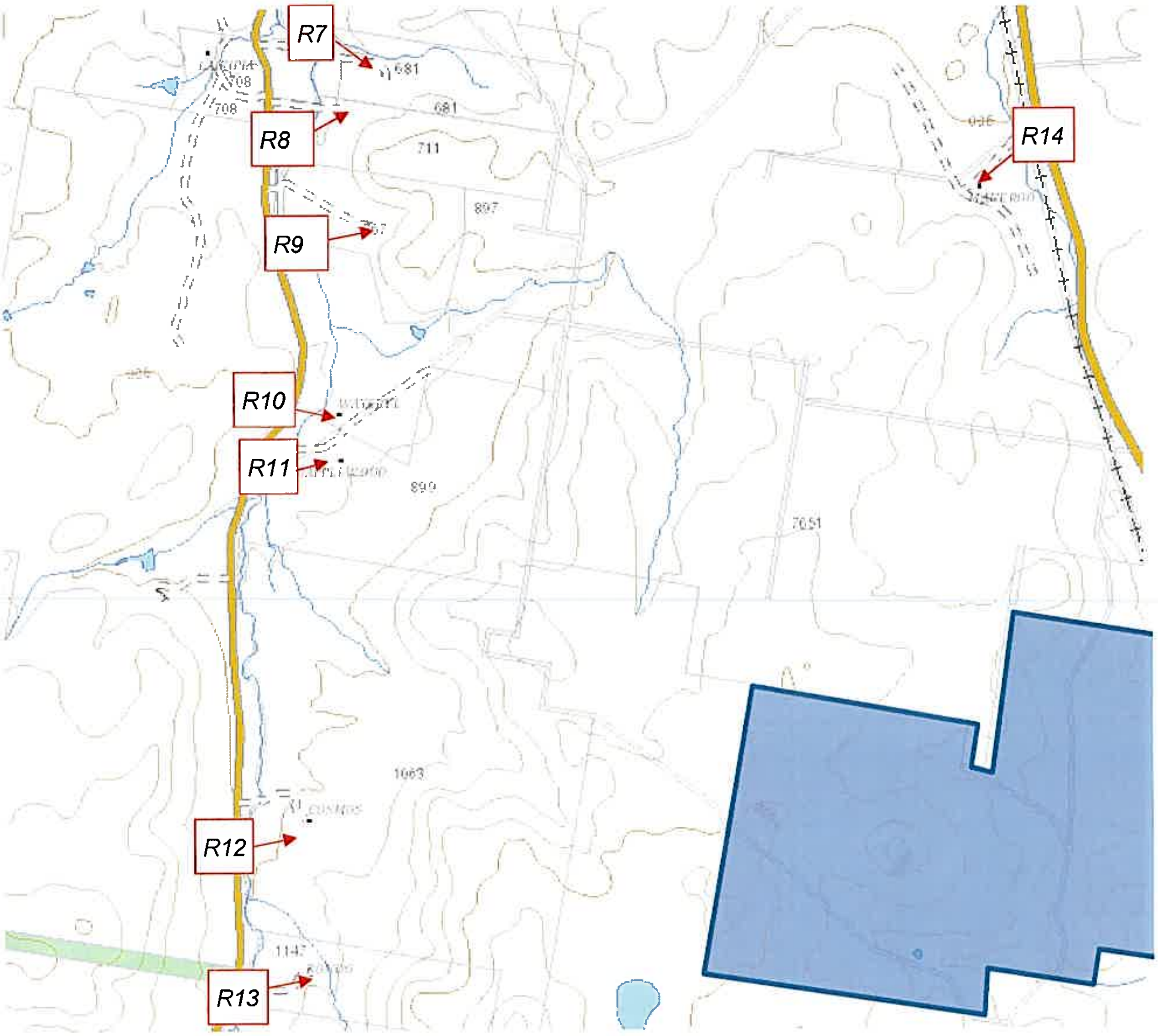

Figure 2-6: Location of proposed quarry and Noise Sensitive Receptors (Map, Northwest)

Table 2-1: Noise Sensitive Receptors and minimum distances to the quarry pit

Location ID	Location/ Address	Lot		Orientation to Subject Site	Minimum Distance
		Lot	Plan		
R1	7260 Monaro Highway	3	DP 825408	East	2700 m
R2	30 Springs Road	2	DP 825408	East	2150 m
R3	7195 Monaro Highway	49	DP 750537	East	2650 m
R4	89 Springs Road	3/3	DP 758883	Southeast	1940 m
R5	143 Springs Road	1	DP 837551	Southeast	1690 m
R6	278 Springs Road*	6	DP 750540	South	1880 m
R7	681 Myalla Road	102	DP 633967	Northwest	4230 m
R8	711 Myalla Road	22	DP 631807	Northwest	4180 m
R9	767 Myalla Road	1	DP 572661	Northwest	3670 m
R10	897 Myalla Road	3	DP 572661	Northwest	3160 m
R11	899 Myalla Road	4	DP 572661	Northwest	3050 m
R12	1063 Myalla Road	56	DP 750540	West	2640 m
R13	1147 Myalla Road	55	DP 750540	West	2670 m
R14	7651 Monaro Highway	68	DP 750540	North	2800 m

* Residence is associated with the quarry forming part of the larger rural holding containing the quarry

3 MAXIMUM EXPECTED BLAST IMPACTS

3.1 GROUND VIBRATION

Ground vibration from quarry blasts can be predicted according to the propagation relationship from AS2187.2 shown below:

$$PPV = K\left(\frac{Dist}{\sqrt{Wt}}\right)^{-n}$$

where *PPV* is the peak particle vibration level (vector sum, measured in mm/s),

Dist is the distance between the monitoring point and the nearest blasthole and

Wt is the maximum weight of explosive per blasthole, or Maximum Instantaneous Charge (kg).

The site constants, *K* and *n*, vary from site to site and may be approximated by the values 1140 and 1.6 for average conditions according to AS2187.2. This standard also describes upper limiting values for these parameters as 4560 and 1.6, which are suitable parameters for prediction of the 95th percentile relationship when assessing blast impact criteria.

Figure 3-1 shows a graph of the predicted ground vibration (PPV in mm/s) versus the distance from the blast for 3 different blasthole explosive weights, i.e. 75kg, 150kg and 225kg. The graph also shows lines representing the ground vibration limit of 5mm/s (see Section 4.2) and the minimum separation distance of NSRs for the proposed quarry (grey line). Monitoring data for the nearby Nimmitabel quarry operated by Schmidt Quarries using 70 kg blast hole charges is also included and shows the predictions are conservative.

The predictions show that ground vibration will be less than 3mm/s at 1,690m for 95% of blasts when the MIC (Mass Instantaneous Charge) of the blast is less than 225kg (see Figure 3-1). Therefore, for MIC values less than 225 kg, residents are not at risk of annoyance from ground vibration from blasting (see Section 4.2).

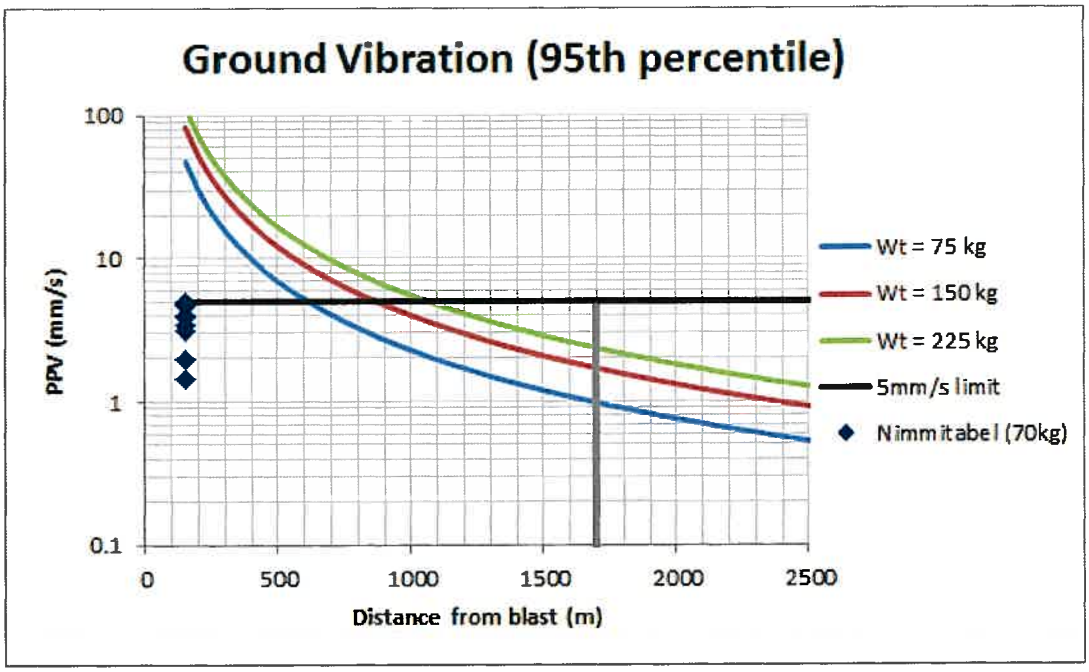

Figure 3-1: Predicted 95th percentile vibration vs distance for different blasthole charge weights

3.2 AIRBLAST OVERPRESSURE

Airblast overpressure (OP) from quarry blasts can be predicted according to the propagation relationship from AS2187.2 as shown in logarithmic form below:

$$OP_{dBL} = dBL - \beta \times Log\left(\frac{Dist}{\sqrt[3]{Wt}}\right)$$

Here, *dBL* = log Ks, where Ks is the site constant, and β =log *a*, where *a* is the site exponent. The 95th percentile relationship for the overpressure data can be conservatively represented by the parameter values of *dBL* = 172 and β =24 when assessing blast impact criteria.

Figure 3-2 shows a graph of the predicted airblast overpressure (in dB linear) versus the distance from the blast for 3 different blasthole explosive weights, i.e. 75kg, 150kg and 225kg. The graph also shows lines representing the airblast limit of 115 dBL (see Section 4.2) and the minimum separation distance of NSRs for the proposed quarry (grey line). Monitoring data for the nearby Nimmitabel quarry operated by Schmidt Quarries using 70 kg blast hole charges is also included and shows the predictions are conservative.

The predictions show that overpressure will be less than 113.5 dBL at 1,690m for 95% of blasts when the MIC (Mass Instantaneous Charge) of the blast is less than 225kg (see Figure 3-2). Therefore, for MIC values less than 225kg, residents are not at risk of annoyance from overpressure from blasting (see Section 4.2).

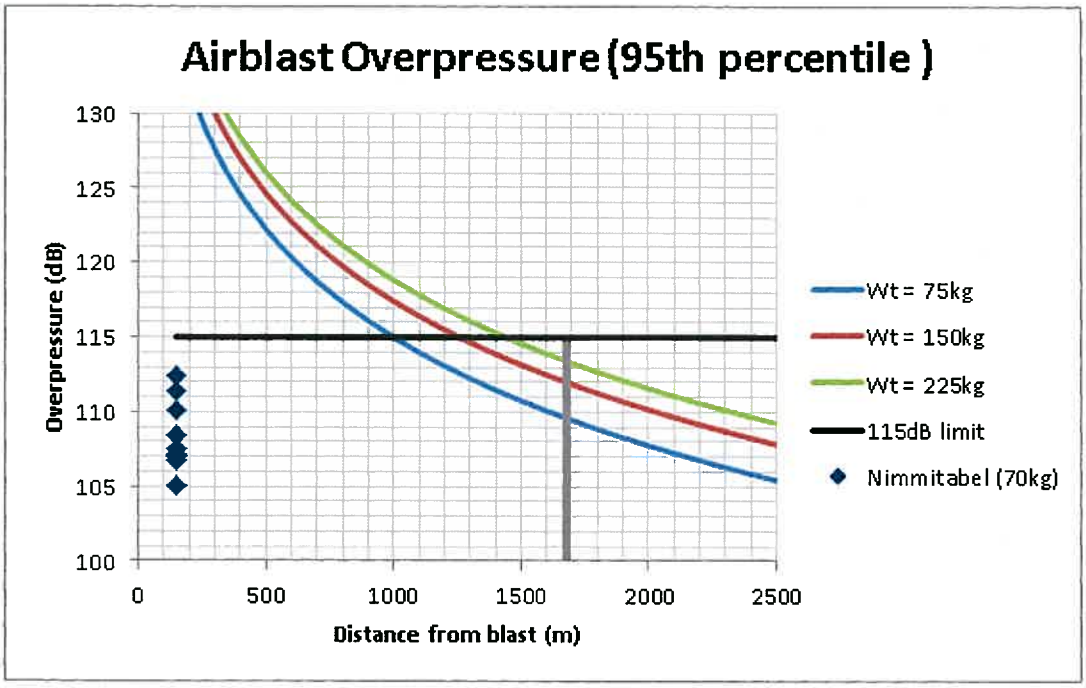

Figure 3-2: *Predicted 95th percentile airblast overpressure vs distance for different blasthole charge weights*

3.3 PREDICTIONS AT NOISE SENSITIVE RECEPTORS

The blast design parameters for prediction of future vibration and overpressure impacts are:

- bench height = 10 to 15 m, with sub-drill 0.5 m;
- blast hole diameter = 89 to 102 mm;
- explosive type density = 0.8 -1.3 density g/cc in the hole; and,
- stemming length 3 to 3.5 metres.

Based on the information above, blasts will typically contain up to 145 kg of explosive per blasthole. The range is expected to be 55 to 145 kg. The maximum instantaneous charge (MIC) can therefore be kept below the value of 225 kg identified as acceptable from Sections 3.1 and 3.2.

Predictions of ground vibration and blast overpressure at receptor locations are provided in Table 3. The values presented in this table, will not be exceeded in 95% of blasts.

Table 2: 95th Percentile Predictions for MIC of 145 kg (maximum expected) and 225 kg (limit)

Property ID	Distance approx. (m)	PPV (mm/s)	Overpressure (dB)	PPV (mm/s)	Overpressure (dB)
		Expected maximum MIC of 145kg		MIC limit of 225 kg	
R1	2700 m	0.8	107	1.1	108
R2	2150 m	1.1	109	1.6	111
R3	2650 m	0.8	107	1.2	109
R4	1940 m	1.3	110	1.9	112
R5	1690 m	1.7	112	2.4	113
R6	1880 m	1.4	111	2.0	112
R7	4230 m	0.4	102	0.5	104
R8	4180 m	0.4	102	0.6	104
R9	3670 m	0.5	104	0.7	105
R10	3160 m	0.6	105	0.9	107
R11	3050 m	0.7	106	0.9	107
R12	2640 m	0.8	107	1.2	109
R13	2670 m	0.8	107	1.1	109
R14	2800 m	0.7	107	1.1	108

3.4 PREDICTION AT BOUNDARY

The ground vibration at the property boundary is predicted to have a maximum 95th percentile value of 5 mm/s for a blasthole charge weight of 225kg. The corresponding 95th percentile airblast overpressure at the boundary is 119dBL. Therefore, uninhabited structures outside the quarry property boundary are not at risk from blasting (see Section 4.3).

4 CRITERIA

4.1 PLANNING AND ENVIRONMENT CONDITIONS

The Environmental Assessment Requirements (EAR1129) for the quarry specifies requirements for blasting. The maximum overpressure level and maximum ground vibration peak particle velocity level must comply with the ANZECC guidelines (see Section 4.2).

Typical conditions of operation require that all blasts be monitored at or near the nearest residence or noise sensitive location that is likely to be most affected by the blast.

4.2 ANZECC

The Australian and New Zealand Environment Conservation Council (ANZECC) provides the following guidelines to minimise the annoyance due to blasting overpressure and ground vibration.

- The recommended maximum level for airblast overpressure is 115 dBL. This level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dBL at any time.
- The recommended maximum level for ground vibration is 5 mm/s peak particle velocity. This level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 10 mm/s peak particle velocity at any time.

4.3 AS2187.2

Appendix J of AS2187.2 provides information on ground vibration and airblast overpressure from blasting. Guidance is provided for the measurement, prediction and control of blast impacts. The importance of blast management and blast monitoring records in minimising blast impacts is stated.

This standard also provides references for acceptable building vibration to avoid various levels of structural damage. A level of 20 mm/s is applicable for screening of non-residential buildings. For residential buildings, the human annoyance criterion is more stringent than the structural damage criterion.

5 BLAST IMPACT ASSESSMENT

Blast impacts from the proposed quarry extension can readily be controlled within acceptable levels. This is because the minimum separation distance between the quarry pit and the nearest receptor is sufficient for adequate control of the propagation of ground vibration and airblast overpressure. Consideration of future blast impacts shows that acceptable levels can be achieved using typical blast designs and good blasting practice.

It is recommended that all blasting conducted for the project is monitored using best practices and permanent monitoring pads as much as possible, with monitors located as close as practical (between the blast and the receptor) to the sensitive receptors nominated for blast monitoring. Appropriate attention must also be directed to those receptors located forward of the free face which may experience peak overpressure levels greater than those measured at the nearest receptor located behind the free face. Where a roving monitor is used in response to community concerns, a permanent monitoring pad will not be required, but geophones must be well coupled to firm ground, or bonded to solid rock outcrops. A Blast Management Plan (BMP) should be implemented to ensure compliance with regulatory authority conditions. It is recommended that the BMP include recent site vibration and overpressure data in the design of blasts, which is a vital step in managing impacts in sensitive areas.

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Vipac Engineers & Scientists

Outline Planning Consultants Pty Ltd

EIS new Quarry at Cooma

Air Quality Assessment

20E-17-0083-TRP-635833-1

12 December 2017

Report Title: Air Quality Assessment
Job Title: EIS new Quarry at Cooma

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EXECUTIVE SUMMARY

Vipac Engineers and Scientists Ltd was commissioned by Outline Planning Consultants Pty Ltd to conduct an Air Quality Impact Assessment for the proposed hard rock quarry located at 278 Springs Road, Rock Flat, which is a part of the Snowy Monaro Regional Council in southern New South Wales. The purpose of this assessment is to evaluate the potential impacts of air pollutants generated from the quarry and to provide recommendations to mitigate any potential impacts that might have an effect on any sensitive receptors.

The air quality impact assessment has been carried out as follows:

- An emissions inventory of TSP, PM10, PM2.5, and deposited dust for the construction and operation of the proposed Project was compiled for construction activities (including site clearance) and maximum operational activities (including resource extraction) using National Pollutant Inventory (NPI) and United States Environmental Protection Agency (USEPA) AP-42 emissions estimation methodology for the Project.
- Estimated emissions data was used as input for air dispersion modelling. The modelling techniques were based on a combination of The Air Pollution Model (TAPM) prognostic meteorological model (developed by CSIRO), and the CALMET model suite used to generate a three dimensional meteorological dataset for use in the CALPUFF dispersion model.
- The atmospheric dispersion modelling results were assessed against the air quality assessment criteria as part of the impact assessment. Air quality controls are applied to reduce emission rates where applicable.

As summarised in **Table ES- 1**, the results of the modelling have shown that the TSP, PM10, PM2.5 and dust deposition predictions comply with the relevant criteria and averaging periods at all sensitive receptors.

Table ES- 1: Summary of Results

Pollutant	Averaging Period	Criteria	Maximum Prediction at Any Receptor		Compliant
			Construction	Operation	
TSP	Annual	90 µg/m³	45.23 µg/m³	45.31 µg/m³	✓
PM10	24 Hour	50 µg/m³	32.91 µg/m³	20.65 µg/m³	✓
	Annual	30 µg/m³	15.99 µg/m³	15.47 µg/m³	✓
PM2.5	24 Hour	25 µg/m³	11.75 µg/m³	9.09 µg/m³	✓
	Annual	8 µg/m³	7.61 µg/m³	7.48 µg/m³	✓
Dust Deposition	Monthly Total	4 g/m²/month	2 g/m²/month	2 g/m²/month	✓
	Monthly Increase	2 g/m²/month	~0 g/m²/month	~0 g/m²/month	✓

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1 INTRODUCTION

Vipac Engineers and Scientists Ltd (Vipac) has been commissioned by Outline Planning Consultants Pty Ltd to conduct an Air Quality Impact Assessment for the proposed new Cooma Quarry, at 278 Springs Road, Rock Flat, NSW.

The purpose of this assessment is to evaluate the potential impacts of air pollutants generated from the Project and to provide recommendations to mitigate any potential impacts that might have an effect on any sensitive receptors.

The assessment has been carried out in accordance with the NSW Environment Protection Authority's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* and addresses the specific requirements set out by the NSW EPA for the proposed quarry (see ***Appendix A***).

2 PROJECT DESCRIPTION

The proposed hard rock quarry is located at 278 Springs Road, Rock Flat (Figure 2-1), which is a part of the Snowy Monaro Regional Council in southern New South Wales. It consists of the lots 62, 76, 78, 106 and 120 DP 75040 and is zoned as 'Primary Production'.

The Quarry development proposes to extract 3.75 million tonnes of basalt over a 25 year period from a hill located within Lot 106. This results in average annual extraction of 150,000 to 200,000 tonnes and would require monthly blasting to dislodge and break hard rock. A production rate of up to 280,000 tonnes per annum is possible. The Quarry would operate from 7:00 am to 6:00 pm Monday to Friday, and from 7:00 am to 2:00 pm on Saturdays.

The extraction area is planned to be 300 metres of diameter, and it would be supported by facilities including processing plant, stockpiling and access road. The total area covered would be approximately 9 hectares. The access road would connect the site to the Monaro Highway, passing through State Rail owned Crown Land in Lot 1.

The first stage of the development involves the construction of the working quarry area including sedimentation dams, preparation of the plant site, establishment of the quarry face and facilities (i.e. office, crushers, weigh bridge, workshops, and the like) and construction of the internal quarry haul route from the Monaro Highway, allowing for quarry truck traffic and other vehicles to turn safely into the quarry. A minimal amount of vegetation will be cleared during the road construction and will be used subsequently in re-vegetation works.

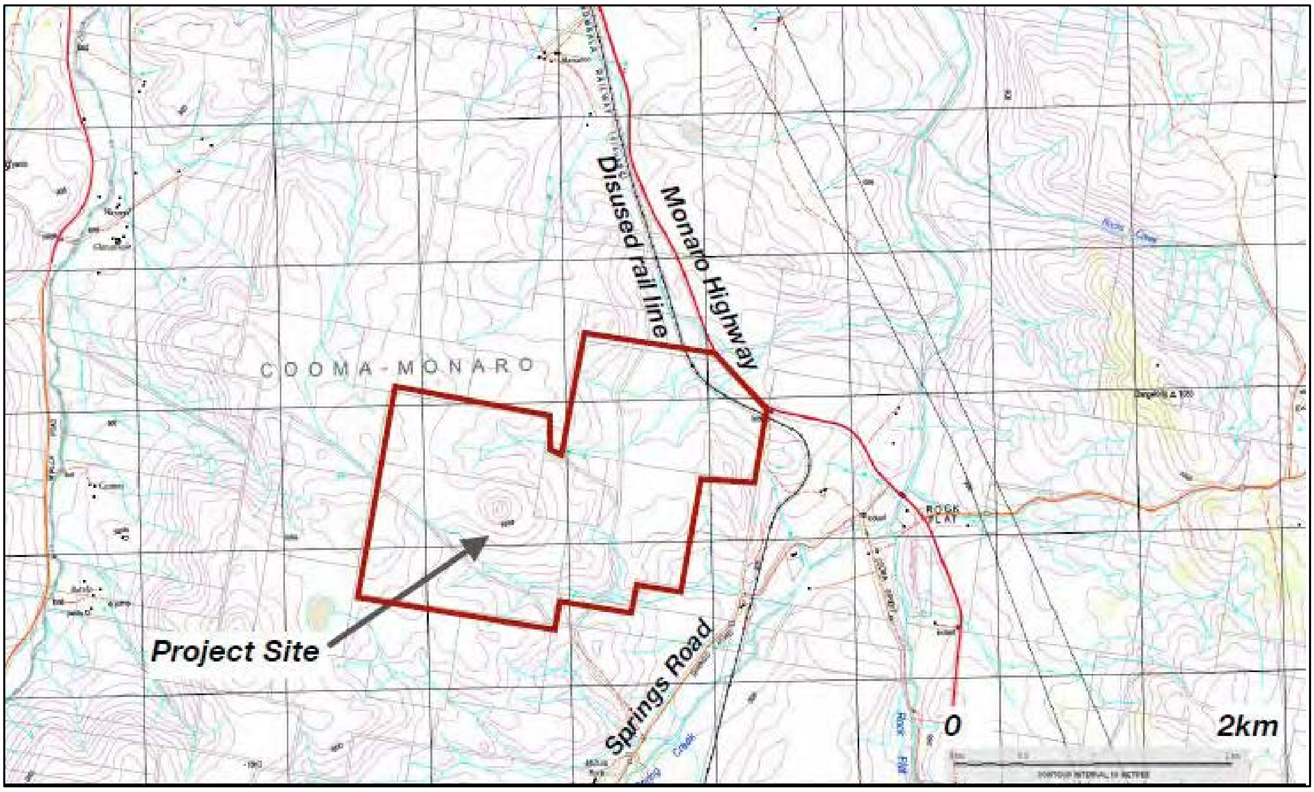


Figure 2-1: Project location

3 POLLUTANTS OF CONCERN

The main emissions to air from quarrying operations are caused by wind-borne dust, vehicle usage, materials handling and transfers. Fugitive air emissions can be estimated using emission factors combined with site-specific information such as the silt and moisture content of material being handled.

Dust is a generic term used to describe fine particles that are suspended in the atmosphere. The dust emissions considered in this report are particulate matter in various sizes:

- Total Suspended Particles (TSP) - Particulate matter with a diameter up to 50 microns;
- PM_{10} - Particulate matter less than 10 microns in size;
- $PM_{2.5}$ - Particulate matter less than 2.5 microns in size; and
- Dust Deposition – deposited matter that falls out of the atmosphere.

4 REGULATORY FRAMEWORK

4.1 NATIONAL LEGISLATION

4.1.1 NATIONAL ENVIRONMENT PROTECTION MEASURE FOR AMBIENT AIR QUALITY

Australia's first national ambient air quality standards were outlined in 1998 as part of the National Environment Protection Measure for Ambient Air Quality (National Environment Protection Council , 1998).

The Ambient Air Measure (referred to as Air NEPM) sets national standards for the key air pollutants; carbon monoxide, ozone, sulfur dioxide, nitrogen dioxide, lead and particles (PM_{10}). A revision to the Measure was issued in 2003 with the inclusion of advisory $PM_{2.5}$ standards. The Air NEPM requires the State's governments to monitor air quality and to identify potential air quality problems.

4.2 STATE LEGISLATION AND GUIDELINES

4.2.1 DEPARTMENT OF ENVIRONMENT AND CONSERVATIONS APPROVED METHODS

The *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW Environment Protection Authority, 2017) detail both the assessment methodology and criteria for air quality assessments. Due to the type of industry and proximity to sensitive receptors, the requirements for a Level 2 assessment have been followed.

4.3 PROJECT CRITERIA

The applicable criteria selected for this assessment are presented in *Table 4-1*.

Table 4-1: Project Air Quality Goals

Pollutant	Basis	Criteria	Averaging Time	Source
TSP	Human Health	90 $\mu g/m^3$	Annual	Approved Methods
PM_{10}	Human Health	50 $\mu g/m^3$	24-hour	Approved Methods
	Human Health	25 $\mu g/m^3$	Annual	Approved Methods
$PM_{2.5}$	Human Health	25 $\mu g/m^3$	24-hour	Approved Methods
	Human Health	8 $\mu g/m^3$	Annual	Approved Methods
Dust deposition	Amenity	Maximum incremental increase of 2 g/m^2/month	Annual	Approved Methods
	Amenity	Maximum total of 4 g/m^2/month	Annual	Approved Methods

5 EXISTING ENVIRONMENT

5.1 LOCAL SETTING

The proposed quarry is located in a rural area approximately 14km southeast of Cooma, and approximately 350km south of Sydney.

The current use of the site is for the grazing of stock. The general topography is undulating grassland with rocky hills and minor drainage lines. The nearest dwelling is found approximately 1.7 kilometres south-east from the site.

5.2 SENSITIVE RECEPTORS

In total, 15 sensitive receptors have been identified within the locality of the proposed Project. These are shown in Figure 5-1 and Figure 5-2, and described in Table 5-1.

Table 5-1: Sensitive receptor locations

Location ID	Location/ Address	Lot		Orientation to Subject Site
		Lot	Plan	
R1	7260 Monaro Highway	3	DP 825408	East
R2	30 Springs Road	2	DP 825408	East
R3	7195 Monaro Highway	49	DP 750537	East
R4	89 Springs Road	3/3	DP 758883	Southeast
R5	143 Springs Road	1	DP 837551	Southeast
R6	278 Springs Road	6	DP 750540	South
R7	681 Myalla Road	102	DP 633967	Northwest
R8	711 Myalla Road	22	DP 631807	Northwest
R9	767 Myalla Road	1	DP 572661	Northwest
R10	897 Myalla Road	3	DP 572661	Northwest
R11	899 Myalla Road	4	DP 572661	Northwest
R12	1063 Myalla Road	56	DP 750540	West
R13	1147 Myalla Road	55	DP 750540	West
R14	7651 Monaro Highway	68	DP 750540	North

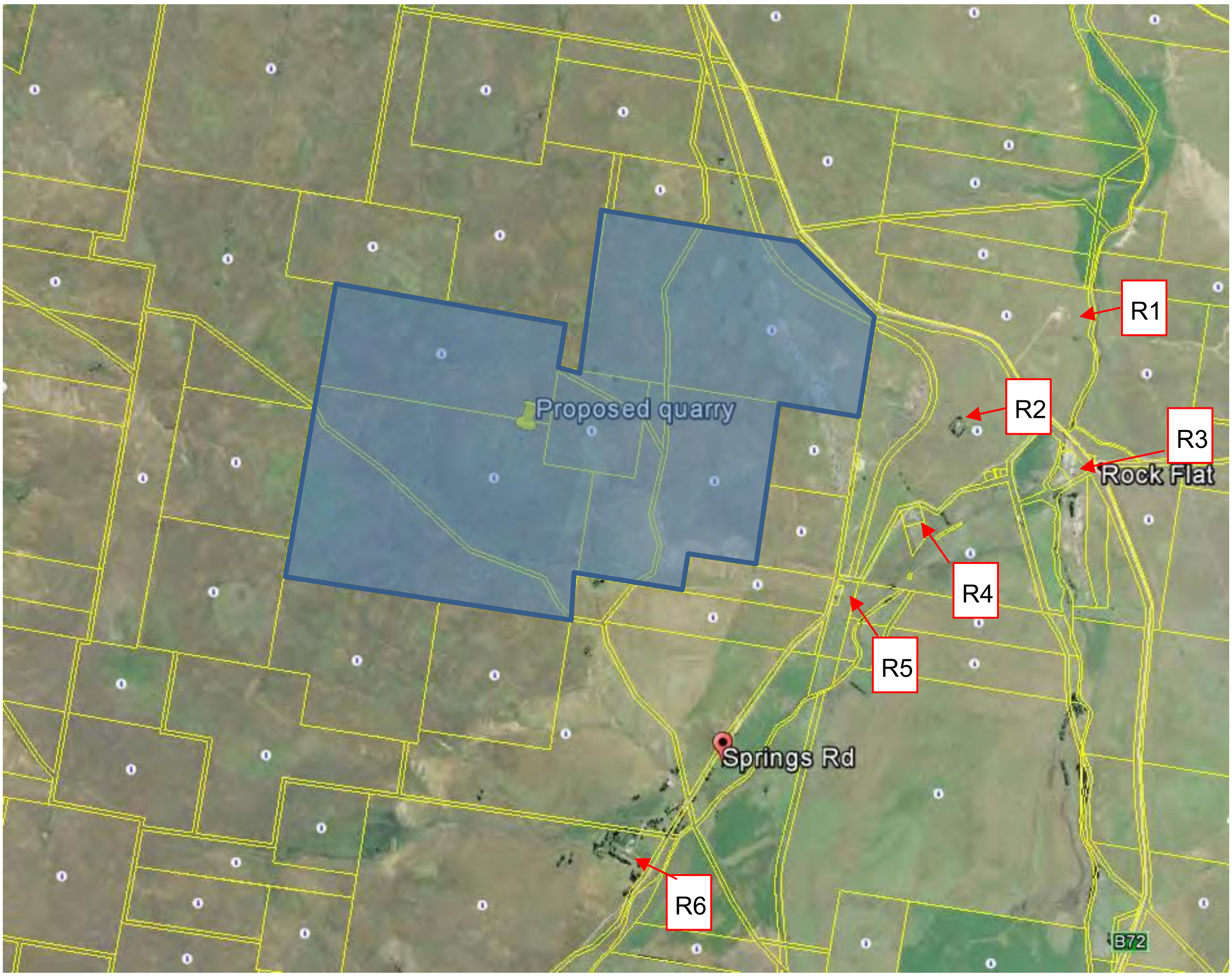


Figure 5-1: Receptor locations (east)

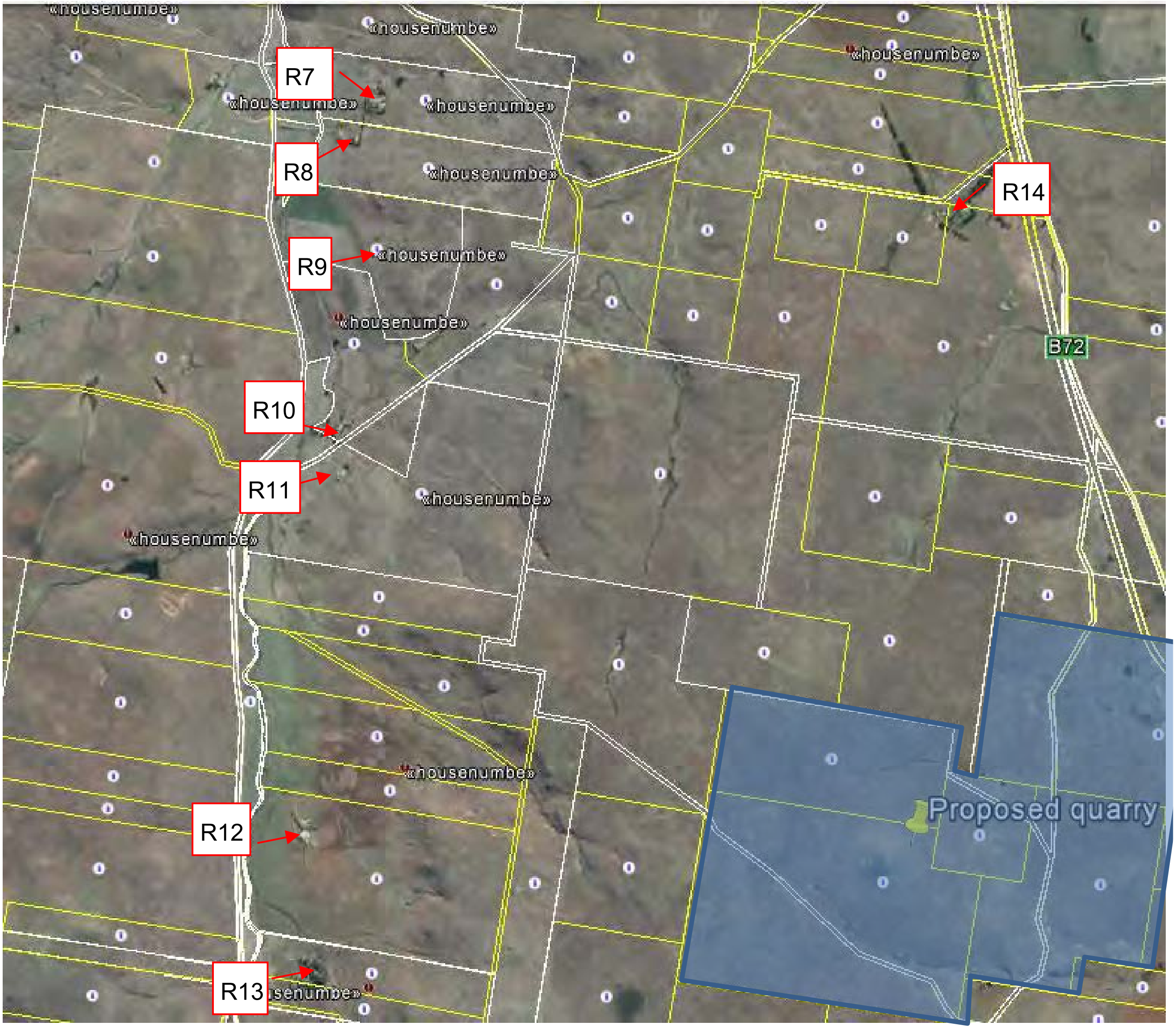


Figure 5-2: Receptor locations (west)

5.3 DISPERSION METEOROLOGY

5.3.1 REGIONAL METEOROLOGY

The nearest Bureau of Meteorology (BOM) station with long term data is at Cooma Airport (Site number 070217), located approximately 14 km north of the Project site. This monitoring station has recorded data since 1967 and a summary of the climate is presented in Table 5-2.

The long term mean temperature range is between -2.1^{o}C and 26.5^{o}C with the coldest month being July and the hottest months being December to February. The area is relatively dry with a low mean annual rainfall of 539 mm. Rainfall reduces the dispersion of air emissions and therefore the potential impact on visual amenity and health.

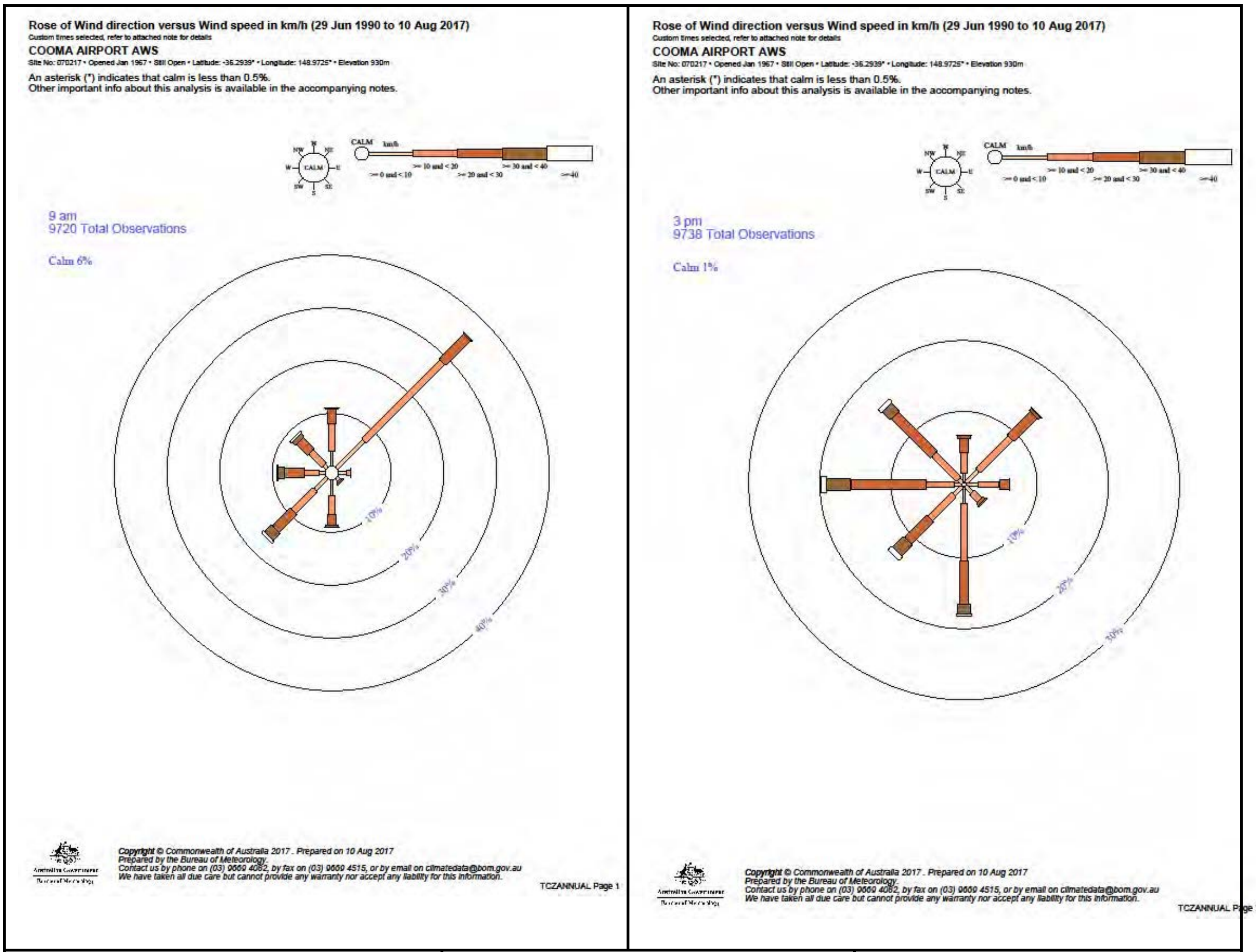
Table 5-2: Long-term weather data for Cooma Airport [BOM]

Month	Mean Temperature		Rainfall		9 am Conditions			3 pm Conditions		
	Max (°C)	Min (°C)	Mean Rain (m)	No. of Days ≥ 1 mm	Temp (°C)	RH (%)	Wind Speed (km/h)	Temp (°C)	Mean RH (%)	Wind Speed (km/h)
Jan	26.5	10.7	53.5	5.5	17.1	69	16	24.7	39	20.3
Feb	25	10.3	49	5.6	15.6	78	14.7	23.7	43	19.5
Mar	22.3	7.7	48.2	5.2	13.1	80	13.3	21.1	43	18.2
Apr	18	3.7	42.1	5.2	10.5	78	14.3	16.9	46	17.6
May	14.2	0.6	27	4.7	7	83	12.7	13	54	17.1
Jun	10.7	-1.1	41.6	5.1	4.3	85	13.2	9.7	60	18.3
Jul	10.2	-2.1	29	5.1	3.5	82	13.1	9	57	19.2
Aug	11.9	-1.5	31.4	4.7	5.3	75	15.7	10.7	48	20.6
Sep	15	1.1	37.8	6.2	8.9	68	18.1	13.5	46	22.2
Oct	18.3	3.5	44.6	6.5	11.8	64	18.3	16.5	43	21.7
Nov	21.3	6.5	68.5	7.4	13.6	68	17.1	19.5	43	21.3
Dec	24	8.5	53	6.8	15.8	66	16.4	22.4	39	20.7
Annual	**18.1**	**4**	**536.4**	**68**	**10.5**	**75**	**15.2**	**16.7**	**47**	**19.7**

A review of the number of rainfall days per year at Cooma shows that on average rainfall, is recorded on 68 days per year and the number of days where rainfall is ≥ 1 mm is 19% of the annual rainfall days are ≥ 1 mm.

Cooma has a subtropical highland climate, owing to its elevation and high diurnal temperature variation. Summers are warm with cool nights, and winters are cold with night time lows.

The long term wind roses recorded daily at the Cooma station at 9am and 3pm are provided in Figure 5-3. Winds are shown to be primarily from the northeast at 9am and from the northwest to south directions at 3pm. Stronger winds (>40km/hr or >11.1m/s) occur infrequently mostly in the afternoon.



Location: **Cooma Airport BoM Station**	Data Period: **1990 to 2017**	Data Type: **Measured Data**

Figure 5-3: Annual wind roses for Cooma Airport Weather Station (1990 to 2017)

5.3.2 LOCAL METEOROLOGY

5.3.2.1 INTRODUCTION

A three dimensional meteorological field was required for the air dispersion modelling that includes a wind field generator accounting for slope flows, terrain effects and terrain blocking effects. The Air Pollution Model, or TAPM, is a three-dimensional meteorological and air pollution model developed by the CSIRO Division of Atmospheric Research and can be used as a precursor to CALMET which produces fields of wind components, air temperature, relative humidity, mixing height and other micro-meteorological variables for each hour of the modelling period. The TAPM-CALMET derived dataset for 12 continuous months of hourly data from the year 2016 and approximately centred at the proposed Project has been used to provide further information on the local meteorological influences. Details of the modelling approach are provided in Section 6.3.

5.3.2.2 WIND SPEED AND DIRECTION

The wind roses from the TAPM-CALMET derived dataset for the year 2016 are presented in Figure 5-4 and Figure 5-5 for the Project site. Figure 5-4 shows that the dominant wind direction is from W during spring, NNW and SSW during the summer months. In autumn, the winds are primarily from the SW and W directions. Overall, winds from the southeast and east are infrequent which is likely indicative of the influences on wind flow from the elevated terrain in these directions.

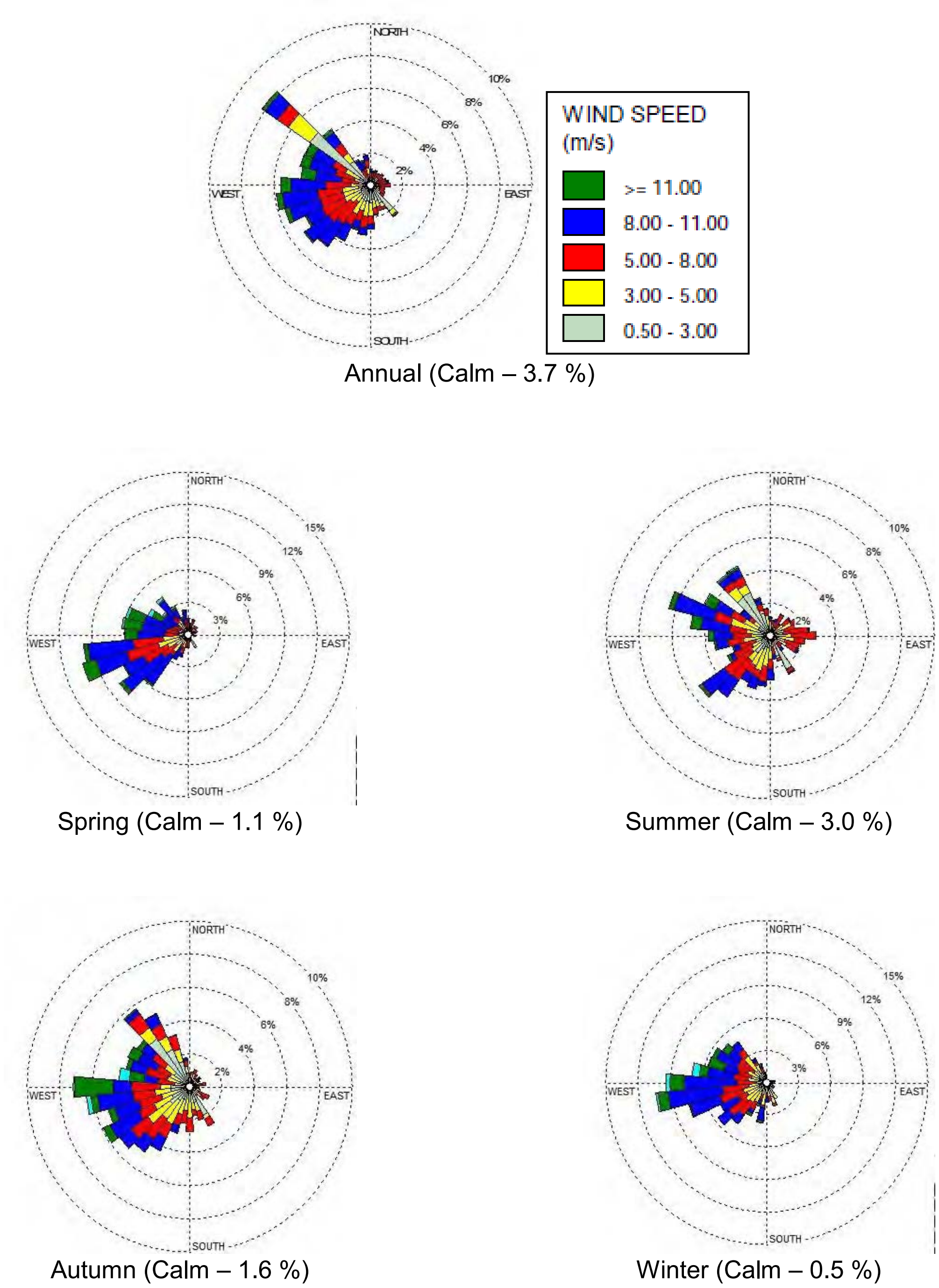
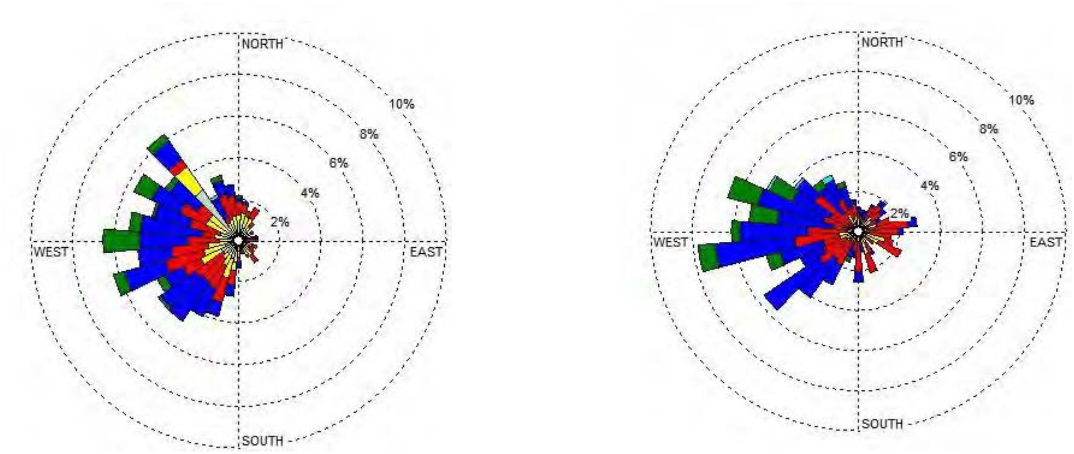


Figure 5-4: Site-specific wind roses by season for the TAPM-CALMET derived dataset, 2016

Figure 5-5 shows the wind roses for the time of day during the year for 2016. It can be seen that there are more frequent and stronger winds from the west and northwest during the afternoon periods.



9am (Calm – 3.6 %) 3pm (Calm – 0.4 %)

Figure 5-5: Site-specific wind roses by time of day for the TAPM-CALMET derived dataset, 2016

A comparison of the wind roses at 9am and 3pm hours for the TAPM-CALMET derived dataset (Figure 5-5) at the Project site was also undertaken with the BOM long-term wind roses at Cooma (Figure 5-3). There are differences between the 9am wind roses from BOM and derived dataset, most notably the absence of winds from the northeast at 9am and south at 3pm in the derived dataset. As outlined above, this is likely indicative of the difference in terrain features between the Cooma Airport and the Project site which is influenced by its proximity to elevated terrain. The wind roses from the TAPM-CALMET derived datasets have some similarities with dominating west and north westerly prevailing winds.

5.3.2.3 ATMOSPHERIC STABILITY

Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion of pollutants. The Pasquill-Turner assignment scheme identifies six Stability Classes (Stability Classes A to F) to categorise the degree of atmospheric stability. These classes indicate the characteristics of the prevailing meteorological conditions and are used in various air dispersion models. The frequency of occurrence for each stability class for 2016 is shown in Figure 5-6. Stability classes D and F are the most frequent which indicates neutral to stable conditions often typified by cool clear nights.

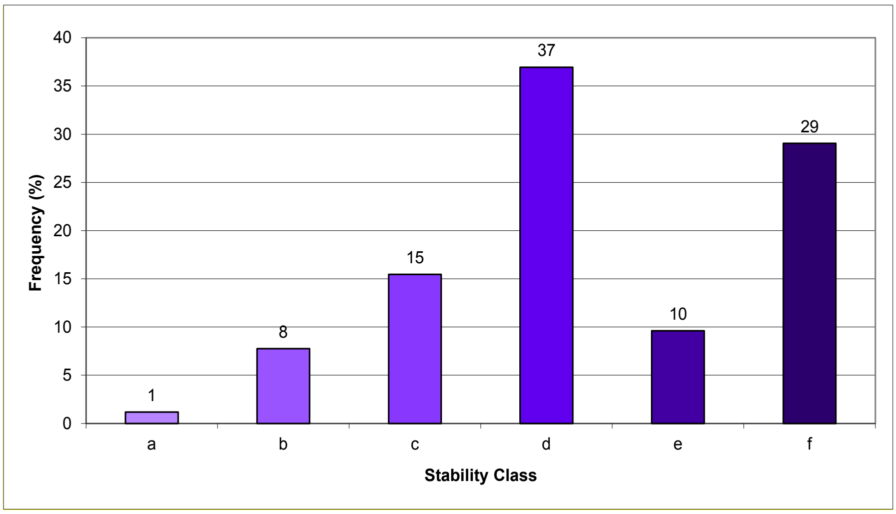


Figure 5-6: Stability class frequency for the TAPM-CALMET derived dataset, 2016

5.3.2.4 MIXING HEIGHT

Mixing height refers to the height above ground within which particulates or other pollutants released at or near ground can mix with ambient air. During stable atmospheric conditions, the mixing height is often quite low and particulate dispersion is limited to within this layer.

Diurnal variations in mixing depths are illustrated in Figure 5-7. As would be expected, an increase in the mixing depth during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and the growth of convective mixing layer.

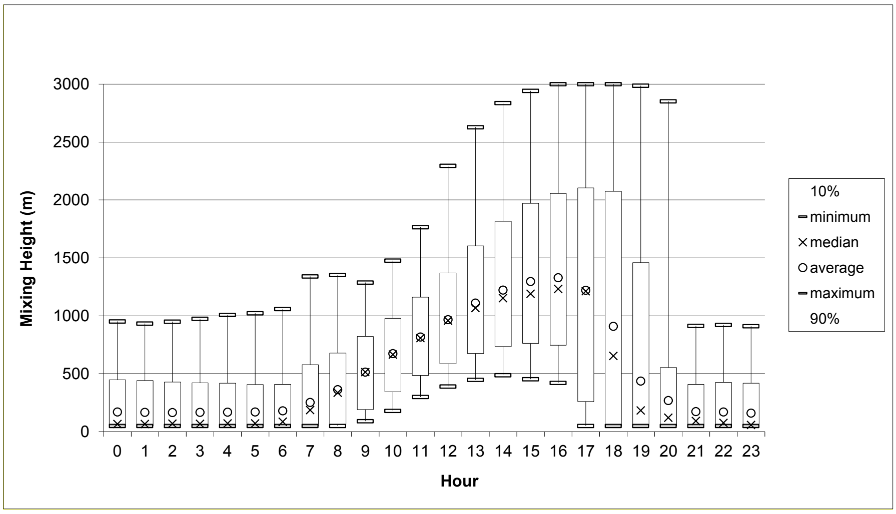


Figure 5-7: Mixing height for the TAPM-CALMET derived dataset, 2016

5.4 EXISTING AIR QUALITY

An extensive network of NATA-accredited air quality monitoring stations which use Standards Australia methods, where available is operated by the NSW EPA. The network does not include any stations close to the Project site. However, it does include monitoring at four rural centres representative of relatively low population densities and no significant industrial sources of pollution. The Project site is considered similar to these locations.

The closest rural monitoring site to the Project site is at Albury. The Albury air quality monitoring site is located in Jelbert Park, on the corner of Kaylock Road and Cambourne Street, Albury, on the New South Wales/Victorian border on the south-west slopes. Where available, the 70th percentile of the 24 hour average data collected at this site for 2016 are used as representative of background for the Project surroundings. Where unavailable, a conservative assumption of 50% of the criteria is adopted.

A summary of the assigned background concentrations used in this study are presented in Table 5-3. These background concentrations will be added to the predicted incremental emissions from the Project to derive total potential concentrations.

Table 5-3: Assigned Background Concentrations

Parameter	Air Quality Criteria	Period	Applied Background	Comments
TSP	90 µg/m³	**Annual**	45 µg/m³	Conservative assumption
PM_{10}	50 µg/m³	**24 Hour**	16.9 µg/m³	NSW EPA Measurement
	25 µg/m³	**Annual**	15.1 µg/m³	
$PM_{2.5}$[1]	25 µg/m³	**24 Hour**	8.2 µg/m³	NSW EPA Measurement
	8 µg/m³	**Annual**	7.4 µg/m³	
Dust Deposition	2 g/m²/month	**Month**	-	-
	4 g/m²/month	**Month**	2 g/m²/month	Conservative assumption

1. In the absence of 2016 data for PM2.5 at Albury, Wagga Wagga data are adopted.

6 METHODOLOGY

6.1 OVERVIEW

The air quality impact assessment has been carried out as follows:

- An emissions inventory of TSP, PM10, PM2.5, and deposited dust for the proposed Project was compiled using National Pollutant Inventory (NPI) and United States Environmental Protection Agency (USEPA) AP-42 emissions estimation methodology for the Project (outlined in Section 6.2).
- Estimated emissions data was used as input for air dispersion modelling. The modelling techniques were based on a combination of The Air Pollution Model (TAPM) prognostic meteorological model (developed by CSIRO), and the CALMET model suite used to generate a three-dimensional meteorological dataset for use in the CALPUFF dispersion model (Section 6.3).
- The atmospheric dispersion modelling results were assessed against the air quality assessment criteria described in Section 4.3 as part of the impact assessment (Section 7). Air quality controls are applied to reduce emission rates where applicable.

6.2 ESTIMATED EMISSIONS

6.2.1 POLLUTION CAUSING ACTIVITIES

The air quality assessment takes into account dust generating activities from quarry activities and disturbed surfaces within the site boundaries. The main emissions to air are dust and particulate matter generated by the onsite activities which primarily occur as a result of the following activities:

- site clearance of areas including vegetation clearance, topsoil removal and storage, and earthworks
- excavation
- loading/unloading of haul trucks
- bulldozer and grader operations
- wind erosion from disturbed areas and stockpiles
- transfer points
- conveyors
- crushing and screening
- vehicle movements
- blasting and drilling

In addition, air pollutants from diesel combustion may release other air pollutants such as particulate matter, (PM10 and PM2.5), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO) and trace quantities of volatile organic compounds. These substances are not considered to be emitted in sufficient quantities to affect air quality at sensitive receptors beyond the Project boundary; and have not been modelled in the air quality assessment.

6.2.2 EMISSION ESTIMATION

Emission factors can be used to estimate emissions of TSP and PM_{10} to the air from various sources. Emission factors relate the quantity of a substance emitted from a source to some measure of activity associated with the source. Common measures of activity include distance travelled, quantity of material handled, or the duration of the activity (Department of Sustainability, Environment, Water, Population and Communities, 2012).

Emission factors are used to estimate a facility's emissions by the general equation:

$$E_{i\,(kg/yr)} = \left[A_{(t/h)} \times OP_{(h/yr)} \right] \times EF_{i\,l(kg/t)} \times \left[1 - \frac{CE_i}{100} \right]$$

Where:

$E_{i\,(kg\,/\,yr)}$ = Emission rate of pollutant

$A_{(t\,/\,h)}$ = Activity rate

$OP_{(h\,/\,yr)}$ = operating hours

$EF_{i\,l(kg\,/\,t)}$ = uncontrolled emission factor of pollutant

CE_{i} = overall control efficiency for pollutant

The equations and activity rates are presented in ***Appendix B***.

6.2.3 EMISSIONS SCENARIOS MODELLED

Two emissions scenarios have been modelled as follows:

- Scenario 1 - the construction scenario including site clearance activities; and
- Scenario 2 - the operational scenario representing maximum activities.

6.3 AIR DISPERSION MODELLING

6.3.1 TAPM

A 3-dimensional dispersion wind field model, CALPUFF, has been used to simulate the impacts from the Project. CALPUFF is an advanced non-steady-state meteorological and air quality modelling system developed and distributed by Earth Tech, Inc. The model has been approved for use in the '*Guideline on Air Quality Models*' (Barclay and Scire, 2011) as a preferred model for assessing applications involving complex meteorological conditions such as calm conditions.

To generate the broad scale meteorological inputs to run CALPUFF, this study has used the model The Air Pollution Model (TAPM), which is a 3-dimensional prognostic model developed and verified for air pollution studies by the CSIRO.

TAPM was configured as follows:-

- Centre coordinates – 36˚ 21.0 S, 149˚ 12.0 E;
- Dates modelled – 30th December 2015 to 31st December 2016 (2 start up days);
- Four nested grid domains of 30 km, 10 km, 3 km and 1 km;
- 25 x 25 grid points for all modelling domains;
- 25 vertical levels from 10 m to an altitude of 8000 m above sea level;
- Data assimilation using measured meteorological data from the Bureau of Meteorology Station at Cooma Airport; and
- The default TAPM databases for terrain, land use and meteorology were used in the model;

6.3.2 CALMET

CALMET is an advanced non-steady-state diagnostic three-dimensional meteorological model with micro-meteorological modules for overwater and overland boundary layers. The model is the meteorological pre-processor for the CALPUFF modelling system.

The CALMET simulation was run as No-Obs simulation with the gridded TAPM three-dimensional wind field data from the innermost grid. CALMET then adjusts the prognostic data for the kinematic effects of terrain, slope flows, blocking effects and three-dimensional divergence minimisation.

6.3.3 CALPUFF

CALPUFF is a non-steady-state Lagrangian Gaussian puff model. CALPUFF employs the three-dimensional meteorological fields generated from the CALMET model by simulating the effects of time and space varying meteorological conditions on pollutant transport, transformation and removal.

Emission sources can be characterised as arbitrarily-varying point, area, volume and lines or any combination of those sources within the modelling domain.

Due to the limited change in topography as discussed in Section 2.6, the radius of influence of terrain features was set at 5 km while the minimum radius of influence was set as 0.1 km. The terrain data incorporated into the model had a resolution of 1 arc-second (approximately 30 m) in accordance with the *Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the 'Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia'*.

6.3.4 OTHER MODELLING INPUT PARAMETERS

6.3.4.1 PARTICLE SIZE DISTRIBUTION

CALPUFF requires particle distribution data (geometric mass mean diameter, standard deviation) to compute the dispersion of particulates (Table 6-1).

Table 6-1: Particle size distribution data

Particle size	Mean particle diameter (µm)	Geometric standard deviation (µm)
TSP	15	2
PM10	4.88	1
PM2.5	0.89	1

7 ASSESSMENT OF IMPACTS

This section presents the results of the air quality impact assessment for predicted ground level concentrations of TSP, PM10 and PM2.5 and dust deposition for the proposed construction and operation of the Project.

The results of the dispersion modelling include individual sensitive receptor and contour plots that are indicative of ground-level concentrations and deposition. This Level 2 impact assessment requires the predictions to be presented as follows:

- The incremental impact of each pollutant as per the criterion units and time periods;
- The cumulative impact (incremental plus background) for the 100th percentile (i.e. maximum value) in units as per the criterion and time periods.

7.1 TSP

The predicted annual average TSP is presented in Table 7-1.

The model predictions for TSP are well below the criteria of 90 µg/m³. TSP emissions from the proposed Project are not predicted to adversely impact upon the sensitive receptors. A contour plot is presented in ***Appendix C***.

Table 7-1: Predicted Annual Average TSP Concentrations (µg/m³)

ID	Predicted Annual Average TSP Concentrations (µg/m³)			
	Construction		Operation	
	Incremental	Cumulative	Incremental	Cumulative
R1	0.16	45.16	0.24	45.24
R2	0.26	45.26	0.29	45.29
R3	0.11	45.11	0.18	45.18
R4	0.20	45.20	0.26	45.26
R5	0.30	45.30	0.31	45.31
R6	0.12	45.12	0.15	45.15
R7	0.01	45.01	0.01	45.01
R8	0.01	45.01	0.01	45.01
R9	0.01	45.01	0.02	45.02
R10	0.01	45.01	0.02	45.02
R11	0.02	45.02	0.02	45.02
R12	0.03	45.03	0.05	45.05
R13	0.02	45.02	0.04	45.04
R14	0.08	45.08	0.09	45.09
Criteria	**90**			

7.2 PM10

The maximum predicted 24 hour and annual average PM10 are presented in ***Table 7-2***.

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The model predictions for 24 hour average and annual average PM10 are well below the criteria of 50 µg/m³ and 25 µg/m³. The 24 hour and annual average PM_{10} emissions from the proposed Project are not predicted to adversely impact upon the sensitive receptors. Contour plots are provided in ***Appendix C***.

Table 7-2: Predicted 24 Hour and Annual Average PM10 Concentrations (µg/m³)

ID	Predicted 24 Hour Average PM10 Concentrations (µg/m³)				Predicted Annual Average PM10 Concentrations (µg/m³)			
	Construction		Operation		Construction		Operation	
	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative
R1	10.00	26.90	3.61	20.51	0.42	15.52	0.26	15.36
R2	15.50	32.40	3.00	19.90	0.69	15.79	0.31	15.41
R3	4.63	21.53	3.12	20.02	0.28	15.38	0.21	15.31
R4	11.06	27.96	3.27	20.17	0.57	15.67	0.30	15.40
R5	14.14	31.04	2.36	19.26	0.89	15.99	0.37	15.47
R6	10.75	27.65	3.75	20.65	0.55	15.65	0.24	15.34
R7	2.12	19.02	0.74	17.64	0.07	15.17	0.03	15.13
R8	3.76	20.66	0.82	17.72	0.09	15.19	0.03	15.13
R9	2.95	19.85	0.93	17.83	0.09	15.19	0.03	15.13
R10	2.44	19.34	0.86	17.76	0.09	15.19	0.04	15.14
R11	2.30	19.20	1.31	18.21	0.10	15.20	0.04	15.14
R12	2.98	19.88	3.06	19.96	0.13	15.23	0.08	15.18
R13	1.44	18.34	1.39	18.29	0.08	15.18	0.06	15.16
R14	6.84	23.74	1.70	18.60	0.33	15.43	0.11	15.21
Criteria	**50**				**25**			

7.3 PM2.5

The maximum predicted 24 hour and annual average PM2.5 are presented in **Table 7-3**.

The model predictions for 24 hour average and annual average PM2.5 are below the criteria of 25 µg/m³ and 8 µg/m³. The 24 hour and annual average PM2.5 emissions from the proposed Project are not predicted to adversely impact upon the sensitive receptors. Contour plots are provided in ***Appendix C***.

Table 7-3: Predicted 24 Hour and Annual Average PM2.5 Concentrations (µg/m³)

ID	Predicted 24 Hour Average PM2.5 Concentrations (µg/m³)				Predicted Annual Average PM2.5 Concentrations (µg/m³)			
	Construction		Operation		Construction		Operation	
	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative
R1	2.24	26.90	0.74	20.51	0.10	15.52	0.06	7.46
R2	3.45	32.40	0.68	19.90	0.16	15.79	0.06	7.46
R3	1.07	21.53	0.67	20.02	0.07	15.38	0.05	7.45
R4	2.46	27.96	0.69	20.17	0.14	15.67	0.06	7.46
R5	3.17	31.04	0.69	19.26	0.21	15.99	0.08	7.48
R6	2.56	27.65	0.89	20.65	0.13	15.65	0.05	7.45
R7	0.49	19.02	0.18	17.64	0.02	15.17	0.01	7.41
R8	0.87	20.66	0.19	17.72	0.02	15.19	0.01	7.41
R9	0.68	19.85	0.21	17.83	0.02	15.19	0.01	7.41

ID	Predicted 24 Hour Average PM2.5 Concentrations (µg/m³)				Predicted Annual Average PM2.5 Concentrations (µg/m³)			
	Construction		Operation		Construction		Operation	
	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative
R10	0.60	19.34	0.19	17.76	0.02	15.19	0.01	7.41
R11	0.51	19.20	0.28	18.21	0.02	15.20	0.01	7.41
R12	0.64	19.88	0.63	19.96	0.03	15.23	0.02	7.42
R13	0.35	18.34	0.28	18.29	0.02	15.18	0.01	7.41
R14	1.53	23.74	0.37	18.60	0.08	15.43	0.02	7.42
Criteria	**25**				**8**			

7.4 DUST DEPOSITION

The maximum predicted monthly average dust deposition are presented in **Table 7-4**.

The model predictions for incremental and cumulative monthly average dust deposition are well below the criteria of 2 g/m²/month and 4 g/m²/month. Dust deposition from the proposed Project is not predicted to adversely impact upon the sensitive receptors. Contour plots are provided in ***Appendix C***.

Table 7-4: Predicted Monthly Average Dust Deposition (g/m²/month)

ID	Predicted Monthly Average Dust Deposition (g/m²/month)			
	Construction		Operation	
	Incremental	Cumulative	Incremental	Cumulative
R1	~0	2.00	~0	2.00
R2	~0	2.00	~0	2.00
R3	~0	2.00	~0	2.00
R4	~0	2.00	~0	2.00
R5	~0	2.00	~0	2.00
R6	~0	2.00	~0	2.00
R7	~0	2.00	~0	2.00
R8	~0	2.00	~0	2.00
R9	~0	2.00	~0	2.00
R10	~0	2.00	~0	2.00
R11	~0	2.00	~0	2.00
R12	~0	2.00	~0	2.00
R13	~0	2.00	~0	2.00
R14	~0	2.00	~0	2.00
Criteria	**2**	**4**	**2**	**4**

8 CONCLUSION

An Air Quality Impact Assessment has been carried out for the proposed hard rock quarry located at 278 Springs Road, Rock Flat, which is a part of the Snowy Monaro Regional Council in southern New South Wales. The purpose of this assessment is to evaluate the potential impacts of air pollutants generated from the quarry and to provide recommendations to mitigate any potential impacts that might have an effect on any sensitive receptors.

The air quality impact assessment has been carried out as follows:

- An emissions inventory of TSP, PM10, PM2.5, and deposited dust for the proposed Project was compiled using National Pollutant Inventory (NPI) and United States Environmental Protection Agency (USEPA) AP-42 emissions estimation methodology for the Project.
- Estimated emissions data was used as input for air dispersion modelling. The modelling techniques were based on a combination of The Air Pollution Model (TAPM) prognostic meteorological model (developed by CSIRO), and the CALMET model suite used to generate a three dimensional meteorological dataset for use in the CALPUFF dispersion model.
- The atmospheric dispersion modelling results were assessed against the air quality assessment criteria as part of the impact assessment. Air quality controls are applied to reduce emission rates where applicable.

As summarised in Table 8-1, the results of the modelling have shown that the TSP, PM10, PM2.5 and dust deposition predictions comply with the relevant criteria and averaging periods at all sensitive receptors.

Table 8-1: Summary of Results

Pollutant	Averaging Period	Criteria	Maximum Prediction at Any Receptor		Compliant
			Construction	Operation	
TSP	Annual	90 µg/m³	45.23 µg/m³	45.31 µg/m³	✓
PM10	24 Hour	50 µg/m³	32.91 µg/m³	20.65 µg/m³	✓
	Annual	30 µg/m³	15.99 µg/m³	15.47 µg/m³	✓
PM2.5	24 Hour	25 µg/m³	11.75 µg/m³	9.09 µg/m³	✓
	Annual	8 µg/m³	7.61 µg/m³	7.48 µg/m³	✓
Dust Deposition	Monthly Total	4 g/m²/month	2 g/m²/month	2 g/m²/month	✓
	Monthly Increase	2 g/m²/month	~0 g/m²/month	~0 g/m²/month	✓

Appendix A: NSW EPA EIS REQUIREMENTS FOR PROPOSED HARD ROCK QUARRY

Description of the Proposal	
Item No. 1	Identify all sources of air emissions from the development
Report Response	**The pollutants of concern potentially generated by the development are outlined in Section 3 and the activities which can generate these pollutants are discussed in Section 6.2.1.**
Item No. 2	Provide details of the project that are essential for predicting and assessing air impacts.
Report Response	**Appendix B outlines the emissions estimation methodologies and Appendix B-2 outlines the activity data adopted for the methodologies.**
The Location	
Item No. 3	Describe the topography and surrounding land uses.
Report Response	**Section 5 outlines the existing environment including topography and surrounding land uses. Air sensitive receptors are also identified in this section.**
Item No. 4	Describe surrounding buildings that may effect plume dispersion
Report Response	**There are no point sources of emissions in this assessment and plume dispersion will therefore not be effected by any surrounding buildings.**
Item No. 5	Provide and analyse site representative data on meteorological parameters.
Report Response	**Section 5-3 discusses meteorology relevant to the dispersion of the pollutants including local and regional meteorology.**
The Environmental Issues	
Item No. 6	Describe baseline conditions
Report Response	**Section 5 outlines the existing environment including an estimation of baseline air quality at the site location (Section 5-4).**
Item No. 7	Assess impacts
Report Response	**As discussed in Section 6, the cumulative impacts of the pollutants of concern potentially generated by the development have been assessed in accordance with the NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* as follows:** • **An emissions inventory of TSP, PM10, PM2.5, and deposited dust for the proposed Project was compiled using National Pollutant Inventory (NPI) and United States Environmental Protection Agency (USEPA) AP-42 emissions estimation methodology for the Project (outlined in Section 6.2).** • **Estimated emissions data was used as input for air dispersion modelling. The modelling techniques were based on a combination of The Air Pollution Model (TAPM) prognostic meteorological model (developed by CSIRO), and the CALMET model suite used to generate a three-dimensional meteorological dataset for use in the CALPUFF dispersion model (Section 6.3).** • **The atmospheric dispersion modelling results were assessed against the air quality assessment criteria described in Section 4.3 as part of the impact assessment (Section 7). Air quality controls are applied to reduce emission rates where applicable.**
Item No. 8	Describe management and mitigation measures
Report Response	**Management and mitigation measures have been recommended (and modelled) as outlined in Appendix B3.**

Cumulative impacts	
Item No. 9	Assess the impact of the proposal against the long term air quality objectives for the area or region.
Report Response	**The cumulative impacts of the proposal have been assessed against the criteria specified in the NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.***

Appendix B: EMISSIONS ESTIMATION

B.1 EMISSION ESTIMATION EQUATIONS

The major air emission from extraction activities is fugitive dust. Emission factors can be used to estimate emissions of TSP, PM_{10} and $PM_{2.5}$ to the air from various sources. Emission factors relate the quantity of a substance emitted from a source to some measure of activity associated with the source. Common measures of activity include distance travelled, quantity of material handled, or the duration of the activity.

The National Pollutant Inventory Emission Estimation Technique Manual for Mining (January 2012) provide the equations and emission factors to determine the emissions of TSP and PM_{10} from mining and quarrying activities. These emission factors incorporate emission factors published by the USEPA in their AP-42 documentation.

Excavation on Overburden

The default emission rates in the NPI EET for Mining have been used for this emission factor.

Material Unloading

Emission rate for dust from stockpile has been calculated using the following emission rates from AP42 11.19.2:

TSP = PM_{10} multiplied by 2

PM_{10} = default of 0.00005

$PM_{2.5}$ = 15% of PM_{10} is $PM_{2.5}$

Crushing and Screening

The default emission rates in the NPI EET for Mining and AP42 11.19.2 have been used.

Drilling

The default emission rates in the NPI EET for Mining and have been used for these emission factors. 10% PM_{10} is $PM_{2.5}$. Six holes per day is the estimated rate.

Blasting

The TSP emission rate for blasting has been calculated using the following equation:

$$Emissions_{\text{TSP}} = 0.00022\ x\ Area\ blasted\ (m^2)^{1.5} \text{ kg /blast}$$

PM_{10} is TSP multiplied by 0.52 and 10% of PM_{10} is $PM_{2.5}$. Area blasted is 1225 m^2 with 15 blasts per year.

In-Pit Retention

The default reductions as detailed in the NPI EET for Mining were applied to one pit in Stage 4 only as the pit is more than RL -50 m:

TSP = 50% reduction

PM_{10} and $PM_{2.5}$ = 5% reduction

Haul Roads

The dust emission rate from haul roads has been calculated using the following equation:

$$Emissions = \left(\frac{0.4536}{1.6093}\right) x\ k\ x\ \left(\frac{s_{(\%)}}{12}\right)^{\alpha} x \left(\frac{W_{(t)}}{3}\right)^{0.45} \text{ kg /VKT}$$

Where:

k = 4.9 for TSP, 1.5 for PM_{10} and 0.15 for $PM_{2.5}$.

$s_{(\%)}$ = surface material silt content

W = mean vehicle weight (tons converted to tonnes)

a = 0.7 for TSP, 0.9 for PM_{10} and $PM_{2.5}$

Conveyors

The dust emission rate from conveyor transfer points has been calculated using the following equation:

$$Emissions = k\ x\ 0.0016\ \frac{(U/2.2)^{1.3}}{(M/2)^{1.4}} \text{ kg /transfer point}$$

Where:

k = 0.74 for TSP, 0.35 for PM_{10}. 15% of PM_{10} is $PM_{2.5}$

U = mean wind speed (m/s)

M = material moisture content (1%)

Stockpile Loading

Emission rate for dust from stockpile has been calculated using the following emission rates from AP42 11.19.2:

TSP = PM_{10} multiplied by 2

PM_{10} = 0.00005

$PM_{2.5}$ = 15% of PM_{10} is $PM_{2.5}$

Wind Erosion

The emission rate for dust from stockpile has been calculated using the following equation for TSP:

$$Emissions = 1.9\ x\ \left(\frac{s_{(\%)}}{1.5}\right) x\ 365\ x\ \left(\frac{365-p}{235}\right) x \left(\frac{f_{(\%)}}{15}\right) \text{ kg /ha /yr}$$

Where:

$s_{(\%)}$ = silt content.

P = number of days per year when rainfall is greater than 0.25 mm. A review of the TAPM-CALMET meteorological data has determined there are 216 days where rainfall is greater than 0.25 mm.

$f_{(\%)}$ = percentage of time that wind speed is greater than 5.4 m/s at the mean height of the stockpile. The frequency of wind speed >5.4 m/s has been determined to be 9.5%.

The fraction of PM_{10} in TSP is 50% and $PM_{2.5}$ is 15% of PM_{10}

Meteorological parameters for emission estimation as determined by TAPM-CALMET:

- Mean wind speed is 4.0 m/s;
- Percentage of time when wind speed >5.4 m/s is 29%; and
- Number of days with rainfall >0.25 mm is 152.

B.2 ACTIVITY OVERVIEW

Operating Hours

Extraction and processing of material has been modelled as 12 hours per day.

Extraction Rates

The expansion proposes a future extraction rate of 0.28 Mtpa

Haul Roads

Haul road locations provided and incorporated into the model are summarised below.

Total Haul Road Length	Modelled Parameter
Extraction Pit (km)	1.02
Processing Area (km)	0.28
External Haul Road (km)	0.70

B.3 EMISSION CONTROLS APPLIED

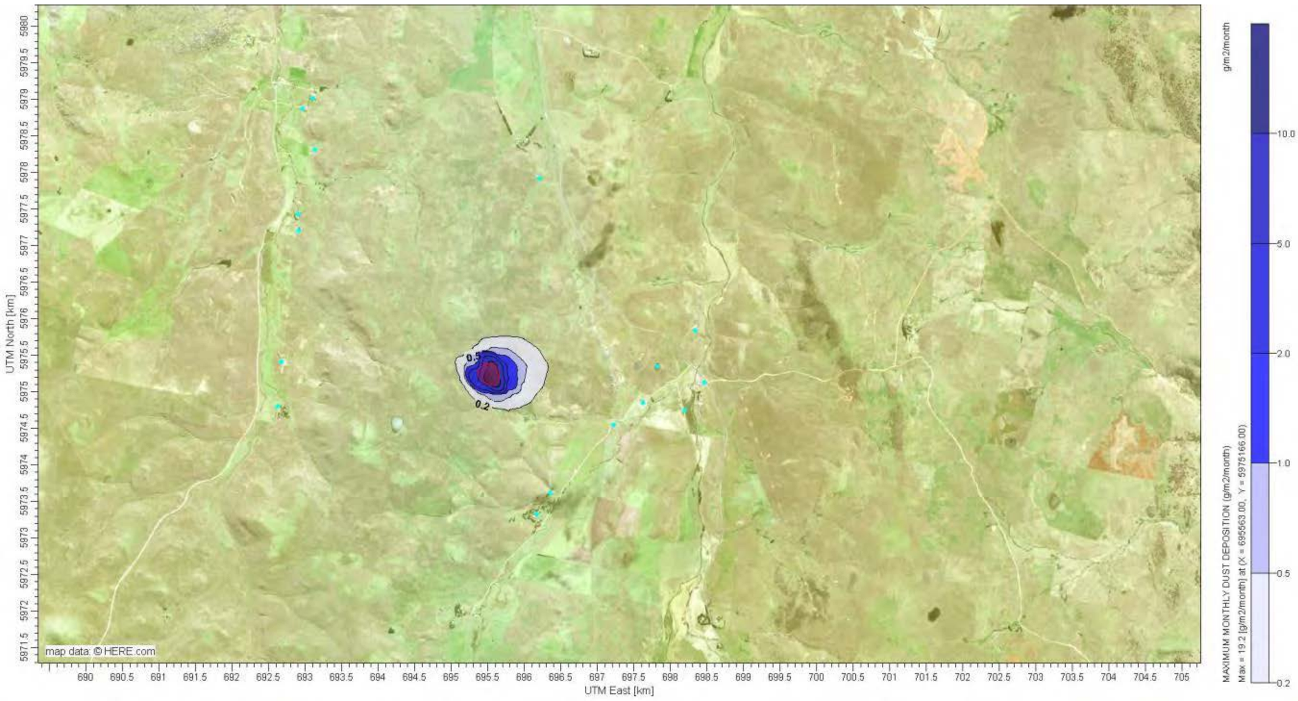
The following control efficiencies were applied to each modelling scenario.

Activity	Modelled Parameter
Haul Roads	Watering Level 2 + speed limit < 40 km/h (83%)
Crushing	WATER SPRAYS TO KEEP ORE WET (50%)
Screening	WATER SPRAYS TO KEEP ORE WET (50%)
Loading Processing Stockpiles	WATER SPRAYS TO KEEP ORE WET (50%)
Conveyors	-

Appendix C: CONTOUR PLOTS

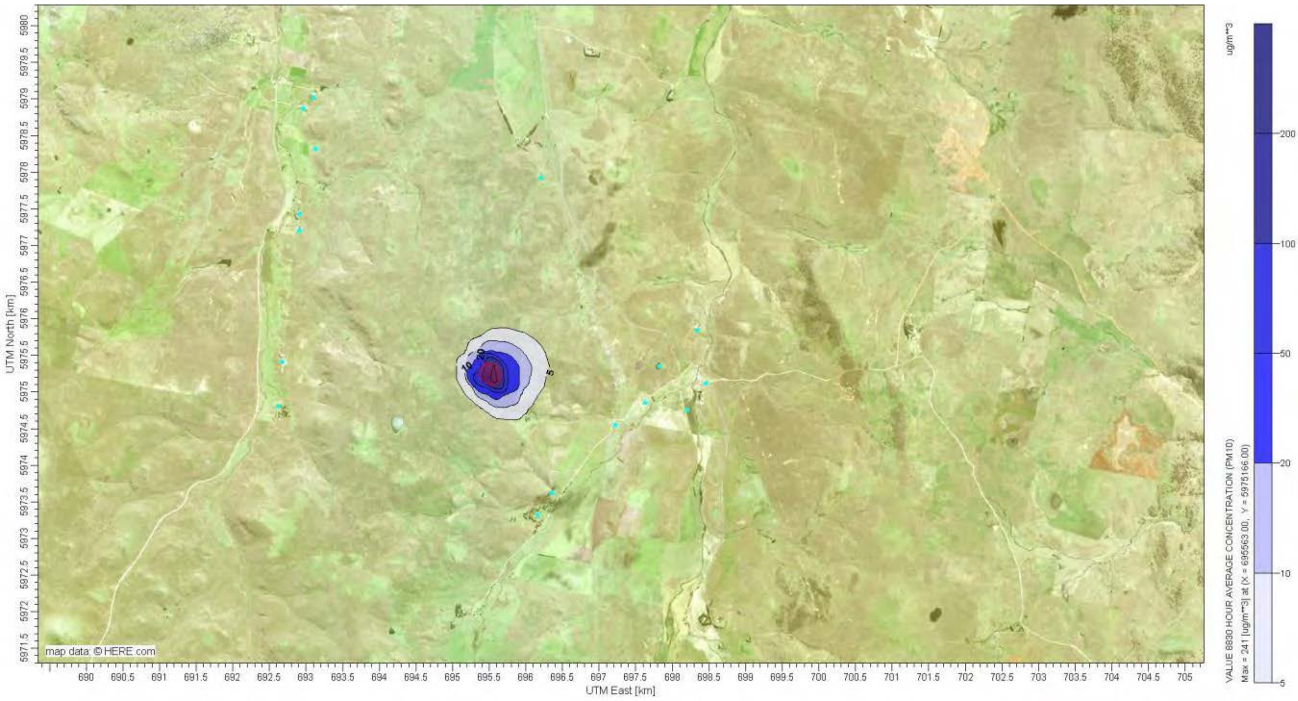
The contour plots are created from the predicted ground-level concentrations at the network of gridded receptors within the modelling domain at frequent intervals. These gridded values are converted into contours using triangulation interpolation in the CALPOST post-processing software within the CALPUFF View software (Version 7.2 - June 2014).

Contour plots illustrate the spatial distribution of ground-level concentrations across the modelling domain for each time period of concern. However, this process of interpolation causes a smoothing of the base data that can lead to minor differences between the contours and discrete model predictions.



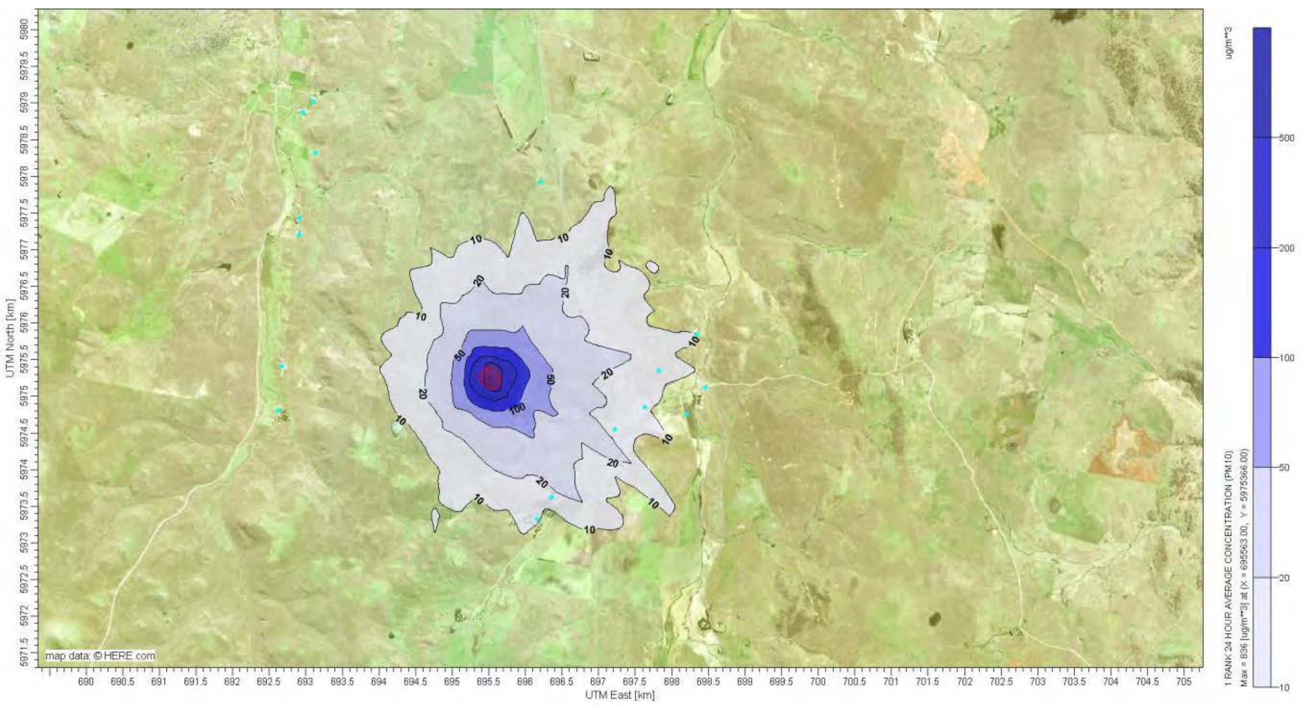
Pollutant:	Averaging Period:	Percentile:	Criteria:
Dust Deposition	Month	100th	2 g/m^2/month

Comment:
Incremental. Approximate pit location shown in red.



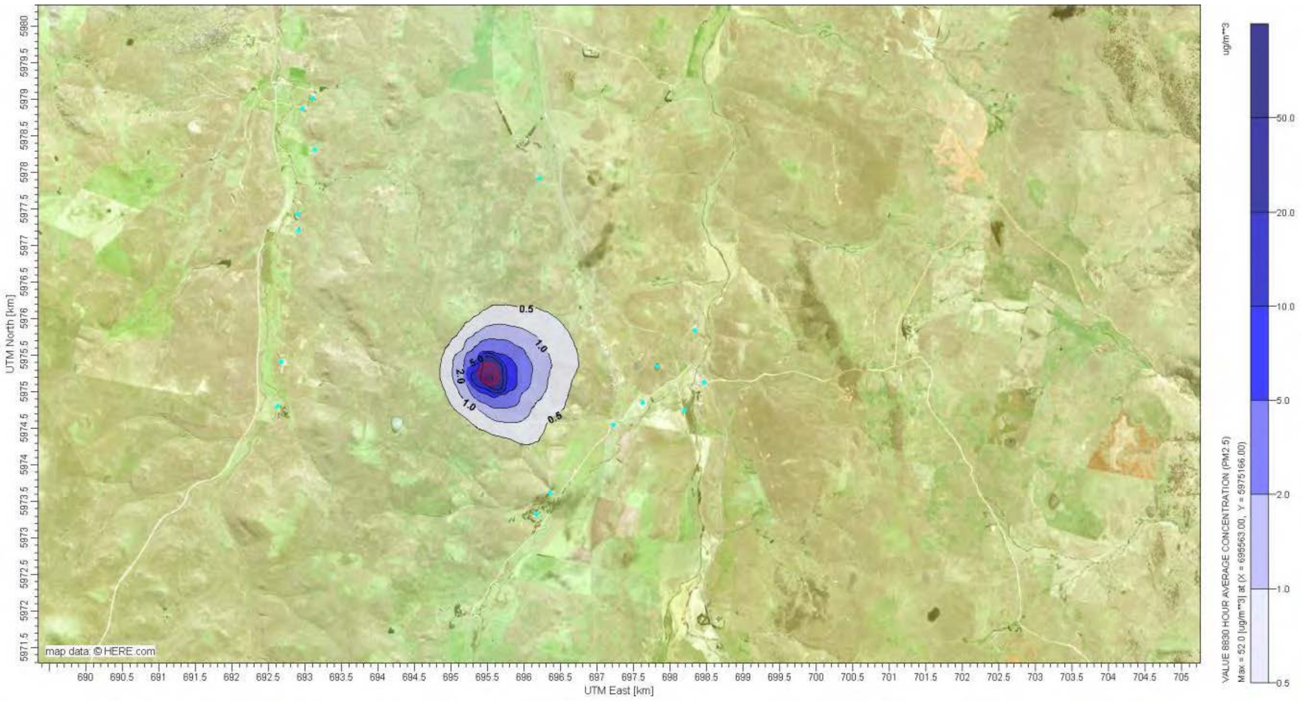
Pollutant: PM10	Averaging Period: Annual	Percentile: 100th	Criteria: 30 µg/m3

Comment:
Incremental. Approximate pit location shown in red.



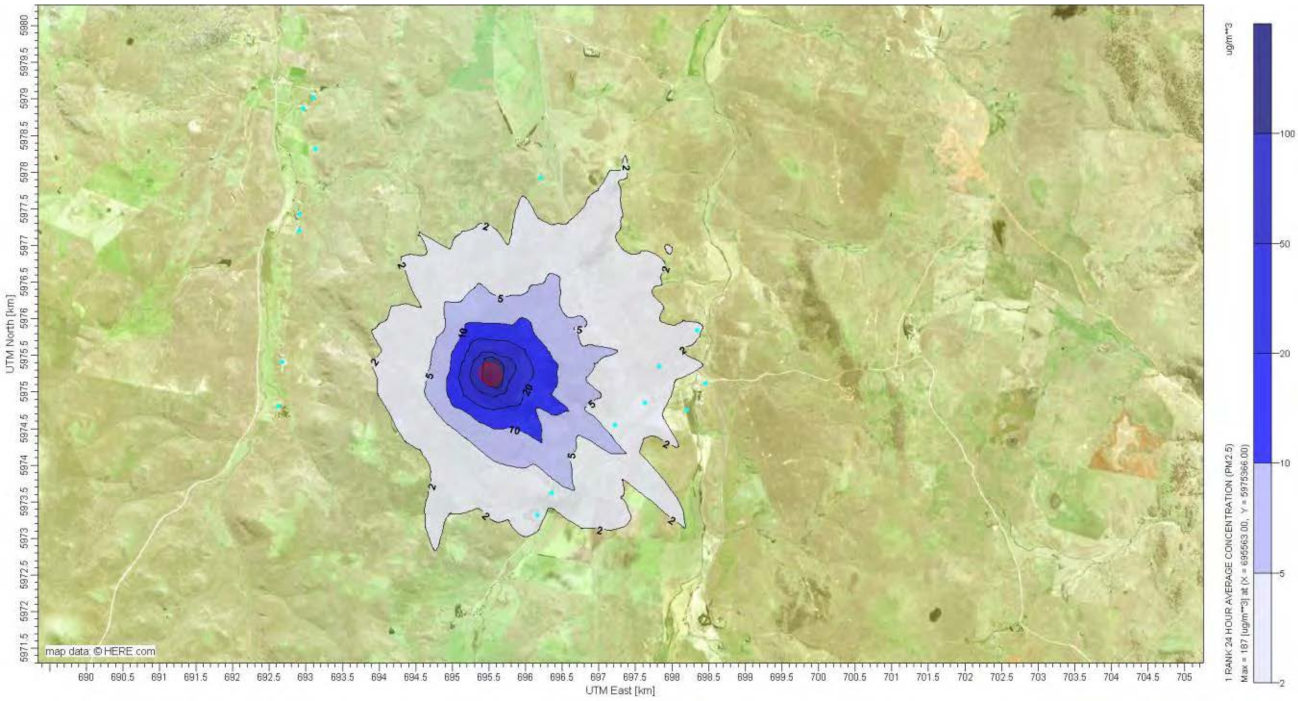
Pollutant: PM10	Averaging Period: 24 Hour	Percentile: 100th	Criteria: 50 µg/m³

Comment:
Incremental. Approximate pit location shown in red.



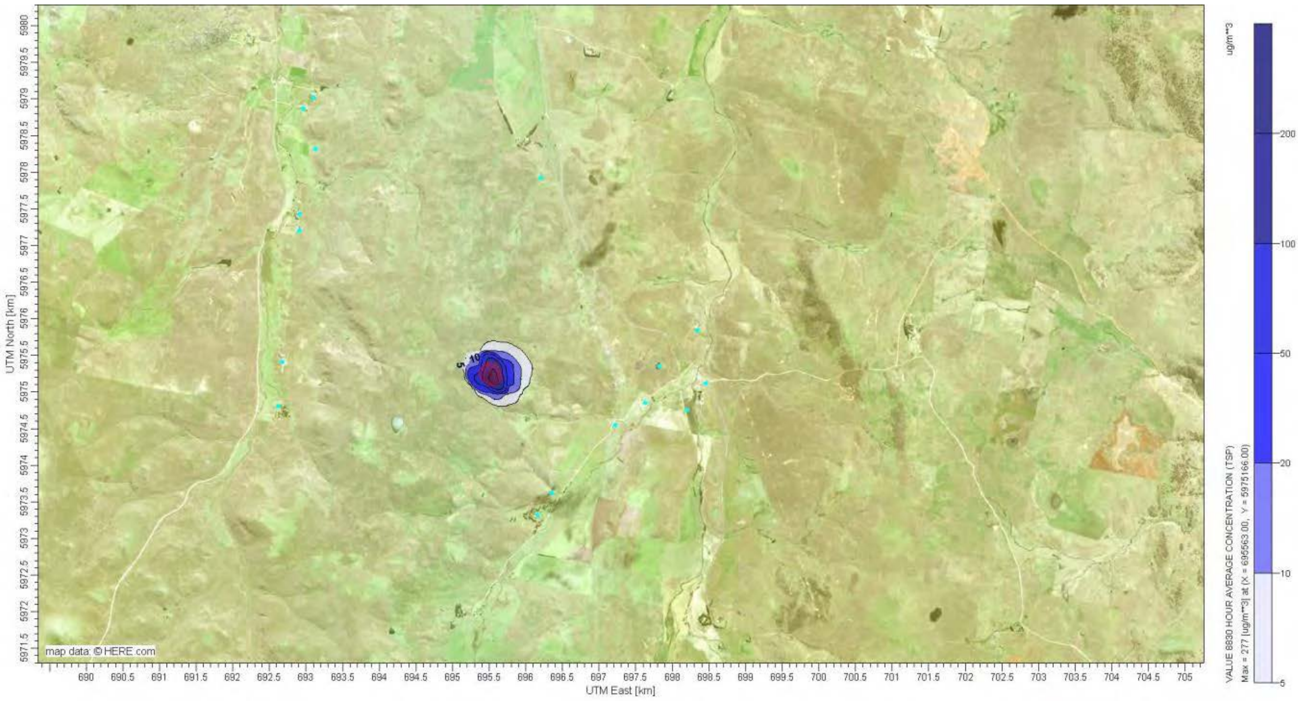
Pollutant:	Averaging Period:	Percentile:	Criteria:
$PM_{2.5}$	Annual	100th	8 µg/m³

Comment:
Incremental. Approximate pit location shown in red.



Pollutant: PM2.5	Averaging Period: 24 Hour	Percentile: 100th	Criteria: 25 µg/m³

Comment:
Incremental. Approximate pit location shown in red.



Pollutant:	Averaging Period:	Percentile:	Criteria:
TSP	Annual	100th	90 µg/m³

Comment:
Incremental. Approximate pit location shown in red.

WATER MANAGEMENT REPORT
ROCK FLAT QUARRY

PREPARED FOR
SQ LICENCES PTY LTD & SCHMIDT QUARRIES PTY LTD

FEBRUARY 2018

• Civil, Environmental & Structural Engineering • Surveying • Environmental • Planning • Architecture

ROCK FLAT QUARRY

WATER MANAGEMENT REPORT

PREPARED FOR:

SQ LICENSES PTY LTD AND SCHMIDT QUARRIES PTY LTD

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Report Title:	*Rock Flat Quarry*
Project:	*Water Management Report*
Client:	*SQ Licenses Pty Ltd and Schmidt Quarries Pty Ltd*
Report Ref.:	*217458_REO_002A.docx*
Status:	*Final*
Issued:	*5 February 2018*

Geolyse Pty Ltd and the authors responsible for the preparation and compilation of this report declare that we do not have, nor expect to have a beneficial interest in the study area of this project and will not benefit from any of the recommendations outlined in this report.

The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

All data and calculations contained within this report is prepared for the exclusive use of SQ Licenses Pty Ltd and Schmidt Quarries Pty Ltd to accompany this report for the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes apart from those stated therein.

Geolyse Pty Ltd accepts no responsibility for any loss, damage suffered or inconveniences arising from, any person or entity using the plans or information in this study for purposes other than those stated above.

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1.0 INTRODUCTION

1.1 BACKGROUND

Geolyse was engaged by Outline Planning Consultants Pty Ltd to prepare a Water Management Report for the site of the proposed hard rock quarry, in Rock Flat NSW 2630, (the site) as a component of an Environmental Impact Statement (EIS) to address the 'Secretary's Environmental Assessment Requirements' (SEARs) for the proposed operation; specifically:

- *An detailed operational site water balance and an assessment of any volumetric water licencing 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 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 the potential impacts on the quality and quantity of surface and groundwater 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.*

The subject site is identified as lots 62, 76, 78, 106 and 120 in deposited plan (DP) 750540.

The site has a total area of approximately 380 hectares and largely consists of pasture / cropping farmland, whilst an unnamed hillock with a circular footprint of approximately 350 m diameter is present on the site. SQ Licenses are proposing to quarry this hillock for hard rock aggregate.

The site is located in a generally rural area within the locale of Rock Flat and approximately 13.4 km south of the NSW township of Cooma. Rural land-uses surround the site. The Monaro Highway is located approximately 1.7 km north-east of the investigation area, whilst the currently disused Goulburn-Bombala Rail Line is aligned approximately 1.5 km north-east of the investigation area.

An existing spring exists approximately 120 m to the SW of the quarry site at an approximate RL of 983 mAHD.

The site area is presented below on **Figure 1**.

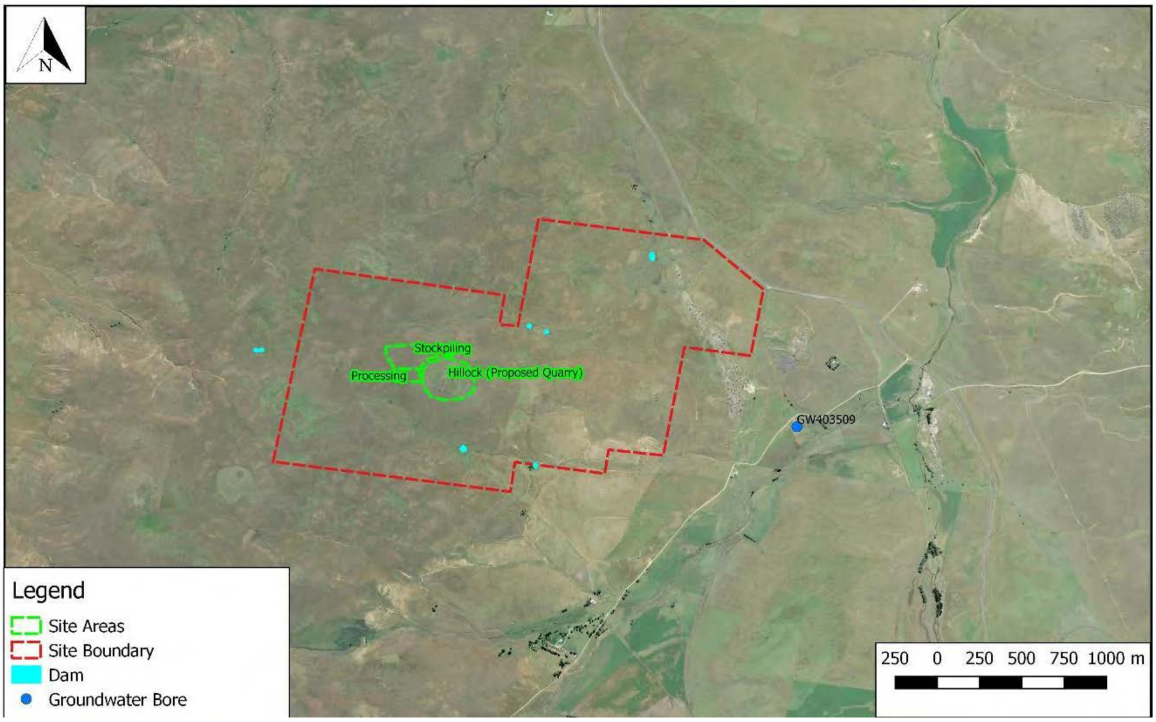

Figure 1: Site Layout

1.2 WATER PLANNING CONTEXT

The following NSW Government authorities have provided requirements for the project for consideration in the EIS:

- Secretary of the Department of Planning & Environment (DP&E) – SEARs;
- Environment Protection Authority (EPA); and
- Office of Environment and Heritage;

All of the authorities' requirements have been addressed in the report below. The SEARs requirements have been addressed as shown in **Table 1.1** below.

Table 1.1 – SEARs

Surface and Groundwater Requirements	Section of Report
• *An detailed operational site water balance and an assessment of any volumetric water licencing 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;*	Sections 3.0, 5.0, 7.0.
• *Identification of any licensing requirements or other approvals required under the Water Act 1912 and/or Water Management Act 2000;*	Section 7.0
• 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);	Sections 3.0, 5.0, 7.0

Table 1.1 – SEARs

Surface and Groundwater Requirements	Section of Report
• *A description of measures proposed to ensure the development can operate in accordance with the requirements of any relevant Water Sharing Plan or water source embargo;*	Sections 3.0, 5.0, 7.0
• *An assessment of activities that could cause erosion or sedimentation issues, and the proposed measures to prevent or control these impacts;*	Sections 3.0, 6.0
• *An assessment of any likely flooding impacts of the development;*	Section 6.0
• *An assessment of the potential impacts on the quality and quantity of surface and groundwater resources, including a detailed assessment of proposed water discharge quantities and quality against receiving water quality and flow objectives;*	Section 6.0
• *A detailed description of the proposed water management system, water monitoring program and other measures to mitigate surface and groundwater impacts.*	Section 3.0, 7.0

1.3 POTENTIAL WATER RESOURCE IMPACTS

The key features of the project that have the potential to impact upon water resources include:

- The quarry operations including drilling and blasting, excavation, transport and processing and haulage of material off site;
- The requirement for water at the quarry for processing of material and dust suppression;
- Construction of additional infrastructure including sediment basins; and
- Rehabilitation of disturbed areas post operational phase until vegetation is established.

2.0 EXISTING SURFACE WATER ENVIRONMENT

2.1 CLIMATE DATA

The quarry site is located just south of the township of Cooma in southern NSW. The nearest Bureau of Meteorology (BoM) station to the site is Cooma Visitors Centre (Site Number 070278), located approximately 15km away, which records rainfall however does not record evaporation. A summary of the monthly rainfall data is provided in **Table 2.1** below.

Table 2.1 – Rainfall Data

Month	Mean Rainfall (mm)	Decile 5 (Median) Rainfall (mm)
January	58.1	46.7
February	60.2	45.1
March	58.5	47.2
April	40.1	24.4
May	29.7	21.0
June	40.6	19.4
July	28.1	20.2
August	27.4	23.8
September	34.9	32.2
October	44.8	38.1
November	64.6	64.5
December	56.3	51.0
Annual	548.4	561.5

Source: Bureau of Meteorology Station 070278

The rainfall data in **Table 2.1** shows a summer dominant pattern with the mean November rainfall (64.6mm) being more than twice that of the months of May, July and August (29.7, 28.1 and 27.4mm respectively). The highest daily rainfall also occurred during January (134.6mm). It is noted that on average there is only 6.1 days per year of rainfall greater than 25 mm. The average and median monthly rainfall figures for Station 070278 are shown in **Figure 2** below.

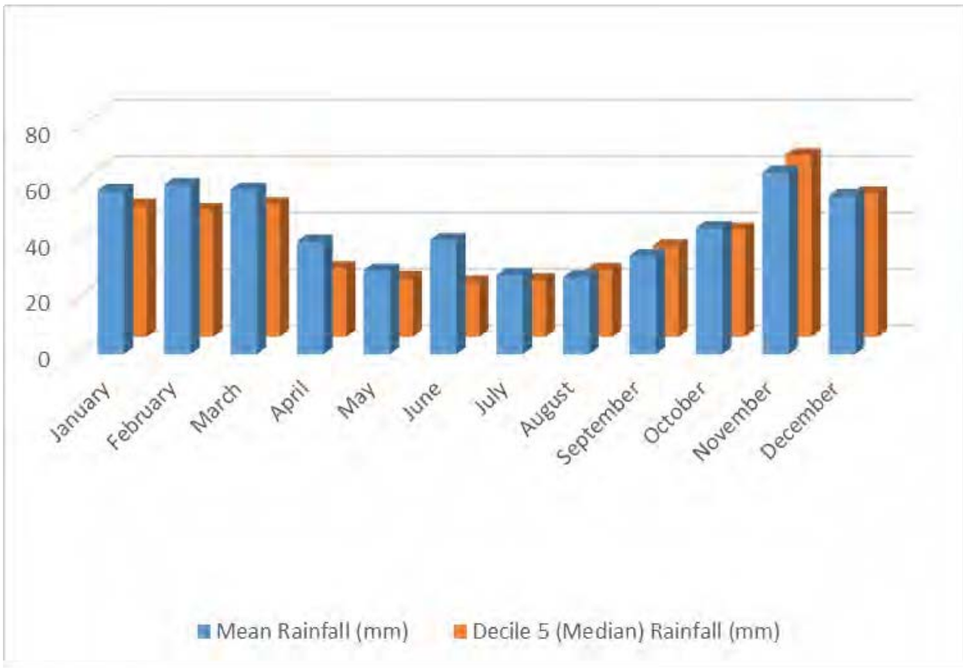

Figure 2: Monthly Rainfall Data for Station 070278 (mm)

Daily evaporation is not recorded at Station 070278 or any of the other nearby BoM stations. However, SILO data was obtained for the purposes of the water balance modelling. The SILO data shows that the average daily evaporation for the site is 3.2 mm.

The SILO average monthly evaporation figures the site are shown in **Table 2.2** below.

Table 2.2 – Evaporation Data

Month	Mean Evaporation
January	183
February	144
March	119
April	73
May	42
June	27
July	32
August	50
September	78
October	114
November	143
December	169
Annual	1,176

Source: SILO

Maximum evaporation occurs in December and January as expected. The average annual evaporation for the station is 1,176 mm. With an average annual rainfall of 548 mm there is an average annual rainfall deficit of 628 mm. Assuming evaporation from a waterbody is 74% of pan evaporation (as recorded for SILO data) the deficit is reduced to 322 mm. The mean monthly evaporation figures are shown in **Figure 3** below.

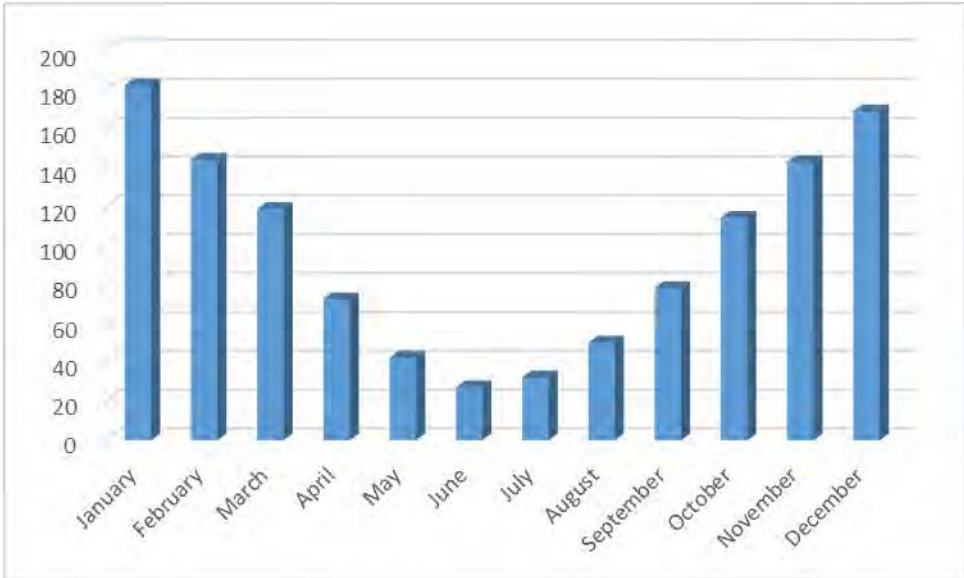

Figure 3: Mean SILO Monthly Evaporation Data (mm)

2.2 SURFACE WATER CATCHMENTS

The topography of the site is undulating with an irregular ridge-line present in a general west-east alignment across the site. The ridge-line feature results in the gradient sloping north in the northern portion of the site and sloping south in the southern portion of the site. The highest location of the site is the peak of the hillock, which rises to an approximate elevation of 1,035 metres Australian Height Datum (mAHD). The unnamed hillock has a circular footprint of approximately 350 m diameter and forms the proposed quarry area.

Ephemeral drainage features are located to the north and south of the site area and are tributaries of Rock Flat Creek and Spring Creek, respectively. Farm dams are associated with these drainage features.

The topography of the surrounding area and existing drainage lines are shown in **Figure 4** below.

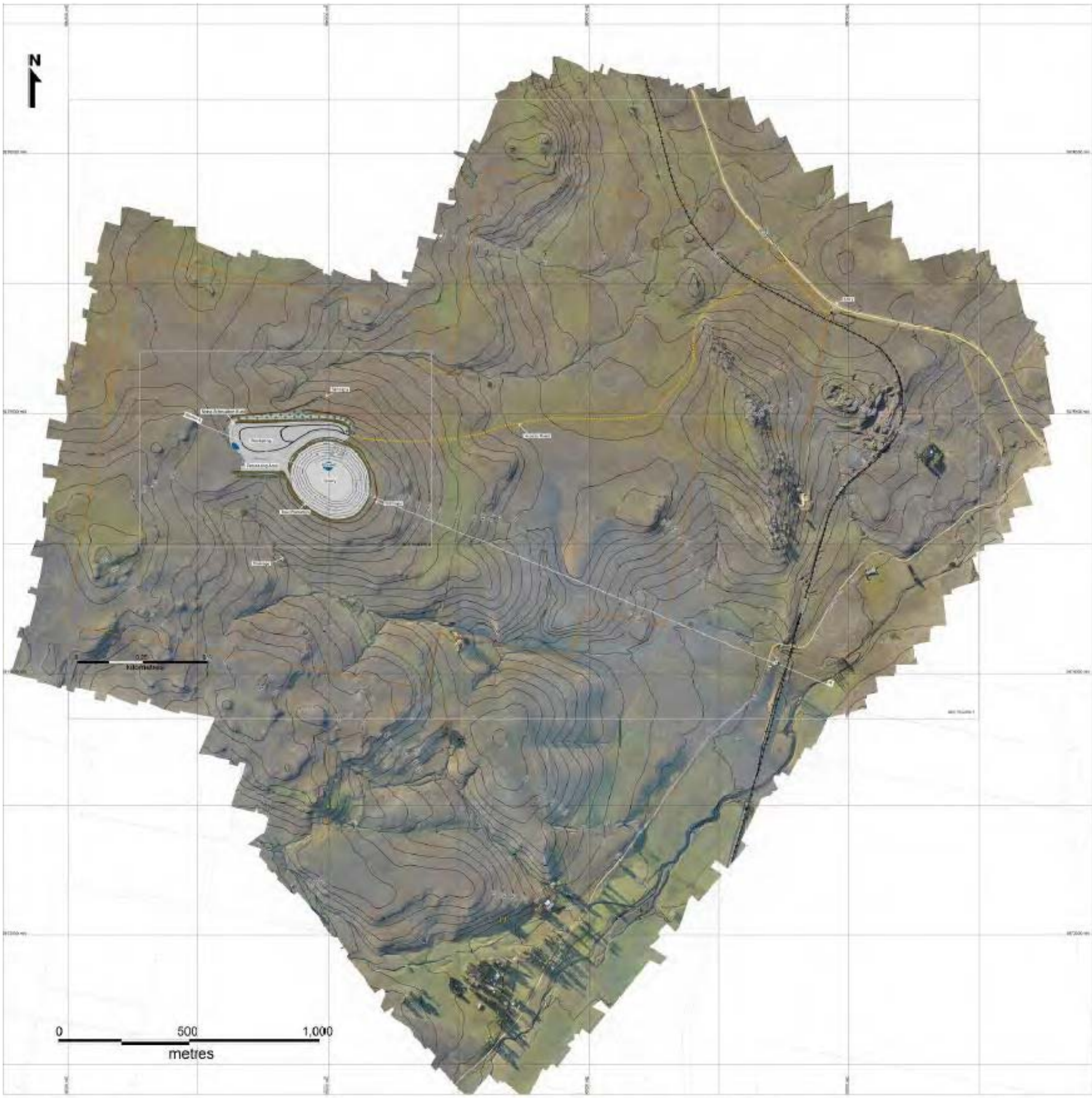

Figure 4: Surrounding Topography

The site is located in an elevated position surrounded by very undulating terrain with nearby drainage lines. Currently, surface water runoff from the site will discharge into the adjacent farming land and into the nearby drainage lines which follow the topography in an easterly direction.

2.3 WATER QUALITY

The proposed quarry is located on pasture grazing/cropping land and is surrounding by similar land uses. No existing surface water quality data was available for the quarry site or surrounding land.

2.4 WATER QUANTITY

The site sits at a natural high point in the topography and as such runoff from the site is at the headwater of the ephemeral drainage lines to the north and south of the site. Due to the location of the site at the natural highpoint surface water flows within the nearby drainage lines will be limited and will have no impact on the site. No records exist for the nearby ephemeral drainage lines.

The Cooma- Monaro Local Environmental Plan 2013 does not contain Flood Planning Maps. A search of Flood Studies was undertaken and the nearest Flood Study is for the township of Cooma which is located at an elevation of 800 mAHD. The location of the site at an elevated position at the top of the catchment of ephemeral drainage lines demonstrates that the site is not subject to flooding.

2.5 WATER USE

The site is not directly linked to any existing watercourses and as such relies on surface water runoff from the site for operational and dust suppression requirements. Collected water will be reused within the site and as such no extraction of surface water outside of the controlled area or groundwater will be undertaken. As a result a water extraction licence is not required for the project.

The site is located within the following water sharing plan areas:

- Murrumbidgee Regulated River;
- Murrumbidgee Unregulated and Alluvial;
- NSW Murray-Darling Basin Fractured Rock Groundwater under the Murrumbidgee Water Management Area; and
- NSW Murray-Darling Basin Porous Rock Groundwater under the Murrumbidgee Water Management Area.

3.0 PROPOSED WATER MANAGEMENT SYSTEM

3.1 OVERVIEW

The proposed Rock Flat Quarry will construct water management infrastructure on the site to cater for the proposed development. The basis of the water management strategy is as follows:

- Clean water diversion drains will be installed upslope of any disturbed areas to divert clean water away from the quarry. The clean water diversion drains will be amended as required as the quarry area expands into the proposed areas to ensure clean water is diverted away from disturbed areas;
- Dirty water catch drains will be installed on the perimeter of disturbed areas to channel all dirty water to the proposed sediment basins;
- Sediment basins will be located as shown in **Figure 5**. One sediment basin will collect dirty water from the infrastructure area (processing and stockpile areas) and the second will be located in the footprint of the quarry area once the floor level of the quarry is below the level of the infrastructure area; and
- During the initial quarry excavation dirty water will be drained to the infrastructure area.

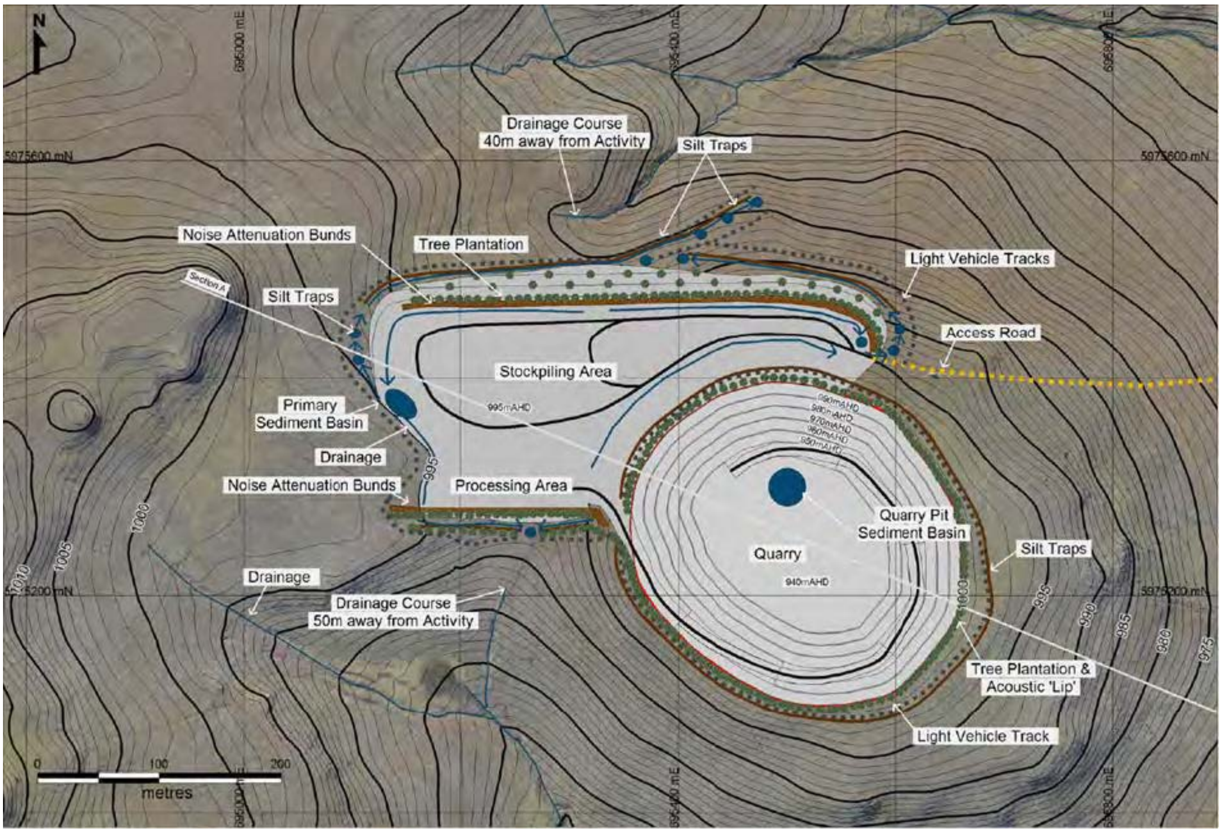

Figure 5: Proposed Quarry Area Layout

The key features of the water management system are shown in **Figure 5** above.

3.2 WATER MANAGEMENT SYSTEM DESIGN

3.2.1 Clean Water Diversion Drains

Clean water diversion drains will be designed to divert clean water away from disturbed areas and be discharged at appropriate locations with adequate scour protection to prevent erosion occurring. The clean water diversion drain catchments are relatively small. Once crest of the hillock is removed and excavations proceed below current surrounding ground levels the need for clean water diversion drains will be reduced. The proposed contours for the fully developed site can be seen in **Figure 5** above.

The clean water diversion drain will be designed to convey the 1 in 20 year Average Recurrence Interval (ARI) peak flow from the catchment upstream of it in accordance with *Managing Urban Stormwater- Soils and Construction- Volume 2E Mines and Quarries* (DECC, 2008).

The clean water diversion drain will be constructed prior to any quarry expansion works and will be amended as required as the expansion progresses to ensure clean water from upslope areas is diverted away from disturbed areas.

3.2.2 Dirty Water Catchment Drains

The dirty water catchment drains will be designed to collect and convey all runoff from disturbed areas and convey it to the sediment basins. The dirty water catchment drains will be designed to convey the 1 in 20 year (ARI) peak flow in accordance with *Managing Urban Stormwater- Soils and Construction- Volume 2E Mines and Quarries* (DECC, 2008).

Dirty water collection drains will also have rock check dams installed where longitudinal gradients exceed 5% to minimise scouring of the channels during storm events.

The dirty water collection drains will be constructed prior to any quarry expansion works to enable all dirty water generated on site to be collected and conveyed to the infrastructure area sediment basin.

3.2.3 Sediment Basins

The sediment basins will be constructed to collect and treat dirty water runoff from the disturbed areas of the site with sufficient capacity to contain the 1 in 20 year Average Recurrence Interval (ARI) peak flow from the catchment upstream of it in accordance with *Managing Urban Stormwater- Soils and Construction- Volume 2E Mines and Quarries* (DECC, 2008). The sediment basin will be sized to include a minimum dry period storage of 20 ML to ensure adequate water is available for operational requirements during extended dry periods.

The infrastructure area sediment basin will be constructed prior to any quarry expansion works to allow all dirty water generated on site to be collected and treated. Water collected in the infrastructure area sediment basin will be used for process water, dust suppression on the haul road, processing area and quarry floor.

Sediment Basin Sizing

The capacity of the proposed sediment basins to control expected sediment loads was determined using guidelines provided in *Managing urban stormwater: soils and construction* (Landcom, 2004) and *Volume 2E Mines and quarries* (DECC, 2008).

Consistent with Section 6.1 of *Volume 2E Mines and quarries* (DECC, 2008) the following default parameters were adopted:

- Type D soil classification
- Soil hydrologic group D
- Erodibility (K-factor) of 0.05

Infrastructure Area Basin

A 95th percentile 5-day design criteria was adopted (39.1mm for Cooma; Table 6.3a (Landcom, 2004)).

The required sediment basin volume was determined as:

V = settling zone + sediment storage zone

The settling zone was calculated in accordance with the equation provided in Section 6.3.4(i) of *Managing urban stormwater: soils and construction* (Landcom, 2004) using the adopted default parameters. The capacity of the sediment storage zone was calculated as 50% of the settling zone volume.

The infrastructure area catchment is 6.18 ha, however during the initial stage of the project some of the quarry area will drain to the infrastructure area basin. An allowance of 2 ha has been made for the initial stage of the quarrying draining to the infrastructure area basin. Therefore A = 8.16 ha.

Settling Zone = 10 x Cv x A x R

= 10 x 0.64 x 8.16 x 39.1

SZ = 2,042 m^3

Storage Zone = 50% of SZ

= 1,021 m^3

Total Volume = Settling Zone + Storage Zone

= 3,063 m^3

The calculated total infrastructure area sediment basin storage capacity was 3,063 m^3.

Quarry Area Basin

A 95th percentile 5-day design criteria was adopted (39.1mm for Cooma; Table 6.3a (Landcom, 2004)).

The required sediment basin volume was determined as:

V = settling zone + sediment storage zone

The settling zone was calculated in accordance with the equation provided in Section 6.3.4(i) of *Managing urban stormwater: soils and construction* (Landcom, 2004) using the adopted default parameters. The capacity of the sediment storage zone was calculated as 50% of the settling zone volume.

The quarry area catchment is 7.03 ha. Therefore A = 7.03 ha.

Settling Zone = 10 x Cv x A x R

= 10 x 0.64 x 7.03 x 39.1

SZ = 1,759 m^3

Storage Zone = 50% of SZ

= 880 m^3

Total Volume = Settling Zone + Storage Zone

= 2,638 m^3

The calculated total quarry area sediment basin storage capacity was 2,638 m^3.

3.2.4 Final Landform

The final excavation landform of the quarry is shown by contours in **Figure 6** below. Following completion of quarrying activities the processing and stockpiling areas will be backfilled with stockpiled overburden and topsoiled and revegetated. The final landform of the processing and stockpiling areas will be shaped to slow runoff and allow vegetation to establish to create a stable vegetated surface that produces clean runoff. The dirty water catchment drains and sediment drains will be maintained on the site until at least the site revegetation has fully established and no dirty water runoff is occurring. The final landform will be shaped to create a free draining surface with collection in the sedimentation basins. The main pit area will retain its final form without backfilling.

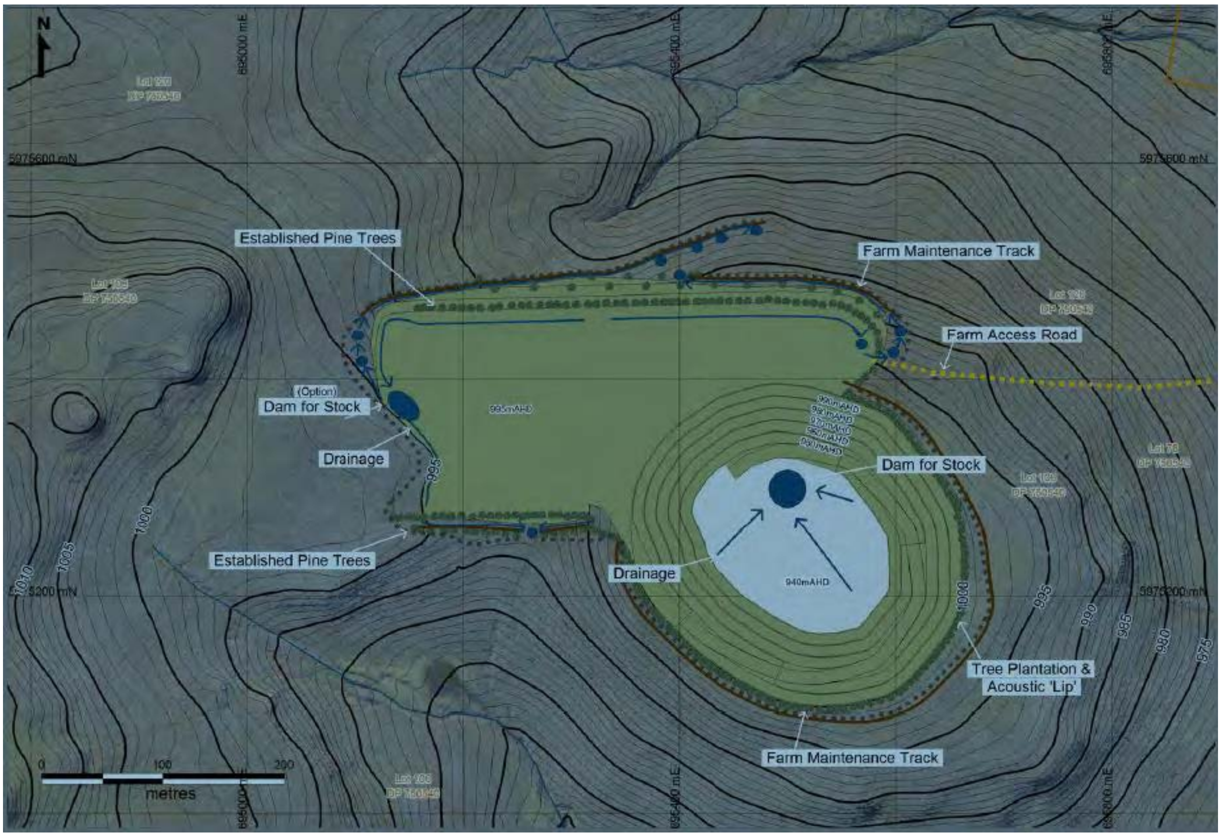

Figure 6: Quarry Rehabilitation Plan

4.0 GROUNDWATER

No groundwater sampling or modelling has been undertaken for the site, however a Stage 1 Contaminated Site Investigation- Assessment of Potential Site Contamination for the site has been prepared by Geolyse (Ref: 217458_REO_001B) which investigated available groundwater related information. The investigation obtained the following information.

"The geology of the site, based on profiling data of excavations provided by Outline Planning, is described as "stony (basalt rock) reddish brown upper soil horizon with lighter clay horizon below, trending back into stony soil at depth"

A search for registered groundwater users located within a 500 m radius of the site did not identify water bearing zones less than 10 m below ground level. A drilling investigation did not identify groundwater to be present within or surrounding the area of the proposed quarry pit."

It is not proposed to extract groundwater for use within the quarry and all surface water will be managed on site to avoid any interaction with groundwater.

4.1 MONITORING

It is not proposed to install and groundwater monitoring points in the vicinity of the site as there is minimal risk for release of contaminants that may impact groundwater and groundwater levels are well below the proposed quarry areas.

5.0 WATER BALANCE

A daily water balance model was used to assess the overall water cycle for the quarry operations. The model uses 127 years of daily SILO rainfall and evaporation data for the site (1 January 1889 to 31 December 2015). The SILO data interpolates rainfall and evaporation values from surrounding climate stations to provide a long term data set for the specific location.

The water cycle is broken down into its various components and then the inflows and outflows are modelled for each section.

Storage Inflows

- Sediment basins – receive runoff the contributing catchments;;
- Quarry pit – receive runoff from the internal quarry pit area; and
- All open storages receive direct rainfall input.

Storage Outflows

- Sediment basins – water for dust suppression and process water;
- Spill from infrastructure area sediment basin (not the quarry basin as water cannot escape without being pumped); and
- Evaporation from each of the water storages.

5.1.1 Water Demand

Water is used on the site for dust suppression and process water. The following assumptions are used to estimate the demand. Landscape watering was also included in the balance to ensure adequate supplies are available.

Dust Suppression

Water for dust suppression is drawn from ponds around the site and distributed across working areas using a water cart.

Based upon operator usage at other sites the dust suppression demand was estimated assuming 1ML/km/yr of trafficked area. The trafficked area was estimated to be 2.9 km which includes the haul road from the Monaro Highway and operational areas. The dust suppression requirement was therefore estimated to be 2.9ML/yr on average. The actual dust suppression demand will vary dependent upon the prevailing climatic conditions.

Process Water

Process water is used for dust suppression on screens and conveyors and to add moisture to the product for processing.

Process water requirements vary depending upon the product being generated. The moisture content of the products being generated on the site is:

- 1.5% for aggregate;
- 6% for crusher dust; and
- 6% road base.

The expected quarry output in a normal year is expected to be 150,000 tonnes of product, of which 20% is crusher dust and road base, with the remaining 70% being aggregate. The maximum production from the quarry will be 280,000 tonnes when a major project occurs (56,000 tonnes of crusher dust and roadbase, 224,000 tonnes of aggregate).

Process water requirements for a normal year will therefore be approximately 6.5 ML whilst in a maximum production year the requirement will increase to 9.62 ML.

5.1.2 Water Sources

All water used on the site for processing and dust suppression will be sourced from the sediment basins.

5.1.3 Water Quality

Water for dust suppression and process water is supplied from the sediment basins – there are no quality limits for this reuse. Therefore no specific water treatment processes are required.

5.1.4 Domestic Water and Wastewater

Potable supplies for staff use will be provided by bottled water. Non-potable supplies will be provided by on site rainwater tanks as required.

Portable amenities will be provided with wastewater removed off-site.

5.2 WATER BALANCE RESULTS

The water balance was run for the fully developed scenario with a normal processing volume and with the maximum processing volume to check that adequate processing water is available. During the initial stages of the project (Stage 1) when the top of the hillock will be removed we assumed that all runoff from the hillock quarry area is within the controlled area and would be collected in the infrastructure area sediment basin via gravity drainage. For Stage 1 a catchment area of 8.18 ha was assumed. Once the hillock is removed and quarrying proceeds below the level of the processing area runoff with be collected in the quarry sediment basin. The total catchment area in the fully developed case is 13.21 ha.

For the fully developed and Stage 1 cases an assessment was undertaken of the 10 %ile, 50 %ile and 90 %ile rainfall years taken from the daily rainfall records for the whole water management system. A summary of the water balance modelling is shown in **Table 5.1** below.

Table 5.1 – Water Balance Results

Rainfall Year	Catchment Runoff+ Pumping from Quarry Basin	Basin Evaporation (both basins)	Basin Direct rainfall (both basins)	Process Water	Dust Suppression	Balance
Fully Developed Case						
Average	19.44	10.04	6.87	3.61	2.90	9.76
10 %ile	23.44	6.09	3.99	3.61	2.90	14.83
50 %ile	25.3	7.92	5.63	3.61	2.90	16.50
90 %ile	29.4	8.46	8.90	3.61	2.90	23.33
Stage 1						
Average	13.32	6.54	4.02	3.61	2.90	4.29
10 %ile	10.81	5.20	2.49	3.61	2.90	1.59
50 %ile	12.40	6.52	3.93	3.61	2.90	3.30
90 %ile	19.59	5.81	5.54	3.61	2.90	12.81

The water balance modelling showed the following:

- There is adequate capacity in the site surface water management system to supply the water demands across the site during normal operating years. This indicates there is adequate water on site to ensure effective dust control.
- The spill frequency from the infrastructure area sediment basin exceeds design requirements. Table 6.2 in Volume 2E (DECC, 2008) indicates that the indicative average annual sediment basin overflow frequency for a 95th percentile design criteria is 1-2 spills/year. The water balance shows that the proposed sediment basin spills on average once every 1.0 years.

It is concluded from this assessment that the proposed surface water management system can be managed to meet relevant design guidelines.

6.0 SURFACE AND GROUNDWATER IMPACTS AND WATER MANAGEMENT METHODS

6.1 GROUNDWATER

A preliminary site investigation and review of available bore data shows that groundwater levels are at depths greater than 10 m below current site levels. It is not proposed to extract groundwater for use in the development and there is minimal risk of contaminants enter groundwater from the development. Therefore there the development is not expected to have any impact on groundwater.

The project was assessed against the NSW Aquifer Interference Policy and as the proposed development is not defined as an aquifer interference activity no further assessment under the Aquifer Interference Policy was required.

6.2 SURFACE WATER

The proposed development was assessed against the NSW Farm Dams Policy and Harvestable Rights Order. As the proposed water management system captures, contains and recirculates drainage and/or effluent that conforms to best management practice and prevents the contamination of downstream watercourses the proposed sediment basins are exempt from the Harvestable Rights calculation.

The proposed quarry footprint is located a minimum of 40 m away from the nearest drainage line and hence is not considered an integrated development relating to water.

6.3 WATER QUALITY

The water management measures detailed in **Section 3.0** of this report demonstrate how water will be managed on the site and will prevent any uncontrolled discharges of runoff from disturbed areas.

The proposed sediment basins have been sized for erosion and sedimentation requirements, however the final design volume has been dictated by the requirement to contain additional water to buffer during extended dry periods.

The water balance shows that the site can be operated without exceeding the discharges from the site as specified in *Managing Urban Stormwater- Soils and Construction Volume 2E Mines and Quarries* (DECC, 2008).

The following key features of the water management system are proposed:

- Clean water from upslope areas will be diverted away from disturbed areas;
- Runoff from disturbed areas will be collected and conveyed to the sediment basins;
- Oil spillages will be dealt with via on-site treatment systems; and
- Sewage will be collected and removed off site.

Using the water management strategies outlined in **Section 3.0** the proposed development can be operated with no impact on water quality.

6.4 DOWNSTREAM WATER USERS

There are no direct downstream water users from the proposed development site. The site is not directly linked to any drainage lines and hence any the development will not impact any downstream water users.

6.5 RIPARIAN AND ECOLOGICAL VALUES OF THE WATERCOURSES

The site is not directly linked to any riparian areas or watercourses and the proposed water management measures will ensure that no uncontrolled discharges occur from disturbed areas. Hence the proposed development will not have any impact on the riparian and ecological and values of watercourses.

6.6 ENVIRONMENTAL FLOWS

The site is not linked directly to any drainage lines. The nearest drainage lines are ephemeral and discharges to these drainage lines will be controlled. The proposed development will not have any impact on watercourses that rely on environmental flows.

6.7 FLOODING

The proposed development will change the landform of the site, however the changes to catchments will be limited. During the construction and operation phases the site will control discharges from disturbed areas. The final landform of the processing and stockpile areas post operation phase will be revegetated to a similar state as that exists currently. Therefore the site will have no impact on flooding.

6.8 EROSION AND SEDIMENT CONTROL MEASURES

The nature of the proposed development increases erosion and sediment loads in runoff due to the disturbance of currently vegetated areas and use of unsealed areas through the construction and operation phases. The proposed erosion and sediment control measures for the construction and operational phases are detailed further below.

6.8.1 Construction Phase

The construction phase erosion and sediment control measures will be constructed and maintained in accordance with relevant guidelines including the relevant volumes of the Blue Book, as follows:

- Landcom, 2004. Managing Urban Stormwater – Soils and Construction, Volume 1, 4th Edition.
- Department of Environment and Climate Change (DECC), 2008. Managing Urban Stormwater – Soils and Construction, Volume 2A- Installation of Services.
- DECC, 2008. Managing Urban Stormwater – Soils and Construction, Volume 2C- Unsealed roads.
- DECC, 2008. Managing Urban Stormwater – Soils and Construction, Volume 2D- Main Road Construction.
- DECC, 2008. Managing Urban Stormwater – Soils and Construction, Volume 2E- Mines and Quarries.

The specific erosion and sediment control strategies to be constructed and maintained during the construction phase in order of priority will include:

- Construction of a clean water diversion drain to divert clean water away from future disturbed areas;
- Construction of the infrastructure area sediment basin;
- Construction of dirty water collection drains;
- Use of sediment fences, rock check dams and other appropriate measures to minimise and contain erosion and sediment as required;
- Ongoing inspection and maintenance of installed erosion and sediment measures, especially following rainfall events.

- Use of appropriate erosion and sediment control measures during the construction of the intersection on the Monaro Highway and haul road. As these areas are outside of the controlled water management area at the quarry they will require particular attention.

All contractors working on the site will be briefed on the required erosion and sediment control measures required for the works they are undertaking.

6.8.2 Operational Phase

During the operation phase erosion and sediment control measures will be amended as required to suit the progression of the works along with ongoing management of the installed key features of the water management system. The site will be managed in accordance with:

- Landcom, 2004. Managing Urban Stormwater – Soils and Construction, Volume 1, 4th Edition.
- DECC, 2008. Managing Urban Stormwater – Soils and Construction, Volume 2E- Mines and Quarries.

Specific erosion and sediment control measures for the operational phase of the project will include:

- Ensuring the location of the clean water diversion drains are appropriate for the current area of works and are amended prior to the following stage of works if required;
- Ensuring the dirty water collection and storage system is operating as intended and is amended to suit the current area of works as required;
- Inspection and maintenance of the sediment basins at regular intervals to ensure adequate capacity is maintained and water quality requirements are complied with during spill events;
- Revegetation of disturbed areas (where possible) and planting around the edge of the area of disturbance; and
- Ensuring completed areas are rehabilitated as soon as is practicable.

6.8.3 Final Landform and Post Operation Phase

The final landform of the quarry will be as shown by the contours in **Figure 6**. The floor of the processing and stockpile areas will be backfilled with stockpiled overburden with a layer of topsoil to allow vegetation to establish. The topsoil layer will be shaped to provide a free draining surface with no depressions that will retain water. A minimum slope of 0.5% is recommended for the final landform to ensure the site remains fee draining. The main pit will retain its final form without backfilling.

The final landform will be revegetated to match the existing vegetation types on the undisturbed areas of the site and hence the surface water runoff regime of the fully revegetated site will closely match that of the existing site.

The water management system will remain in place and will be maintained until the site has stabilised and is fully revegetated (excluding exposed rock areas). Monitoring of the site post operations will ensure that discharges from the site are controlled until the surface water runoff quality meets required criteria.

6.8.4 Summary of Potential Impacts

The nature of the proposed development results in the increased chance of impacts on downstream water quality. However the assessment of the site relating to water indicates the following:

- The location of the site relative to drainage lines means that site runoff can be contained and discharges controlled reducing the likelihood of impacts on downstream watercourses;
- The implementation of the proposed water management system will ensure that all site discharges are controlled and treated prior to release, with a low risk of impacting downstream watercourses;
- There is expected to be no impact on groundwater due to the proposed development as the site will not extract groundwater and groundwater is at depths greater than 10 m below current levels;

- No significant change is expected in catchment runoff volume due to the proposed development and flooding risk will not be altered due to the elevated location of the site relative to watercourses;
- Post-closure the site will be rehabilitated with vegetation matching the currently undisturbed areas of the site and hence the surface water runoff regime is expected the closely match that of the current site.

6.8.5 Cumulative Impacts

The site is surrounded by pasture grazing/cropping farmland with the nearest drainage lines north and south of the site. With the proposed water management system installed the proposed development will divert clean water away from disturbed areas and all dirty water will be collected and treated on site prior to release. No significant impact on runoff volume is expected due to the proposed works in the operational phase. The site will be rehabilitated post operations and the fully rehabilitated site will match closely the existing surface water runoff regime.

The development will have no impact on groundwater as no extraction of groundwater is proposed and groundwater levels are at depths greater than 10 m below the existing levels.

7.0 MONITORING, LICENSING AND REPORTING

The monitoring proposed in the Sections below will be detailed in the Surface Water Monitoring Program for the project which will be prepared as part of the implementation of the project.

7.1 MONITORING EROSION AND SEDIMENT CONTROLS

Erosion and sediment controls will be monitored during construction and operation in accordance with the Blue Book (Landcom 2004 and DECC 2008) including regular inspection and inspection after rainfall events. Monitoring schedules will be set out in the Quarry Management Plan.

7.2 WATER BALANCE MONITORING

As part of the water management system SQ Licences will monitor water use on site including imported water, water use, volumes stored and any discharges from the controlled area in accordance with NOW reporting requirements.

7.3 GROUNDWATER MONITORING

No groundwater monitoring is proposed for the development.

7.4 SURFACE WATER MONITORING

Surface water monitoring for the development will entail the following:

- Monitoring of the water management system will be undertaken monthly and after storm events; and
- Undertake safety and maintenance checks every two years on the embankment of the sediment basins.

7.5 CONTINGENCY MEASURES

The following measures will be used to address potential surface water impacts from unlikely but possible events:

7.5.1 Water Shortages

The water balance modelling shows that sufficient water should be available for processing in the majority of years. There is a risk during extended dry periods that water availability for dust suppression may be reduced. To offset the risk of lack of water availability it is proposed to provide additional storage volume in the sediment basins to buffer extended dry periods.

Should an extended dry period utilise all stored water it is proposed to utilise external water sources which will be trucked to the site in accordance with relevant licences and approvals.

7.5.2 Water surplus

The water balance modelling also shows that during extended wet periods there may be an excess of water surplus to requirements. The water balance modelling shows that the expected number of spills from the infrastructure area sediment basin is lower than that required in Volume 2E of the Blue Book (DECC, 2008).

The proposed water management system will capture and treat surface water runoff from disturbed areas with additional storage capacity within the main quarry pit being utilised.

7.5.3 Unforeseen Failure or Catastrophic Events

In the event of an unforeseen spillage associated with accidental damage, operational failures or extreme catastrophic occurrences, the hazard notification protocols in the proposed Water Management Plan will be followed.

7.5.4 Possible Impacts of Climate Change

The water balance has not specifically evaluated the possible impact of climate change. However, the proposed water management system has been designed with the main water quality treatment component exceeding the capacity required for erosion and sediment control purposes for the site. Hence the water management system has adequate capacity to deal with potential increases in rainfall intensities brought about by climate change.

7.6 DECOMMISSIONING OF THE WATER MANAGEMENT SYSTEM

As part of the decommissioning of the quarry the water management system will be maintained until the site is fully rehabilitated and water quality meets the required objectives.

7.7 LICENCING REQUIREMENTS

7.7.1 Protection of the Environment Operations Act

The proposed quarry expansion will be licenced under the *Protection of the Environment Operations Act 1997* Section 120.

7.7.2 Water Management Act 2000

The following water sharing plans apply to the site:

- Murrumbidgee Regulated River;
- Murrumbidgee Unregulated and Alluvial;
- NSW Murray-Darling Basin Fractured Rock Groundwater under the Murrumbidgee Water Management Area; and
- NSW Murray-Darling Basin Porous Rock Groundwater under the Murrumbidgee Water Management Area.

As a result the surface water of the project area is governed by the *Water Management Act 2000*. All water proposed to be used on-site will be sourced from the quarry's dirty water management system.

Groundwater beneath the project area is governed by the *Water Management Act 2000.* As no groundwater extraction is proposed no licences are required.

7.8 REPORTING

The Annual Environmental Review will report the surface water monitoring results for that year against relevant development consent condition requirements.

8.0 REFERENCES

Department of Environment & Climate Change (2008) *Managing urban stormwater: Soils and construction, Volume 2E Mines and quarries*.

Landcom (2004) *Managing urban stormwater: Soils and construction, Volume 1*.

Received
Snowy Monaro Regional Council
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New South Wales Archaeology Pty Ltd ACN 106044366

Proposed Hard Rock Quarry, 278 Springs Road, Rock Flat, via Cooma

Aboriginal Cultural Heritage Assessment Report

Date: January 2018
Author: Dr Julie Dibden
Proponent: SQ Licenses Pty Ltd & Schmidt Quarries
Local Government Area: Snowy Monaro Regional Council

www.nswarchaeology.com.au

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SUMMARY

This summary presents an overview of the legislative context, proposed development, subject area, study aims, conclusions and recommendations.

The National Parks and Wildlife Act 1974 (NPW Act) is the primary legislation for the protection of some aspects of Aboriginal cultural heritage in NSW. One of the objectives of the NPW Act is:

> *... the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including but not limited to: (i) places, objects and features of significance to Aboriginal people ... (s.2A(1)(b)).*

Part 6 of the NPW Act is administered by the NSW Office of Environment and Heritage (NSW OEH) and provides specific protection for Aboriginal objects and declared Aboriginal places by establishing offences of harm. Harm is defined to mean destroying, defacing or damaging an Aboriginal object or declared Aboriginal place, or moving an object from the land. Anyone proposing to carry out an activity that may harm an Aboriginal object or declared Aboriginal place must investigate, assess and report on harm that may be caused by the activity they propose.

SQ Licenses Pty Ltd and Schmidt Quarries (the proponent) propose to extract and process up to 4.6 million tonnes of rock from the project site encompassed by Lots 62, 76, 78, 106 & 120 in DP 750540 278, Springs Road, Rock Flat, some 15 kilometres southeast of Cooma. New South Wales Archaeology Pty Ltd has been commissioned to undertake an Aboriginal Cultural Heritage Assessment in relation to this proposal.

This assessment has been conducted in accordance with the NSW Office of Environment and Heritage's (NSW OEH 2011) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* and *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW DECCW 2010a).

A process of Aboriginal community consultation has been undertaken in accordance with the guidelines as set out in OEH's *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010b). There are seven Registered Aboriginal Parties (RAPs) in the process of consultation for the project.

The study has sought to identify and record Aboriginal cultural areas, objects or places, to assess the archaeological status of the proposal area, and to formulate management recommendations based on the results of community consultation, background research, field survey and impact assessment.

A search of the NSW OEH Aboriginal Heritage Management Information System (AHIMS) has been conducted for this project (AHIMS Reference: 292605). One Aboriginal object site is listed in the search and is some distance outside and to the south of the subject area.

A field survey for Aboriginal areas, objects and places has been conducted. The subject area was found to have sustained low/moderate impacts as the result of previous agricultural land use. No Aboriginal objects were recorded during the field survey. Generally, the subject area has been found to be of very low to low archaeological sensitivity and potential.

No historic features or values were identified during the assessment.

As a result of the assessment the following conclusions are made:

- There are no identified heritage constraints in regard to the proposal. The subject area is assessed to be of very low heritage potential and significance.
- No further heritage investigations are required.
- No Aboriginal objects are known to be present in the activity area. An AHIP is not required.

Acknowledgments:
Archaeological evidence confirms that Aboriginal people have had a long and continuous association with the region for thousands of years. We would in particular like to acknowledge and pay our respects to the traditional owners of the country which is encompassed by the proposal.

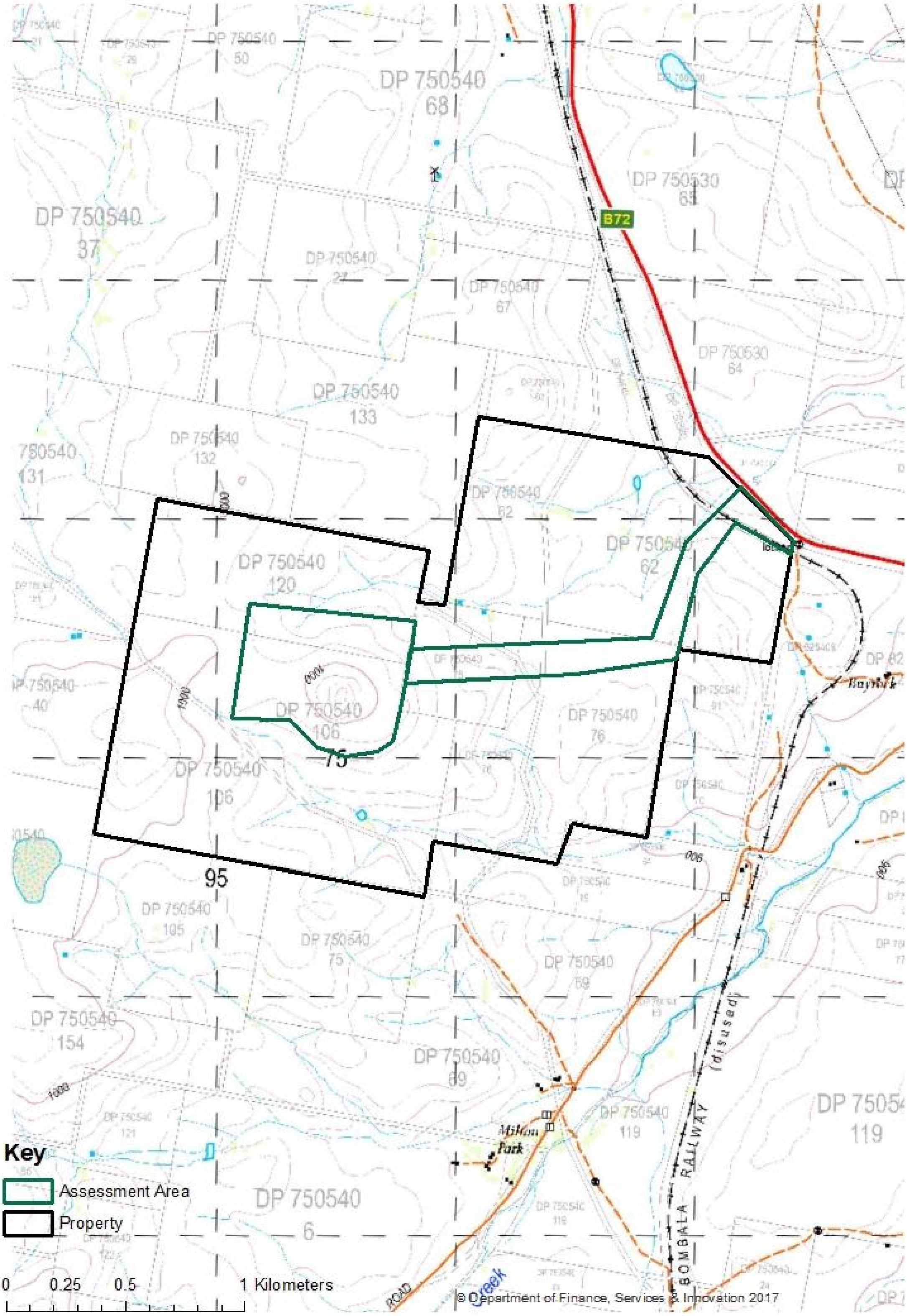

Figure 1 Location of the subject area.

1. INTRODUCTION

This document describes the Aboriginal cultural heritage assessment undertaken in respect of a proposed hard rock quarry at Rock Flat, via Cooma NSW (Figure 1). SQ Licenses Pty Ltd and Schmidt Quarries propose to establish the hard rock quarry at 278 Springs Road, Rock Flat and to extract up to 280,000 tonnes per annum, with a total resource of approximately 4.6 million tonnes.

The subject area is located on the western side of the Monaro Highway, approximately 15 kilometres south of Cooma.

The project is designated local development under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The NSW Department of Planning and Environment has issued the Secretary's Environmental Assessment Requirements (EAR 1129) for the preparation of an Environmental Impact Statement (EIS). Heritage is identified as a Key Issue requiring:

> *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.*

The objective of the cultural heritage assessment is to prepare an ACHAR which would form a component of an Environmental Impact Assessment (EIS).

The content and format of the report is set out in accordance with the NSW OEH (2011) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* document. The report aims to document:

- The Aboriginal objects and declared Aboriginal places (as relevant) located within the area of the proposed activity;
- The cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places that exist across the whole area that will be affected by the proposed activity, and the significance of these values for the Aboriginal people who have a cultural association with the land, as relevant;
- How the requirements for consultation with Aboriginal people have been met (as specified in clause 80C of the NPW Regulation);
- The views of those Aboriginal people regarding the likely impact of the proposed activity on their cultural heritage (if relevant);

- The actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified;
- Any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places (if relevant); *and*
- Any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm, or, if this is not possible, to manage (minimise) harm (if relevant).

This project has been undertaken by Julie Dibden (Australian National University: BA with Honours; PhD) and Andrew Pearce (BA Archaeology and Paleoanthropology), NSW Archaeology Pty Ltd. Field assistance was provided by Eric Naylor, Merrimans Local Aboriginal Land Council.

2. DESCRIPTION OF THE AREA

In this section, background and relevant contextual information is compiled, analysed and synthesized. The purpose of presenting this material is to gain an initial understanding of the cultural landscape; the following topics are addressed (*cf*. OEH 2011: 5):

- The physical setting or landscape;
- History of peoples living on that land; *and*
- Material evidence of Aboriginal land use.

2.1 The Physical Setting or Landscape

Aboriginal people have occupied NSW for more than 42,000 years (Bowler *et al.* 2003). Evidence and cultural meanings relating to occupation are present throughout the landscape (NSW OEH 2011: iii).

A consideration of landscape is particularly valuable in archaeological modelling for the purposes of characterising and predicting the nature of Aboriginal occupation across the land. In Aboriginal society, landscape could be both the embodiment of Ancestral Beings and the basis of a social geography and economic and technological endeavour. The various features and elements of the landscape are/were physical places that are known and understood within the context of social and cultural practice.

Given that the natural resources that Aboriginal people harvested and utilised were not evenly distributed across landscapes, Aboriginal occupation and the archaeological manifestations of that occupation will not be uniform across space. Therefore, the examination of environmental context is valuable for predicting the type and nature of archaeological sites which might be expected to occur. Factors that typically inform the archaeological potential of landscape include the presence or absence of water, animal and plant foods, stone and other resources, the nature of the terrain and the cultural meanings associated with a place.

Additionally, geomorphological and humanly activated processes need to be defined as these will influence the degree to which material evidence may be visible and/or conserved. Land which is heavily grassed and geomorphologically stable will prevent the detection of archaeological material, while places which have suffered disturbance may no longer retain artefacts or stratified deposits. A consideration of such factors is necessary in assessing site significance and formulating mitigation and management recommendations. The following information describes the landscape context of the subject area.

The subject area property consists of Lots 62, 76, 78 106 and 120 of DP 750540 in the Parish of Gladstone, County of Beresford, in the local government area of the Snowy Monaro Regional Council. It is located approximately 15 kilometres southeast of Cooma. The location is shown on Figure 1.

The area is situated on the Monaro and is part of the Eastern Uplands of southeastern Australia (Jennings and Mabbutt 1977). The Eastern Uplands consists of a wide plateau which extends from the coastal escarpment on the east, to the slopes of its western side. The landscape has low relative relief, lies generally below 600m altitude and slopes generally less that 5º. About 20% of the Uplands contains steeper hills and ranges, and the subject area falls generally within this latter description.

The Monaro is an area of high tablelands and mountains; it is bounded on the north by the Namadgi ranges, on the west by the alpine watershed, the east by the Kybeyan and Gourock escarpment and the south by the Victorian border (Flood 1980). Four distinct natural environments have been defined by Costin (1954); the alpine, sub-alpine, montane and tableland. The proposal area is situated within the latter. The tableland is generally located at elevations between 610 - 915m (Flood 1980).

The area has a strongly seasonal thermal climate (Jennings and Mabbutt 1977). In summer, hot days are followed by temperate nights, while in winter days are cool to cold and the nights cold and frosty with temperatures regularly falling below 0 degrees C. Each winter brings some light snow falls over most of the district which can be heavier on higher ground (Plowman 2007). Average rainfall annual is 688mm (Flood 1980). Flood (1980) draws attention to the phenomena of cold air drainage, frost and wind as affecting human occupation in the region. High winds and frost occur frequently; Flood (1980) argues that, in particular, the combination of cold temperature with wet winds was probably more significant in regard to human occupation than cold in itself.

In terms of the broader-scale landscape, the subject area comprises a summit which falls away steeply before gradients ease on surrounding simple slopes. Thereafter the gradient further lessens to encompass an area of undulating upland flat, before again falling away gently nearer to the highway. The ground surface over the site generally falls from west to east. It is situated to the west of Spring Creek, which flows into Rock Flat Creek in an area to the east of the proposal area. There is no reliable water near the site although first order open depressions commence drainage at the site (Figure 1).

The geology of the site is basalt, with the hill proposed for extraction comprising a volcanic neck (plug/dyke) - See Figure 2. Cobbles are scattered copiously across most of the subject area and there is some low quality quartz present.

The site is vegetated with grasses, tussock, some shrubs (at elevation), thistle and other weeds, and is currently used for grazing (Plates 1 & 2). The great majority of the original vegetation structure has been altered through clearance and subsequent farming. No trees remain in the subject area. The local landscape has a history of European land use extending from the earlier-mid part of the 1800s and principally comprising the grazing of livestock, clearing and timber getting (Dearling 2004; Plowman 2007). The subject area itself has experienced extensive clearance and grazing management over many years.

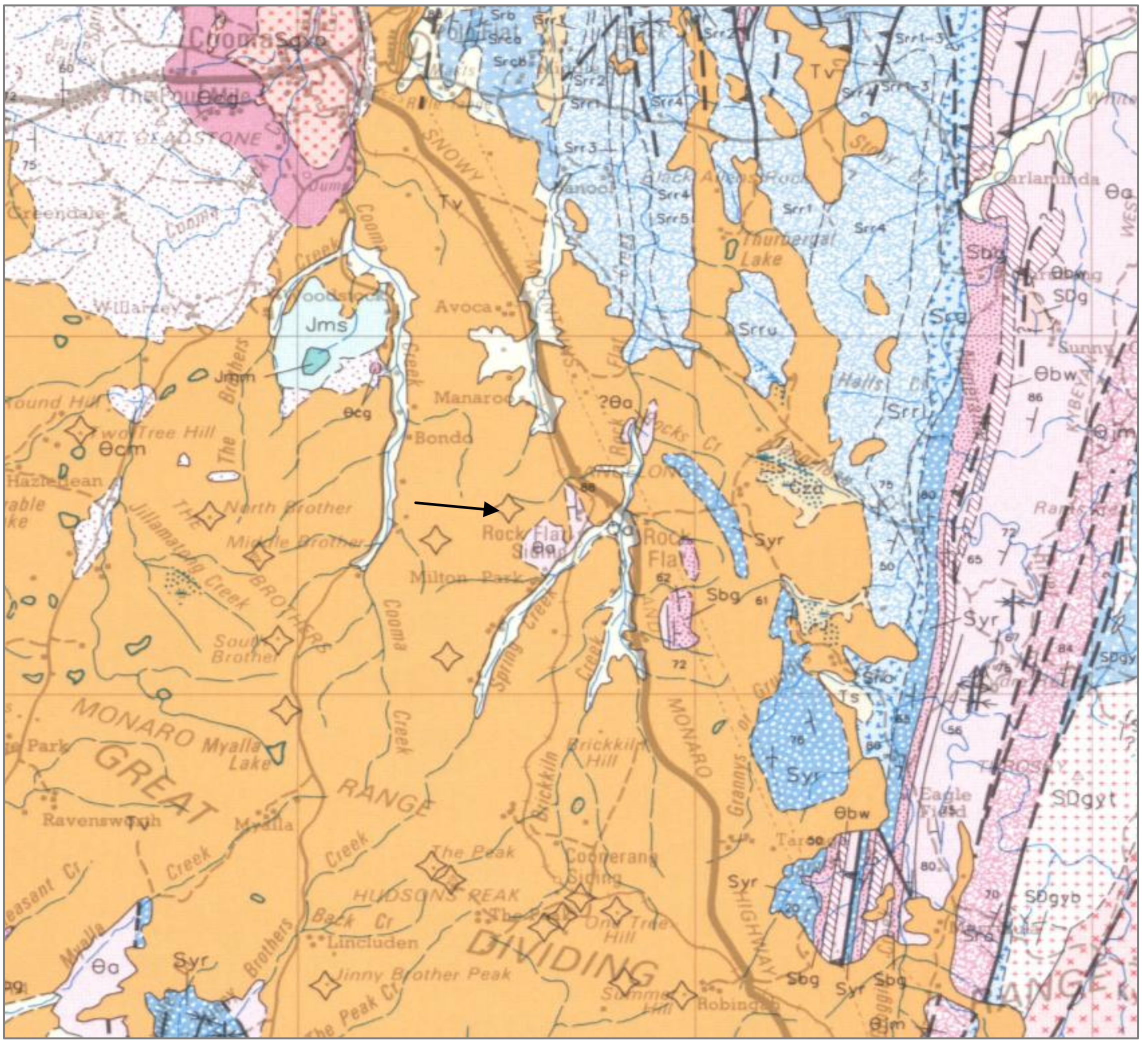

Figure 2 The geological mapping for the local area with the volcanic neck indicated.

Plate 1 The subject area. Photo taken from base of the dyke, looking 50°.

Plate 2 Looking 270˚ from Survey Unit 5.

2.2 History of Peoples Living on the Land

Aboriginal people have occupied Australia for at least 40,000 years and possibly as long as 60,000 (Mulvaney and Kamminga 1999: 2). By 35,000 years before present (BP), all major environmental zones in Australia, including periglacial environments of Tasmania, were occupied (Mulvaney and Kamminga 1999: 114).

At the time of early occupation, Australia experienced moderate temperatures. However, between 25,000 and 12,000 years BP (the Last Glacial Maximum), dry and either intensely hot or cold temperatures prevailed (Mulvaney and Kamminga 1999: 114). At this time the mean monthly temperatures on land were 6-10ºC lower; in southern Australia coldness, drought and winds acted to change the vegetation structure from forests to grass and shrublands (Mulvaney and Kamminga 1999: 115-116).

During the Last Glacial Maximum at about 24-22,000 years ago, sea levels fell to about 130 metres below present and, accordingly, the continent was correspondingly larger. With the cessation of glacial conditions temperatures rose with a concomitant rise in sea levels. By c. 6,000 BP, sea levels had more or less stabilised to their current position. With the changes in climate during the Holocene, Aboriginal occupants had to deal not only with reduced landmass, but changing hydrological systems and vegetation; forests again inhabited the grass and shrublands of the Late Glacial Maximum. As Mulvaney and Kamminga (1999: 120) have remarked:

> When humans arrived on Sahul's shores and dispersed across the continent, they faced a continual series of environmental challenges that persisted throughout the Pleistocene. The adaptability and endurance in colonising Sahul[1] is one of humankinds' inspiring epics.

Aborigines have lived in the Cooma-Monaro district and its environs for at least 21,000 years (Flood *et al.* 1987). In the south-eastern highlands the Birrigai rock-shelter has provided dates of occupation from 21,000±200 years BP (Flood *et al.* 1987: 16). During the Pleistocene the environment of the region would have been cold steppe grassland with vegetated shrubs and scattered groups of Eucalypts located in protected positions (Mulvaney and Kamminga 1999). Between 23,000 and 15,000 years ago harsh conditions prevailed and the mountain peaks were glaciated above 1900 metres; periglacial conditions were present to at least 1000 metres above sea level. The alpine zone was a cold desert with scattered fields of perennial *Plantago* herb fields which may have provided some bulbs and tubers for human consumption (Mulvaney and Kamminga 1999). Over time, the Aboriginal people experienced and adapted to steady and considerable changes in conditions associated with gradual climatic warming, including the alteration of vegetation and variation in the distribution of wildlife (Young 2000).

As far as possible, an ethnographic and historical review of Aboriginal life in the region will be outlined below. However, our understanding of Aboriginal people in this area, and

[1] Sahul is the name given to the single Pleistocene era continent which combined Australia with New Guinea and Tasmania.

the historical dimension of the colonial encounter has been reconstructed from scant records produced during a context of death and dispossession (Swain 1993: 115); it is sketchy and severely limited. Stanner (1977) has described the colonial and post-colonial past as a 'history of indifference', and this portrays both the substantive situation which prevailed and the general lack of regard for this history. For a considerable period of time after Europeans arrived in Australia, no concerted ethnographic investigations were undertaken to learn about the society and culture of Aboriginal people. As a result, in trying to reconstruct the complex traditional cultures of Aboriginal groups, investigators of today are necessarily required to piece together, as best as possible, fragmentary information derived from the incidental annotations of disparate early observers. As elsewhere, this applies also to the Aboriginal peoples who occupied the country that included the subject area. Knowledge and understanding of Aboriginal social life and organisation in south-eastern New South Wales at the time of European occupation is minimal. Fundamental details relating to kinship, clan, territorial and religious organisation is, by and large, unknown.

At the time of European contact, the major part of what is now called the Monaro was inhabited by at least 500 Ngarigo speaking Aborigines (Helms 1895: 388). This group exploited the resources of the riverine, grassland and open forests of the region, including those located in the environs of the subject area. Their choice of camp-site was influenced by several factors, and from archaeological evidence, Flood (1980: 158) indicates that in this region camp-sites will be typically found within one kilometre of reliable water sources, most usually within 100 metres from water, though never at the water's edge.

The Ngarigo people maintained social relationships with neighbouring groups including Ngunnawal, Djilamatang, Jamathang and coastal groups including the Yuin (Howitt 1904). Some information is recorded about the nature of Aboriginal occupation of the region during the early period of European occupation. The literature which does exist has presented a biased view of Aboriginal life within the mountains which is focused particularly on Bogong Moth exploitation. Indeed, the ethnohistoric literature has implied to some readers that seasonal exploitation of the moth was the major reason for Aboriginal usage of the Alpine region (Flood 1980).

Flood (1973, 1980) was heavily influenced by the extant ethnohistoric literature which focused on moth exploitation in her seminal study of the region. She constructed a hypothesis of seasonal usage of the highlands based on the exploitation of the moth. The moth, she argued, was important as an economic food source and its exploitation may have been causal as the impetus for the initial usage of the highlands. Flood (1980) suggested that the Ngarigo people occupied low altitude valleys (< than 600 m) in winter, moving into higher areas in summer primarily for the purpose of exploiting the Bogong Moth. She argued that the occupation pattern which resulted from the exploitation of moths is one in which a series of camps extended from the lowest valleys below 300 m up to the alpine treeline zone at 1830 m.

A contrary viewpoint to Flood's (1980) model has been provided by Chapman (1977) who argued that there was no evidence which pointed to the moth as being a staple food source; Chapman argued that the importance of the moth as a food resource has been over emphasized by early commentators. She argued that in addition to the lack of evidence that the moth was a reliable food source, moths lack the nutritional value to act as a staple and that the moth, in any case was primarily consumed by men. Chapman (1977) instead argued that the significance of moth exploitation was that it fostered social cohesion within the region. Likewise, Kamminga *et al.* (1989) have argued that the large inter tribal gatherings which were associated with moth exploitation acted to mediate and foster political and social linkages between the different language and tribal groups which came together during these occasions.

Researchers such as Bowdler (1981), Cooke (1988), Gott (1982) and Kamminga *et al.* (1989) have drawn attention to a variety of vegetable products available locally which are likely to have been utilized as food resources. Bowdler (1981) has argued that the importance of the moth was more ideological than economic and that the yam daisy would have provided a more reliable food source.

A model of seasonal usage of the high country nevertheless continues to have currency within the literature. The seasonal migration to higher altitudes in summer months is accepted (*cf.* Navin 1991). During winter small groups of Aboriginal people would have occupied the lower montane valleys and the adjacent tablelands (Mulvaney and Kamminga 1999: 298). The region would have opened up considerably however, in summer. It was during this time that people from other areas gathered to perform inter-tribal ceremonies (Mulvaney and Kamminga 1999: 299). Although ceremonial activities are not known to have taken place in the subject area, nevertheless these affiliated groups moved through various corridors in order to congregate in the Alps, and while making their way through country they may have traversed the region where the survey area is situated (*cf.* Howitt 1904; Payten 1949; Flood 1980).

White settlers began to move into the Monaro region during the early 1800s. European settlement ultimately resulted in the alienation of Aboriginal people from their traditional lands and changes in regard to cultural and economic relationships with country. In the local area Aboriginal people worked as shepherds and sheep washers on Bibbenluke Station in the mid 1800s (Dawson 1996).

Much of the impetus for early exploration in NSW was driven by the need for new land for grazing (*cf.* Andrews 1998). In 1823, a group of experienced explorers gathered at the Throsby property at Bong Bong, Moss Vale to prepare for their next expedition. The men in question were Charles Throsby, Captain Mark Currie, Major John Ovens, Throsby's overseer Joseph Wild and an Aboriginal guide. Together they set out to explore the land south of Lake George, which had been partially explored in previous years by Throsby and Wild, who had discovered the Queanbeyan River and the Murrumbidgee. The party attempted to follow the Murrumbidgee south but upon encountering rugged terrain they elected to travel a few kilometres to the east through a chain of clear downs that is thought to correspond to the Michelago, Colinton and Bredbo valleys. It was during this part of the journey that they came across an Aboriginal tribe near Billilingra. After overcoming some apparent initial fear of the newcomers the Aboriginal people engaged in conversation with the assistance of the guide accompanying Throsby's party, and amongst other things they informed the explorers that the area of the rolling downs was the 'Monaroo'. The group continued on and crossed a river they presumed to be the Murrumbidgee but that is thought to have more likely been the Numeralla and made it to an area in the vicinity of present day Bunyan before having to turn back on account of their limited supplies. They named the treeless rolling downs 'Brisbane Downs' after the governor of the time, however, the Aboriginal name proved the more popular name in time (Neal 1976: 5-6; Plowman 2007: 6, 8-9).

European settlement of the area began in the late 1820s as various farmers made the decision to take their chances with squatting. The Limits of Location at that time ended at Michelago, so all settlement to the south was technically illegal. Census records from 1828 indicate that there were already 20 new settlers on the Monaro, although there is some confusion regarding this number since the people listed were all servants living on the Limestone Plains. Nevertheless, Richard Brooks is known to have had stock and men at Gegedzerick near Berridale in 1827. In 1832 William Glanville came to the area to work for Joseph Ward at Wambrook and he reported that at that time there was a hut at Cooma (Kuma) belonging to Cooper and Levy and that Coolringdon, Gegedzerick and Wambrook were the only stations to the west of this. Two years later, John Lhotsky relayed information from Mr Bath, the manager of Kuma Station, that R. Campbell had been established at Waterholes, near Michelago for seven years, Richard Brooks had been at Jijedery (Gegedzerick) for six years, Cooper and Levy had been at Cooma for five years and Dr Reid had been at Bunyan for a similar period of time (Neal 1976; Plowman 2007: 10).

When John Lhotsky travelled through the region in 1834, he considered himself 'surrounded by absolute anarchy and lawlessness' (cited in Andrews 1998). At that time the majority of men living on the Monaro during the 1830s were assigned servants either serving their sentence, ticket of leave, or freed and in employment (Andrews 1998). The theft and resale of livestock was common practice.

Lhotsky's description of the landscape noted that it was a remarkable though inexplicable fact that the plains were 'altogether destitute of trees'. He observed that there was a surprising number of travellers on the roads that he was continually being interrupted. 'There is a greater traffic and motion on Menoro, than our Legislature may believe'. At Bunyan he met with a Dr Reid who suggested a visit to Mr Bath, the manager of Kuma Station. The encounters with Reid and Bath and the subsequent inspection of the Rock Flat Spring provided Lhotsky with a lot of material for his journal but unfortunately at that date the manuscript abruptly ends with the balance appearing to be lost, even though his expedition continued on, heading south (Ploughman 2007).

2.3 Material Evidence

A search of the NSW OEH Aboriginal Heritage Information Management System (AHIMS) was conducted on 24th July 2017 (AHIMS client service ID: 292605). The search area measures 66 square kilometres, with a buffer of 50 meters, and is encompassed by the following co-ordinates at Datum GDA, Zone 55 - Eastings: 690000 - 701000, Northings: 5972000 - 5978000. One Aboriginal object site is in the AHIMS search area and is outside the proposed development (Table 1; Figure 3).

Searches have been conducted of the NSW State Heritage Inventory and the Australian Heritage database. No Aboriginal heritage sites are listed on these as being in the activity area.

Table 1 AHIMS Site search.

Site ID	Site name	Datum	Zone	Easting	Northing	Context	Site features	Site types	Recorders
62-2-0236	EGP 2-26	AGD	55	698260	5975190	Open site	Artefact : 2	Open Camp Site	Kerry Navin

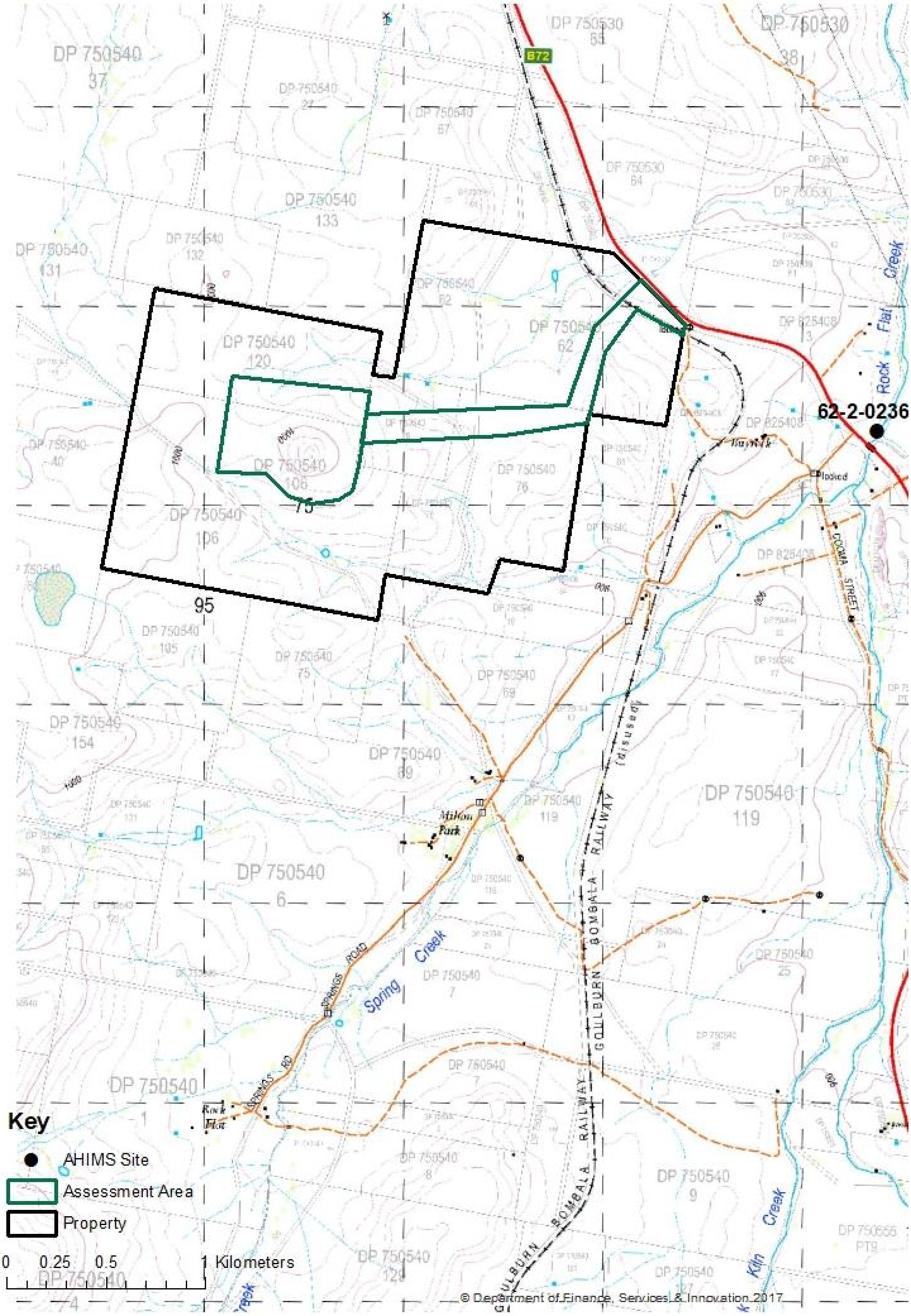

Figure 3 Location of the closest registered Aboriginal site identified in the search of the NSW OEH AHIMS in respect of proposed activity area.

2.3.1 Previous Archaeological Work

While archaeological studies conducted within the local area have been limited in number, a greater number of studies have been carried out within the broader region. The following discussion includes archaeological work and its results conducted within the wider Monaro area.

On the tablelands around Cooma, Flood (1980) recorded two artefact scatters which she described as being indications of transitory camp sites. One was positioned on a slope beside Cooma Creek, south of Cooma, while the other was recorded on a slope above Rock Flat in association with a quartzite deposit and mineral spring. Flood's (1980: 181) survey on the Monaro Tablelands was 'rather uneven', however, she argued that the site distribution patterns were significant. Flood (1980) found that few sites were recorded on the treeless parts of the tablelands and explained this as being due to the unfavourable nature of such an environment. Flood (1980) suggested that the location of sites in the area indicated an intention to exploit local raw material such as quartzite and basalt and could also be '…in the nature of transit camps'.

Djekic (1982) recorded twelve sites while surveying the route for a proposed transmission line between Cooma and Jindabyne. These sites comprised six scarred trees, four artefact scatters and two isolated artefact finds.

Lance and Hughes (1983) surveyed an area of c. six hectares in the northern area of the Cooma township for the proposed site of the Snowy Mountains Hydro-Electric Authority head office. Visibility was limited and no sites were found. However, Lance, formerly a Cooma resident, noted his previous observation of artefact scatters on slopes one kilometre from Cooma Creek near North Cooma, comprised of quartz and quartzite flakes and flaked pieces.

Paton (1985) recorded fourteen artefact scatters, six isolated finds and one stone quarry while surveying for the proposed Cooma-Royalla 132 kV transmission line north of Cooma. One extensive site recorded covered an area of 1,000 sq. metres; artefact density is calculated to have been in the order of one artefact per two square metres. Paton (1985) attributed the location and size of these sites to their aspect and proximity to the nearby Numeralla River.

In 1991 two burials were found in an alluvial terrace north-east of Bunyan. The skeletal remains were dated to about 6,000 years BP and were accompanied by grave goods, including 327 pierced macropod teeth from Eastern Grey, Red Neck and Swamp Wallabies, as well as 450 grams of red ochre (Feary and Pardoe 1992). Stone artefacts, including hammerstones and bone implements, were also found at the site.

Navin (1994) conducted a survey for a proposed Cooma sewerage augmentation program. This survey included planned pumping stations at Cooma North, Central Cooma, Cooma South and Polo Flat, as well as several kilometres of linking mains and a four hectare area beside Cooma Creek known as 'The Glen'. The survey located three Aboriginal sites adjacent to Cooma Creek, two of which were small low density artefact scatters. The third site located on basal spur slopes on the western side of the ridgeline at 'The Glen', contained '… numerous concentrations of surface artefacts of varying density, surface area and artefact rock type' (Navin 1994:12). These included flakes, cores and flaked pieces of vein and crystal quartz, silcrete, volcanics and chert. Subsequent subsurface testing revealed a similar assemblage of raw materials present in the deposit (English and Gay 1994).

Kuskie, Navin and Officer (1995) surveyed the proposed route of the Eastern Gas Pipeline. On the Monaro section of their study area 101 sites were recorded. Several artefact scatters were located in the local area of the proposed development, including the site listed on the AHIMS search. It was concluded that sites were situated on elevated, relatively level ground adjacent to a permanent water source, that larger sites occurred in proximity to major fluvial corridors or in areas where high quality quartz occurred and that sites tended to be situated in elevated contexts away from cold air drainage and tend to be found on north facing slopes.

An archaeological survey of a proposed pine plantation location in cleared, open farmland south-west of Countegany was undertaken by Stone (2000). This area is on the upper watersheds of Hindmarsh Creek and Dirty Waterhole Creek. Two small artefact scatters were recorded during the survey. Site 'Countegany 1' (62-2-0325) was located in association with a low sandy rise directly adjacent to Dirty Waterhole Creek. It contained seven stone artefacts, all flakes of quartz and silcrete. Site 'Countegany 2' (62-2-0324) was recorded on a low granite ridge fronting Hindmarsh Creek. It contained an unspecified number of flakes and a core of quartz, silcrete, chert and quartzite (Stone 2000). It was noted that the locations were most likely originally ribbon gum forest fronting the creek corridors (Stone 2000). From this information it may be deduced that these sites were associated with ecotonal positions in the landscape, in these cases between forest/woodland and second to third order riparian corridors.

Dibden and Mason (2003 pers observ.) recorded a sparse artefact scatter on the top of the cliff and extending southwards over a large area on the eastern side of Lambie Gorge.

Dibden (2003) conducted an assessment of a proposed subdivision site at West Cooma. The landforms comprised simple northward faces slopes at some distance from water. No Aboriginal artefacts were recorded. This result was argued to be in keeping with the relevant predictive model of site location.

Carter (2003) recorded an isolated find while surveying an area of ca. 2.5 hectares for a proposed subdivision of Lot 4 DP 845442, North Cooma. Carter (2003) assessed the study area to be of low potential generally.

A 2003 survey of Portion 319 of 31 ha in Yallakool Road did not locate any Aboriginal sites (Saunders 2003a). Areas of archaeological sensitivity associated with a creek and a drainage line were identified on the basis of topographic modelling, but were too disturbed to have retained any archaeological potential.

Saunders (2003b) surveyed an area of 4.047 hectares at North Cooma in response to a subdivision proposal, finding an extensive Aboriginal artefact scatter, comprised predominantly of chert and silcrete, in multiple exposures. The area surveyed was a low gradient footslope land element, and the Effective Survey Coverage was estimated to have been 2.8%.

Surface artefact salvage and subsurface testing subsequently recovered a total of 71 artefacts. Eighty two percent were recovered from the surface and 18% from the test pits (Saunders 2004a). The artefacts comprised flakes, flaked pieces, a blade and a chip. The raw material was mainly silcrete, with a small amount of chert and quartz.

Saunders (2004b) surveyed a proposed 27.8 ha subdivision in Yallakool Road, Cooma. The proposal area was situated mainly on the moderate to steep slopes of a major spur off the Tillabudgery ridgeline, but also included areas of low gradient basal slope near a minor tributary of Cooma Creek. No sites were found despite many areas of bare, partly eroded ground.

In 2004 Dearling carried out preliminary level archaeological assessments within eight northern Monaro nature reserves (Coornatha NR, Dangelong NR, Good Good NR, Kybeyan NR, Mt Clifforf NR, Numeralla NR, Undoo NR and Wadjan NR) and two state conservation areas (Kybeyan SCA and Macanally SCA). Based on environmental and topographic attributes, Dearling rated each study area's potential for prehistoric Aboriginal utilisation and subsequent archaeological signature; more rugged settings affording only periodic or sporadic water sources were generally seen as having low potential and most were most likely utilised during ephemeral, low intensity hunter-gatherer visitation, whereas zones with gentler terrain and more reliable water were attributed variable or higher potential (Dearling 2004). These assessments were based on a preliminary predictive model created on the basis of previous archaeological findings made in the broader region (Dearling 2004: 13-14), specifically:

- Sites will generally be found in association with low gradient or flat areas along major ridges, particularly at ridge junctions and connective points with subsidiary ridge features such as spurs, in saddles or on shoulders;

- Larger sites tend to occur on elevated terraces or basal slopes of spurs and knolls adjacent to permanent or ephemeral water sources, particularly above areas of cold air drainage;
- Near riverine corridors Aboriginal sites will be found on low gradient ground adjacent to but elevated above river channels (eg. low ridges, spurs, knolls and crests);
- Artefact scatters exhibiting higher artefact counts and greatest density will occur closer to permanent watercourses; and
- 'Major sites' will be found at or near spur termini above river valleys.

Subsequent survey of the nature reserves and state conservation areas resulted in the recording of 22 Aboriginal sites including 13 artefact scatters and nine isolated finds, containing a total of 167 artefacts; one 'probable' Aboriginal scarred tree was also noted in Good Good NR (Dearling 2004: 122, 202). In general accordance with the predictive model, it was found that more rugged terrain with less reliable water sources (eg. Coornatha NR, Mt Clifford NR, Numeralla NR and elevated components of Dangelong NR) exhibited little archaeology aside from occasional small, low density artefact scatters (Dearling 2004: 19-20, 39). In these elevated areas, features such as major ridge lines were seen as examples of locations most likely to exhibit small sites with low artefact counts and densities (Dearling 2004: 122). Conversely, most finds were made near more substantial watercourses on locally elevated and well-drained features (eg. river and creek banks, basal slopes and slightly elevated crests in Kybeyan SCA, Dangelong NR and Kybeyan NR) with highest site/assemblage complexity being apparent within or close to ecological boundaries (Dearling 2004: 41, 57-58, 95 122). The highest artefact density was apparent in Good Good Nature Reserve where the low gradient spur and ridge system adjacent to Cowra Creek was seen to be a particularly attractive zone for Aboriginal occupation (Dearling 2004: 46, 122).

Saunders (2005a) located a small disturbed artefact scatter in a proposed 1.21 ha residential subdivision in Kiah Avenue, Cooma. Four stone artefacts were recorded on gently inclined lower slopes approximately 150m from Cooma Back Creek. The artefacts comprised three flakes and a core. Recorded stone types were chert, quartz and quartzite. Saunders concluded that the artefacts probably originated in Kiah Avenue and were outliers of a larger scatter situated on a less disturbed basal slope closer to the creek.

Saunders (2005b) also surveyed a proposed residential subdivision of 12.5 hectares in Kiah Avenue. The proposal area was situated on the eastern slopes of a spur emanating from Mt Gladstone and terminating at Cooma Back Creek. Slope gradient was variable, ranging from approximately 20%, mainly at upper elevations, to approximately 5%. Five small low density stone artefact scatters were recorded. The artefacts comprised flakes, flaked pieces and a core. Raw materials were quartz, volcanic, silcrete and quartzite. All the sites were all highly disturbed.

Dibden (2009b) was commissioned by Lawrie Carlson, CSD Engineering, to undertake an Aboriginal archaeological assessment in relation to the proposed replacement of a water reservoir at Church Hill, located in North Cooma, NSW. The proposal area was situated on an elevated area about one kilometer to the east of Cooma Creek. The area was a gently sloping crest with a gradient ranging between 0 - 7°. Eleven stone artefacts were recorded in five different exposures across the landform. Effective Survey Coverage encountered during the survey was low, however, numerous soil exposures were present. The area was assessed to be of low archaeological potential due to the high degree of prior impacts and the relatively low density of artefact distribution over that area. The Aboriginal objects recorded were assessed to be of low archaeological significance.

Numerous studies have been conducted south of the subject area. Lewis (1976) conducted a survey of an area of the Lower Snowy River measuring 100 kilometres. The northern boundary of that survey area is situated c. three kilometres below Dalgety. Lewis recorded over 56 sites within the survey area focused on the margins of the Snowy River. Lewis found that sites were present on *any* flat or gently sloping area situated above the flood level. Often sites were found where creeks joined the Snowy River. The majority of sites recorded by Lewis comprised stone artefact scatters. The main source of raw material encountered was found to be river pebbles.

Geering (1981) systematically surveyed an area along the Lower Snowy River, finding a high density of Aboriginal sites which she described as being 'continuous from Dalgety to the Victorian border'. In all, 142 sites were located including 119 open campsites, 21 scarred trees and two stone arrangements. The open campsites ranged in the number of stone artefacts they contained, from three to 367, with about 33% of the scatters comprised of less than 10 artefacts and 18% comprised of more than 100 artefacts. It should be noted, however, that quartz pieces were not included in the artefact count; this is likely to have lessened overall artefact numbers.

Geering (1981) noted that the majority of open campsites located consisted of 'extensive scatters of artefacts with an average density of *only* one or two artefacts per square metre'. All campsites were located on gently sloping or flat ground above the flood level; most level areas along the river were found to contain artefacts. Geering (1981) indicates that the majority of the 21 scarred trees recorded could quite possibly have been the product of Non-Indigenous activity and expresses similar reservations with regard to the two stone arrangements. The findings of high site density are described as being atypical in the Southern Uplands, suggesting that the Lower Snowy River valley and its major tributaries were 'a favoured location for Aboriginal occupation'. Geering (1981) notes however, that given the absence of surveys conducted in the surrounding hills it is not possible to consider whether or not occupation was focused exclusively on the river corridor.

Lewis (1985) conducted a surface survey of Portion 72 Dalgety in response to a proposed tourist development. The survey area is situated on the east side of the Snowy River immediately south of Dalgety township. Lewis located one artefact scatter which extended along the river bank for a distance of 200 metres. The site consisted of flakes, cores and pebble artefacts including three choppers and one possible hammerstone. The stone materials in the artefact assemblage included silcrete and quartzite. Some artefacts possessed pebble cortex and Lewis (1985) indicated that some raw materials present had been sourced from the Snowy River.

Grinbergs (1992) investigated the prehistory of the Highlands, focusing on the valleys and ranges adjoining the Lower Snowy River, for the purposes of a B.A. Honours thesis. The study area was bounded by the Snowy River and the Suggan Buggan and Ingeegoodbee Rivers and encompassed some 165 sq km. The field survey was principally conducted on areas of exposure provided by vehicle access tracks. In total, 22 open stone artefact scatters and one stone arrangement was identified. The conclusions drawn from analysis of the findings challenge notions of a limited seasonal exploitation of high altitude resources and, instead, Grinbergs (1992) proposed a more complex scenario of occupation and resource exploitation of the region. This proposal suggested a dynamic system of movement and resource exploitation between Lower Altitude, Upper Altitude and High Altitude occupation zones, which took place on a year round basis.

In a survey covering some 124 hectares, Stone (1998) recorded three open artefact scatters on spur crests and ridgelines some 200 metres west of the Undowah River. In addition, one possible Aboriginal scarred tree was noted.

Stone and Duncan (1999) surveyed 1,193 hectares in this area and recorded three Aboriginal scarred trees on the crest of a hill, with one open artefact scatter recorded within 10 metres of Bennetts Creek.

Stone (2000) surveyed an additional 875 hectares in an area near Ando. A total of six open artefact scatters were recorded, three on high ridgelines above a creek, two adjacent to the Undowah River, and one in an elevated area above the river. In all three of these surveys, open artefact scatters were found to be comprised of varying percentages of chert, silcrete and quartz, with some minor representation of quartzite.

Dibden (2005) conducted an assessment of simple slopes located on either side of Native Dog Creek, 22 kilometres south of Nimmitabel. The survey was hampered by low exposure and ground visibility. No sites were recorded, however, given the topographic and broader environmental context, the area was assessed to be of low archaeological potential.

Surveying for a proposed sawmill complex just to the south of Bombala, in an area of 96 hectares, Stone (2001) recorded two open artefact scatters, both situated on ridgelines overlooking watercourses.

A total of 56 Aboriginal object locales were recorded in the Boco Rock Wind Farm site during the assessment conducted for the development application (Dibden 2009a). The majority of these were low or very low density stone artefact distributions located within Survey Units assessed to be of low archaeological potential and sensitivity. A small number of Aboriginal object locales were assessed to be of low/moderate or moderate archaeological significance.

Stone artefacts were found in all environmental contexts surveyed except for flats beside the Maclaughlin River. Generally plateau and ridge crest landforms were found to contain sparse and isolated stone artefact distributions only, and in many Survey Units on such landforms, no artefacts were found at all. More consistent artefact distribution was found on lower elevation landforms including crests and slopes which fall away from the plateau, or otherwise, are situated above but in close proximity to the Maclaughlin River. This pattern of artefact density and distribution is generally consistent with the predictive model of site type and location applicable to the area.

Artefacts were not recorded in half of the Survey Units (#21). It was predicted that stone artefacts are likely to be present in most, if not all these Survey Units, however, it was assessed that artefact density would be low, very low or negligible.

As noted above, no artefacts were recorded on flats situated in Survey Units adjacent to the Maclaughlin River. This result is in keeping with the predictive model of site type and location relevant to the local area in which it is considered that camp site locations in the vicinity of reliable water are likely to have been on elevated landforms above cold air drainage. While it is unlikely that there are no artefacts in flat landforms, the survey results suggest that artefact density is likely to be very low in flats; effective survey coverage was consistently and considerably higher in flats than elsewhere in the study area.

Approximately half of the artefact recordings consisted of either single stone artefacts (#26: 46%) or otherwise very low numbers (26 locales consist of between 2 and 10 artefacts). The results were assessed to be a reflection of the low artefact density present in the landforms in which they are situated.

The majority of artefacts recorded were flakes, flake portions, flaked pieces and cores made from a range of materials including quartz, silcrete, chert, quartzite and volcanics. The majority of artefacts were made from milky quartz with a minor presence of translucent quartz. Quartz is locally available in pebble form in the Maclaughlin River and also in terrestrial exposures in shale bedrock. All cortex on quartz artefacts was found to be of pebble form. The dominance of this material is likely to be a reflection of the local availability of this stone. It is noted that the majority of the Survey Units are situated on basalt bedrock and autochthonous quartz was found to be generally absent. Accordingly, the majority of fractured quartz found was considered likely to be artefactual.

Silcrete in many different colours and textures was recorded. Silcrete artefacts possessed both terrestrial and pebble cortex indicating that this material has come from a variety of regional sources. A distinctive, fine grained silcrete with brown and grey mottles was recorded; this same or very similar material has been observed in assemblages at Jindabyne (pers. observation). Other materials were found in very minor frequencies.

As already noted, the majority of artefacts recorded were representative of flaking debitage. The majority of artefacts are the result of hard hammer percussion flaking, however, a small number of bipolar flaked artefacts were also observed.

In addition to flaking debitage, a number of other artefact types or implements were recorded including a silcrete retouched artefact, three amorphous flaked pieces with evidence of usewear (possible scrapers) two hammerstones, an anvil and a large chopper. These implements were found in all landform contexts.

A subsequent program of salvage excavation was undertaken at the Boco Rock Wind Farm in 2016 (Dibden 2017a). This excavation revealed the subsurface presence of stone artefacts across the three topographic contexts sampled and, in particular, moderate densities in two of the sites. Site SU19/L2, on top of the high, exposed ridge crest of Sherwin's Range is located at c. 2.5 kilometres from any water and there is no protection from the weather. Site SU13/L5 is located at between 1 and 2 kilometres from water and was also exposed. None of the sites fit easily within previous occupation and predicted site locational models.

The salvage program revealed the incidence of significant artefact densities in landforms situated at considerable distance from water and in exposed and potentially hostile environmental contexts. This finding is a considerable archaeological revelation and provides an important counter narrative to previous occupation models in which Aboriginal habitation is seen to be tethered to riparian zones or otherwise sheltered from the prevailing weather. Rather, it is likely that Aboriginal people experienced the Monaro landscape in a manner and in ways which we, at some distance, at least in time, cannot readily comprehend.

In addition, a new retouched artefact type has been identified, hitherto unknown in southeastern Australia. These highly standardised, tiny and delicate, triangular shaped microliths were made from a range of materials and found in all three sites. Their function is not known with any certainty at this time, however, they are likely to have been a variety of spear barb. As such, they are likely to have been elements of men's subsistence equipment and, accordingly, provide a nuanced and gendered perspective to the archaeological record.

Dibden (2017b) conducted an assessment of a proposal to construct an access track and conduct the drilling of up to 10 bore holes within the Rock Lodge prospect at Myalla. 12 Aboriginal object locales of very low density, highly disturbed artefact distributions were recorded on simple slopes and a crest landform near Jinny Brother Creek.

2.3.2 Predictive Model of Aboriginal Site Distribution

Based on the above review and a consideration of the elevation, geology, hydrology and topography of the study area, the type of Aboriginal objects known to occur in the region and the potential for their presence within the subject area are listed as follows.

Stone Artefacts

Stones artefacts are located either on the surface and/or in subsurface contexts. The detection of artefact scatters depends on ground surface factors and whether or not the potential archaeological bearing soil profile is visible. Prior ground disturbance, vegetation cover and sediment/gravel deposition can act to obscure artefact scatter presence. The raw materials used for artefact manufacture will commonly be silcrete, chert, quartzite, quartz and volcanics. Within the local area, stone artefacts will be widely distributed across the landscape in a virtual continuum, but with significant variations in density in relation to different environmental factors. Artefact density and site complexity will be greater near reliable water and the confluence of resource zones.

Given the environmental context of a summit grading into simple slopes and then a level area located at significant distance from potable water, it is assessed that archaeological evidence in the form of stone artefacts would be present in very low density, if at all.

Grinding Grooves

Grinding grooves are found in rock surfaces and result from the manufacture and maintenance of ground edge tools. Given the absence of sandstone exposures, grinding groove sites are unlikely to be present.

Burial/interment sites

Burial/interment sites have been recorded within the wider region. On the Monaro they include human remains buried in excavated ground contexts (eg. Helms 1895: 404-406; Feary 1996), placed in limestone caves (eg. Spate 1997: 39) and deposited in standing hollow trees (eg. Helms 1895: 399; Flood 1980: 120). This site type is rarely located during field survey. There is, however, little potential for burials to be present in the subject area given the underlying geology, paucity of very old hollow trees and lack of soil cover of any significant depth across the study area.

Rock Shelter Sites

Rock shelters sites are unlikely to be present in the subject area given the absence of vertical stone outcrops.

Scarred and Carved Trees

Scarred and carved trees result from either domestic or ceremonial bark removal. Carved trees associated with burial grounds and other ceremonial places have been recorded in the wider region. In an Aboriginal land use context this site type would most likely have been situated on flat or low gradient landform units in areas suitable for either habitation and/or ceremonial purposes.

Bark removal by European people through the entire historic period and by natural processes such as fire blistering and branch fall make the identification of scarring from a causal point of view very difficult. Accordingly, given the propensity for trees to bear scarring from natural causes, their positive identification is impossible unless culturally specific variables such as stone hatchet cut marks or incised designs are evident and rigorous criteria with regard to tree species/age/size and specific characteristics with regard to regrowth is adopted.

Nevertheless, the likelihood of trees bearing cultural scarring remaining extant and in situ is low given events such as land clearance and bushfires. Generally scarred trees will only survive if they have been carefully protected (such as the trees associated with Yuranigh's grave at Molong where successive generations of European landholders have actively cared for them).

The subject area is has been comprehensively cleared and this site type is unlikely to be present.

Stone Quarry and Procurement Sites

A lithic quarry is the location of an exploited stone source (Hiscock & Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occur. Comber (1988) recorded numerous quartz quarries on the Monaro.

The bedrock geology which underlies the subject area is basalt. Basalt was used by Aboriginal people for the manufacture of certain tool types including hatchet heads and grinding implements. Basalt grinding implements were generally made from broad flattish coarse-grained stone, while hatchet heads were fashioned from either pebbles or large flakes struck from rock outcrops. The best basaltic raw materials for hatchet manufacture, selected for their suitability for use in cutting, scraping, pounding and chopping, occur in relatively few places and were extracted from specific quarry locations (Mulvaney & Kamminga 1999). Given that most surface exposures of basalt are of a quality poorly suited for tool manufacture, a stone quarry is unlikely to be recorded during the current survey, although it is possible.

Ceremonial Places and Sacred Geography

Burbung and ceremonial sites are places which were used for ritual and ceremonial purposes. Possibly the most significant ceremonial practices were those which were concerned with initiation and other rites of passage such as those associated with death. Sites associated with these ceremonies are burbung grounds and burial sites. Additionally, secret rituals were undertaken by individuals such as clever men. These rituals were commonly undertaken in 'natural' locations such as water holes.

In addition to site specific types and locales, Aboriginal people invested the landscape with meaning and significance; this is commonly referred to as a sacred geography. Natural features are those physical places which are intimately associated with spirits or the dwelling/activity places of certain mythical beings (*cf.* Knight 2001; Boot 2002). Boot (2002) refers to the sacred and secular meaning of landscape to Aboriginal people which has '… legitimated their occupation as the guardians of the places created by their spiritual ancestors'.

Knight's (2001) Masters research conducted in the area of the Weddin Mountains, examined the cultural construction and social practice of inhabiting a sacred landscape. This approach is a departure from a consideration of the land and its resources as being a determinant of behaviour, to one in which land is regarded as a *text;* – within this conception, land and its individual features, are redolent with meanings and significances which are religiously and ritually centred, rather than economically based.

Knight's (*cf.* 2001:1) work was possible in great measure by the historical record which explicitly defines Weddin as a site of ritual significance. However, the research was additionally driven by a theoretical approach to 'cultural landscapes'. Landscape is redefined away from considerations of its material features which provide a backdrop to human activity, towards a view that a landscape *is rather*, a conceptual entity. According to this view the natural world does not exist outside of its conceptual or cognitive apprehension. The landscape becomes known within a naming process or narrative; thus the landscape is brought into being and understanding – within this process: - '… explanatory parables…' such as legends and mythology are the embodiment of the landscape narrative (Knight 2001: 6).

These narratives are relative to a particular culture, and it is this which makes an archaeological investigation of the cultural landscape such a thorny one. At distance in time and cultural geography, and especially in the absence of specific ethnographic information, how can the archaeologist attempt to investigate and know these narratives? Knight (2001: 11) employed the concept of the landscape as *mentifact,* whereby archaeological interpretation is concerned with the reconstruction of the landscape as a reflection of prehistoric cosmologies. He argued that this can be reconstructed by exploring the systematic relationships between sites and their topographic setting. This is defined as an *inherent* approach as it is concerned with the role of landscape in both everyday and sacred life. This view is concerned with an integration of the sacred and profane rather than their existence as separate categories of social life: - where "Cult activity may have existed as an inextricably 'embedded' component of daily life, where significant locations and ritual aspects of material culture were thoroughly incorporated into secular ranges and uses" (Knight 2001:13). In this regard, Knight (2001: 14) correctly points out that no dichotomy between the material and ideational world existed within Aboriginal life.

Knight (2001: 15) argued that the notion of sacred space is of central concern within an inherent perspective on interpreting cultural landscape. Within human cosmologies, locales within the landscape are constructed as being sacred space; this process of the construction of sacred space has been termed *hierophany* by Eliade (1961 in Knight 2001: 15). However, while Knight (2001: 15) suggests that physical entities such as stones, trees, or topographic features such as mountains, caves and rocky outcrops may be subject to such processes of transformation or construction, in reality, in Aboriginal society any natural feature of less obvious significance can and should be included within this listing. Aboriginal constructions of heirophany can include the most insignificant landscape features and objects of less fixed temporal existence such as animals and plants. While the outside observer readily 'sees' and apprehends mountains and rocky features, more subtle elements of the natural world are easily passed 'unseen'. This point is one which suggests that the personal cultural geography of the archaeologist can severely impact upon the interpretation of the sacred landscape (*cf.* also, Boot 2002: 288). Knight (2001) does acknowledge this by illustrating the issue with reference to the example of "Jump Up Rock" situated north of Weddin. This place is only understood to have been an important landscape feature by recourse to prior knowledge regarding the meaning of the site name; the hill itself is insignificant and therefore not readily apprehended through an outsiders gaze as being of special significance.

Knight (2001: 16) refers to the issue of peculiarities of form (e.g. shape, colour, size or texture) and natural distinctiveness (e.g. isolated mountains or rocky features within a plains context) as being an important distinguishing feature of sacred locales. Knight (2001: 16) argues that the construction of sacred space in such a manner is particularly relevant to people for whom the natural domain is the dwelling place of/or the manifestation of their deities. Knight (2001: 16) again draws from Eliade (1964) to suggest that it is at the sacred place that the three fundamental cosmological worlds, the everyday, the upper and underworld may converge; typically the upper world will be associated as a point of 'access' with tall things such as trees while the underworld will be associated with pools and caves. Eliade contends that places where all three worlds can possibly connect, the *axis mundi*, are of a heightened order of sacredness. Hierophanies are therefore natural features which are ascribed sacredness. Additionally, Knight (2001: 17) refers to their ability to provide a landscape based opportunity for people to commune with other worldly deities and associated power because they may constitute spatial access between worlds via ritual.

Guided by these theoretical considerations, Knight (2001: 20) engaged with Bradley's (cited in Knight 2001) model of the 'archaeology of natural places' in order to provide guidance for investigating the cultural landscape. In this view, natural places can be explored archaeologically in order to determine the nature of their role in human cosmologies by attending to four archaeological categories: - Votive offerings, rock art, production sites and monuments. This model was developed within a European context, with its attendant biases of concepts and archaeological categories; clearly not all concepts, some of which are clearly Eurocentric, will be applicable in Australia. However, while not all of these data sets may be expected to be found within the Australian context, corresponding cultural landscape themes, human belief systems and site patterning are to a large degree readily discernible within ethnographies, historical documentation, extant Aboriginal societies and the archaeological record.

Knight (2001) gives consideration to the types of natural places which might be ascribed sacred significance. These include mountains, woodlands and groves, springs, pools and lagoons, rock outcrops and caves and sinkholes. He argues that Aboriginal cosmology is expressed via the natural landscape and sacred places were those which were directly related to the Dreaming. He says that these sacred sites typically are those which are remarkable or important physiographically such as caves, rocks and so on.

Some local places on the Monaro are known in respect of their sacredness; these include the Green Hills stone arrangement (Flood 1980: 146-150), the initiation ridge line near Bunyan (Knight and Boot 2010) and the 'teaching place' landscape in the Badja forest (Grinbergs and Knight 1995: 34, 53). However, none of these places occurs in direct or close proximity to the proposal area.

Contact Sites

These sites are those which contain evidence of Aboriginal occupation during the period of early European occupation. Evidence of this period of 'contact' could potentially be Aboriginal flaked glass, burials with historic grave goods or markers, and debris from 'fringe camps' where Aborigines who were employed by, or traded with the white community, may have lived or camped. The most likely location for contact period occupation sites would be places adjacent to permanent water and located in relative proximity to centres of European occupation such as towns and homesteads. The potential for such sites to be in the subject area is unlikely.

2.3.3 Field Survey – Methodology

The methodological approach adopted in this assessment attends particularly to location and relationality as a means of contextualising the material evidence of cultural practice across space. Given the nature of the physiography, different places within the region are likely to have been utilised for different purposes, and also by different categories of people. Landscape is more than a set of 'objective' topographic features. Landscapes are constructed out of cultural and social engagement; they are '... topographies of the social and cultural as much as they are physical contours' (David & Thomas 2008: 35). The conceptual approach to understanding landscape in this assessment is based on a concern with experience, occupation and bodily practice (cf. Thomas 2008: 305). The location of material evidence in different environmental and topographic contexts across the study area has the potential to be informative of different activities and social contexts. Landform and environmental elements, as measurable empirical space, will be employed methodologically to explore landuse, occupation and the nature of both recorded and unseen (ie subsurface) material evidence. Given the large space encompassed by the subject area, this methodology allows for the identification, at a fine level of spatial resolution, of elements representative of the patterns of social life and how these may vary over space.

The archaeological survey entailed a wide-ranging pedestrian survey undertaken by two people, Andrew Pearce, NSW Archaeology Pty Ltd and Eric Naylor, Sites Officer, Merrimans LALC. The survey was aimed at locating Aboriginal objects, areas and places. An assessment was also made of prior land disturbance, survey coverage variables (ground exposure and archaeological visibility) and the potential archaeological sensitivity of the land.

The field survey was designed to assess the archaeological sensitivity of the entire subject area. Survey Units are broad polygon areas defined according to landform element. The survey methodology entailed walking across individual Survey Units. The field survey was particularly focused on any areas of ground surface exposure that may have been present within each Survey Unit. Each Survey Unit was surveyed until the entire area had been systematically inspected. This methodology enabled direct visual inspection of as much of the ground surface of the area as practicable.

The approach to recording in the current study has been a 'nonsite' methodology: the elementary unit recorded is an artefact rather than a site (*cf* Dunnell 1993; Shott 1995). The rationale behind this approach is that artefacts may be directly observed however 'sites' are a construction within an interpretative process. Given that it can be expected that full archaeological visibility will not be encountered during the survey the process of identifying site boundaries (if they exist at all) will not be possible.

The density and nature of the artefact distribution will vary across the landscape in accordance with a number of behavioural factors which resulted in artefact discard. While cultural factors will have informed the nature of land use, and the resultant artefact discard, environmental variables are those which can be utilised archaeologically in order to analyse the variability in artefact density and nature across the landscape. Accordingly, in this study while the artefact is the elementary unit recorded it is the Survey Unit which is utilised as a framework of recording, analysis, and management (*cf* Wandsnider and Camilli 1992). The subject area has been divided into six Survey Units each of which have been defined according to landform elements.

The data collected during this field assessment forms the basis for the documentation of survey results outlined in the section below.

Survey Unit Variables

Landscape variables utilised are conventional categories taken from the ***Australian Soil and Land Survey Field Handbook*** (McDonald ***et al.*** 1998).

Survey Coverage Variables

Survey Coverage Variables are a measure of ground surveyed during the study and the type of archaeological visibility present within that surveyed area. Survey coverage variables provide a measure with which to assess the effectiveness of the survey so as to provide an informed basis for the formulation of management strategies.

Specifically, an analysis of survey coverage is necessary in order to determine whether or not the opportunity to observe stone artefacts in or on the ground was achieved during the survey. In the event that it is determined that ground exposures provided a minimal opportunity to record stone artefacts, it may be necessary to undertake archaeological test excavation for determining whether or not stone artefacts are present. Conversely, if ground exposures encountered provided an ideal opportunity to record the presence of stone artefacts, the survey results may be considered to be adequate and, accordingly, no further archaeological work may be required.

Two variables were used to measure ground surface visibility during the study; the area of ground exposure encountered, and the quality and type of ground visibility (archaeological visibility) within those exposures. The survey coverage variables estimated during the survey are defined as follows:

> *Ground Exposure* (GE) – an estimate of the area of exposures of bare ground; *and*
>
> *Archaeology Visibility* (AV) – an estimate of the average levels of potential archaeological surface visibility within those exposures of bare ground. Archaeological visibility is generally less than ground exposure as it is dependent on adequate breaching of the bare ground surface which provides a view of the

subsurface soil context. Based on subsurface test excavation results conducted in a range of different soil types across New South Wales it is understood that artefacts are primarily situated 10 - 30 cm below the ground surface; reasonable archaeological visibility therefore requires breaching of the ground surface to at least a depth of 10 cm.

Based on the two visibility variables as defined above, an estimate (Net Effective Exposure – NEE) of the archaeological potential of exposure area within a survey unit has been calculated. The Effective Survey Coverage (ESC) calculation is a percentage estimate of the proportion of the Survey Unit which provided the potential to view archaeological material.

2.3.4 Field Survey – Results

In accordance with the OEH Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010a), the purpose of a field survey is to record the material traces and evidence of Aboriginal land use that are:

- Visible at or on the ground surface, or
- Exposed in section or visible as features (e.g. rock shelters with rock-art),

and to identify those areas where it can be inferred that, although not visible, material traces have a high likelihood of being present under the ground surface (DECCW 2010a: 12).

Survey Coverage and Observations

A comprehensive field survey was conducted on 1 December 2017. During the field survey effective survey coverage (ESC) was generally quite low. Survey coverage is described and summarised in Table 2 below. The subject area consists of six Survey Units which have been delineated based on changes of landform element, aspect and gradient.

The entire area of proposed impacts has undergone moderate levels of prior disturbance associated with grazing, land clearance, fencing and track use. Arising from these human activities, notable subsequent erosion from wind and water has also taken place. This previous landuse and its cumulative effects are assessed to have caused moderate levels of impact to almost all ground surfaces where impacts are proposed, and to any Aboriginal objects which may once have been present in those areas.

Cobbles of varying sizes occur extensively across the site. Generally, these are larger closer to the summit, and decrease in size with distance from this prominence. Ground exposures inspected included areas of animal marks and tracks, erosional exposures and patches of bare earth. Broad areas of ground exposure were infrequent, and ground exposures measured approximately a total of 23363 square metres in area. Of that ground exposure area, archaeological visibility inspected (the potential artefact bearing soil profile) was moderate. Archaeological visibility is estimated to have been c. 11015 square metres (NEE). Effective Survey Coverage is calculated to have been 1.8% of the proposal area.

No stone artefacts were found in the subject area. The ESC encountered during the field survey is low and less than adequate for the purposes of determining the archaeological status and potential of the subject area based on the field inspection results alone. Accordingly, recourse to the predictive model is necessary in order to consider the nature of the archaeological sensitivity of the subject site. In this regard, all Survey Units are predicted to contain very low to negligible artefact density.

Table 2 Survey Coverage

SU	Landform	Area sq m	GE %	GE sq m	AV %	NEE sq m	ESC %	Predicted artefact density
SU1 (Plate 3)	Summit. Very steep gradient and open aspect. General disturbance resulting from grazing, and extensive water and wind erosion.	196961	2%	3939	20%	788	0.4	Very low/ negligible
SU2 (Plate 4)	Saddle. Very gentle gradient. General disturbance resulting from grazing, and extensive water and wind erosion.	97777	2%	1956	20%	391	0.4	Very low
SU3 (Plate 5)	Simple slope. Moderate to slightly steep gradient. General disturbance resulting from grazing, and extensive water and wind erosion.	36033	2%	721	20%	144	0.4	Very low/ Negligible
SU4 (Plate 6)	Simple slope. Moderate to slightly steep gradient. General disturbance resulting from grazing, vehicle tracks, and extensive water and wind erosion.	91082	10%	9108	80%	7287	8	Very low/ Negligible
SU5 (Plate 7)	Undulating flat. Very gentle gradient. General disturbance resulting from grazing, vehicle tracks, and water and wind	130055	5%	6503	30%	1951	1.5	Very low

SU	Landform	Area sq m	GE %	GE sq m	AV %	NEE sq m	ESC %	Predicted artefact density
	erosion.							
SU6	Simple slope. Moderate gradient. General disturbance resulting from railway line construction, grazing, and water and wind erosion.	56854	2%	1137	40%	455	0.8	Very low/ negligible
Total		608762		23363		11015	1.8	

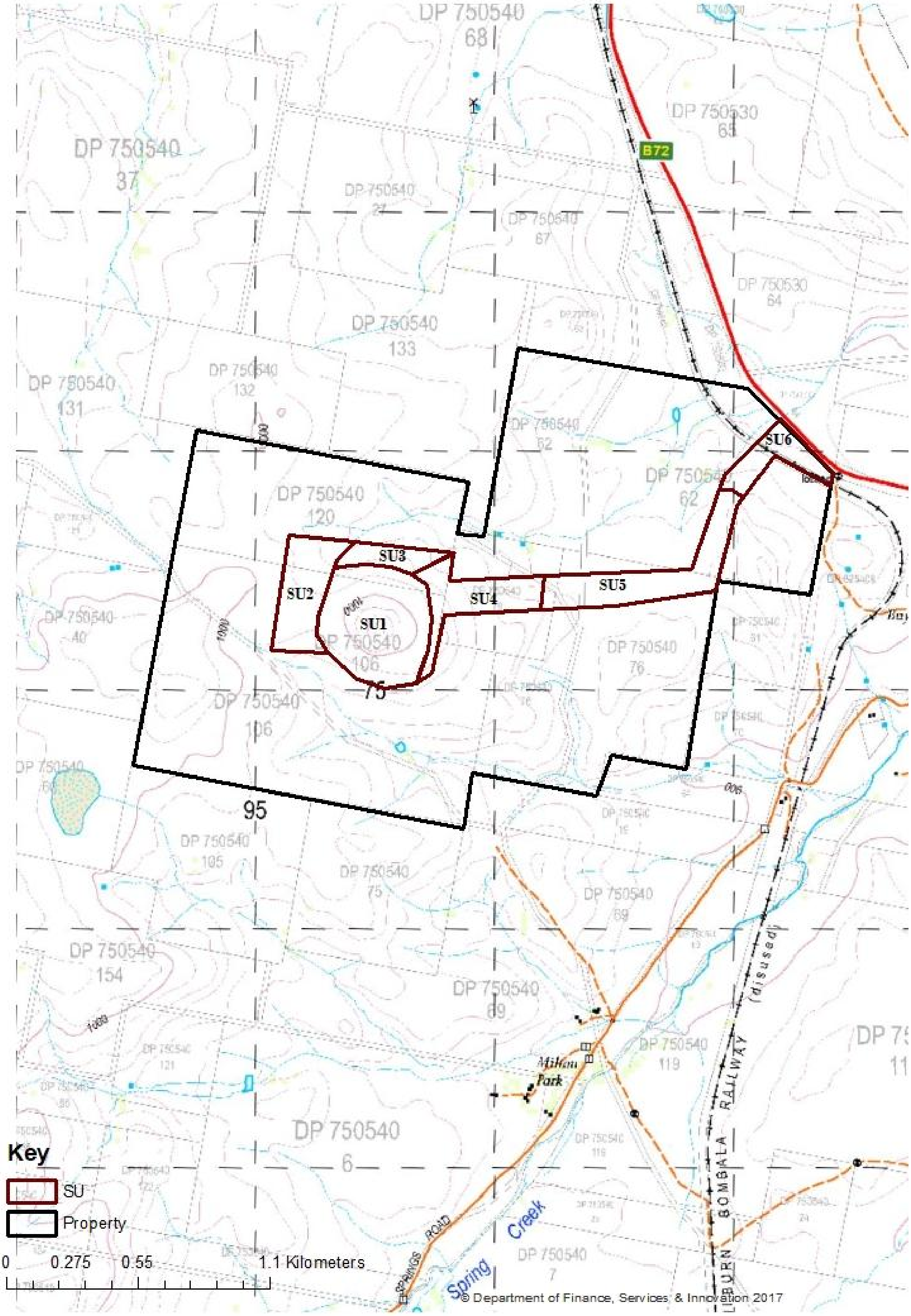

Figure 4 Location of Survey Units in the subject area.

Plate 3 Survey Unit 1 taken from the first minor break of slope, looking to 120˚.

Plate 4 Survey Unit 2; looking 270°.

Plate 5 Survey Unit 3; looking 340˚.

Plate 6 Survey Unit 4; looking 240˚, showing sheep track and grazing exposures.

Plate 7 Survey Unit 5; looking 0°, showing sheep track exposures.

Plate 8 Survey Unit 6; looking 90°, showing train track and associated disturbance across the Survey Unit to its left.

3. CONSULTATION PROCESS

A formal process of Aboriginal community consultation has been undertaken as a component of this assessment in accordance with the guidelines as set out in the NSW OEH's *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010b).

3.1 Consultation

In order to identify, notify and register Aboriginal people who may hold cultural knowledge relevant to determining the cultural significant of Aboriginal objects and/or places in the subject area, the following procedure was implemented (Appendix 2).

Correspondence dated 31 July 2017 was sent to:

- NSW OEH Queanbeyan office;
- Merrimans Local Aboriginal Land Council;
- the Office of the Registrar, Aboriginal Land Rights Act 1983;
- the National Native Title Tribunal, requesting a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements;
- Native Title Services Corporation Limited (NTSCORP Limited);
- Cooma-Monaro Shire Council;
- Cooma Local Land Services.

In addition, an advertisement was placed with the local paper (Cooma-Monaro Express) and appeared in the 23 August 2017 edition.

In accordance with NSW OEH list of relevant parties for the area, further correspondence dated 23 August 2017 was sent to those groups/individuals listed.

The Office of the Registrar Aboriginal Land Rights Act 1983 responded (8 August 2017) indicating that the Register of Aboriginal Owners lists the Registered Aboriginal Owners for Biamanga and Gulaga National Parks, pursuant to Division 3 of the Aboriginal Land Rights Act 1983 (ALRA). We note that these groups do not have jurisdiction of the freehold land in questions. In addition, we were referred to Merrimans Local Aboriginal Land Council. The National Native Title Tribunal responded via email dated 31 July 2017 indicating that there were no Native Title applications, Determinations of Native Title or Indigenous Land Use Agreements over the area.

There are seven Registered Aboriginal Parties in the process of consultation for the project.

In accordance with Section 4.2 and 4.3 of the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010b) guidelines, information with regard to the project, proposed consultation process and assessment methodology was furnished to the RAP's for comment on 7 September 2017.

The following response has been received:

Glen Freeman, Koomurri, emailed a response on 9/9/17:

> *As the Highway was always a part of the old Ngunawal walking track leading to Queanbeyan of our ancestors we are always interested in any project in the region. As such we have no issues with the methodology for the proposed project and look forward to working with you on it.*

A response was emailed to Glen on 30/9/17, as follows:

> Thanks for your email. The proposed quarry is south of Cooma. It is in Ngarigo country, I believe. I'm wondering if you are thinking of somewhere else.

Glen Freeman, Koomurri, emailed a response on 30/9/17:

> *Oops! Yes I was and as it's Ngarigo country Knac's policy is never to work on other people's country so we respectfully decline to take any further part in this project, thanks for the clarification.*
> *Regards.*
> *Glen*

Wally Bell, Buru Ngunawal Aboriginal Corporation, emailed a response on 20/9/17:

> *Thanks for the notification but this is outside our boundary.*

Mr Eric Naylor, Merrimans Local Aboriginal Land Council, assisted with the field survey.

A draft copy of this report was provided to RAPS for review. No responses were received.

4. SUMMARY AND ANALYSIS OF BACKGROUND INFORMATION

In previous sections, the results of the background research, survey and consultation has been outlined. The purpose of this section of the ACHAR is to explain the results.

It is noted that no information about Aboriginal places, areas or objects has been identified as a result of the formal process of Aboriginal consultation which has been undertaken (as specified in clause 80C of the NPW Regulation).

No previously recorded sites are listed on AHIMS as being present in the subject area and none were encountered during the field survey.

In an Aboriginal land use context, the subject area would have been a forest resource environment. The area contains low biodiversity values and a source of potable water is absent. At its nearest point, the subject area is located more than a kilometre away from the semi-reliable waters available at Rock Flat Creek. For this reason, the area is predicted to have been utilised for sporadic Aboriginal occupation associated with hunting and gathering forays conducted away from base camp locations. It is predicted that the material evidence of such occupation would be a very low density to negligible distribution of artefacts.

The ESC encountered during the field survey is low and considered to be less than adequate for the purposes of determining the archaeological status and potential of the subject area by way of visual inspection. However, as noted above, it is predicted that artefact distribution would be very low to negligible.

Subsurface test excavation is not warranted and there are no information gaps which are of a significant magnitude to warrant any further consideration.

5. CULTURAL HERITAGE VALUES AND STATEMENT OF SIGNIFICANCE

The information provided in this report and the assessment of significance of Aboriginal objects provides the basis for the proponent to make informed decisions regarding management and mitigation which should be undertaken in respect of proposed impacts.

5.1 Significance Assessment Criteria

The NPWS (1997) defines significance as relating to the meaning of sites: "meaning is to do with the values people put on things, places, sites, land". The following significance assessment criteria is derived from the relevant aspects of ICOMOS Burra Charter and NSW Department of Urban Affairs and Planning's 'State Heritage Inventory Evaluation Criteria and Management Guidelines'.

Aboriginal sites are assessed under the following categories of significance:

- cultural value to contemporary Aboriginal people,
- archaeological value,
- aesthetic value,
- representativeness, and
- educational value.

Aboriginal cultural significance

The Aboriginal community will value a place in accordance with a variety of factors including contemporary associations and beliefs and historical relationships. Most heritage evidence is valued by Aboriginal people given its symbolic embodiment and physical relationship with their ancestral past.

Archaeological value

The assessment of archaeological value involves determining the potential of a place to provide information which is of value in scientific analysis and the resolution of potential archaeological research questions. Relevant research topics may be defined and addressed within the academy, the context of cultural heritage management or Aboriginal communities. Increasingly, research issues are being constructed with reference to the broader landscape rather than focusing specifically on individual site locales. In order to assess scientific value, sites are evaluated in terms of nature of the evidence, whether or not they contain undisturbed artefactual material, occur within a context which enables the testing of certain propositions, are very old or contain significant time depth, contain large artefactual assemblages or material diversity, have unusual characteristics, are of good preservation, or are a part of a larger site complex. Increasingly, a range of site types, including low density artefact distributions, are regarded to be just as important as high density sites for providing research opportunities.

In order to assess the criteria of archaeological significance further, and also to consider the criteria of rarity, consideration can be given to the distribution of stone artefacts across the continent. There are two estimates of the quantity of accumulated stone artefacts in Australia (Wright 1983:118; Kamminga 1991:14; 2002). Wright estimated an average of 500,000 débitage items and 24,000 finished tools per square kilometre, which equates to a total of about 180 billion finished stone tools and four trillion stone débitage items in Australia. Kamminga's estimates, which were determined from a different set of variables, provide a conservative estimate of 200 billion stone tools and 40 million tonnes of flaking débitage (see Kamminga 1991:14; 2002). These two estimates are similar, and suggest that the actual number of stone tools and items of flaking débitage in Australia is in the trillions. The stone artefacts distributed in the proposed activity area cannot, therefore, be considered to be rare.

The vast majority of stone artefacts found in Australia comprise flaking debris (termed débitage) from stone tool making. While it can be reasonably inferred from a range of ethnographic and archaeological evidence that discarded stone artefacts and flaking debris was not valued by the maker, in certain circumstances these objects may to varying degrees have archaeological research potential and/or Aboriginal social value. However, only in very exceptional circumstances is archaeological research potential high for particular open context sites such as those encountered in the subject area (Kamminga, J. pers. comm. June 2009).

Representativeness

Representative value is the degree to which a "class of sites are conserved and whether the particular site being assessed should be conserved in order to ensure that we retain a representative sample of the archaeological record as a whole" (NPWS 1997). Factors defined by NPWS (1997) for assessing sites in terms of representativeness include defining variability, knowing what is already conserved and considering the connectivity of sites.

Educational value

The educational value of cultural heritage is dependent on the potential for interpretation to a general visitor audience, compatible Aboriginal values, a resistant site fabric, and feasible site access and management resources.

Aesthetic value

Aesthetic value relates to aspects of sensory perception. This value is culturally contingent.

5.2 Significance Value of the Aboriginal Object Sites in the Study Area

No Aboriginal objects are known to be present in the subject area. The majority of the subject area is assessed to be of very low archaeological value primarily because of the predicted very low to negligible distribution of stone artefacts. As a result of the process of Aboriginal consultation, no cultural values have been identified.

6. THE PROPOSED ACTIVITY

In this section, the nature and extent of the proposed activity and any potential harm to Aboriginal areas, objects and/or places is identified.

6.1 Proposed Impacts

Schmidt Quarries proposes to establish the hard rock quarry at 278 Springs Road, Rock Flat and to extract a maximum of 4.6 million tonnes of basalt over a period of 25 years at a rate of up to 280,000 tonnes of rock per annum.

Testing of the rock located on the project site has indicated that it is of sufficiently high quality so as to be suitable to satisfy Australian Standards requirements for engineering purposes. Accordingly, the establishment of the quarry will assist in meeting the regional demand for volcanic rock products well into the future. The proposed quarry is well positioned to service various roads and associated projects to the north and to the south (Outline Planning Consultants Pty. Limited 2017).

The land proposed for quarrying will also contain associated operational facilities including stockpiles, bunds, sediment basins and a crushing plant, which in total is referred to as the quarry site. The proposed development will entail the construction of the working quarry area which will include sedimentation dams, preparation of the plant site, establishment of the quarry face and facilities (that being an office, crushers, weigh bridge, workshops, and the like) and the construction of the internal quarry road extending from the Monaro Highway. Thereafter landscaping is proposed to mitigate the visual impact of the quarry as seen from the highway (Outline Planning Consultants Pty Limited 2017).

6.2 Type of Harm

The works would not cause harm to any known Aboriginal areas, places or objects.

7. AVOIDING AND/OR MINIMISING HARM

Ecologically Sustainable Development (ESD) is defined in the Protection of the Environment Administration Act 1991. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes and that ESD can be achieved through the implementation of:

(a) the precautionary principle,

(b) inter-generational equity,

(c) conservation of biological diversity and ecological integrity,

(d) improved valuation, pricing and incentive mechanisms.

The principles of ecologically sustainable development and the matter of cumulative harm have been considered for this project. The proposed impacts will occupy a comparatively small disturbance area. Given the low levels of prior, existing and potential future impacts in the local and regional context in which the proposed activity area is situated, the majority of cultural values, including archaeological, which attach to comparable landforms (elements and units) and the broader landscape remain intact across the region.

Avoidance or the mitigation of harm has not been considered as an option in relation to the proposed activities. It is considered that the significance of any undetected Aboriginal objects would not be sufficient to warrant the implementation of avoidance or impact mitigation strategies. However, a number of management strategies are possible and these are each given consideration below.

7.1 Management and Mitigation Strategies

Further Investigation

The field survey has been focused on recording artefactual material present on visible ground surfaces. Further archaeological investigation would entail subsurface excavation undertaken as test pits for the purposes of identifying the presence of artefact bearing soil deposits and their nature, extent, integrity and significance. Further archaeological investigation in the form of subsurface test excavation can be appropriate in certain situations. These generally arise when a proposed development is expected to involve ground disturbance in areas which are assessed to have potential to contain high density artefactual material and when the Effective Survey Coverage achieved during a survey of a project area is low due to ground cover, vegetation etc.

No areas of the proposal area have been identified which warrant further archaeological investigation in order to formulate appropriate management and mitigation strategies. It is our conclusion that artefact density in a subsurface context, where it may occur, would be very low and generally negligible.

Finally, it is noted that no Aboriginal objects or survey units with potential conservation value have been identified to have a high probability of being present in the subject area. Accordingly, test excavation conducted under OEH's *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010: 24) is not necessary.

Conservation

Conservation is a suitable management option in any situation, however, it is not always feasible to achieve. Such a strategy is generally adopted in relation to sites which are assessed to be of high cultural and scientific significance, but can be adopted in relation to any site type. In the case at hand, the development of a conservation strategy is not relevant given the absence of known Aboriginal objects and the predicted low archaeological potential of the subject area.

Mitigated Impacts

Mitigated impact usually takes the form of partial impacts only (i.e. conservation of part of an Aboriginal site or Survey Unit) and/or salvage in the form of further research and archaeological analysis prior to impacts. Such a management strategy is generally appropriate when Aboriginal objects are assessed to be of moderate or high significance to the scientific and/or Aboriginal community and when avoidance of impacts and hence full conservation is not feasible. Salvage can include the surface collection or subsurface excavation of Aboriginal objects and subsequent research and analysis. In the case at hand, the development of a mitigated impact strategy is not required given the absence of known Aboriginal objects and the predicted low archaeological potential of the subject area.

Unmitigated Impacts

Unmitigated impact to Aboriginal objects can be given consideration when they are assessed to be of low archaeological and cultural significance and otherwise in situations where conservation is simply not feasible. Unmitigated impacts is appropriate in regard to the proposed activities.

Monitoring

Monitoring during construction for the purposes of identifying cultural material that may be uncovered during earth disturbance can be implemented as a management strategy. However, monitoring is a reactive rather than proactive strategy, and as such, is not an ideal management tool in cultural heritage management. Monitoring for artefacts is not a widely accepted method of management because sites of significance can be destroyed as monitoring is taking place and because it can result in lengthy and costly delays to development works if significant cultural material is uncovered. In the case at hand, the development of a monitoring strategy is not considered necessary or appropriate.

8. STATUTORY INFORMATION

The NPW Act provides statutory protection for all Aboriginal objects and Aboriginal Places.

An 'Aboriginal object' is defined as

> 'any deposit, object or material evidence (not being a handicraft for sale) relating to Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'.

An Aboriginal place is an area declared by the Minister to be an Aboriginal place for the purposes of the Act (s84), being a place that in the opinion of the Minister *is or was of special significance with respect to Aboriginal culture*.

Part 6 of the National Parks and Wildlife Act 1974 (NPW Act) provides specific protection for Aboriginal objects and declared Aboriginal places by establishing offences of harm. Harm is defined to mean destroying, defacing, damaging or moving an object from the land. There are a number of defences and exemptions to the offence of harming an Aboriginal object or place. One of the defences is that the harm is carried out under an Aboriginal Heritage Impact Permit (AHIP).

There are no known Aboriginal objects in the subject areas. Accordingly, a s90 AHIP is not required.

9. RECOMMENDATIONS

The recommendations are made on the basis of:

- A consideration of the relevant legislation (see Section 8 Statutory Information).
- The results of the investigation as documented in this report.
- Consideration of the type of development proposed and the nature of proposed impacts.
- The discussion is Section 7 regarding impact mitigation and management.

The following recommendations are made:

1. There are no identified cultural and/or archaeological heritage constraints in regard to the proposed works.

2. No further archaeological investigations are required in respect of the proposal.

3. No Aboriginal objects have been recorded in the subject area. Furthermore, the area is assessed to be of very low archaeological potential.

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GLOSSARY

Aboriginal object - A statutory term, meaning: '… any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains' (s.5 NPW Act).

Declared Aboriginal place - A statutory term, meaning any place declared to be an Aboriginal place (under s.84 of the NPW Act) by the Minister administering the NPW Act, by order published in the NSW Government Gazette, because the Minister is of the opinion that the place is or was of special significance with respect to Aboriginal culture. It may or may not contain Aboriginal objects.

Development area - Area proposed to be impacted as part of a specified activity or development proposal.

Harm - A statutory term meaning '… any act or omission that destroys, defaces, damages an object or place or, in relation to an object – moves the object from the land on which it had been situated' (s.5 NPW Act).

Place - An area of cultural value to Aboriginal people in the area (whether or not it is an Aboriginal place declared under s.84 of the Act).

Proponent - A person proposing an activity that may harm Aboriginal objects or declared Aboriginal places and who may apply for an AHIP under the NPW Act.

Proposed activity - The activity or works being proposed.

Subject area - The area that is the subject of archaeological investigation. Ordinarily this would include the area that is being considered for development approval, inclusive of the proposed development footprint and all associated land parcels. In this instance, the subject area is defined as the quarry footprint in which proposed impacts would take place.

APPENDIX 1 ABORIGINAL CONSULTATION

Example of a letter of notification

New South Wales Archaeology Pty Limited ABN 53106044366

PO Box 2135
Central Tilba NSW 2546
Ph 02 44737947
Mob. 0427074901
www.nswarchaeology.com.au

31 July 2017
The Chairperson
Merrimans Local Aboriginal Land Council
13 Umbarra Road
Wallaga Lake NSW 2546

Dear Anne

Re Proposed Hard Rock Quarry 278 Springs Road, Rock Flat via Cooma

Schmidt Quarries proposes to extract and process a maximum of 3.75 million tonnes of rock from the project site at 278 Springs Road, Rock Flat via Cooma. NSW Archaeology Pty Ltd is undertaking consultation with Aboriginal people on behalf of the proponent according to the requirements stipulated in the former NSW DECCW Aboriginal cultural heritage consultation requirements for proponents, 2010. The purpose of Aboriginal community consultation is to assist the proponent in understanding Aboriginal peoples views and concerns about the project, and to understand cultural values present in the area, and to assist the NSW Office of Environment and Heritage (OEH) in a determination of an AHIP application if required, or otherwise, general terms of approval.

We are seeking to identify Aboriginal persons who hold cultural knowledge relevant to this project area and who may wish to register an interest. Those who choose to register will have the opportunity to provide culturally appropriate information and to comment on the cultural heritage significance of Aboriginal objects and the area. If you are aware of Aboriginal people or groups who you believe may wish to register an interest please provide contact details to NSW Archaeology Pty Ltd on behalf of the proponent before the 14 August 2017.

Yours faithfully

Dr Julie Dibden
New South Wales Archaeology Pty Limited

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PUBLIC NOTICE

Cooma Chamber of Commerce inc.

MEET THE CANDIDATES EVENING

Local Government Election - September 9.
Cooma Chamber of Commerce are hosting a Meet the Candidate Information Evening for members of the Cooma Chamber of Commerce, the general public and interested organisations.
When: Monday 28 August 2017 6pm
Where: Cooma Ex Services Club Functions Room
All candidates for the upcoming Snowy Monaro Regional Council Election have been invited to attend.

Schmidt Quarries proposes to extract and process rock from 278 Springs Road, Rock Flat via Cooma. An Aboriginal Heritage Impact Permit or other approvals may be required. Aboriginal people with cultural knowledge relevant to determining the significance of Aboriginal objects and/or places in the area are invited to register an interest in the process of consultation. The purpose of consultation is to assist in the preparation of an application for an AHIP and to assist the Director General of NSW OEH in its consideration and determination. Proponent: David Schmidt 12 Bass Street Queanbeyan NSW. Please register in writing to: Julie Dibden, NSW Archaeology PL, PO Box 2135 Central Tilba NSW 2546, before 6 September 2017.

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Example of second letter of notification

New South Wales Archaeology Pty Limited ABN 53106044366

PO Box 2135
Central Tilba NSW 2546
Ph 02 44737947
Mob. 0427074901
www.nswarchaeology.com.au

23 August 2017
The Chairperson
Bega Local Aboriginal Land Council
PO Box 11
Bega NSW 2550

Dear Sir/Madam

Re Proposed Hard Rock Quarry 278 Springs Road, Rock Flat via Cooma

Schmidt Quarries (David Schmidt - Schmidt Quarries - 12 Bass Street, Queanbeyan NSW 2620) proposes to extract and process a maximum of 3.75 million tonnes of rock from the project site at 278 Springs Road, Rock Flat via Cooma. As a part of that process, NSW Archaeology Pty Ltd is undertaking consultation with Aboriginal people on behalf of the proponent according to the requirements stipulated in the former NSW DECCW Aboriginal cultural heritage consultation requirements for proponents, 2010. The purpose of Aboriginal community consultation is to assist the proponent in understanding Aboriginal peoples views and concerns about the project, and to understand cultural values present in the area, and to assist the NSW Office of Environment and Heritage (OEH) in a determination of an AHIP application, if required.

Aboriginal people with cultural knowledge relevant to determining the significance of Aboriginal objects and/or places in the area are invited to register an interest in the process of community consultation. OEH provided your details to us and indicated that you may have an interest in the area. If you wish to register in a process of community consultation with the proponent please notify: Julie Dibden, NSW Archaeology PL, PO Box 2135 Central Tilba NSW 2546, before 7 September 2017. Please note that if you do register an interest your details will be forwarded to the OEH and the relevant Local Aboriginal Land Councils unless you specify that you do not want your details released.

Yours faithfully

Dr Julie Dibden
New South Wales Archaeology Pty Limited

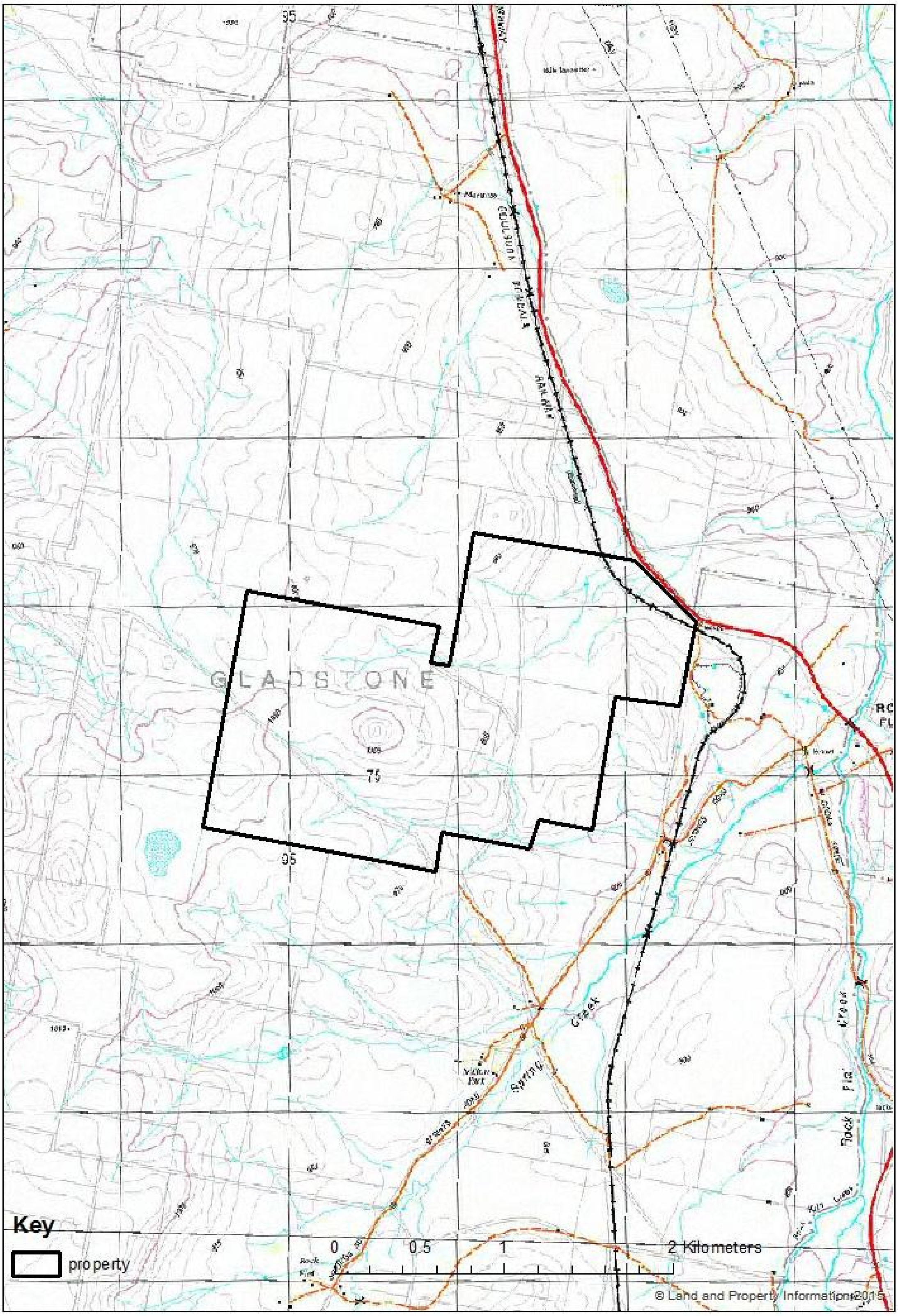
Project information, proposed consultation process and methodology documents

PROJECT DESCRIPTION AND PROPOSED CULTURAL HERITAGE ASSESSMENT AND CONSULTATION PROCESS
THE PROPOSED ACTIVITY

NSW Archaeology Pty Ltd has been commissioned to conduct a formal process of Aboriginal Consultation in relation to the proposed Hard Rock Quarry at 278 Springs Road, Rock Flat via Cooma (the Project). The project area is within the Merrimans Local Aboriginal Land Council boundary. It is 15km south of Cooma on the Monaro Highway.

Schmidt Quarries proposes to extract and process a maximum of 3.75 million tonnes of rock from the project site. NSW Archaeology Pty Ltd is undertaking consultation with Aboriginal people on behalf of the proponent. This would be conducted in accordance with the requirements stipulated in the former NSW DECCW *Aboriginal cultural heritage consultation requirements for proponents, 2010*. The purpose of Aboriginal community consultation is to assist the proponent in understanding Aboriginal people's views and concerns about the project, and to understand cultural values present in the area, and to assist the NSW Office of Environment and Heritage (OEH) in a determination of an AHIP application, if required, or otherwise, general terms of approval.

Please review the following information which sets out the proposed cultural heritage and assessment process for your review and consideration.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PROPOSED CULTURAL HERITAGE ASSESSMENT PROCESS

This document is being provided to Registered Aboriginal Parties (RAPs) for the purposes of agreeing on outcomes relating to the assessment process.

The cultural heritage assessment process for this project would be conducted in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (NSW DECCW). The NSW Office of Environment and Heritage - OEH (formally DECCW) manages Aboriginal cultural heritage in NSW in accordance with the National Parks and Wildlife Act 1974. Part 6 of the Act provides specific protection for Aboriginal objects and Aboriginal places by administering offences for harming them without authorisation. When an activity is likely to impact Aboriginal objects or declared Aboriginal Places, approval of the OEH is required, issued in the form of an Aboriginal Heritage Impact Permit (AHIP) or where relevant, General Terms of Approval.

NSW OEH requires effective consultation with Aboriginal people because it recognises that:

- Aboriginal people should have the right to maintain culture, language, knowledge and identity;
- Aboriginal people should have the right to directly participate in matters that may affect their heritage; and
- Aboriginal people are the primary determinants of the cultural significance of their heritage.

The purpose of the NSW OEH Aboriginal Cultural Heritage Consultation Requirements for Proponents document (NSW DECCW 2010) is to facilitate positive Aboriginal cultural heritage outcomes by:

- affording an opportunity for Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the proposed project area to be involved in consultation so that information about cultural significance can be provided to NSW OEH to inform decisions regarding applications for an AHIP or General Terms of Approval; and
- providing Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the proposed project area with the opportunity to participate in decision-making regarding the management of their cultural heritage by providing proponents with information regarding cultural significance and inputting into management options (NSW DECCW 2010).

The ACHCRP requirements outline four main consultation stages to be implemented during consultation undertaken with Aboriginal people (these are outlined below). In summary, the consultation process involves getting the views of, and information from, Aboriginal people and reporting these.

To fulfil the consultation requirements, NSW Archaeology Pty Ltd, on behalf of the proponent, proposes to implement the following procedure:

Stage 1 Notification of project proposal and registration of interest.
This stage is already underway, and the aim is to identify, notify and register Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the proposal area.

- NSW Archaeology, on behalf of the proponent, has sought to identify the names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places. An advertisement has been placed in the local paper and letters have been written to various agencies.

- As we receive registrations of interest, NSW Archaeology is making a record of the names of each Aboriginal person or group who has registered an interest. Unless it is specified by a registered Aboriginal party that they do not want their names released, the list of names will be provided to OEH and the Local Aboriginal Land Councils.

- Where an Aboriginal organization representing Aboriginal people who hold cultural knowledge has registered an interest, a contact person for that organization must be nominated. We rely on that organization to make these arrangements. Where Aboriginal cultural knowledge holders have appointed a representative to act on their behalf, this information must be provided in writing to NSW Archaeology Pty Ltd.

Stage 2 Presentation of information about the proposed project
The aim of this stage is to provide registered Aboriginal parties with information about the scope of the proposed project and the proposed cultural heritage assessment process. This will entail:

- The proponent has engaged NSW Archaeology Pty Ltd to conduct the consultation process. It is therefore the role of Julie Dibden, NSW Archaeology Pty Ltd, to co-ordinate the assessment process. Aboriginal parties are invited to define their role, function and responsibility in this process.

- All registered Aboriginal parties are invited to identify, raise and discuss any cultural concerns, perspectives and assessment requirements (if any). In this regard registered Aboriginal parties should contact Julie Dibden, and this may be done in writing or by telephone.
- Provision of project information and the proposed cultural heritage process is provided to registered Aboriginal parties as per this document and the accompanying *Methodology* document.
- If further information is required regarding the proposal this will be provided to Aboriginal parties upon request. If necessary, additional information about the project may entail a project site visit.
- A record will be made that the proposed project information has been submitted. A record of any agreed outcomes and any contentious issues that may require further discussion to establish mutual resolution (if applicable) will be kept and a record will be provided to registered Aboriginal parties.
- All comments and feedback regarding the Consultation Process and Project Methodology should be provided to NSW Archaeology within 28 days.

Stage 3 Gathering information about cultural significance
The aim of stage 3 is to facilitate a process whereby Aboriginal parties can contribute to culturally appropriate information gathering and the project methodology, provide information that will enable the cultural significance of Aboriginal objects and/or places in the proposal area to be determined, and to have input into the development of cultural heritage management options.

- A proposed methodology for the cultural heritage assessment will be provided to registered Aboriginal parties for review. Any comments regarding the methodology should be provided to Julie Dibden, NSW Archaeology Pty Ltd, within 28 days. Any protocols that registered Aboriginal parties wish to be adopted into the information gathering process and assessment methodology, and any other matters, should be provided in writing or may be sought by the consultant.
- As a part of consultation, NSW Archaeology Pty Ltd, on behalf of the proponent, seeks cultural information from registered Aboriginal parties to identify whether there are any Aboriginal objects or places of cultural value to Aboriginal people in the proposal area and if so, to uncover knowledge about their context to reveal their meaning and significance. Registered Aboriginal parties who wish to contribute to this process should contact Julie Dibden (within 28 days) so that appropriate arrangements regarding collecting cultural knowledge can be made.

- If any information obtained is sensitive, appropriate protocols will be developed and implemented for sourcing and holding sensitive information.
- Registered Aboriginal parties are invited to identify, raise and discuss any cultural concerns, perspectives and assessment requirements by telephone or in writing to Julie Dibden, NSW Archaeology, within 28 days.
- All feedback received from registered Aboriginal parties will be documented in the Aboriginal cultural heritage assessment report as appropriate.

Stage 4 Review of Draft Cultural Heritage Assessment Report
The aim of this stage is to prepare and finalise an Aboriginal cultural heritage assessment report with input from registered Aboriginal parties.

- A draft report will be compiled.
- The draft report will be provided to registered Aboriginal parties for review and comment.
- Any comments regarding the report should be provided to Julie Dibden, NSW, within 28 days.

After considering comments the report will be finalised and copies will be provided to registered Aboriginal parties. The final report will include copies of any submissions made and the proponents response to any submissions.

PROPOSED METHODOLOGY FOR THE INDIGENOUS HERITAGE (CULTURAL AND ARCHAEOLOGICAL) ASSESSMENT

NSW Archaeology Pty Ltd has been commissioned to conduct a formal process of Aboriginal Consultation in relation to the proposed Hard Rock Quarry at 278 Springs Road, Rock Flat via Cooma (the Project). The project area is within the Merrimans Local Aboriginal Land Council boundary. It is 15km south of Cooma on the Monaro Highway.

Schmidt Quarries proposes to extract and process a maximum of 3.75 million tonnes of rock from the project site.

NSW Archaeology Pty Ltd is undertaking consultation with Aboriginal people on behalf of the proponent according to the requirements stipulated in the former NSW DECCW Aboriginal cultural heritage consultation requirements for proponents, 2010.

NSW Archaeology Pty Ltd is a consultancy specialising in Indigenous cultural heritage management and aims to prepare assessments of a high standard to satisfy all stakeholders including the local Aboriginal community and the NSW Office of Environment and Heritage – OEH.

The project will be conducted in accordance with the requirements of the OEH *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* and the *DECCW 2010 Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. In addition, the study is being undertaken following the requirements for *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRP) (NSW DECCW 2010).

In accordance with the process as outlined in *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRP) (NSW DECCW 2010), this methodology is being provided to all Aboriginal groups/individuals who have registered an interest in this process of consultation. The purpose of providing registered stakeholders with this methodology is for stakeholders to review and provide feedback to the consultant, including identification of issues/areas of cultural significance that might affect the methodology. Stakeholders are invited to make a written response to this proposed methodology within 28 days.

The methodology which is proposed to be implemented during this project is set out below.

It is proposed that the assessment of cultural heritage values of the project area will entail the following aspects as defined in the OEH *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*:

Review of background information: Definition and mapping of the physical landscape; reviewing historic values via recourse to written and oral histories and existing heritage data bases; and define the material evidence of Aboriginal land use via review of previous research, development of predictive model and a field inspection and survey (the latter to be documented in a survey report). Any information received from registered Aboriginal parties will be used in this process. Registered Aboriginal parties are invited to inform Julie Dibden regarding areas, objects and places of cultural value in the proposed activity area.

Initiate ongoing consultation in accordance with the OEH's Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. Information is sought from registered Aboriginal parties on whether there are any Aboriginal areas, objects or places of cultural value to Aboriginal people in the proposed activity area.

Identify and assess the cultural heritage values: Upon receipt of information that would enable the cultural significance of Aboriginal areas, objects and/or places in the proposed activity area to be determined, the range of social, historical, scientific and aesthetic values present across the study area would be identified, mapped, and assessed as to why they are important.

Assess harm of the proposed activity: Identification of the nature of the proposed activity and any potential harm to Aboriginal areas, objects and/or places. This would take into consideration the principles of ecologically sustainable development (ESD) if relevant.

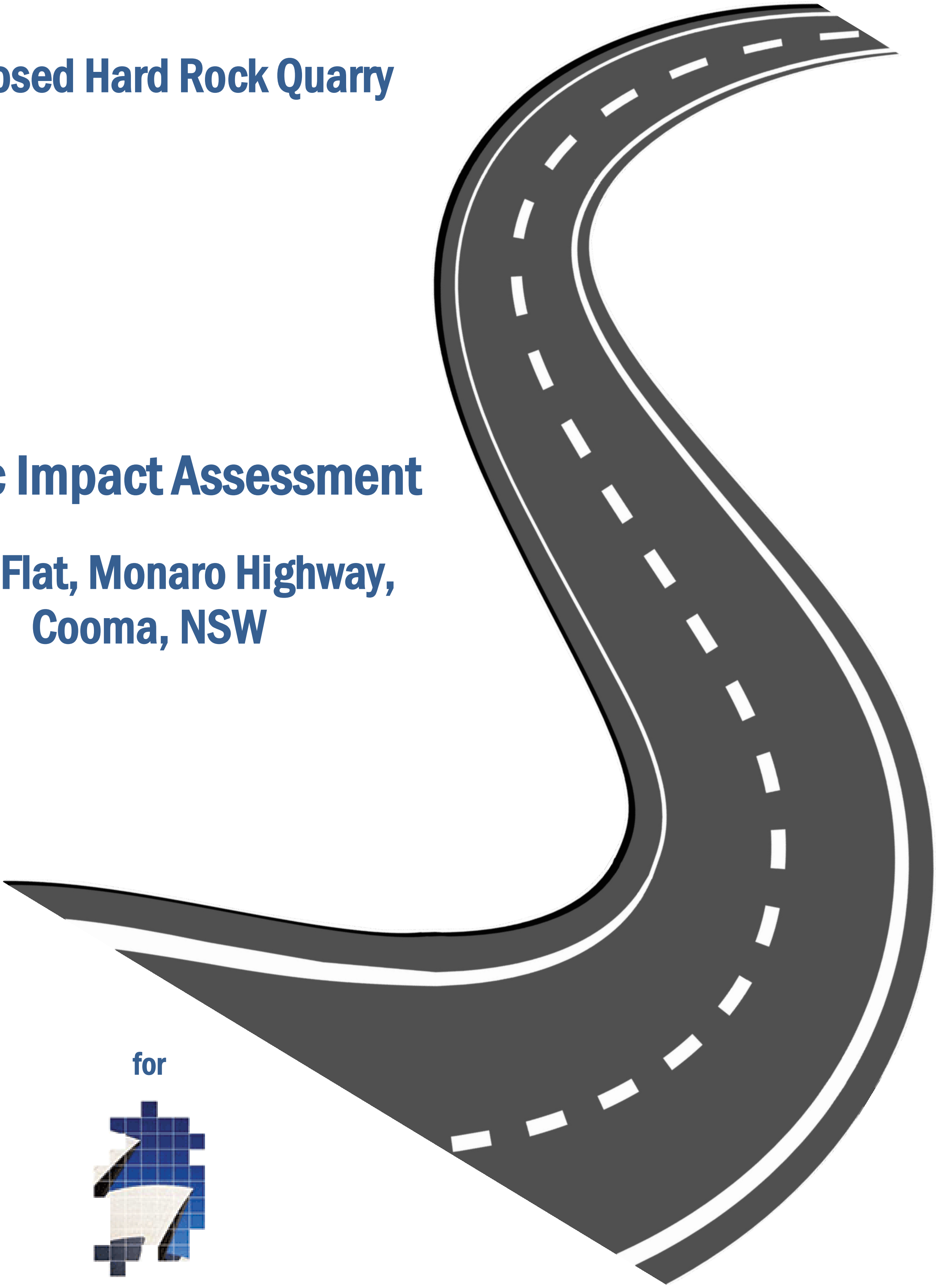
Develop harm avoidance and/or minimisation strategies: Registered stakeholders would be invited to have input into the development of cultural heritage management options. The development of avoidance and/or minimisation strategies if required would commence in the field, and be developed further within an Aboriginal cultural heritage assessment report.

Documentation of Findings: An Aboriginal cultural heritage assessment report would be prepared. The report would be prepared in accordance with the report outline as set out in OEH's *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*.

A draft copy of the report will be provided to all Aboriginal groups or individuals who register an interest in this project for review and comment.

Upon review of this proposed methodology, registered stakeholders are invited to make submissions relating to the information gathering and assessment methodology, and any matters such as issues/areas of cultural significance that might affect, inform or refine the assessment methodology, to Julie Dibden within 28 days. All feedback received will be documented in the cultural heritage assessment report, which will include copies of submissions received and the proponent's response to issues raised.

Proposed Hard Rock Quarry



Traffic Impact Assessment

Rock Flat, Monaro Highway, Cooma, NSW

for

Outline Planning

November 2017

Traffic Impact Assessment Details

Generic Document No.				
Edition / Revision No.	1	2		
Event				
Document Status	Internal Review	Updated Report	Updated Report	Final Report
Prepared By	Andy Davis Director	Andy Davis Director	Andy Davis Director	Andy Davis Director
Reviewed By	Craig Nethery Director	Craig Nethery Director	Craig Nethery Director	Craig Nethery Director
Date	20 Sept 2017	16 Oct 2017	29 Nov 2017	15 Dec 2017
Internal Review Completed By / Date				

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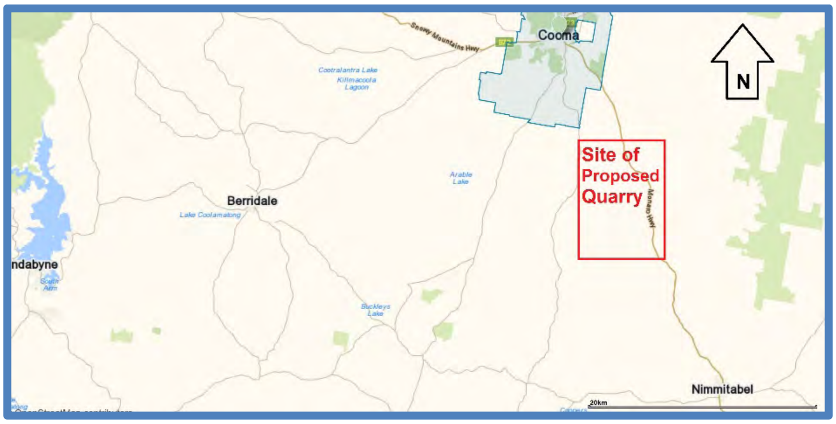
CONTENTS

APPENDICES

1. INTRODUCTION

1.1 General

StreetWise Road Safety and Traffic Services have been engaged to prepare a Traffic Impact Assessment report for a proposed hard rock quarry at Rock Flat, on the Monaro Highway, approximately 15kms south of Cooma. The proposed development is to be on land comprising Lot 62,76,78, 106 & 120 in Deposited Plan 750540, No. 278 Springs Road, Rock Flat, located approximately 14km to the south of Cooma, on the Monaro Plain in the NSW Southern Tablelands. The proposed is located on the western side of the Monaro Highway.



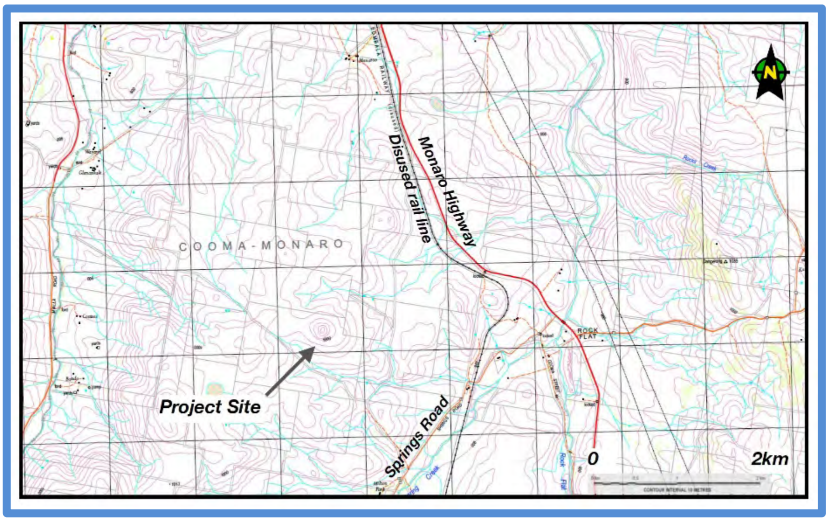


Figure 1 – Locality Plan

1.2 Scope

This traffic impact assessment of the proposed quarry at Rock Flat, Cooma, includes:

- Completion of a Site Inspection
- Complete an AM & PM Peak Manual Intersection Count for the intersection of the Monaro Highway & Springs Road, Rock Flat
- Liaise / Consult with Snowy Monaro Regional Council and the local region of the Roads and Maritime Services.
- Assess the traffic impacts including:
  - Determine Traffic Generation (Quarry Construction)
  - Determine Traffic Generation (Quarry Operation)
  - Distribute Traffic Assignment (Quarry Construction)
  - Distribute Traffic Assignment (Quarry Operation)
  - Intersection / Access Sight Distance Assessment

- Intersection / Access Design Assessment
- Development of Intersection / Access Concept Layout, including Swept Turnpath Assessment
- Sidra Modelling for
  - Assessment of existing AM & PM Peaks without development.
  - Assessment of existing AM & PM Peaks with development.
  - Assessment of existing AM & PM Peaks without development for 10-year future.
  - Assessment of existing AM & PM Peaks with development for 10-year future.
- Haulage Route Assessment
- Preparation of Traffic Impact Assessment Report Location of Project

The EPA requirements also include:
<u>Traffic & Transport</u>

- Accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the type of vehicle to be used for the transportation of quarry products
- An assessment of potential traffic impacts on the capacity, condition, safety, and efficiency of the state and local road network, detailing the nature of the traffic generated, haulage routes, traffic volumes and the potential impacts on local and regional roads
- A description of the measures to 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.
- A description of access roads, specifically in relation to nearby Crown Roads and fire trails.

1.3 Description of Project

The site of the proposed quarry development at Rock Flat is currently undulating grassland, with occasional rocky hills and grassland. The land is generally cleared and used for grazing stock. The nearest dwelling is approximately 1.7 kms to the south-east.

The proposed development involves extraction of basalt from a single hill located centrally within the 9 ha site. The actual area of the extraction site is proposed to be approximately 300m in diameter. The ancillary buildings and infrastructure will include a processing plant (crusher and sorter), stockpile area facilities and access road to the Monaro Highway. The proposed access road will cross Lot 1 DP 7102, which is Crown Land, owned by State Rail.

The Applicant and quarry operator, Schmidt Quarries Pty Ltd, proposes the establishment of a new quarry to extract a total of 3.75 million tonnes of basalt over a 25-year period. The annual volume of hard rock extraction is 280,000 tonnes (approx. 182,000 cu metres). The quarry will have about 4.6 million tonnes of extractive resource and a life of about 30 years.

2. ROAD NETWORK

2.1 Local Road Network

The proposed development site is located approximately 15kms south of the township of Cooma. The site located on the western side of the Monaro Highway, which links the ACT and Cooma to the east coast, via Nimmitabel and Bega. The highway is designated B23, and in the vicinity of the proposed development site, is approximately 9m wide, with 3.5m wide lanes in either direction, and a 1m sealed shoulder on both sides. Across the frontage of the subject site, the sealed shoulder has been widened to 2m on the eastbound side, to allow vehicles to pass any vehicles slowing or waiting to turn right into the property access. The posted speedzone of the Monaro Highway, in the vicinity of the proposed development, is 100kmh.

Figure 2.1: Existing property access off Monaro Highway

In the vicinity of the proposed quarry, there are a few minor side roads on either side of the highway. These are generally unsealed and provide access to rural properties. At the time of inspection, it was noted that the intersections with the highway serve as informal school pick-up points during peak times.

3. TRAFFIC VOLUMES

3.1 Existing Traffic Volumes

3.1.1 <u>Monaro Highway</u>

StreetWise obtained historical traffic data for the Monaro Highway, with an RMS counter located outside Nimmitabel, approximately 22 kms east of the subject site. It is assumed these volumes will be similar to those across the frontage of the site, given the minimal number of cross roads and properties between the 2 sites. The following table (Fig 3.1) shows the average annual traffic volumes on the Monaro Highway, while the graph below (Fig 3.2) shows the growth of average daily traffic volumes between 2007 and 2016 is approximately 1.5% p.a..

Year	*Eastbnd*	*Westbnd*	*Total*
2007	918	900	1818
2008	1058	1038	2096
2009	1009	1022	2031
2010	1103	1104	2207
2011	1046	1056	2102
2012	1022	1012	2034
2013	1110	1105	2215
2014	1135	1126	2261
2015	1101	1107	2208
2016	1122	1133	2255

Figure 3.1: Average Daily Traffic Volumes – Monaro Highway, Nimmitabel 2007 - 16

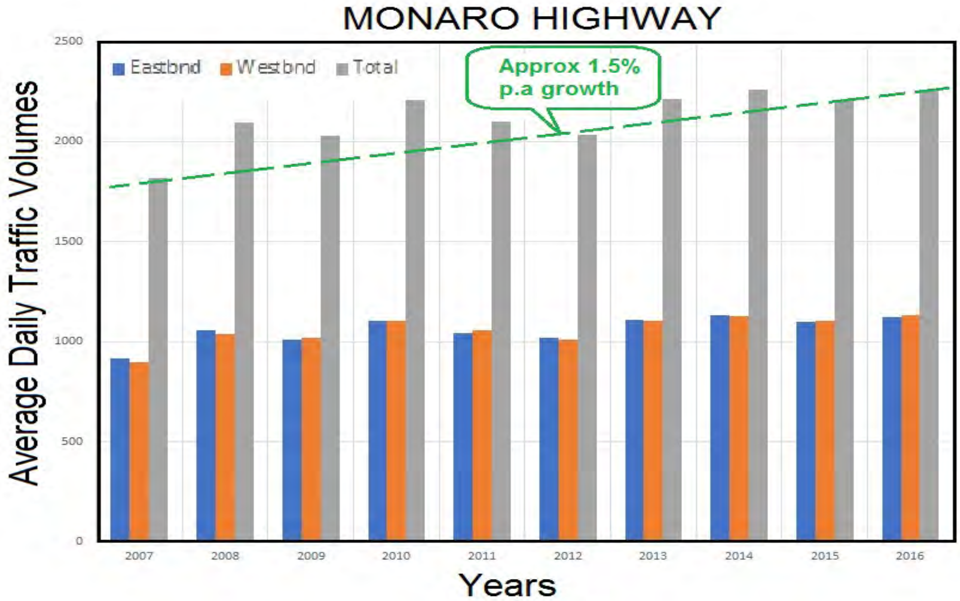


Figure 3.2: Traffic Volumes Growth – Monaro Highway, Nimmitabel 2007 - 16

The RMS website includes detailed traffic data gathered from the collection point on the Monaro Highway at Nimmitabel, east of the proposed quarry. The information available covers period from 2007 - 2016, and includes hourly traffic volumes, in both directions. Figure 3.3 below shows hourly traffic volumes in both directions on a typical weekday. As can be seen from the graph, the traffic volume:

- increases steadily from 5am to 11am
- remains relatively high between 11am and 3pm
- decreases steadily between 3pm and 8pm
- remains low overnight (between 8pm and 5am)
- the Eastbound volumes (towards Cooma) are higher in the morning
- the westbound volumes (towards Bega) are higher in the afternoon.

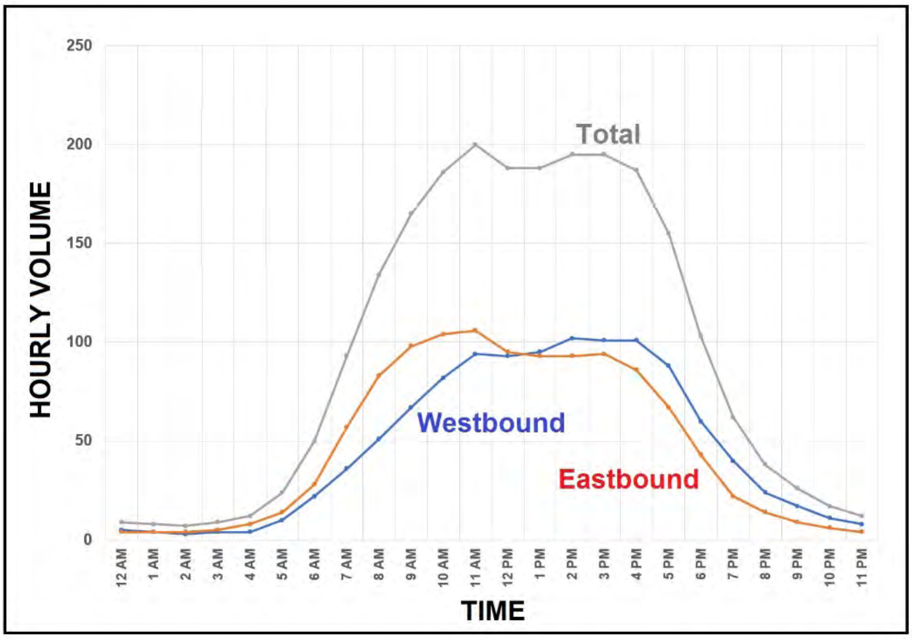


Figure 3.3: Typical Weekday Traffic Volumes – Monaro Highway, Nimmitabel 2016 (RMS Website)

StreetWise also observed the highway traffic volumes in the vicinity of the site during the afternoon period (Wednesday 16 August 2017) and the following morning period (Thursday 17 August). The results of the traffic count are tabulated below, in Figure 3.4 and 3.5

		1			2					3	4	5	6
Time		M Hwy - into Cooma			M Hwy - from Cooma					Out of T Groggen	Into T Groggen	Into Spring	Out of Spring
		Light	HV	Total	Light	HV	Total	Hwy Total					
7:00 AM	7:15 AM												
7:15 AM	7:30 AM												
7:30 AM	7:45 AM	23	4	27	11	1	12	39		0	1	0	1
7:45 AM	8:00 AM	16	2	18	18	2	20	38		1	1	0	0
8:00 AM	8:15 AM	22	2	24	13	4	17	41		3	0	0	2
8:15 AM	8:30 AM	32	3	35	12	1	13	48	166	3	2	1	3
8:30 AM	8:45 AM	23	3	26	10	1	11	37	164	0	1	0	1
8:45 AM	9:00 AM												
	Total	*116*	*14*	*130*	*64*	*9*	*73*	*203*		*7*	*5*	*1*	*7*

Figure 3.4: Observed PM Traffic Volumes – Wednesday 16-08-17

		1			2					3	4	5	6
Time		M Hwy - into Cooma			M Hwy - from Cooma					Out of T Groggen	Into T Groggen	Into Spring	Out of Spring
		Light	HV	Total	Light	HV	Total	Hwy Total					
7:00 AM	7:15 AM												
7:15 AM	7:30 AM												
7:30 AM	7:45 AM	23	4	27	11	1	12	39		0	1	0	1
7:45 AM	8:00 AM	16	2	18	18	2	20	38		1	1	0	0
8:00 AM	8:15 AM	22	2	24	13	4	17	41		3	0	0	2
8:15 AM	8:30 AM	32	3	35	12	1	13	48	166	3	2	1	3
8:30 AM	8:45 AM	23	3	26	10	1	11	37	164	0	1	0	1
8:45 AM	9:00 AM												
	Total	*116*	*14*	*130*	*64*	*9*	*73*	*203*		*7*	*5*	*1*	*7*

Figure 3.5: Observed AM Traffic Volumes – Thursday 17-08-17

The StreetWise traffic count results indicate a peak hour of 166 vehicles in both the AM and PM periods, which correlate to the traffic movements obtained from the RMS website (Fig 3.3 above). The ratio of eastbound to westbound movements also confirm the patterns shown in Figure 3.3.

The turn movements into and out of Spring Road and Tom Groggin Road (to the south-east of the proposed quarry) were included to indicate the low volumes on the adjacent local roads, which were generally related to school pick-up or drop-offs.

Heavy vehicles numbers were approximately 11% of the total highway volume in both the morning and afternoon counts.

3.2 Future Traffic Volumes

Based on the 10 years of Monaro Highway data provided by the RMS, which indicates a steady increase of 1.5% per annum, StreetWise expect the annual increase to continue, and a future growth of 1.5% per annum has been adopted for the purposes of this assessment. Similarly, it is assumed the content of heavy vehicles will remain constant (11%) and the current hourly patterns (as shown in Figure 3.3) will also continue.

Year	Eastbnd			Westbnd			Total
	Cars	HV	Total	Cars	HV	Total	
2016	999	123	1122	1008	125	1133	2255
2017	1014	125	1139	1023	126	1150	2289
2027	1176	145	1322	1188	147	1335	2656

Figure 3.6: Estimated Future Monaro Highway Daily Weekday Volumes (2027)

3.3 Development Generated Volumes

The applicant proposes to establish a hard rock quarry, to extract and process a maximum of 3.75 million tonnes over a 25-year period, at a rate of 280,000 tonnes per year. Given that the applicant currently operates existing quarries, with a fleet of truck & dog trailers, which haul an average of 39 tonnes per trip, the following can be concluded:

Proposed annual total	280,000 tonnes
Capacity of standard truck	39 tonnes (58 cu metres)
Annual total of trips	7,180 laden or 14,360 haul & return
Average per week (50 weeks)	144 laden or 288 return trips
Average per day (5.5 days)	26 laden or 52 return trips
Average per hour (10-hour day)	2.6 laden or 5.2 return trips

The above estimate is based on an average number of weekly, daily and hourly trips to deliver 280,000 tonnes of processed hard rock per year. However, the demand for gravel is not usually constant, with the local civil construction industry varying between periods of peak and quiet activity. The main customers for existing local quarries are concrete batching plants, and roadworks projects. While the deliveries of gravel to concrete batching plants are generally steady, the demand for gravel on roadworks projects varies greatly.

The applicant stated that in his experience, a current peak day would be a maximum 2500 tonnes. This would require an estimated 64 laden trips to deliver the gravel, or a maximum 128 return trips (Note: not ALL gravel deliveries will include a return trip). This averages out to approximately 13 return trips per hour (for a 10-hour working day) on a peak day. However, it is likely the number of hourly trips will be greater in the morning than afternoon, with 8 laden trips (or a total of 16 trips) per hour adopted as the maximum number of movements for the purposes of this assessment.

In addition to the haulage movements generated by the quarry, the site employs truck drivers, plant operators and administrative staff, who will commute to the site from Cooma and other locations. As with the existing quarry operations at other locations, it is expected that staff will arrive at the site from around 6 am at a rate of about 5 per hour through to 9am. Similarly, staff will leave work from mid-afternoon at a similar rate.

3.4 Trip Assignment

For the purposes of this assessment, the following assumptions have been adopted, based potential customers and movements from existing quarries in the Cooma area:

- The majority of laden truck movements (65%) out of the site are likely to be south, towards Nimmitabel, via the Monaro Highway. The rest of the movements (35%) will head north on the Monaro Highway towards Cooma and locations further afield.
- While the average number of estimated trips is 4 trips per hour, and the hourly average to deliver 2500 tonnes per day is 13, a maximum of 16 heavy vehicle trips per hour (8 laden trips) has been adopted for the morning peak times, and 6 (3 laden) per hour for afternoons.
- Staff movements will be approximately 5 per hour in both the morning and afternoon. All trips to and from the site will be via the Monaro Highway, with a split of 60% from Cooma and 40% from the south adopted for this assessment.

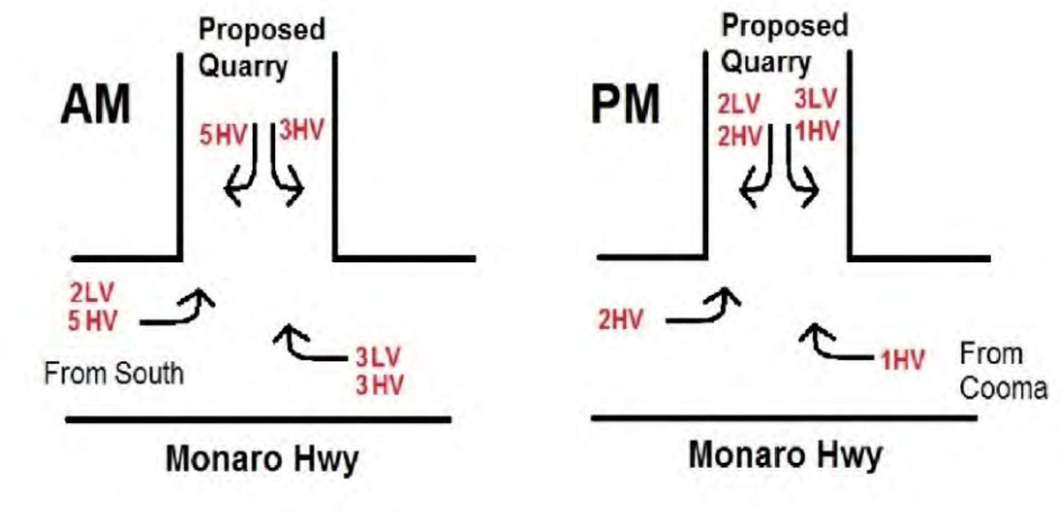


Figure 3.7: Estimated hourly vehicle trips to be generated by development

3.5 Development impacts on Monaro Highway and local road network

As discussed in Section 3.3 and 3.4 above, the proposed quarry will generate approximately 160 trips per day during maximum quarry operations, with up to 21 trips per hour in and out of the site access during a morning peak (7:00 – 8:00am). During morning and afternoon peak times, approximately 50% of the movements will be staff commuting via light vehicles.

As discussed previously in Section 3, existing traffic volumes on the Monaro Highway are relatively low (total of 2255 vpd in 2016), with a peak hourly volume of 200 vehicles (total of both directions).

It should be noted that existing traffic patterns on the Monaro Highway actually result in a peak volume around mid-day (see Figure 3.3). However, when the peak movements are expected to be generated by the quarry (around 7am), existing hourly volumes on the Monaro Highway total approximately 100 vehicles. Similarly, when the Monaro Highway experiences peak volumes (between 11am and 3pm), the quarry will be generating 2 laden trips (or total of 4 movements) per hour.

The Monaro Highway is also a B-class state road, and currently has the standard and capacity to cater for both the minor increase in volumes and the weight and size of the haulage vehicles to be generated.

The most significant traffic impacts will result from the conflict between the slow speed, slow acceleration heavy vehicles from the quarry, and the highspeed vehicles on the Monaro Highway. However, given the current low volumes on the highway (max 200 vph), the average gaps in the traffic (30+ seconds), and good sight distance either side of the proposed access location, the impacts on the local traffic movements are likely to be minimal.

It should be also noted that the applicant operates other quarries in the Cooma region, with one of those quarries to be closed in the near future. It is planned that the proposed quarry will replace the existing quarry, and supply a similar volume of gravel to existing or similar customers. The new quarry will generate a similar number of trips utilising the existing truck & dog trailers to haul the gravel. The new quarry will likely employ the same drivers and staff, thereby generating a similar volume of light vehicle movements as well. ***Therefore, the proposed quarry will have minimal impacts on the local road network, due to the minimal net change in traffic volumes or haulage trips generated.***

4. SITE ACCESS

4.1 Existing Access

It is proposed to upgrade the existing unsealed driveway off the Monaro Highway to provide access to the future hard rock quarry. The existing gravelled access is located on the western (northbound) side of the Monaro Highway.

Access through the property from the existing driveway is via an existing unsealed track – through an existing gate, then across Crown land and a disused single railway track.

Clause 84 of SEPP (infrastructure) 2007, provides that development consent is required for any new rail crossing (cl. 84(1)(a)) as well as any development that involves "*(c) a likely significant increase in the total number of vehicles or the number of trucks using a level crossing that is in the vicinity of the development.*"

Discussions have been held with Stanley Knight-Smith of John Holland Group, who manage the railway property on behalf RailCorp. John Holland advise that, despite the railway being disused, the existing crossing has previously been approved by RailCorp. It is proposed to locate the future internal haul road to utilise the approved railway crossing. The applicant, David Schmidt, has also received advice from John Holland that a section of the existing rails can be removed and stored adjacent to the existing railway, to allow construction of a suitable haul road.

The proposed internal roadway is planned to cross the railway line within the Devereux property and then to head ENE to the proposed upgraded intersection. The proposed route has also been planned to avoid threatened species habitat (see Option 1 - Appendix A).

Figure 3.8: Looking west at the existing access from the Monaro Hwy

Figure 3.9: Detail of disused railway line across property

The preferred access (Option 1) utilises the existing driveway off the Monaro Highway, and the previous discussions, including sight distances, relate to this location. At the time of preparing this report, ongoing inspections were assessing environmental issues which may require consideration of alternative highway access locations. Appendix A shows an alternative option (Option 2). Any alternative highway access location will have adequate sight distance, provided it is located west of the existing driveway.

4.2 Intersection assessment

4.2.1 Intersection Layout

The existing highway volumes and the estimated peak traffic generation from the future quarry are relatively low. Any SIDRA traffic modelling will indicate that there are satisfactory gaps in the traffic to allow efficient movements through the future intersection/access to the site i.e. the volumes are low, and all movements, including turn movements, will result in a Level of Service (LoS) of 'A'.

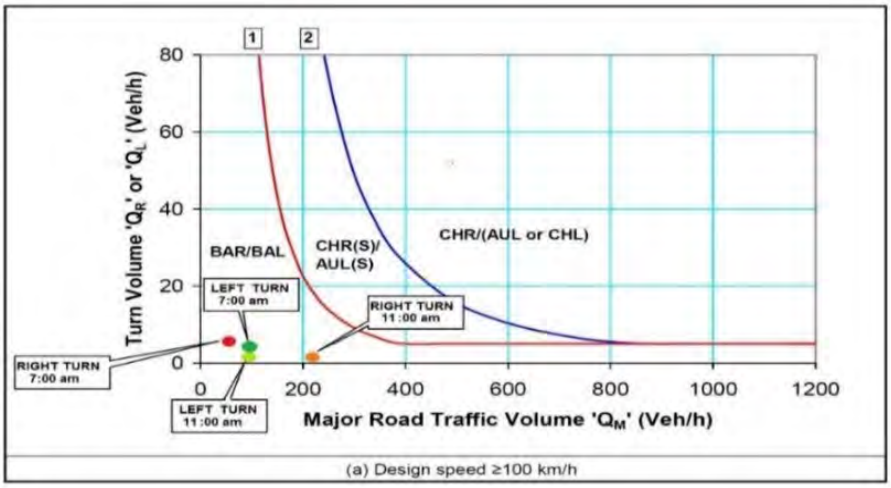


Figure 3.9: Warrant for Intersections: AustRoads Guide to Traffic Management Part 6

Also, using the existing highway traffic volumes and the estimated peak traffic generation from the proposed development, we can determine the future intersection requirements, utilising the Warrants for BA, AU and CH Turn Treatments from the 'Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings (2017 Edition)'.

As can be seen from the graph above, the future traffic movements at the access to the proposed quarry will be relatively low, and a Basic-type intersection will adequately cater for the future through and turn movements i.e. a channelised intersection will not be required. See Appendix B for Basic Intersection Layout.

As discussed previously, the existing access location already includes widening on the opposite (southbound) side of the Monaro Highway. This section of additional sealed shoulder extends for approximately 100 metres. This section should be extended by approximately 60m to conform with AustRoads requirements for a 100 kmh speedzone (see Appendix B).

4.2.2 Intersection Sight Distance

The applicant is proposing to utilise the existing property access on the western side of the Monaro Highway to provide access to the proposed quarry. The existing access is located approximately 14 kms south of Cooma, on the outside of an existing large radius curve (see Figure 3.9 below). The Monaro Highway, across the frontage of the subject site, has a speed limit of 100kmh. Sight distance to the north (towards Cooma) is over 500m, while sight distance to the south (from Bega) is approximately 300m.

Figure 3.9: Looking north towards Cooma from the proposed access

Figure 3.10: Looking south towards Bega from the proposed access

The AustRoads Guide to Road Design: Part 4A – Unsignalised and Signalised Intersections, indicates the following is required (for standard vehicles and a reaction time of 2.5 seconds):

Approach Sight Distance	179m
Safe Intersection Sight Distance	262m

Also, using Table A14 : Minimum EDD (Extended Design Domain) Safe Intersection Sight Distance and Corresponding Crest Vertical Curve requirements for sealed roads with level grades for the truck-day base case using an observation time of 2.5 seconds, the safe intersection sight distance for a 100 kmh speedzone is **275m**. Given there is a slight grade upwards from the proposed access, the adjusted sight distance requirement in both directions is approximately **280** metres.

As discussed previously, there is greater than 300m sight distance currently available in both directions from the existing property access. Also, it is not expected that many laden truck and dog movements will be scheduled outside of daylight hours, which means there will be minimal heavy vehicle turn movements in or out of the quarry after dark.

Therefore, the existing sight distance in either direction is satisfactory to provide safe access to and from the proposed quarry, with minimal impacts on through traffic on the Monaro Highway. However, it is recommended that signage be installed at both approaches to the site, warning drivers of possible trucks turning in and out of the access.

4.3 Alternative Property Access

Alternative access to the site is available from the southern boundary, off Spring Road. An existing driveway connects the site with Spring Road, approximately 1.5kms west of the Monaro Highway. As discussed previously, Spring Road is a narrow, unsealed local road, suitable for light traffic. Spring Road also includes an existing railway crossing.

Spring Road is not currently suitable for use as a haulage route, due to mainly to it's narrow, unsealed formation, but also the following reasons:

- Close proximity to a number of residences, potentially resulting in noise and dust issues
- Reduced safety for local residents, due to the resulting shared use of narrow road with laden truck & dogs, particularly at school bus pick-up location
- Potential significant cost of upgrading Spring Road, and the adjacent intersection with Monaro Highway
- Sight distance at existing intersection to be checked. Possibly less sight distance available than preferred access locations discussed in Section 4.2 above.
- Monaro Highway grades upwards in both directions from Spring Road. This would result in longer acceleration times for laden truck & dogs than the preferred access location discussed in Section 4.2 above.

5. SUMMARY

- It is proposed to extract 280,000 tonnes of crushed basalt annually from the future quarry, which will generate an average of 144 laden truck & dog movements during a 5.5 day working week, or 288 return trips. However, to allow for variable demands of local concrete batching plants and gravel deliveries to other civil construction projects, a maximum of 64 laden haulage trips (or 128 return trips) per day has been adopted for this assessment, with approximately 8 laden truck trips during the busier early morning period. It is also estimated that the quarry will generate 5 light vehicle movements an hour between 6 and 8 am, and again in the afternoon when staff commute home.
- The proposed quarry will replace an existing quarry within the Cooma area, with staff, vehicles, plant and equipment being re-located to the new Rock Flat site. The haulage volumes generated by the proposed quarry will be similar to the existing to be closed, as will the size and type of truck & dogs. The new quarry will service existing or similar customers in the Cooma area. Therefore, there will be minimal net increase in traffic volumes or impacts on local roads generated by the proposed quarry.
- The peak traffic volumes on the Monaro Highway (Cooma – Nimmitabel) historically occur during the middle of the day (11am – 3pm). However, the expected peak times relating to quarry-generated traffic movements will occur from 7am to mid-morning. Therefore, the majority of truck & dog, and staff commuting movements, will occur during off-peak times, minimising the impacts on local traffic movements.
- The site will have direct access from the Monaro Highway, with haulage routes generally following the existing highway. The highway is currently designated as a B-double route, and the width and pavement is designed to cater for heavy vehicles. The existing volumes on the Monaro Highway are also relatively low, with average gaps of greater than 30 seconds, which will allow quarry truck & dogs to turn in and out of the site with no significant impacts on local traffic.
- The current driveway to the property from the Monaro Highway is considered the most suitable location for the future access to the proposed Rock Flat quarry. It is proposed to upgrade and seal the existing access layout, and ensure it conforms with the AustRoads

BASIC intersection layout (check the existing shoulder widths and provide adequate sealed width - suitable for the swept path of a truck & dog trailer). The current driveway location (and preferred future access location – Option 1) has good sight distance (greater than 300m) in either direction, and it is considered that additional auxiliary lanes (acel/decel) are not required.

- The alternative access via Spring Road is not considered suitable as a haulage route, due to the existing narrow, unsealed formation, the (likely) unsuitable pavement thickness, the potential noise and dust impacts on existing residences, and the likely requirement to upgrade existing Spring Road and the intersection with Monaro Highway.

6. RECOMMENDATIONS

- Based on the small number of estimated hourly turn movements in and out of the proposed quarry site, and the relatively low volumes (200 vph) currently utilising the Monaro Highway, the minimum intersection treatment ('BAR/BAL') is required (as per Figure 3.9). The existing driveway location currently includes widening on the opposite side (eastbound – towards Bega), and the applicant is proposing to upgrade and seal the first 30m of the proposed quarry access to cater for truck & dog turn movements. It is intended that the upgrade of the future access layout will conform with the minimum requirements of AustRoads BASIC intersection. The works should include upgrading the existing shoulder widening on the southbound side of the Monaro Highway. Note that any works to be undertaken on the Monaro Highway will require the approval of the RMS.
- Signage should be installed at both approaches to the proposed quarry access to warn Monaro Highway motorists of potential truck movements in the vicinity.
- The proposed internal access road currently crosses a disused railway line within a Crown Reserve. It is proposed to utilise this existing crossing as part of the haulage route to and from the Monaro Highway. It the time of writing this report, discussions were still continuing with John Holland Group, on behalf of State Rail, in regard to any required approvals or upgrades of the existing railway crossing.

7. REFERENCE MATERIAL

Austroads – AGRD04A - 17 Guide to Road Design Part 4A – Unsignalised and Signalised Intersections

Austroads – AGDRD06A – 17 Guide to Road Design Part 6A – Paths for walking and cycling

Austroads – AGRD03 -09 Guide to Road Design Part 3 – Geometric Design

Austroads – AGTM03 – 13 Guide to Traffic Management Part 3 – Traffic Studies and Analysis

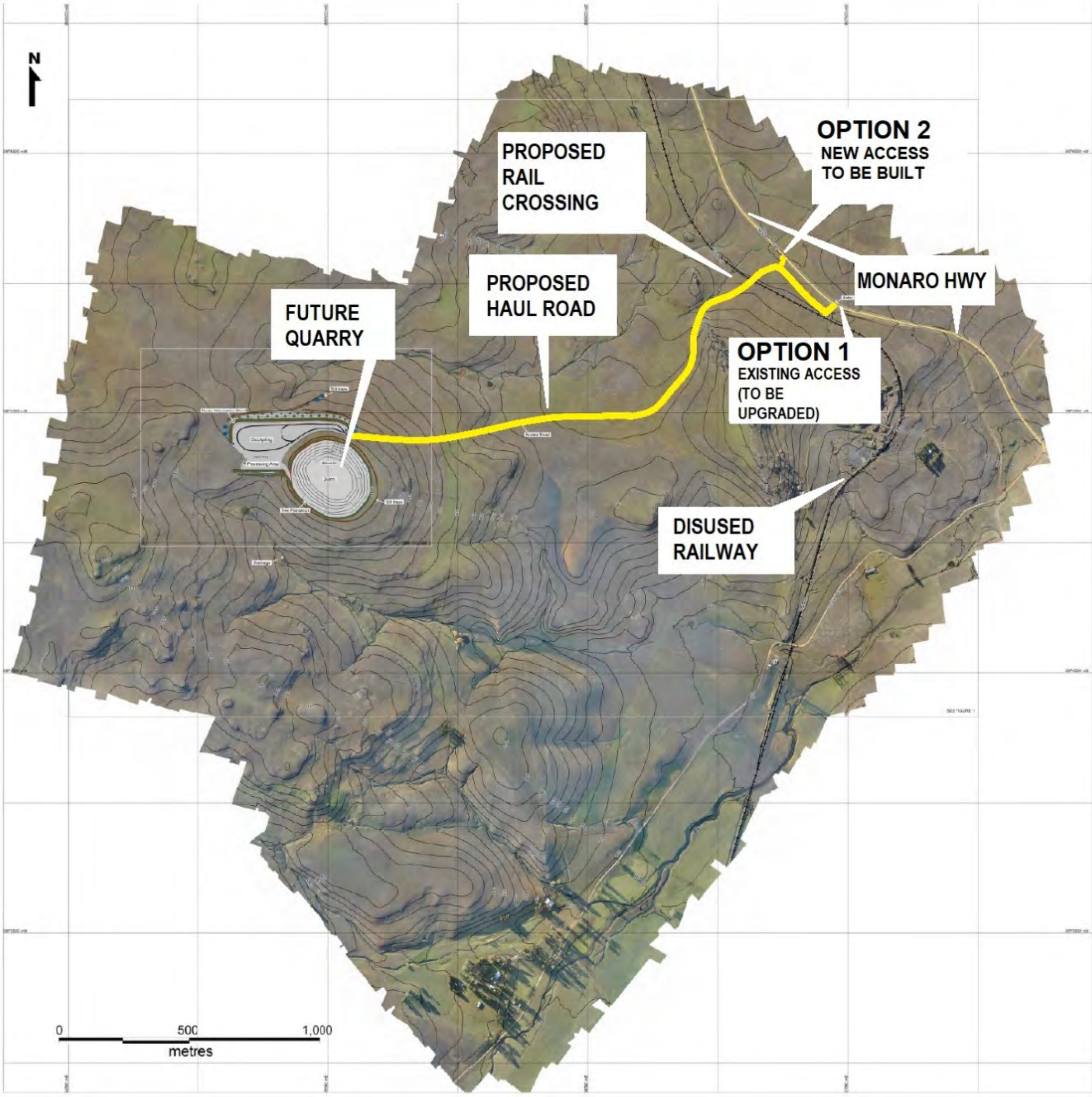
RMS – TDT2013/04a – Guide to Traffic Generating Developments – Updated traffic Surveys

RTA – TTR – 002 – 02 – Guide to Traffic Generating Developments

RMS – website *'http://www.rms.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/aadt-map/index.html#/?z=13&lat=-36.494384455333126&lon=149.2998436777343&yr=2015&id=08171'*

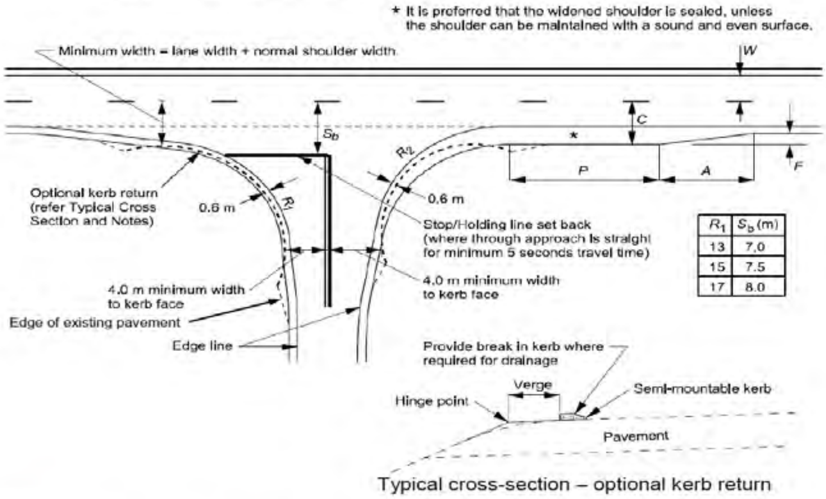
Appendix A

Proposed Site Plan


N
OPTION 2
NEW ACCESS
TO BE BUILT
PROPOSED
RAIL
CROSSING
MONARO HWY
PROPOSED
HAUL ROAD
FUTURE
QUARRY
OPTION 1
EXISTING ACCESS
(TO BE
UPGRADED)
DISUSED
RAILWAY
0
500
1,000
metres

Appendix B
Basic Rural Intersection Layout

Figure 8.2: Rural basic left-turn treatment (BAL)



R_1	S_b (m)
13	7.0
15	7.5
17	8.0

Notes:

- *R_1 and R_2 are determined by the swept path of the design vehicle.*
- *The dimensions of the treatment are defined thus:*

  W = Nominal through lane width (m) (including widening for curves).

  C = On straights – 6.0 m minimum
  On curves – 6.0 m plus curve widening (based on widening for the design turning vehicle plus widening for the design through vehicle).

  A = $\frac{0.5VF}{3.6}$

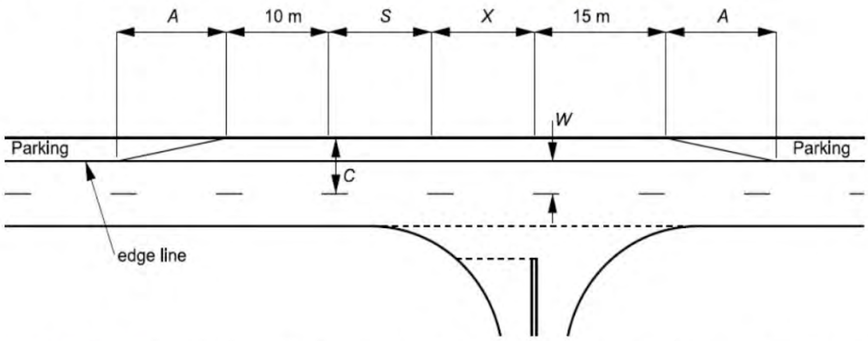
  V = Design speed of major road approach (km/h).

  F = Formation/carriageway widening (m).

  P = Minimum length of parallel widened shoulder (Table 8.1).

  S_b = Setback distance between the centre of the major road and the give way or stop line in the minor road.

Figure 7.6: Basic right-turn treatment (BAR) for a two-lane urban road



Notes: This diagram does not show any specific bicycle facilities. Where required bicycle facilities should be provided in accordance with this Part.
The dimensions of the treatment are defined thus:

W = Nominal through lane width (m) (including widening for curves). Width to be continuous through the intersection.

C = On straights – 6.0 m minimum
– 6.5 m minimum for 19 m semi-trailers and B-doubles
– 7.0 m minimum for Type 1 and Type 2 road trains
On curves – widths as above + curve widening (based on widening for the design turning vehicle plus – widening for the design through vehicle).

A = $\frac{0.5V(C-W)}{3.6}$
Increase length A on tighter curves (e.g. where side friction demand is greater than the maximum desirable). Where the design through vehicle is larger than or equal to a 19 m semi-trailer, the minimum speed used to calculate A is 80 km/h.

V = Design speed of major road approach (km/h).

S = Storage length to cater for one design turning vehicle (m) (minimum length 12.5 m).

X = Distance based on design vehicle turning path, refer to Design Vehicles and Turning Path Templates (Austroads 2013f).

Source: Department of Main Roads (2006)[30].

STAGE 1 CONTAMINATED SITE INVESTIGATION
PROPOSED HARD ROCK QUARRY SITE, ROCK FLAT

PREPARED FOR
SQ LICENSES PTY LTD

NOVEMBER 2017

• Civil, Environmental & Structural Engineering • Surveying • Environmental • Planning • Architecture

STAGE 1 CONTAMINATED SITE INVESTIGATION

ASSESSMENT OF POTENTIAL SITE CONTAMINATION

PROPOSED HARD ROCK QUARRY SITE,
ROCK FLAT, NSW

PREPARED FOR:

SQ LICENSES PTY LTD

NOVEMBER 2017

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Report Title:	*Stage 1 Contaminated Site Investigation*
Project:	*Assessment of Potential Site Contamination – 'Rock Flat' Quarry Site*
Client:	*SQ Licenses Pty Ltd*
Report Ref.:	*217458_REP_001A.docx*
Status:	*Final*
Issued:	*27 November 2017*

Geolyse Pty Ltd and the authors responsible for the preparation and compilation of this report declare that we do not have, nor expect to have a beneficial interest in the study area of this project and will not benefit from any of the recommendations outlined in this report.

The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

All information contained within this report is prepared for the exclusive use of SQ Licenses Pty Ltd to accompany this report for the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes apart from those stated therein.

Geolyse Pty Ltd accepts no responsibility for any loss, damage suffered or inconveniences arising from, any person or entity using the plans or information in this study for purposes other than those stated above.

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Executive Summary

Geolyse was engaged by SQ Licenses Pty Ltd to conduct a Stage 1 Contaminated Site Investigation (S1 CSI) for the site of the proposed hard rock quarry, in Rock Flat NSW 2630, (the site) as a component of an Environmental Impact Statement (EIS) to address the 'Secretary's Environmental Assessment Requirements' (SEARs) for the proposed operation; specifically:

> *"**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)".*

The scope of work for this S1 CSI consisted of a desktop review of available information and a review of pertinent historical records.

The S1 CSI did not include sampling and analysis of soil, groundwater, sediment or surface water, and the findings of this investigation do not conclusively verify the existence (or otherwise) of contamination across the entirety of the site.

The site has a total area of approximately 380 hectares and largely consists of pasture / cropping farmland, whilst an unnamed hillock with a circular footprint of approximately 350 m diameter is present on the site. SQ Licenses are proposing to quarry this hillock for hard rock aggregate.

The site is located in a generally rural area within the locale of Rock Flat and approximately 13.4 km south of the NSW township of Cooma. Rural land-uses surround the site. The Monaro Highway is located approximately 1.7 km north-east of the investigation area, whilst the currently disused Goulburn-Bombala Rail Line is aligned approximately 1.5 km north-east of the investigation area.

The geology of the site, based on profiling data of excavations provided by Outline Planning, is described as "*stony (basalt rock) reddish brown upper soil horizon with lighter clay horizon below, trending back into stony soil at depth*".

A search for registered groundwater users located within a 500 m radius of the site did not identify water bearing zones less than 10 m below ground level. A drilling investigation did not identify groundwater to be present within or surrounding the area of the proposed quarry pit.

The area of the site does not appear to have utilised for any intensive purpose(s). Land uses at the majority of the site have been generally limited to grazing land.

Potential on-site sources of contamination which may have impacted the soil, sediment, surface water and/or groundwater at the site include pesticide treatment processes and/or infrastructure.

Chemicals of potential concern (COPC) associated with the known previous uses of the site and considered to have the potential to adversely impact the underlying soil and groundwater environments are limited to arsenic, organochlorine pesticides and organophosphorus pesticides.

Significant pesticide usage is not considered to have occurred in areas other than the grazing pasture land. Associated impacts are not considered to be present within the area of the proposed quarry pit or operational areas.

Based on the findings of this preliminary site investigation, Geolyse considers that risks to quarry personnel from potential soil contamination impacts may be adequately managed by conducting works in accordance with construction industry standards.

Introduction

1.1 BACKGROUND

Geolyse was engaged by SQ Licenses Pty Ltd to conduct a Stage 1 Contaminated Site Investigation (S1 CSI) for the site of the proposed hard rock quarry in Rock Flat NSW 2630, (the site) as a component of an Environmental Impact Statement (EIS) to address the 'Secretary's Environmental Assessment Requirements' (SEARs) for the proposed operation; specifically:

> *"**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)".*

The subject site is identified as lots 62, 76, 78, 106 and 120 in deposited plan (DP) 750540.

This S1 CSI has been prepared in general accordance with the NSW EPA publication Contaminated Sites: *Guidelines for Consultants Reporting on Contaminated Sites* (EPA, November 1997). The overall objective is to identify the potential for land contamination at the site and recommend mitigation, management and/or remedial measures (if considered necessary) to minimise risk to the environment and general public.

The site has a total area of approximately 380 hectares and largely consists of pasture / cropping farmland. An unnamed hillock with a circular footprint of approximately 350 m diameter is present on the site. SQ Licenses are proposing to quarry this hillock for hard rock aggregate.

The site area is presented below on **Figure 1**.

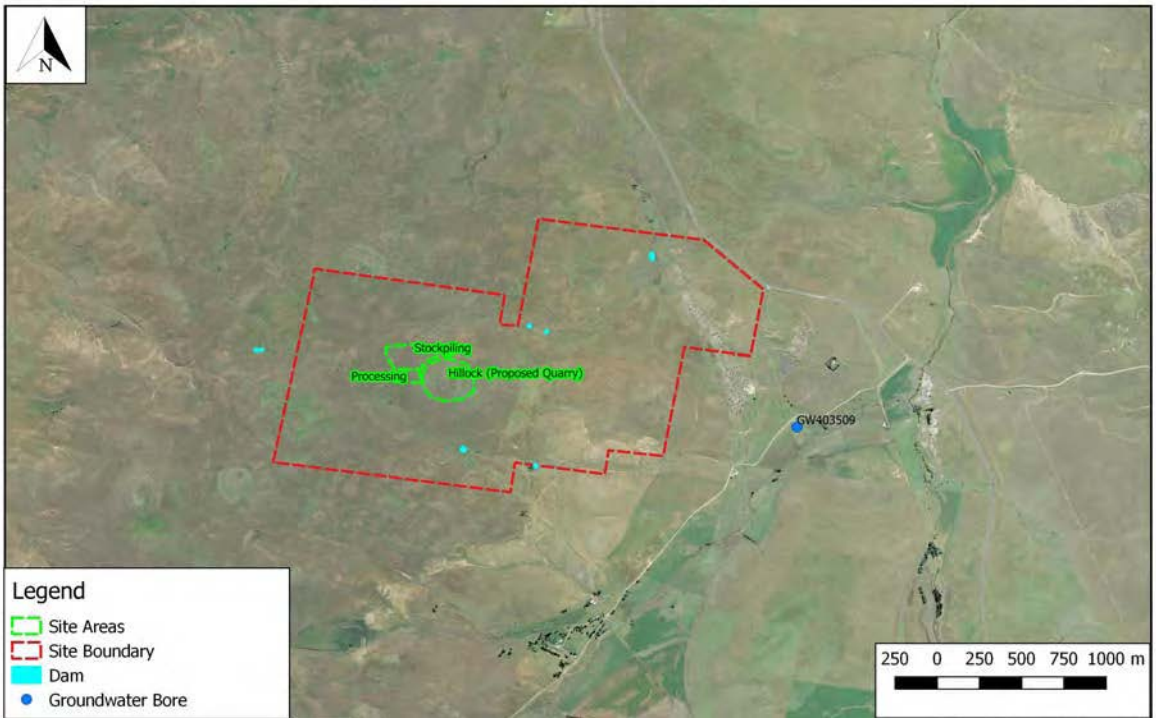


Figure 1: Site Layout

For the purposes of this S1 CSI, the investigation area is limited to areas of the site where quarrying operations are proposed.

1.2 SCOPE OF WORK

The scope of work for this S1 CSI consisted of the following components:

- Review of the following third party documents:
  - Published topographical, geological and soil maps of the area;
  - Details of groundwater bores located within 500 m of the site and registered on the groundwater bore database, maintained by the NSW Office of Water (http://allwaterdata.water.nsw.gov.au/water.stm);
  - The public register managed by the NSW EPA for information on scheduled activities and penalty notices issued under the Protection of the Environment Operations Act;
  - The database managed by the NSW Environment Protection Authority (EPA) for information on notices issued under the Contaminated Land Management Act 1997;
  - Historical parish charting maps (1884 to 1979), as well as regional charting maps, status branch charting maps and the NSW Land Titles Office (LTO) charting maps;
  - Aerial photographs – selected historical aerial photographs of the site available for review to provide evidence of the history of development of the site and indications of potential sources of contamination;
  - Review title folio documentation to provide details of historic ownership and land use(s) for nominated properties;
  - Review of site records, where available.
- Review of site photography, including aerial drone imagery, to provide further information regarding potential contaminant sources and areas of significant environmental liability, by assessment for:
  - Areas of operational processes including waste management, water management, the condition of the site surfaces and buildings, and the presence of electrical transformers on site.
  - Areas of potential landfilling.
  - Potential impacts of neighbouring land uses.
  - Sensitivity of the receiving environment.
  - Other relevant information which could be provided by the site operator.
- Preparation of this factual report detailing the S1 CSI findings.

An overview of neighbouring properties was also conducted to identify the presence and proximity of sensitive receptors which could be significantly impacted upon by the site, and off-site operations which could have a significant impact on land contamination at the site.

The S1 CSI did not include sampling and analysis of soil, groundwater, sediment or surface water, and the findings of this investigation do not conclusively verify the existence (or otherwise) of contamination across the entirety of the site.

Site Description

2.1 SITE DEFINITION

Table 2.1 – Summary of Property Description Details

Feature	Details
Facility Address[1]	278 Springs Road, Rock Flat NSW 2630
Title Identification Details[1]	Lots 62, 76, 78, 106 and 120 in deposited plan (DP) 750540
Current Ownership	Schmidt Quarries Pty Ltd
Current Site Use and Zoning[2]	Land Use: Pasture cropping Zoning: Primary Production (RU1)
Proposed Future Site Use	Hard rock quarrying
Previous Environmental Reports	• *nil*
Site Area[1]	380 hectares (approximately)

Sources:
1: SIX Maps Website developed by NSW Government, Land and Property Information. http://maps.six.nsw.gov.au/ (accessed October 2017).
2: Cooma Monaro Local Environmental Plan, 2013, under the Environmental Planning and Assessment Act 1979.

2.2 SITE SETTING

2.2.1 REGIONAL SETTING

The site is located in a generally rural area within the locale of Rock Flat and approximately 13.4 km south of the NSW township of Cooma. Rural land-uses surround the site. The Monaro Highway is located approximately 1.7 km north-east of the investigation area, whilst the currently disused Goulburn-Bombala Rail Line is aligned approximately 1.5 km north-east of the investigation area.

The following sensitive receptors are located proximal to the investigation area:

- Residents of off-site rural dwellings;
- Unnamed tributaries of Spring Creek to the south of the investigation area;
- Unnamed tributaries of Rock Flat Creek to the north of the investigation area;
- Livestock utilising rural land in the vicinity of the site; and
- Groundwater present in aquifer(s) underlying the site.

2.2.2 LOCAL SETTING

No structures are located within the investigation area.

Land uses and properties adjacent to the site, including those across adjacent roads were obtained from review of third party documents outlined in **Section 1.2**. The local area surrounding the site is displayed in **Figure 1**. Identified adjacent land uses are summarised in **Table 2.2**:

Table 2.2 – Adjacent Properties Descriptions

Direction From Site	Site Use (Nature of Activity)
North	Rural land uses
South	Rural land uses
East	Former Goulburn-Bombala Rail Line, with quarry site and rural land uses beyond
West	Rural land uses

A detailed presentation of the surrounding area is attached as **Drawing 1**.

2.3 TOPOGRAPHY

Topographical site information was obtained from the Cooma 8725-4S, 1:25,000 Scale, Topographic Map, Second Edition (New South Wales Land and Property Information, 2001).

An irregular ridge-line is present in a general west-east alignment across the site. This feature results in the gradient sloping north in the northern portion of the site and sloping south in the southern portion of the site. The highest location of the site is the peak of the hillock, which rises to an approximate elevation of 1,030 metres Australian Height Datum (mAHD).

2.4 SURFACE WATER RECEPTORS

Transient drainage features are located to the north and south of the investigation area and are tributaries of Rock Flat Creek and Spring Creek, respectively. Farm dams are associated with these drainage features.

2.5 REGIONAL AND SITE GEOLOGY

Mapped soil landscapes around the site are shown on **Figure 2**. The proposed quarry portion of the investigation area lies on the 'Brothers' soil landscape, whilst the processing and stockpiling areas lie on the 'Maneroo' soil landscape.

The Brothers soil landscape consists of "*moderately inclined basalt slopes with benches due to ash layers*" with "*shallow to moderately deep (<60 cm), well drained chocolate soils and moderately deep to deep (>100 cm), well-drained Chernozems on slopes*".

The Maneroo soil landscape consists of "*gently undulating plain to undulating rises with flat summit surfaces on basalt*" with "*shallow (<50 cm), well-drained reddish chocolate soils on crests and upper slopes*".

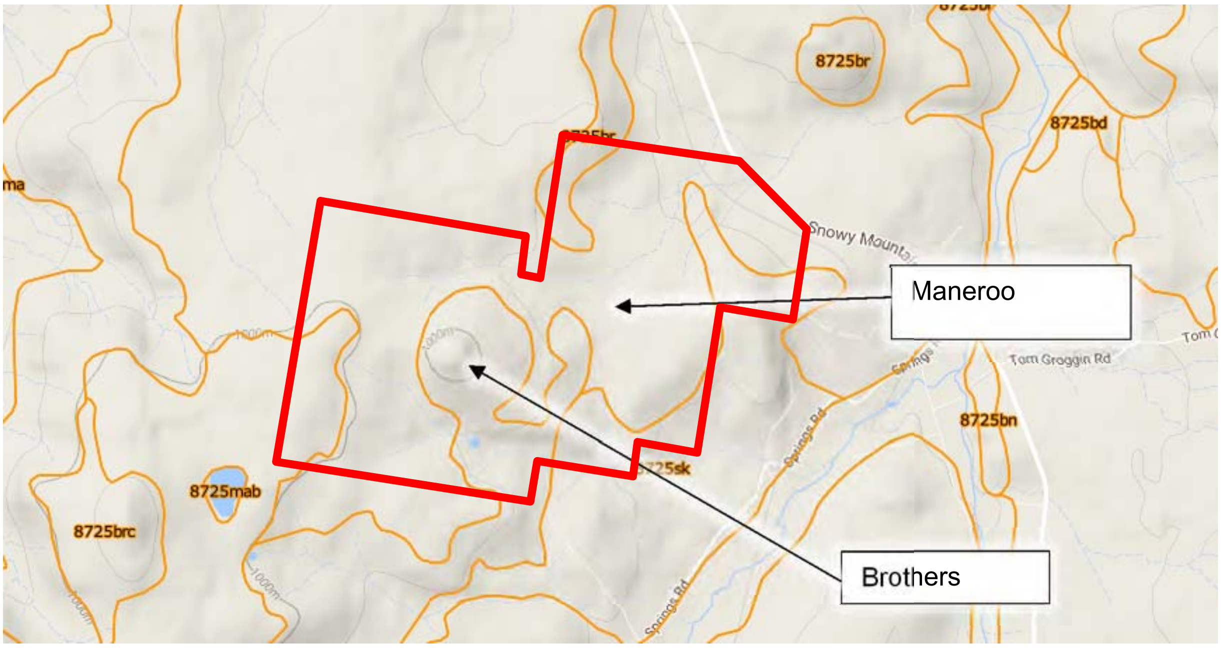


Figure 2: Soil Landscape Group Distribution

The Bega – Mallacoota Geological 1 : 250,000 Series Sheet 55-08 (Geological Survey of NSW, 1995) indicates the underlying geology of the low lying areas is expected to comprise "*basalt (basalt dykes) of the Monaro Volcanics and Bondo Dolerite Member*" of cainozoic (cenozoic) age. The geology of the hillock is identified as a 'volcanic neck' comprised of "nephelnite and tescherite".

Site-specific geology of the proposed quarry area, based on profiling data of excavations provided by Outline Planning, is described as "*stony (basalt rock) reddish brown upper soil horizon with lighter clay horizon below, trending back into stony soil at depth*".

The *Australian Soil Resource Information System* (ASRIS) on-line database, maintained by CSIRO Land and Water, indicates there is an extremely low probability of occurrence of acid sulphate soils in the area of the site (compiled 2010, accessed September 2017).

The NSW Heads of Asbestos Coordination Authorities (HACA) *Mapping of Naturally Occurring Asbestos in NSW* (2015) has assessed the area surrounding the site as having the lowest potential for naturally occurring asbestos (NOA) to be encountered within approximately 10 metres of the natural surface. No NOA indicator minerals such as serpentinite, tremolite or antigorite, have been identified as being associated with the known geology of the site.

2.6 REGIONAL HYDROGEOLOGY

2.6.1 GROUNDWATER BORE RECORDS SEARCH

A search for registered groundwater users located within a 500 m radius of the site was undertaken using the NSW Office of Water on-line database (http://realtimedata.water.nsw.gov.au/water.stm), in October 2017. The results indicated that there is one (1) groundwater bore registered for stock and domestic purposes within 500 m of the site. A NSW Office of Water monitoring bore is also located on the northern boundary of the site.

Table 2.3 – Groundwater Bores within 500 m of Site

Licence Reference	Location	Depth	Water Bearing Zone(s)
GW403509	400 m east (2 km east of quarry area)	25.0 m	11.0 m to 12.0 m

Source: NSW Office of Water on-line database (http://realtimedata.water.nsw.gov.au/water.stm)

Registration details of groundwater bores recorded above are included in **Appendix A**.

Geolyse has considered the surrounding agricultural land uses and notes the potential for unregistered bores for irrigation purposes proximal to the site.

2.6.2 GROUNDWATER DRILLING INVESTIGATION

Drilling profile information provided by Outline Planning indicates no groundwater to be present within or surrounding the area of the proposed quarry pit.

Site Historical Review

A review of the site history was undertaken to assess historical use of the site, and in particular to identify activities with the potential to contaminate soil and/or groundwater at the site.

3.1 NSW EPA RECORDS

3.1.1 SCHEDULED ACTIVITIES AND/OR ENVIRONMENTAL NOTICES

A search of the NSW EPA on-line register (http://www.epa.nsw.gov.au/prpoeoapp/) was undertaken in October 2017 for environment protection licenses and/or penalty notices issued under the Protection of the Environment Operations Act (POEO) 1997. The search indicated that no licenses or penalty notices have been issued for the titles comprising the site or within 1 km of the site.

3.1.2 CONTAMINATED SITES REGISTER

A search of the NSW EPA on-line register (http://www.environment.nsw.gov.au/prclmapp/) was undertaken in October 2017 for contaminated land notices issued or regulated under the Contaminated Land Management Act 1997. The search indicated that the NSW EPA holds no contaminated land records relating to the site and properties within 1 km of the site.

3.2 HISTORICAL PARISH CHARTING MAPS

Editions of the 'Parish of Gladstone (Beresford County) map, held by NSW Land and Property Information, were reviewed by Geolyse, and information relevant to the site is summarised below:

- Crown grants of the land comprising the site commenced in 1870.
- The 1883 edition identifies the owners of the area encompassing the investigation area as 'Commercial Banking Co. of Sydney.
- The 1906 edition identifies the owners of the area encompassing the investigation area as 'James Joseph Devereux'.
- The 1924 edition indicates no change of ownership or lot divisions.

3.3 PREVIOUS TITLE INFORMATION

Historic title information was sought for lot 78, 106 and 120 in DP 750540

Previous title ownership for these titles is attached in **Appendix B** and summarised in **Tables 3.1** to **3.3**:

Table 3.1 – Title History, Lot 78 DP 750540

Date Range	Ownership
1870 – 1876	William Wallace – Grantee of **Portion 78 Parish Gladstone Vol 223 Fol 95**
1876 – 1897	George King and Robert John King, Merchants.
1897 – 1900	Robert John King, Merchant
1900 – 1906	Lucy Eliza King, George Chatfield King, Edwin Dixon Charles Stuart King
1906 – 1919	James Joseph Devereux, Grazier
1919 - 1962	Timothy Vincent Devereux, Grazier.

Table 3.1 – Title History, Lot 78 DP 750540

Date Range	Ownership
1962 –	Norman Hain Devereux, Grazier.

Table 3.2 – Title History, Lot 106 DP 750540

Date Range	Ownership
1901 – 1903	Commercial Banking Company of Sydney Limited – Grantee of **Portion 106 Parish Gladstone Vol 1385 Fol 225**
1903 – 1919	James Joseph Devereux, Grazier
1919 – 1962	Timothy Vincent Devereux, Grazier.
1962 –	Norman Hain Devereux, Grazier.

Table 3.3 – Title History, Lot 120 DP 750540

Date Range	Ownership
1904 – 1919	James Joseph Devereux, Grazier
1919 - 1962	Timothy Vincent Devereux, Grazier.
1962 –	Norman Hain Devereux, Grazier.

3.4 HISTORICAL AERIAL PHOTOGRAPHY SURVEY

An historical aerial photography survey was undertaken for the site, with a total of six (6) photographs identified and reviewed. The historical aerial photographs that were reviewed spanned a period of approximately 62 years, with the most recent from 2017, to the earliest in 1959. Aerial photographs, as attached in **Appendix C**, were reviewed to track changes in use of the site and surrounding properties over time. Key observations made during the review of aerial photos are summarised in **Table 3.2** as follows:

Table 3.4 – Summary of Aerial Photo Information

Date / Ref	Site Activity	Surrounding Land Use
1959 NSW.458-8-122	No structures are present on the site.	Land to the north, south, east and west appears to be utilised for gazing pasture. The Goulburn-Bombala Rail Line is present to the east of the site. A number of structures are present near the Monaro Highway to the east of the site.
1967 NSW.1469-5155	The area encompassing the site is generally unchanged.	Land uses of the surrounding area do not appear to have been significantly altered.
1985 NSW.3425-6-41	The area encompassing the site is generally unchanged.	Land uses of the surrounding area do not appear to have been significantly altered.
2002 [*Google Earth Imagery*]	Additional dams are present to the north east and south of the hillock. The area encompassing the remainder of the site is generally unchanged.	Land uses of the surrounding area do not appear to have been significantly altered.
2011 [*NSW Spatial Services*]	The area encompassing the site is generally unchanged.	Land uses of the surrounding area do not appear to have been significantly altered.

Table 3.4 – Summary of Aerial Photo Information

Date / Ref	Site Activity	Surrounding Land Use
2017 [*Private Drone Imagery*]	The area encompassing the site is generally unchanged.	Land uses of the surrounding area do not appear to have been significantly altered.

3.5 SUMMARY OF SITE HISTORY INFORMATION

Crown grants incorporating the site commenced in 1870, which has been subject to private ownership to the present. Based on historical aerial photographs, the area of the site does not appear to have utilised for any intensive purpose(s).

Land uses at the majority of the site have been generally limited to grazing land, based on aerial photography and previous title ownership.

Various chemicals such as arsenic, organochlorine pesticides (OCPs) and organophosphorus pesticides (OPPs) associated with sheep and cattle grazing activities are potential contaminants at the site based on known historic uses, however these are unlikely to have been utilised in the area of the proposed quarry pit due to the difficult terrain and presence of rocky outcrops.

Current Site Status

4.1 WASTE MANAGEMENT

No waste generation activities are currently understood to be occurring at the site. Any waste that is generated on the site is collected and transported off-site for recycling or disposal.

No landfilling currently occurs on the site, and no historic landfilling is considered to have occurred. No sewer or septic wastewater systems are known to be present at the site.

4.2 STORMWATER

The majority of site stormwater would be absorbed by the agricultural land at the site. Where surface flows occur, stormwater would be captured by drainage gullies and discharged into farm dams.

4.3 CHEMICAL AND FUEL STORAGE / SPILLS

There is no storage of fuels, oils or other chemicals at the site.

No findings of the historic aerial photography review (refer to **Section 3.4**) indicate the presence (historic or otherwise) of bulk chemical storage infrastructure at the site.

No sheep dips or cattle dips are known to be present at the site. The difficult terrain and presence of rocky outcrops are considered likely to have precluded installation of such structures.

No evidence of stressed vegetation, which may be indicative of soil and/or groundwater contamination, has been noted.

4.4 ASBESTOS

There is no evidence of structures having been present at the site. The potential presence of asbestos containing material (ACM) is considered to be low, based on the absence of development at the site.

4.5 POLYCHLORINATED BIPHENYLS (PCBS)

PCBs are known to have been used in electrical and hydraulic equipment, and were produced commercially in large quantities until the late 1970s until their phasing out in Australia in the 1970s (Department of the Environment, National Pollutant Inventory). Australia banned the import of PCBs in 1975. Capacitors containing PCBs were installed in various types of equipment including fluorescent light fittings during the 1950's, 60's and 70's (Identification of PCB-Containing Capacitors, Australian and New Zealand Environment and Conservation Council 1997).

There is no evidence of structures having been present at the site. The potential presence of equipment containing PCBs is considered to be low, based on the absence of development at the site.

4.6 LANDFILLING

No areas where potential for landfilling (e.g. in-filled dams) have been noted, based on review of historic aerial photography (**Section 3.4**).

Based on the site topography there is minimal potential for other 'cut-and-fill' civil works to have occurred at the site. No illegally dumped waste has been noted at the site.

Contamination Status

5.1 POTENTIAL CONTAMINATION ISSUES

5.1.1 POTENTIAL SOURCES

Potential on-site sources of contamination which may have impacted the soil, sediment, surface water and/or groundwater at the site are considered to be limited to livestock and/or pasture pest chemical-treatment processes and/or infrastructure.

5.1.2 CHEMICALS OF POTENTIAL CONCERN (COPC)

COPC associated with the known previous uses of the site and considered to have the potential to adversely impact the underlying soil and groundwater environments are limited to arsenic, organochlorine pesticides and organophosphorus pesticides.

5.1.3 POTENTIAL IMPACTS

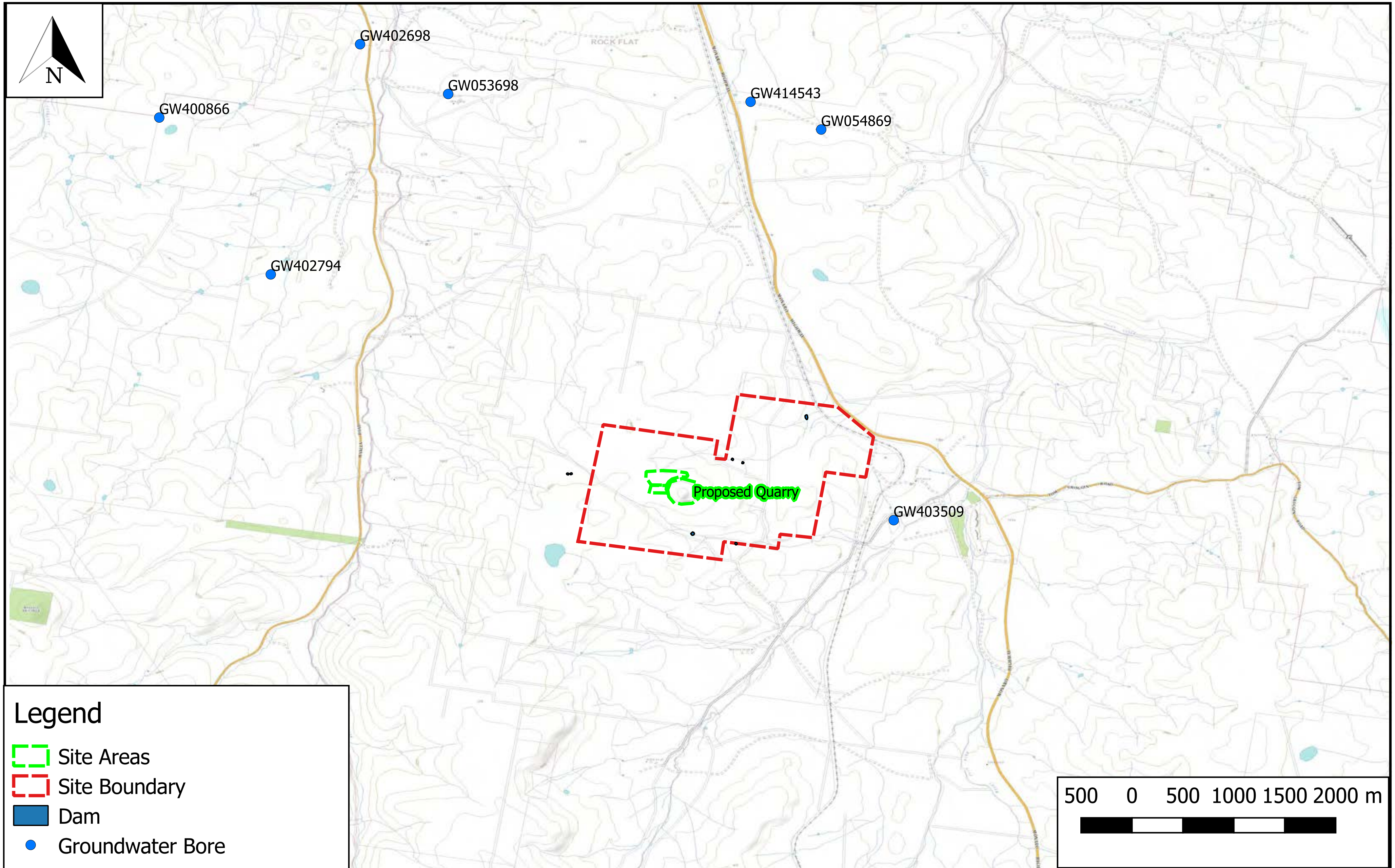
Significant pesticide usage is not considered to have occurred in areas other than the grazing pasture land. Associated impacts are not considered likely to be present within the area of the proposed quarry pit or operational areas.

Conclusions

Geolyse make the following conclusions regarding the potential for land contamination at the site, based on a desktop review of available information and historical records.

- Based on the review of historic operations at the site, the area of the site does not appear to have utilised for any intensive purpose(s).
- Land uses at the majority of the site have been generally limited to grazing land, based on aerial photography and previous title ownership.
- Based on the findings of this preliminary site investigation, Geolyse considers that risks to quarry personnel from potential soil contamination impacts may be adequately managed by conducting works in accordance with construction industry standards, specifically:
  - Any excavation that identifies the presence of building rubble should be assessed for the presence of asbestos in accordance with applicable SafeWork NSW guidelines and codes of practice, and managed accordingly.
  - Avoiding skin contact with soil that is discoloured, malodourous, containing foreign matter and/or generally inconsistent with virgin soil; and
  - No entry permitted into confined spaces and excavations.

Drawings



GEOLYSE

CLIENT:
Schmidt Quarries Pty Ltd

Project:
Stage 1 Preliminary Site Investigation
Proposed 'Rock Flat' Hard Rock Quarry

DRAWING 1:
Site Locality

Appendix A

REGISTERED GROUNDWATER BORE RECORDS

NSW Office of Water
Work Summary

GW403509

Licence: 40BL190607

Licence Status: CONVERTED

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status: New Bore
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 14/08/2005

Final Depth: 25.00 m
Drilled Depth: 25.00 m

Contractor Name: Watermin Drillers Pty Ltd
Driller: Allan Ross Jones
Assistant Driller:

Property: N/A LOT 3 SPRINGS ROAD ROCK FLAT VIA COOMA 2630
GWMA: -
GW Zone: -

Standing Water Level: 6.000
Salinity:
Yield: 1.263

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	BERES	BERES.20	3/3/758883
Licensed:	BERESFORD	GLADSTONE	Whole Lot 4/3/758883

Region: 40 - Murrumbidgee
CMA Map:

River Basin: - Unknown
Area/District:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 5974878.0
Easting: 697587.0

Latitude: 36°21'03.3"S
Longitude: 149°12'07.0"E

GS Map: -
MGA Zone: 0
Coordinate Source: GPS - Global Positioning System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	25.00	127			Rotary Air
1		Annulus	Waterworn/Rounded	11.00	25.00				Graded
1	1	Casing	Pvc Class 9	0.30	25.00	125			Seated on Bottom, Glued
1	1	Opening	Slots - Horizontal	9.00	12.00	125		1	Casing - Hand Sawn Slot, PVC Class 9, SL: 60.0mm, A: 2.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
11.00	12.00	1.00	Unknown	6.00		1.26			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	Topsoil	Topsoil	

1.00	7.00	6.00	Clay	Clay	
7.00	25.00	18.00	Basalt	Basalt	

Remarks

***** End of GW403509 *****

Appendix B

PREVIOUS TITLE RECORDS

No. 72/180

New South Wales.

DIEU ET MON DROIT

REGISTER BOOK,
VOL. CCXXII FOLIO 95

CANCELLED

ISSUE OF NEW FOLIO 78/750540

GRANT OF LAND UNDER THE VOLUNTEER FORCE REGULATION ACT OF 1867.

VICTORIA, by the Grace of God, of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith, and so forth:— TO ALL to whom these presents shall come, Greeting:—

WHEREAS William Wallace of Irema is entitled, under the provisions of the Volunteer Force Regulation Act of 1867, to receive a free grant of fifty acres of land: **Now Know Ye,** That in satisfaction of the right or claim of the said William Wallace under the provisions of the Volunteer Force Regulation Act of 1867, and in consideration thereof, WE, for Us, Our Heirs and Successors, DO HEREBY GRANT unto the said William Wallace, his Heirs and Assigns, subject to the several and respective reservations hereinafter mentioned, ALL THAT Allotment or Parcel of Land in Our said Colony, containing by Admeasurement fifty acres, be the same more or less, situated in the County of Beresford and Parish of Gladstone Portion Seventy eight

Scale 20 Chains to 1 Inch

COMMENCING at the north western corner of portion seventy six of one hundred and sixty four acres and bounded thence on the east by a western boundary of that portion bearing south twenty three chains and forty two links on the south by a line bearing west twenty two chains and thirty seven links on the west by a line bearing north twenty three chains and forty two links and on the north by a line and part of the southern boundary of portion sixty two of two hundred and sixty acres in all bearing east twenty two chains and thirty seven links to the point of commencement. Exclusively of a road one chain wide passing through the land in a north westerly direction the area of which has been deducted from the total area

As per plan in the margin hereof: With all the Rights and Appurtenances whatsoever thereto belonging: **To Hold** unto the said William Wallace his Heirs and Assigns for ever: Subject nevertheless, to the reservations, provisoes, and conditions hereinafter contained, that is to say: **Provided Nevertheless,** AND WE DO HEREBY RESERVE unto Us, Our Heirs and Successors, all Minerals which the said Land contains, with full power and authority for Us, Our Heirs and Successors, and such person or persons as shall from time to time be authorized by Us, Our Heirs and Successors, or by the Governor for the time-being of Our said Colony, to enter upon the said Lands, and to search for, mine, dig, and remove the said Minerals, with full right of ingress, egress, and regress, for the purposes aforesaid: **Provided Also,** AND WE DO HEREBY FURTHER EXCEPT AND RESERVE unto Us, Our Heirs and Successors, all such parts and so much of the said Land as may hereafter be required for a Public Way, or Public Ways, Canals, or Railroads, in, over, and through the same, to be set out by Our Governor for the time-being of Our said Colony, or some person by him authorized in that respect; AND ALSO all Sand, Clay, Stone, Gravel, and Indigenous Timber, and all other Materials, the natural produce of the said Land, which may be required at any time or times hereafter by the Government of Our said Colony, for the construction and repair of any Public Ways, Bridges, or Canals, or for Naval purposes, or Railroads, or any Fences, Embankments, Dams, Sewers, or Drains necessary for the same, together with the right of taking and removing all such Materials; AND ALSO all Land within One hundred feet of High Water Mark on the Sea Coast, and on every Creek, Harbour, and Inlet of the Sea; AND ALSO the right of full and free ingress, egress, and regress, into, out of, and upon the said Land for the several purposes aforesaid, or any of them: **In Testimony Whereof,** We have caused this Our Grant to be Sealed with the Seal of Our said Colony.

WITNESS Our Trusty and Well-beloved SIR HERCULES GEORGE ROBERT ROBINSON, *Knight Commander of Our Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief of Our Colony of* NEW SOUTH WALES *and its Dependencies, and Vice-Admiral of the same, at Government House, Sydney, in* NEW SOUTH WALES *aforesaid, this* twenty fifth *day of* March *in the thirty-* eighth *year of Our Reign; and in the year of Our Lord One thousand eight hundred and seventy-* five

C.A.

Hercules Robinson

RECORDED and ENROLLED in the Registrar General's Office, at Sydney, in New South Wales, this 17th day of June 187

Registrar General.

No. [illegible] TRANSFER DATED 4 May 1876 FROM THE within NAMED William Wallace to George King and Robert John King of Sydney Merchants OF THE LAND within DESCRIBED PRODUCED & ENTERED 11 May 1876 AT 1/2 past 11 O'CLOCK IN THE fore NOON.
Dep. Reg.r Gen.l

No. [illegible] TRANSFER DATED 4 July 1918 FROM THE above NAMED [illegible] OF THE LAND within DESCRIBED PRODUCED & ENTERED [illegible] 191[illegible] AT [illegible] O'CLOCK IN THE [illegible] NOON.

No. A [illegible] TRANSFER dated 3rd March 191[illegible] from the said [illegible] of the land within described.
Produced and entered [illegible] 191[illegible]
at [illegible] o'clock in the [illegible] noon.
REGISTRAR GENERAL.

No. 262.162 *NOTICE of DEATH. Proof of the death of the within-named GEORGE KING, having been furnished to me, the surviving joint tenant, ROBERT JOHN KING, is now registered sole proprietor of the land within described. PRODUCED and ENTERED 6th March, 1897, at 11 minutes to 12 o'clock in the forenoon.*

Dep. Registrar General.

No. 279480 Caveat dated 1st June 1898 Produced and entered 4th July 1898 at 28 mts to 11 o'clock in the forenoon.
Dep Reg Genl

No. D[illegible] CAVEAT
by the Registrar General
Entered 3 DEC 1947
REGISTRAR GENERAL

WITHDRAWAL of the above CAVEAT No. 279,480, dated 17th April, 1899. PRODUCED and ENTERED 17th April, 1899, at 3 minutes to 3 o'clock in the afternoon.

Dep. Registrar General.

The within Caveat No. D[illegible] is hereby withdrawn
Dated 17th December 1962
REGISTRAR GENERAL

No. 290.190 *MORTGAGE dated 28th March, 1899, from the within-named ROBERT JOHN KING, to AUGUSTA HELEN DANIELL, of Ryde, Isle of Wight, in England, Widow. PRODUCED and ENTERED 17th April, 1899, at 3 minutes to 3 o'clock in the afternoon.*

Dep. Registrar General.

NORMAN HAIN DEVEREUX of Cooma Grazier is now the registered proprietor of the land within described
See TRANSFER No. J 197486 Dated 30th October 1962
Entered 19th December 1962

REGISTRAR GENERAL

COMPUTER FOLIO
NO FURTHER DEALINGS TO BE REGISTERED.

No. 7029 APPLICATION BY TRANSMISSION [illegible] IS NOW THE REGISTERED PROPRIETOR OF THE LAND WITHIN DESCRIBED IN PURSUANCE OF THE ABOVE APPLICATION PRODUCED [illegible] 192[illegible] AND ENTERED [illegible] 190[illegible] AT [illegible] O'CLOCK IN THE [illegible] NOON
DEP. REG.R GEN.L

DISCHARGE OF THE [illegible] MORTGAGE No. 290190
DATED [illegible] 19[illegible] PRODUCED & ENTERED [illegible] 19[illegible] AT [illegible] O'CLOCK IN THE [illegible] NOON
DEP. REG.R GEN.L

15.498

No. 1901/
/2259

NEW SOUTH WALES. One Pound Ten Shillings STAMP DUTY. SYDNEY N.S.W.

State of New South Wales.

[LAND GRANT.] B

HONI SOIT QUI MAL Y PENSE — DIEU ET MON DROIT

REGISTER BOOK,
VOL. 1385 FOL. 225

CANCELLED W
ON ISSUE 1064750540

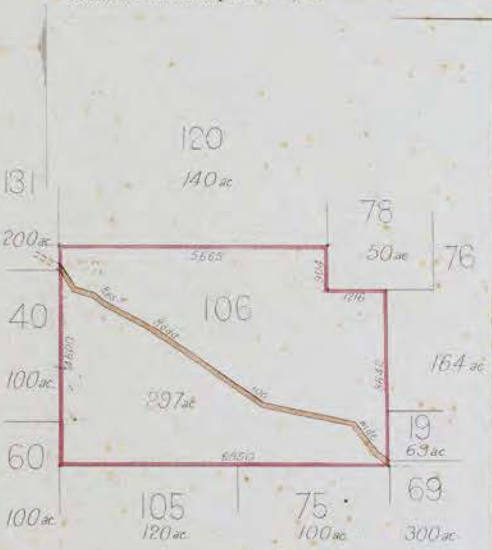
GRANT OF LAND PURCHASED BY CONDITIONAL SALE WITHOUT COMPETITION.

(UNDER THE CROWN LANDS ALIENATION ACT OF 1861.)

EDWARD VII, by the Grace of God, of the United Kingdom of Great Britain and Ireland, King, Defender of the Faith, and so forth:— TO ALL to whom these Presents shall come, Greeting:—

WHEREAS *The Commercial Banking Company of Sydney, Limited (hereinafter called "the said Company")* ~~in Our State of New South Wales~~, claim to be entitled, in respect of a purchase by Conditional Sale, without competition, under the *13th* Section of the Crown Lands Alienation Act of 1861, to the Parcel of Land hereinafter described; and the declaration , as by law required, has been made, and the Minister for the time being charged with the administration of the public lands is satisfied that all things required by law to be done to entitle the said *Company* to a grant of the fee simple of the said Lands, subject to the Reservations hereinafter contained, have been done and performed: **And Whereas** the sum of *Two hundred and ninety seven pounds* sterling, being the purchase money payable for the said Land, has been duly paid into the Office of the Treasurer of Our ~~said~~ *said* State: **Now Know Ye,** That for and in consideration of the said sum, for and on Our behalf well and truly paid into the Treasury of Our said State, before these Presents are issued, and of all and singular the premises, We, for Us, Our Heirs and Successors, Do HEREBY GRANT unto the said *Company* ~~Heirs~~ and Assigns, subject to the several and respective Reservations hereinafter mentioned, ALL THAT piece or parcel of land in Our said State, containing by Admeasurement *Two hundred and ninety seven acres* be the same more or less, situated in the County of *Beresford* and Parish of *Gladstone*

Portion 106



Commencing on the Eastern boundary of portion sixty of one hundred acres at the North Western corner of portion one hundred and five of one hundred and twenty acres and bounded thence on the South by the Northern boundary of portion one hundred and five and the Northern boundary of portion seventy five of one hundred acres in all bearing Easterly sixty nine chains fifty links on the East by part of a Western boundary of portion sixty nine of three hundred acres the Western boundary of portion nineteen of sixty nine acres and a Western boundary of portion seventy six of one hundred and sixty four acres in all bearing Northerly thirty six chains forty five links on the North by part of the Southern boundary of portion seventy eight of fifty acres bearing Westerly twelve chains sixteen links to the South Western corner of portion seventy eight again on the East by part of the Western boundary of portion seventy eight bearing Northerly nine chains four links again on the North by the Southern boundary of portion one hundred and twenty of one hundred and forty acres bearing Westerly fifty six chains sixty five links and on the West by part of the Eastern boundary of portion one hundred and thirty one of two hundred acres the Eastern boundary of portion forty of one hundred acres and part of the Eastern boundary of portion sixty aforesaid in all bearing Southerly forty six chains to the point of commencement Exclusively of a road one chain wide passing through this land in a South Easterly direction to the South Eastern corner the area of which has been deducted from the total area

As per plan in the margin hereof: with all the Rights and Appurtenances whatsoever thereto belonging: **To Hold** unto the said *Company* ~~Heirs~~ and Assigns for ever: Subject, nevertheless, to the several and respective Reservations hereinafter contained, that is to say: **Provided Nevertheless,** And WE DO HEREBY RESERVE unto Us, Our Heirs and Successors, all Minerals which the said Land contains, with full power and authority for Us, Our Heirs and Successors, and such person or persons as may from time to time be authorised by Us, Our Heirs and Successors, or by the Governor for the time being of Our said State, to enter upon the said Land, and to search for, mine, dig, and remove the said Minerals, with full right of ingress, egress, and regress, for the purposes aforesaid: **Provided Also,** AND WE DO HEREBY FURTHER EXCEPT AND RESERVE unto Us, Our Heirs and Successors, all such parts and so much of the said Land as may hereafter be required for a Public Way, or Public Ways, Canals, or Railroads, in, over, and through the same, to be set out by Our Governor for the time being of Our said State, or some person by him authorised in that respect: AND ALSO all Sand, Clay, Stone, Gravel, and Indigenous Timber, and all other Materials, the natural produce of the said Land, which may be required at any time or times hereafter by the Government of Our said State, for the construction and repair of any Public Ways, Bridges, or Canals, or for Naval Purposes, or Railroads, or any Fences, Embankments, Dams, Sewers, or Drains, necessary for the same, together with the right of taking and removing all such materials; AND ALSO the right of full and free ingress, egress, and regress, into, out of, and upon the said Land, for the several purposes aforesaid, or any of them: **In Testimony Whereof,** We have caused this Our Grant to be Sealed with the Seal of Our said State.

WITNESS Our Trusty and Well-beloved the Honorable SIR FREDERICK MATTHEW DARLEY, *Knight Grand Cross of Our Most Distinguished Order of Saint Michael and Saint George, Our Lieutenant-Governor of Our State of* NEW SOUTH WALES *and its Dependencies, in the Commonwealth of Australia, at Sydney, in Our said State, this sixth day of December in the first year of Our Reign, and in the year of Our Lord one thousand nine hundred and one.*

Fred. M. Darley
Lieutenant-Governor.

RECORDED and ENROLLED in the Registrar General's Office, at Sydney, in New South Wales, this 17 day of January 1902.

Deputy Registrar General.

No. 368307 TRANSFER DATED 28 July 1903 FROM THE SAID Commercial Banking Company of Sydney Limited To James Joseph Devereux of near Cooma Grazier OF THE LAND within DESCRIBED PRODUCED & ENTERED 12th August 1903 AT 20 mts p 3 O'CLOCK IN THE afternoon

Deputy Registrar General.

No. A 445851. TRANSFER dated 3rd March 1919 from the said James Joseph Devereux - To Timothy Vincent Devereux of near Cooma Grazier

of the land within described.

Produced and entered 10th March 1919 at 37 mts p 2 o'clock in the after noon.

REGISTRAR GENERAL

No. D 500090A CAVEAT by the Registrar General. Entered 3 DEC 1947

REGISTRAR GENERAL

The within Caveat No. D 500090A is hereby withdrawn

Dated 19th December 1962

REGISTRAR GENERAL

NORMAN HAIN DEVEREUX of Cooma Grazier is now the registered proprietor of the land within described
See TRANSFER No. J 197486 Dated 30th October 1962
Entered 19th December 1962

REGISTRAR GENERAL

COMPUTER FOLIO NO FURTHER DEALINGS TO BE REGISTERED.

J 197486 T

No. 190/1/1933 **State of New South Wales.** [LAND GRANT.] B

P
GRM

One pound
STAMP DUTY, N.S.W.

REGISTER BOOK,
VOL. 1540 FOL. 58

CANCELLED
ON ISSUE OF NEW FOLIO 120/750540

0377 127
Coona

GRANT OF LAND PURCHASED BY CONDITIONAL SALE WITHOUT COMPETITION.

(UNDER THE CROWN LANDS ALIENATION ACT OF 1861.)

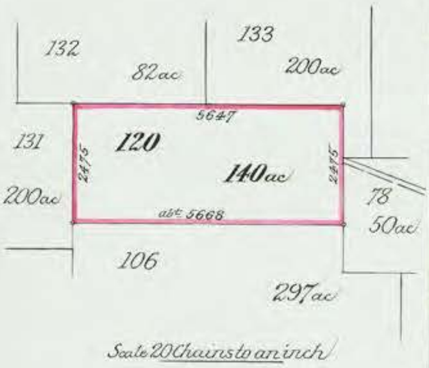
N.S.W. DEPARTMENT 22 VI 1904 OF STAMP DUTIES

120

EDWARD VII, by the Grace of God, of the United Kingdom of Great Britain and Ireland, King, Defender of the Faith, and so forth:—
TO ALL to whom these Presents shall come: Greeting:—

WHEREAS *James Joseph Devereux* of *Mullar Park near Coona* in Our State of New South Wales, claims to be entitled, in respect of a purchase by Conditional Sale, without competition, under the 21st Section of the Crown Lands Alienation Act of 1861, to the Parcel of Land hereinafter described; and the declaration, as by law required, has been made, and the Minister for the time being charged with the administration of the public lands is satisfied that all things required by law to be done to entitle the said *James Joseph Devereux* to a grant of the fee simple of the said Lands, subject to the Reservations hereinafter contained, have been done and performed: **And Whereas** the sum of *One hundred and forty pounds* sterling, being the purchase money payable for the said Land, has been duly paid into the Office of the Treasurer of Our said State: **Now Know Ye**, That for and in consideration of the said sum, for and on Our behalf well and truly paid into the Treasury of Our said State, before these Presents are issued, and of all and singular the premises, We, for Us, Our Heirs and Successors, Do HEREBY GRANT unto the said *James Joseph Devereux* *his* Heirs and Assigns, subject to the several and respective Reservations hereinafter mentioned, ALL THAT piece or parcel of land in Our said State, containing by Admeasurement *One hundred and forty acres* be the same more or less, situated in the County of *Beresford* and Parish of *Gladstone*

Portion 120



Commencing on an Eastern boundary of portion one hundred and thirty one of two hundred acres at the North Western corner of portion one hundred and six of two hundred and ninety seven acres and bounded thence on the South by a Northern boundary of portion one hundred and six bearing East about fifty six chains sixty eight links on the East by part of the Western boundary of portion seventy eight of fifty acres and a Western boundary of portion one hundred and thirty three of two hundred acres in all bearing Northerly twenty four chains seventy five links on the North by a Southern boundary of portion one hundred and thirty three and part of the Southern boundary of portion one hundred and thirty two of eighty two acres in all bearing West fifty six chains forty seven links to a North Eastern corner of portion one hundred and thirty one aforesaid and on the West by part of an Eastern boundary of portion one hundred and thirty one bearing South twenty four chains seventy four links to the point of commencement.

As per plan in the margin hereof: with all the Rights and Appurtenances whatsoever thereto belonging: **To Hold** unto the said *James Joseph Devereux* *his* Heirs and Assigns for ever: Subject, nevertheless, to the several and respective Reservations hereinafter contained, that is to say: **Provided Nevertheless**, And WE DO HEREBY RESERVE unto Us, Our Heirs and Successors, all Minerals which the said Land contains, with full power and authority for Us, Our Heirs and Successors, and such person or persons as may from time to time be authorised by Us, Our Heirs and Successors, or by the Governor for the time being of Our said State, to enter upon the said Land, and to search for, mine, dig, and remove the said Minerals, with full right of ingress, egress, and regress, for the purposes aforesaid: **Provided Also**, AND WE DO HEREBY FURTHER EXCEPT AND RESERVE unto Us, Our Heirs and Successors, all such parts and so much of the said Land as may hereafter be required for a Public Way, or Public Ways, Canals, or Railroads, in, over, and through the same, to be set out by Our Governor for the time being of Our said State, or some person by him authorised in that respect: AND ALSO all Sand, Clay, Stone, Gravel, and Indigenous Timber, and all other Materials, the natural produce of the said Land, which may be required at any time or times hereafter by the Government of Our said State, for the construction and repair of any Public Ways, Bridges, or Canals, or for Naval Purposes, or Railroads, or any Fences, Embankments, Dams, Sewers, or Drains, necessary for the same, together with the right of taking and removing all such materials; AND ALSO the right of full and free ingress, egress, and regress, into, out of, and upon the said Land, for the several purposes aforesaid, or any of them: **In Testimony Whereof**, We have caused this Our Grant to be Sealed with the Seal of Our said State.

WITNESS Our Trusty and Well-beloved SIR HARRY HOLDSWORTH RAWSON, *Admiral in Our Royal Navy, Knight Commander of Our Most Honourable Order of the Bath, Our Governor of Our State of* NEW SOUTH WALES *and its Dependencies, in the Commonwealth of Australia, at Sydney, in Our said State, this* seventh *day of* June *in the* fourth *year of Our Reign, and in the year of Our Lord one thousand nine hundred and* four

Harry H. Rawson

RECORDED and ENROLLED in the Registrar General's Office, at Sydney, in New South Wales, this 23rd day of June 1914

Deputy Registrar General.

No. A 445 849 TRANSFER dated 3rd March 1919
from the said James Joseph Devereux - to - Timothy Vincent Devereux of near Cooma Grazier
of the land within described.
Produced and entered 10th March 1919
at 37 mts pt 2 o'clock in the after noon.

REGISTRAR GENERAL

No. D500000A CAVEAT
by the Registrar General
Entered - 3 DEC 1947

REGISTRAR GENERAL

The within Caveat No. D500000A is hereby withdrawn
Dated 4th December 1962

REGISTRAR GENERAL

*NORMAN HAIN DEVEREUX of Cooma Grazier is now the registered proprietor of the land within described
See TRANSFER No. J 197486 Dated 30th October 1962
Entered 19th December 1962

REGISTRAR GENERAL

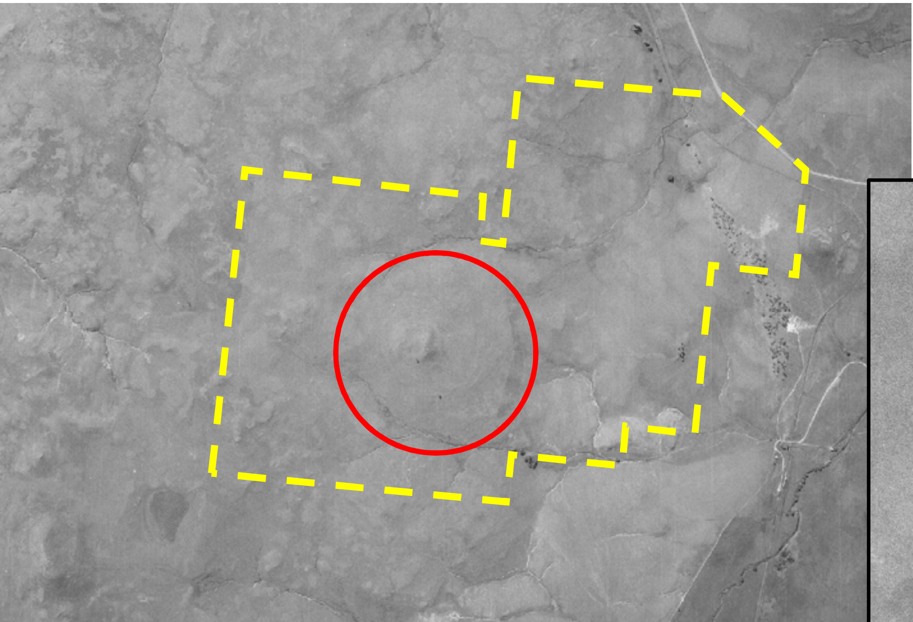
COMPUTER [illegible] NO FURTHER DEALINGS TO BE REGISTERED.

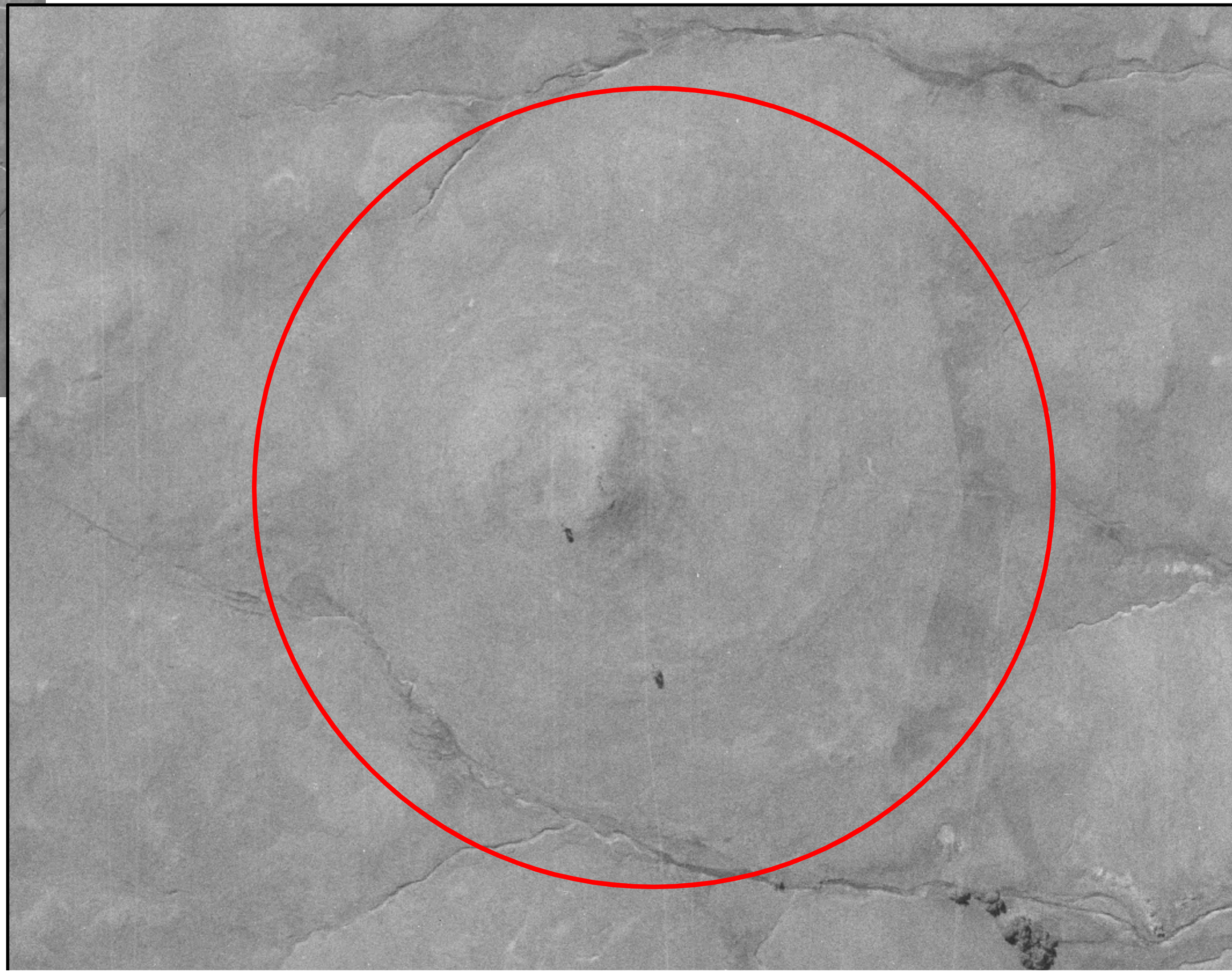
J197486T

Appendix C

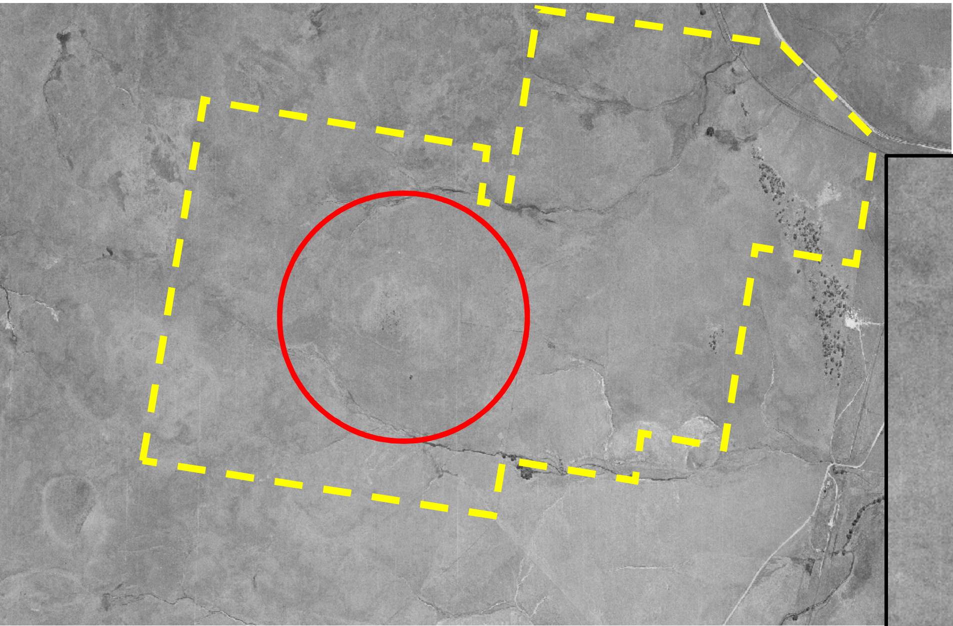
HISTORIC AERIAL PHOTOGRAPHY

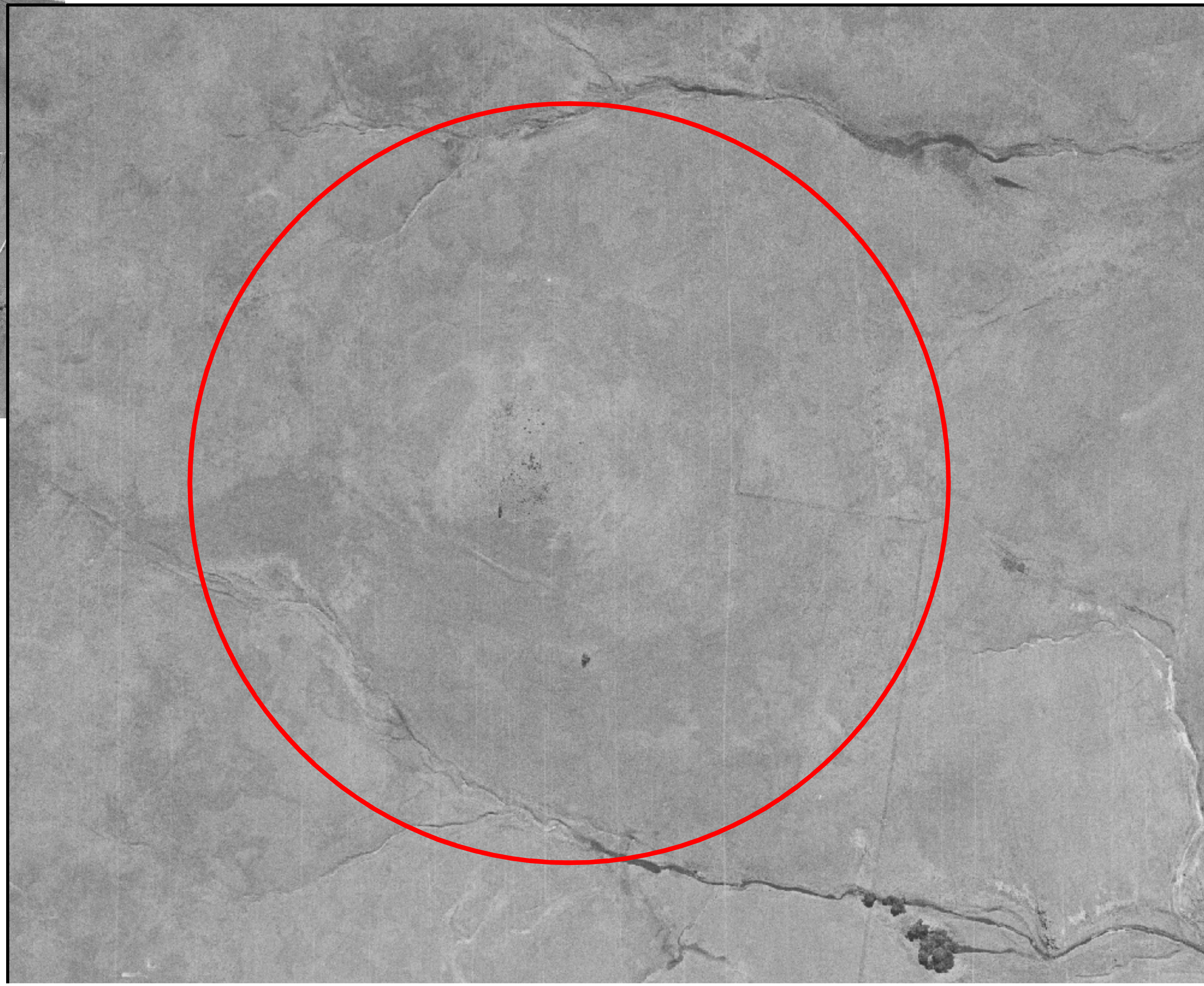
1959 Aerial Photography



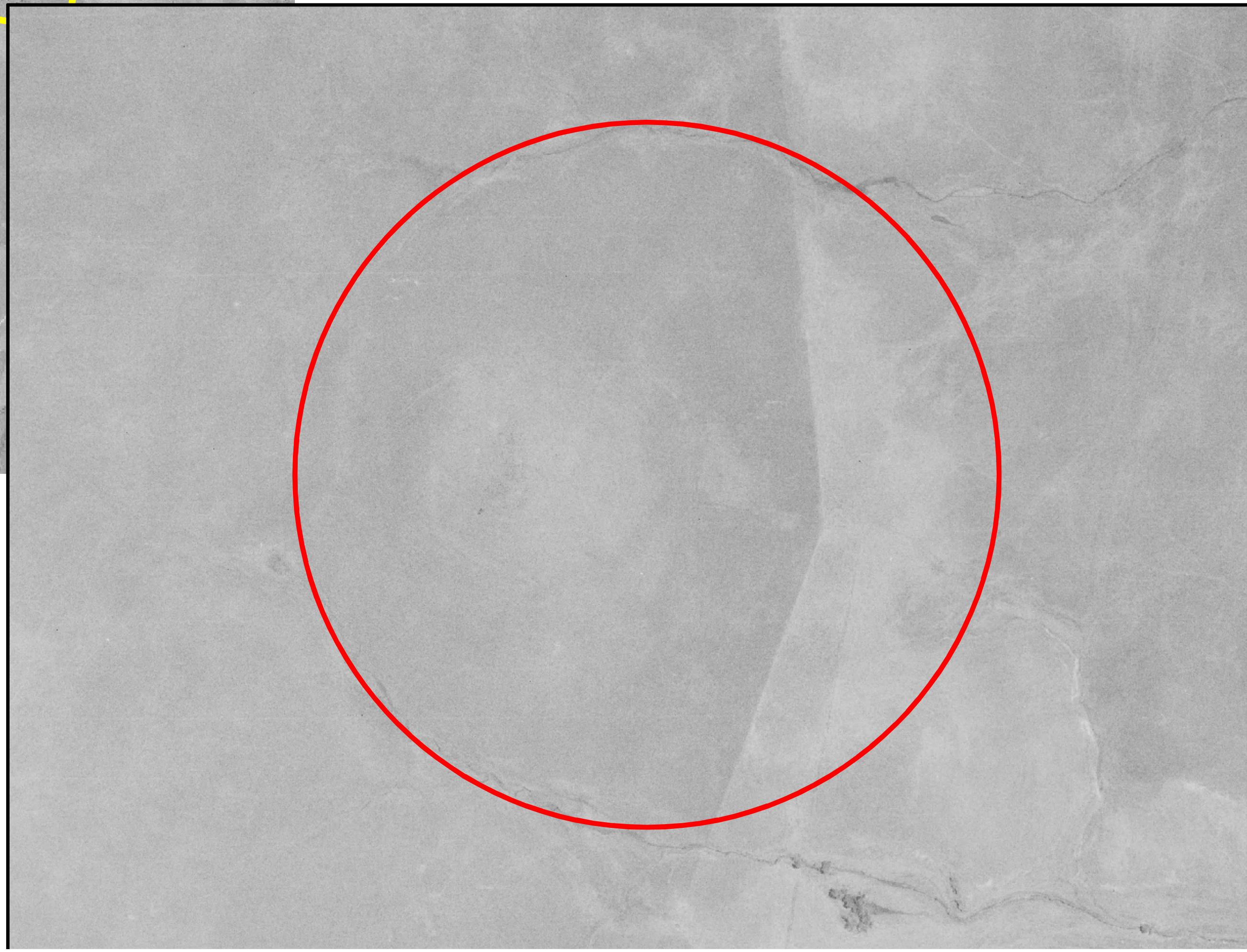


1967 Aerial Photography

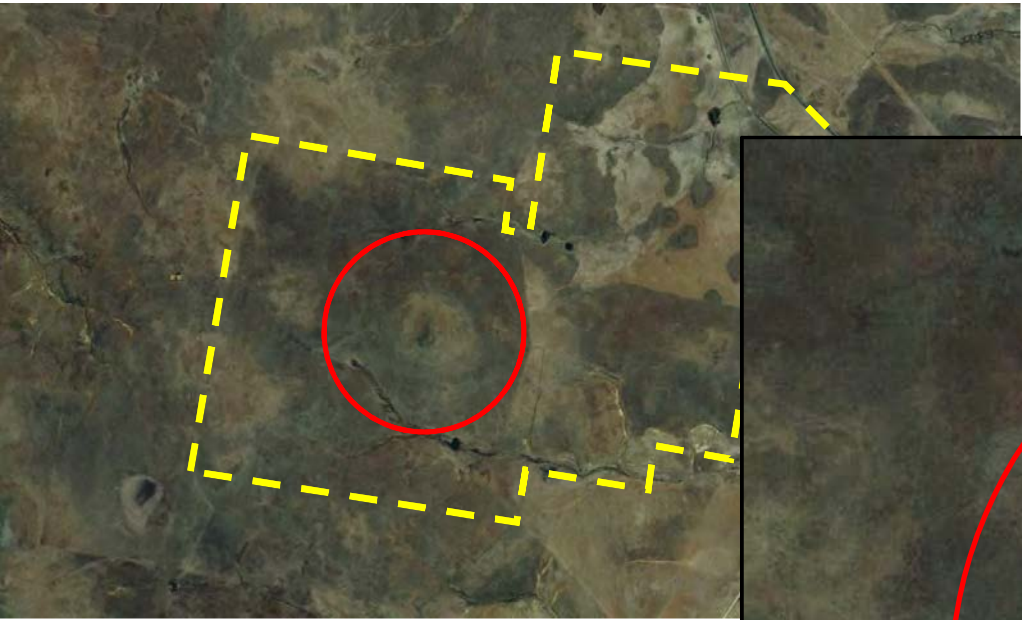




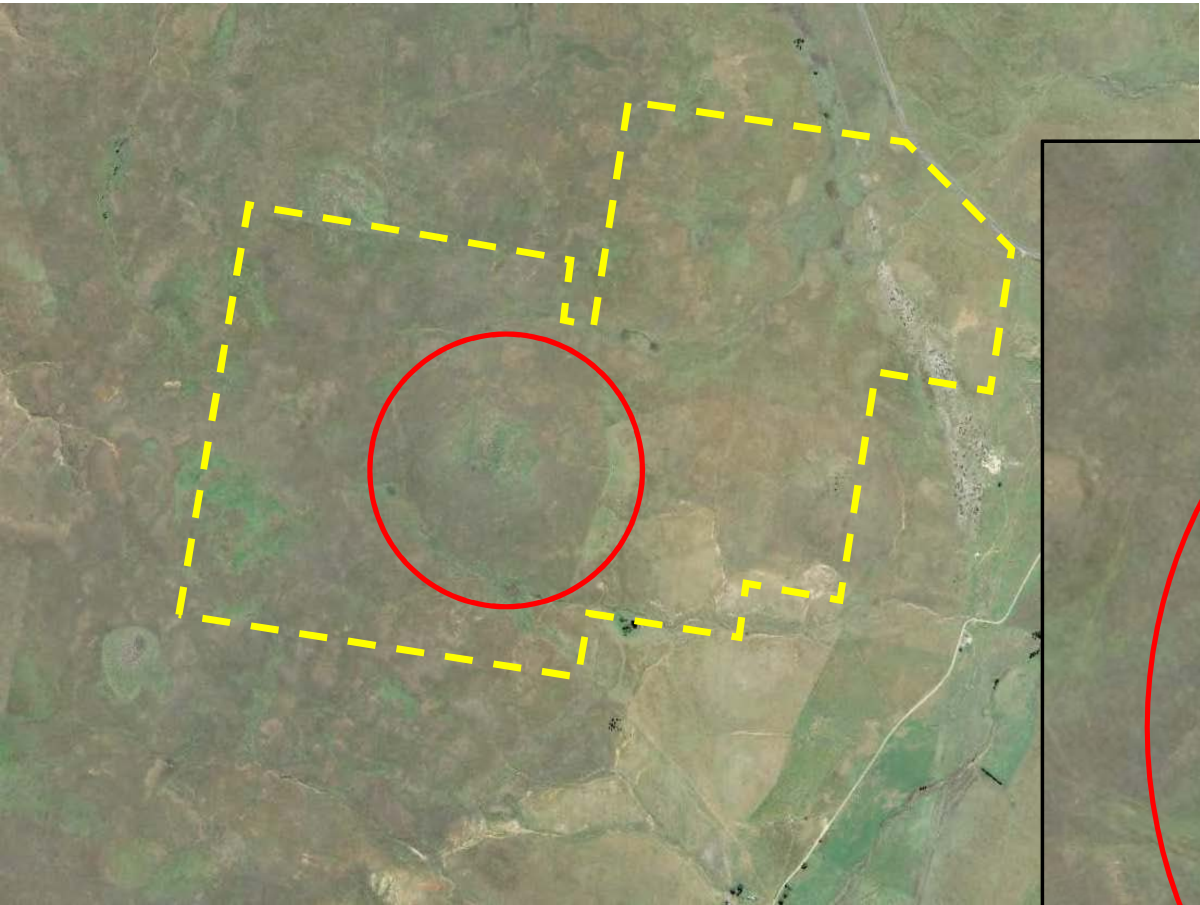
1985 Aerial Photography



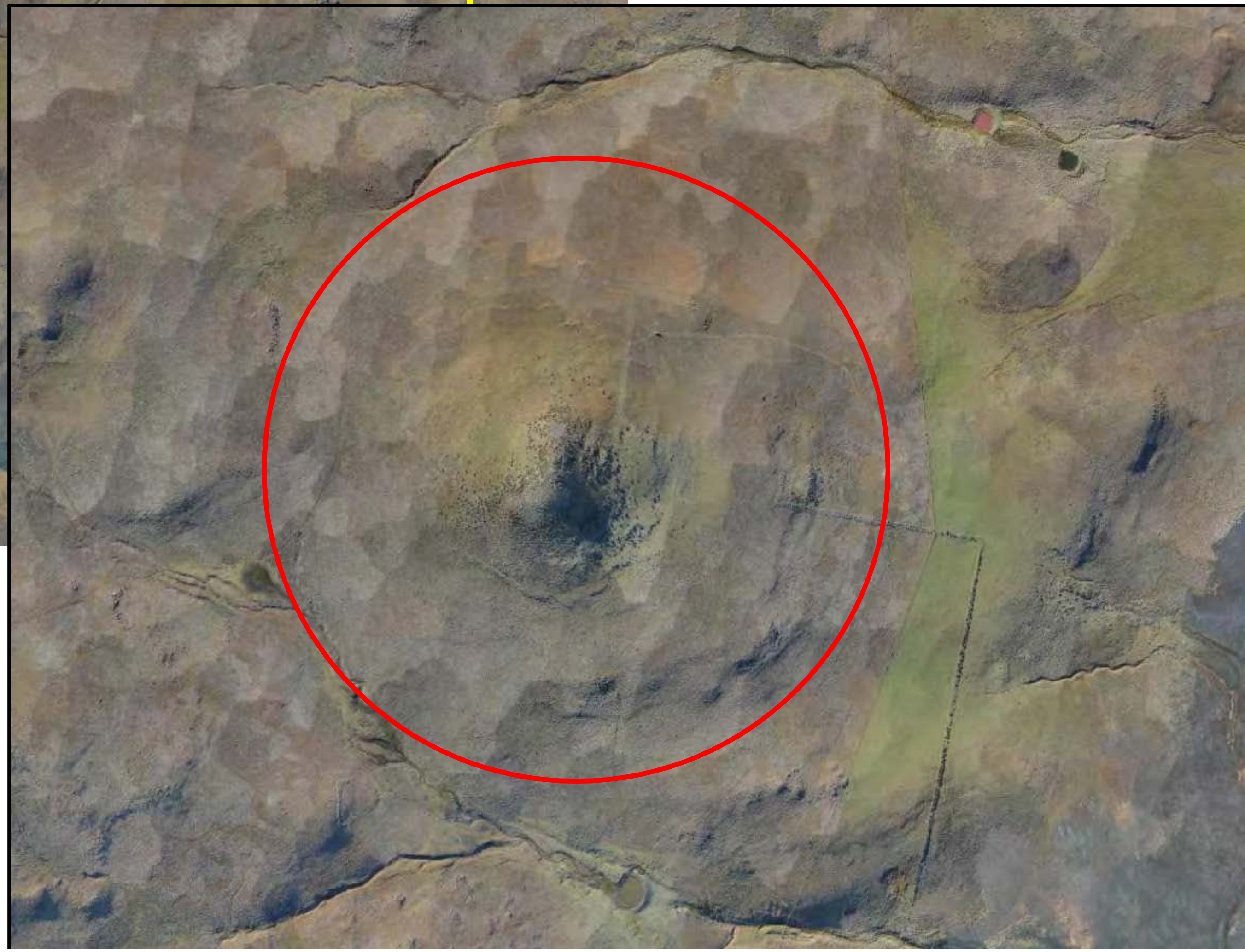
2002 Aerial Photography



2011 Aerial Photography



2017 Aerial Photography



APPENDIX L

Flora & Fauna Impact Assessment
(Gunninah)

gunninah

Proposed Hard Rock Quarry

278 Springs Road, Rock Flat - NSW

Ecological Issues & Assessment Report

F Dominic Fanning - Gunninah

February 2018

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Proposed Hard Rock Quarry

278 Springs Road, Rock Flat - NSW

Ecological Issues & Assessment Report

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February 2018

PROPOSED HARD ROCK QUARRY

278 SPRINGS ROAD, ROCK FLAT– NSW

ECOLOGICAL ISSUES & ASSESSMENT REPORT

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February 2018

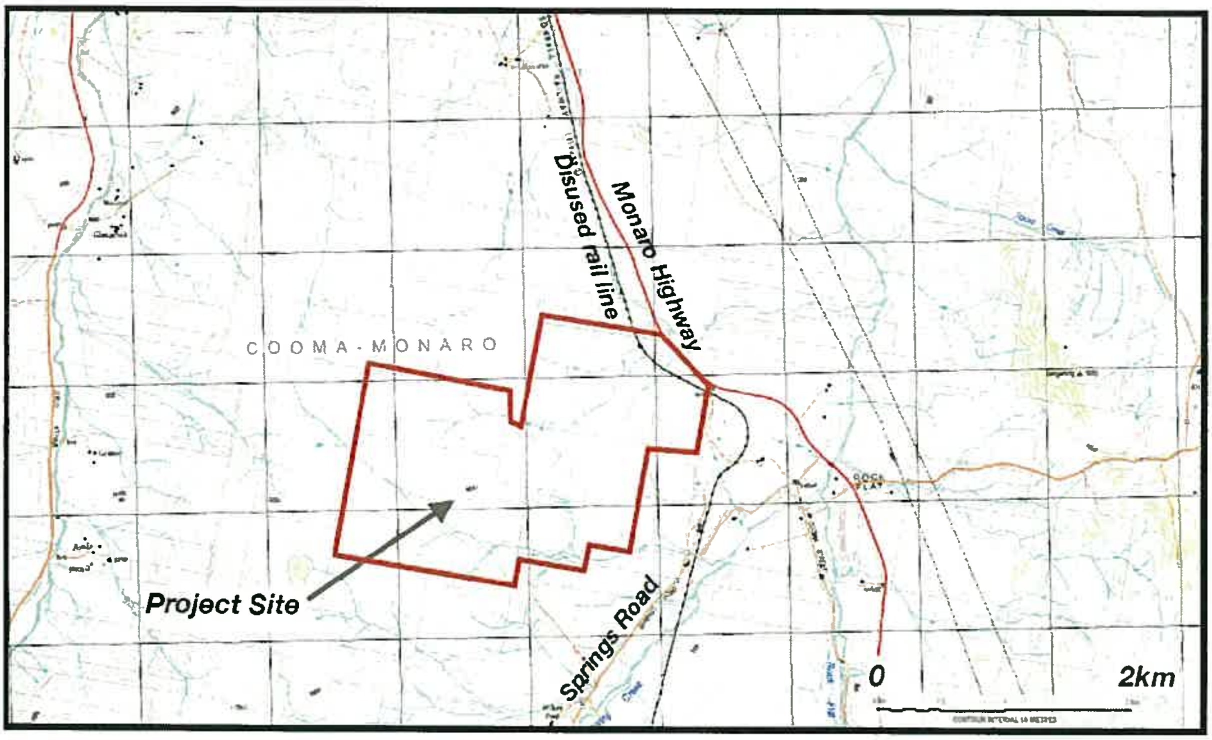
PART A	INTRODUCTION & INFORMATION BASE

1 INTRODUCTION

1.1 The Subject Land and Subject Site

The land which is the subject of this *Ecological Issues & Assessment Report* (EIAR) consists of long established agricultural land on the Monaro Plain, approximately 14km south of the town of Cooma in the southern tablelands of New South Wales (see plans in Attachment A and below). The "*subject land*" consists of Lots 62, 76, 78, 106 and 120 in DP 750540 (known as No. 278 Springs Road, Rock Flat); and occupies a total area of approximately 304 hectares.

The area to be affected by a proposed hard rock quarry on the subject land (referred to hereafter as the "*subject site*") consists of a part of the subject land – occupying approximately 14.21ha (see plans in Attachment A and below), excluding the access road (which will be retained). The majority of the subject land will continue to be used for grazing purposes – as has been the case for the past 100 years or so.



1.2 Relevant Definitions

Particular definitions of the areas referred to in this EIAR are provided below; with other relevant definitions and terms in the *Glossary* at the end of this *Report*.

- "*subject land*" Lots 62, 76, 78, 106 and 120 in DP 750540 (known as part of No. 278 Springs Road, Rock Flat). The "*subject land*" (which occupies ~ 304ha) is referred to in the EIS as the "*Project Site*" (see plan from the EIS above).

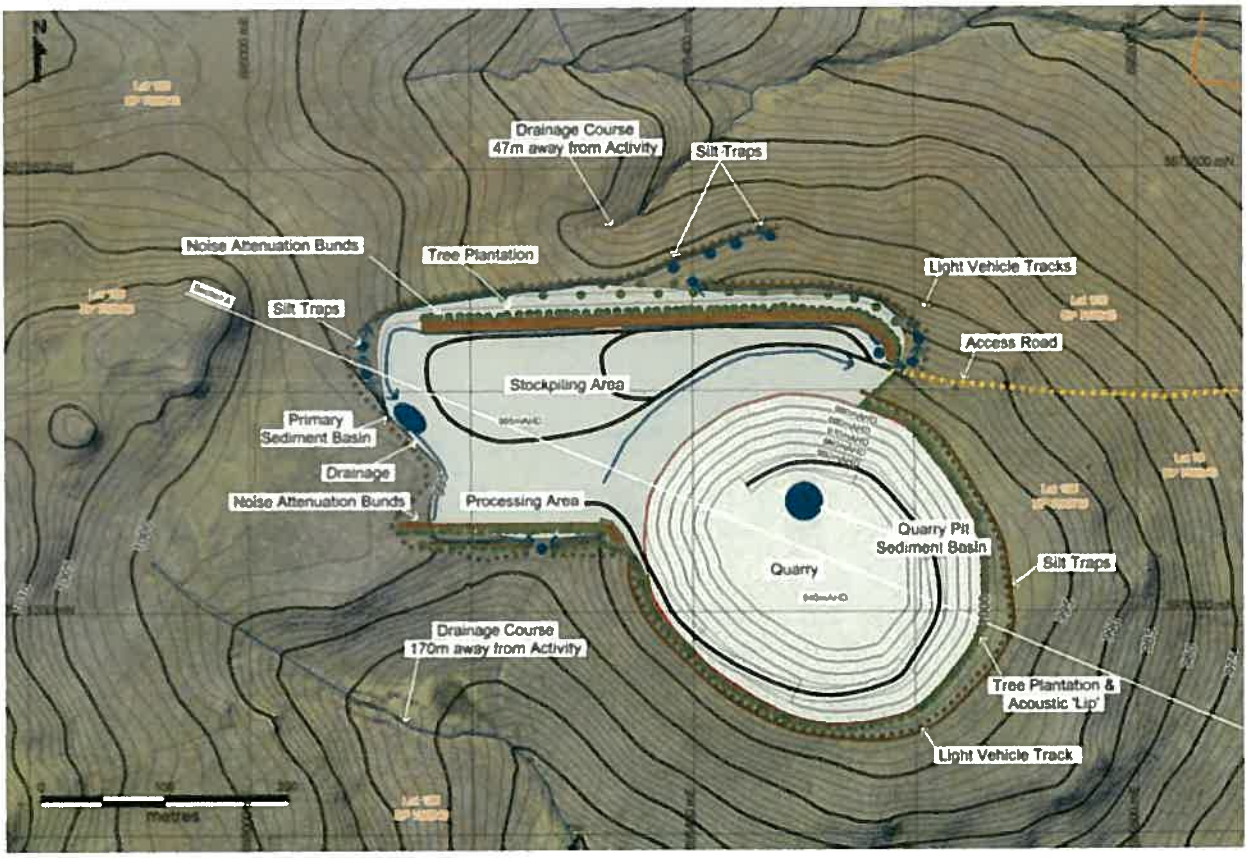
  The "*subject land*" (or "*Project Site*") is part of a much larger landholding of approximately 2000ha (including the historic 'Milton Park' homestead) owned by Mr Peter Devereux.

- "*subject site*" The area to be occupied by the hard rock quarry and all of its associated works and activities (including the access/haul road, crushing and stockpiling facilities, office and sheds, water treatment dams and electricity supply).

  The proposed Flat Rock Quarry and its associated activities will occupy a total area of approximately 14 hectares (see the EIS).

1.3 The Proposed Activities

The proposal is for the development of a hard rock quarry on the subject land at Rock Flat; with associated activities (being the construction of an access/haul road, processing and stockpiling areas, an office and workshop, and an array of bunds and sediment traps or basins at strategic locations – see plan below and in Appendix A).



The details of the proposed quarry operations are provided in the EIS prepared by Outline Planning Consultants; as described briefly below.

- Initial Phase

  Clear relevant areas; remove and stockpile or re-use topsoil and vegetation; commence extraction from the northwestern side of the hill (to be used initially for construction of the access/haul road and working pads for the processing and stockpiling areas); construct bunds and drainage; commence planting of screening trees.

- Commencement of Active Quarry Phase

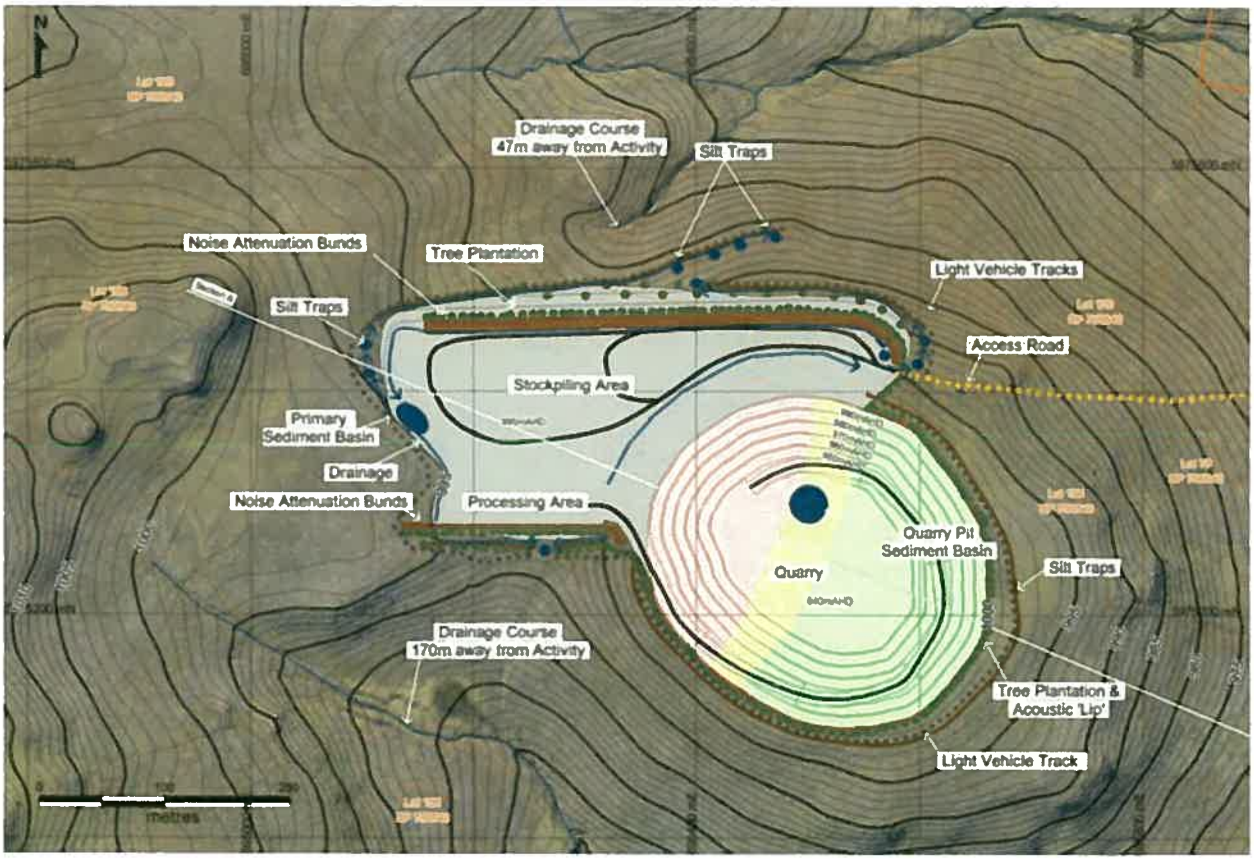
  Continue extraction from the northwestern side of the hill (lowering the hill profile by approximately 35m); progressively expand processing and stockpile areas (as required); continue tree planting and maintenance.

- Active Quarry Phase

  Continue extraction from the northwestern side of the hill and extend into the quarry pit; continue to progressively expand processing and stockpile areas (as required); continue tree planting and maintenance.

- Decommissioning Phase

  Remove all plant and equipment, buildings, structures and foundations; retain water storage basins and drainage bunds; re-contour pit slopes (as required); rehabilitate stockpile and processing areas; replace topsoil and rehabilitate with native grasses.



1.4 Purpose of This Report

This *Ecological Issues & Assessment Report* (EIAR) with respect to the subject land and the proposed hard rock quarry at Rock Flat has been prepared in order to address the following requirements.

- To describe the subject land and relevant adjoining lands.
- To identify the flora and fauna species, and ecological communities, present and/or likely to occur on the lands.
- To collate information and data from relevant databases and other available sources regarding the subject land.
- To consider the likely or potential impacts of the proposed activities with respect to native biota – pursuant to Section 5A and Section 79C of the *Environmental Planning & Assessment Act 1979* (EP&A Act); and the relevant considerations of the *Environment Protection & Biodiversity Conservation Act 1995* (EPBC Act).
- To recommend and detail appropriate impact amelioration and environmental management measures for the project.
- To address relevant legislation and planning instruments – including:
    - the *National Parks & Wildlife Act 1974* (NP&W Act)
    - the *Threatened Species Conservation Act 1995* (TSC Act)
    - the *Environmental Planning & Assessment Act 1979* (EP&A Act)
    - the Commonwealth *Environment Protection & Biodiversity Conservation Act 1995* (EPBC Act)
    - the *Water Management Act 2000*
    - the *Cooma-Monaro Local Environmental Plan 2013*.

It is noted that this EIAR, and the EIS which it supports, have been prepared pursuant to Clauses 27 and 28 of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*; as a consequence of which Part 7 of the *Biodiversity Conservation Act 2017* does not apply to the Flat Rock Quarry project.

It is also noted that the *Native Vegetation Act 2003* does not apply to the Flat Rock Quarry project – pursuant to section 25 of that Act.

1.5 Declaration

I have prepared this *Ecological Issues & Assessment Report* (EIAR) in full cognisance of the requirements of expert witnesses in the NSW Land & Environment Court. In particular, I have read and understand Part 31 - Division 2 of the *Uniform Civil Procedures Rules* (UCPRs) and the *Expert Witness Code of Conduct* - contained in *Schedule 7* to the UCPRs.

2 INFORMATION BASE and ASSUMPTIONS

2.1 Existing Information

An array of information sources has been taken into account in the compilation of this *Ecological Issues & Assessment Report* (EIAR).

- The NSW Wildlife Atlas (BioNet Atlas) of the Office of Environment & Heritage (OEH) – see Appendix 2 of the Lesryk Report (Attachment B of this EIAR).
- Profiles and information on relevant or potentially relevant threatened biota contained on the OEH website.
- The information contained on the EPBC Act website for threatened biota; including both the listings of potentially relevant threatened biota (Appendix 2 of the Lesryk Report – Attachment B) and documents regarding relevant or potentially relevant threatened biota.
- Information identified in the submission from the OEH to the Department of Planning & Environment (DP&E) for the *Secretary's Environmental Assessment Requirements* (SEARs) – see the *Environmental Impact Statement* (EIS) prepared by Outline Planning Consultants and Attachment D of this EIAR
- The general scientific and published literature on native biota and threatened species in Australia (see Bibliography).

2.2 Dedicated Surveys for this Report

Dedicated field investigations of the subject land were undertaken for this EIAR by Lesryk Consulting (Attachment B of this EIAR) – in November and December 2017. In addition, the author of this EIAR inspected the subject land on 06 December 2017 (see photographs in Attachment C of this EIAR).

Five different ecologists have attended the subject land on a total of 15 person-days in November and December 2017. The identification of specific dedicated surveys below does not, therefore, constitute the total quantum of flora and fauna surveys conducted on the subject land, and any assertions or assumptions to that end would be incorrect and inaccurate.

The Lesryk investigations involved the following activities during the following periods – 01-03 and 13 November 2017 and 06-08 December 2017 (inclusive).

Flora Surveys

- A 'Random Meander' botanical survey[1] (*sensu* Cropper 1993) was undertaken in November 2017 – to search for threatened plant species and to collect a flora assemblage list.
- A further Random Meander was conducted by the author of this EIAR on 06 December – specifically targeting the threatened plant species identified below by the OEH.

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1 The 'Random Meander' survey technique is consistent with the random stratified sampling design specified in Chapter 5.1 (Stratification, sampling and replication) of the *Threatened Biodiversity Survey and Assessment. Guidelines for Development and Activities. Working Draft*. DEC 2004.

The site survey by the author of this EIAR (on 06 December 2017) included an extensive 'Random Meander' botanical survey, with a particular focus *inter alia* on threatened plants.

Fauna Surveys

The following fauna surveys were undertaken by Lesryk between 01 November and 08 December 2017 (see details in Attachment B).

• Vehicular transects (diurnal and nocturnal)	over 7 days
• Walked transects (diurnal and nocturnal)	over 7 days
• Stag-watching and spotlighting for nocturnal fauna	3 person-hours
• Echolocation sensors (Anabats)	38 Anabat-hours
• Dedicated herpetofauna searches	23 person-hours
• Dedicated bird surveys	2 person-hours[2]

An additional 4 hours was spent on the subject land (on 06 December 2017) by the author of this EIAR.

2.3 Limitations and Assumptions

Flora and fauna surveys are always limited – by the total quantum of time allowable and/or spent on site; by the time of year in which the surveys are undertaken, and sometimes by the prevailing weather conditions; and by the fact that surveys are generally a snapshot of a site at one particular time. They can also be affected by longer term climatic circumstances.

This, no flora and fauna survey is ever 'complete'. It is always necessary to make assumptions about flora and fauna species, and their presence on and/or use of a site, in any assessment of a project.

Given the nature of the subject land and the subject site, however, the array of flora and fauna utilising the subject site and the subject land at Rock Flat would be quite limited. There are only limited habitats and resources present, and a significant array of flora and fauna would not utilise the subject site at any time (*eg* forest and woodland species; species reliant on even a single tree or on tree-hollows; species reliant on wetlands and ponds, or on cliffs and caves).

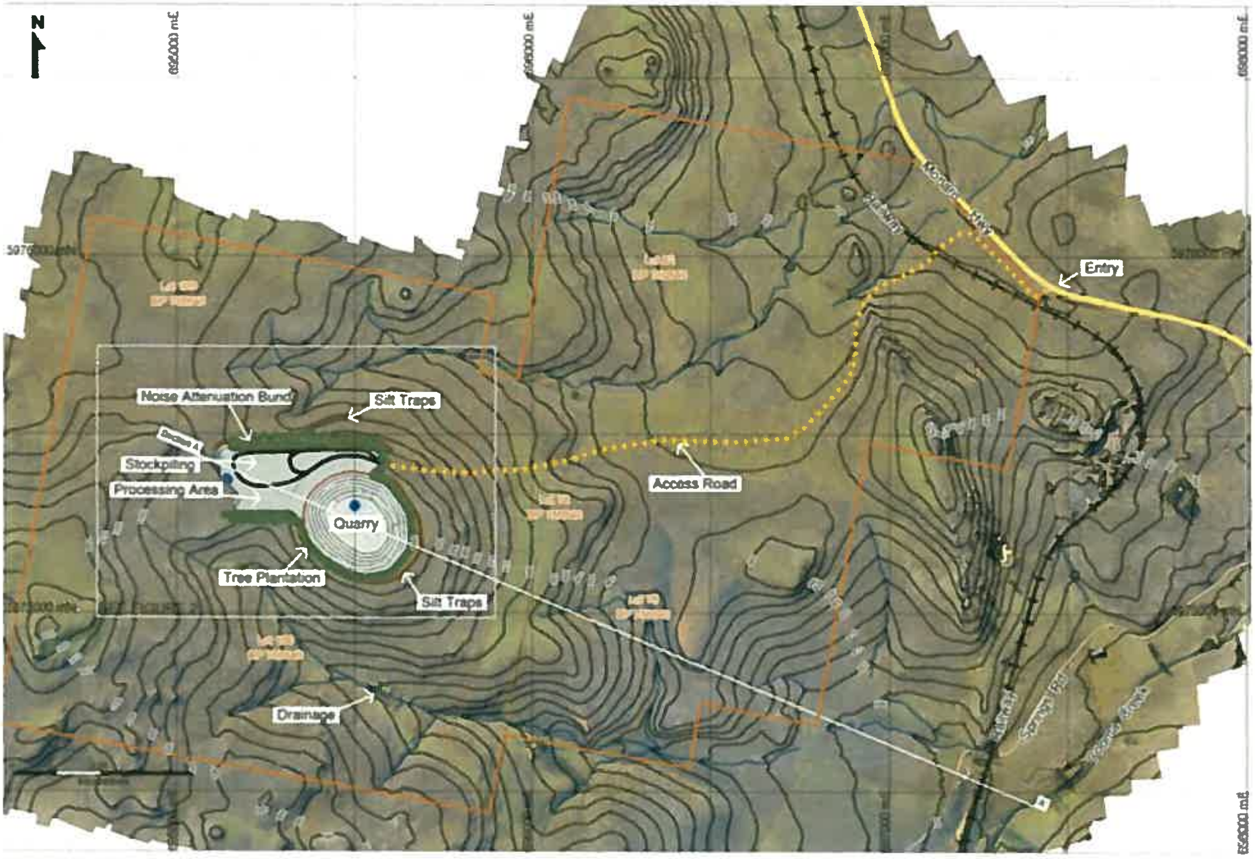
It is accepted in this EIAR that additional native flora and fauna species are likely to occur on the subject land on occasions at least and/or under different climatic circumstances; potentially including a number of threatened species. Those species have been taken into account in subsequent parts of this *Report*, and the potential impacts of the proposal have been addressed in the light of those possible occurrences.

It is a basic assumption of the impact analysis contained within this EIAR that the vegetation clearing and ongoing quarrying operations and associated activities on the subject land will be undertaken in an environmentally responsible manner – in accordance with the impact avoidance and amelioration measures discussed throughout the EIAR and/or as provided in Chapter 10 of the *Report*.

2 It is to be noted that general wildlife surveys were undertaken opportunistically during all visits to the subject land – by 2-3 persons over a total of 7 days between 01 November and 08 December 2017.

3 SITE DESCRIPTION and HISTORY

The subject land is part of the rolling hills landscape of the Monaro Plain in the southern tablelands of NSW (Attachment A). It slopes away from the volcanic plug which is the focus of the hard rock quarry proposal - from an elevation of approximately 1035m AHD to lower slopes at approximately 900-905m in the southeastern corner of the subject land and 910m along the Monaro Highway in the northeastern corner of the land (see site plan in Attachment A and below).



The subject land is surrounded by existing extensive grazing and agricultural lands – which have long been grazed and in places (including on the subject land) 'pasture-improved' and/or used for more intensive agricultural pursuits (see photographs in Attachment C). The subject land itself appears only to have been used, in relatively recent times at least, for the broad-scale grazing of sheep and cattle.

As a result *inter alia* of the long-term grazing of the land over many decades, and previous pasture-improvement activities, the vegetation on the subject land has been modified, and contains varying levels of introduced and pasture grasses and weeds.

The majority of the subject land is a treeless tussock grassland (as are most of the surrounding properties), and the only trees present on the subject land are located along the small ridgeline near the Monaro Highway (see aerial photographs above and in Attachment A).

Shrubs are confined to the small ridgeline mentioned above (in the eastern part of the subject land) and to the top of the basalt hill proposed for quarrying. Otherwise, the subject land is characterised by the tussock grassland described in detail in Chapter 4 of this EIAR, and by areas of improved-pasture (see vegetation map in Attachments A and B, and below; and detailed descriptions in Chapter 4).

The treeless grassland feature of the landscape is the natural condition of the Monaro Plain, as referenced in the Outline Consulting EIS.

> The Monaro Plain "*is famously known as the treeless plain and many people think this is because it has been over grazed, but this is not the case. It was treeless when pioneers first came to the region. Lhotsky (1835) described the plains in the vicinity of Cooma - "The scene all around was composed of undulating downs, long projected hills among them, covered with very few trees". The Monaro Plain is a classic case of how geology and weather affects land use. The soil in the region is thin, the temperatures are cold and the plain falls in a rain shadow area between the Eastern Escarpment and the Snowy Mountains"* (source: Geological Sites of NSW website).

The Monaro Plain is an elevated undulating plain (elevations in the vicinity of the subject site range from 850 to >1,000m AHD), located between the ACT and the Victorian border. It is located within a 'rain shadow' created by the Snowy Mountains to the west and the coastal ranges to the east. Annual rainfall on the Monaro Plain is approximately 580mm; and the winters are long and cold.

The soils of the subject land are based on the underlying volcanic geology; and are of the Brothers (on the hill) or Maneroo (lower slopes and flats) soil landscapes. Despite being described as of 'high' fertility, the soils are also described as 'thin', and in addition have been allocated as being of moderate to high levels of agricultural limitations (for the reasons cited above). The dominance of the tussock grassland in the landscape on an historical basis (a vegetation type that typically thrives in soils of low fertility and limited rainfall) stands testimony to the low productive potential of the Monaro Plain.

Most of the subject land slopes away, in all directions, from the basalt hill in the western part of the land, which is the site of the proposed quarry operations (see contour map in Attachment A). The only other feature which generates localised drainage is the low ridge in the northeastern part of the subject land – aligned roughly parallel with the Monaro Highway.

There are two main 'watercourses' or drainage features on the subject land – both of which are ephemeral and flow only after significant rainfall (see contour map in Attachment A). The southern watercourse rises in the hills in the western part of the subject land, and flows southeasterly and easterly (around the western and southern flanks of the hill) into Spring Creek - approximately 1km east of the subject land. The second (northern) watercourse rises in the northwestern part of the subject land, and flows easterly (around the northern flank of the hill) into Rock Flat Creek – approximately 2km to the northeast of the subject land.

Both watercourses have been affected by the long-term grazing of the property (as is typical of the general locality), and there are several farm dams along the watercourses (see aerial photograph above and in Attachment A). There is also a small swamp or bog near the upper part of the southern watercourse (see photographs in Attachment C).

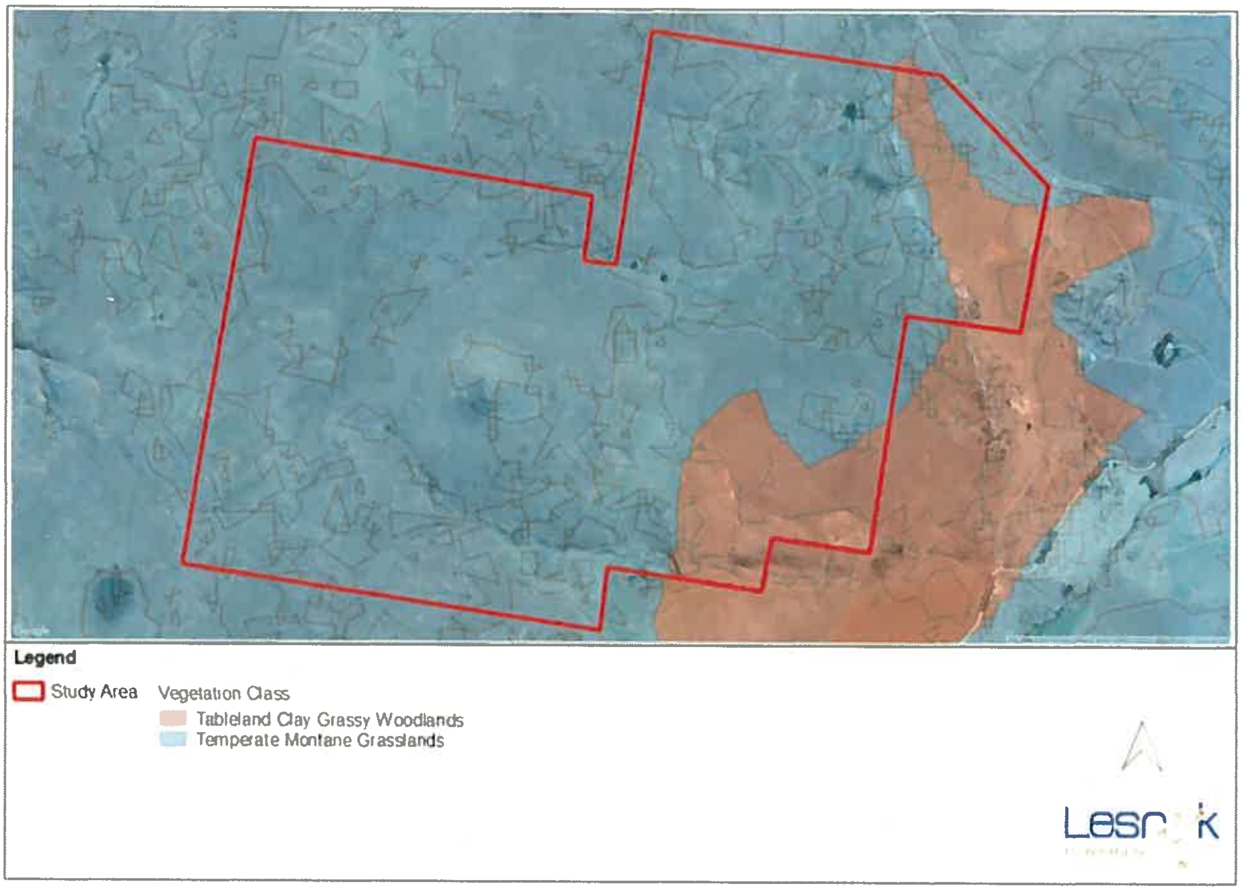
The only other features of the subject land are two items of infrastructure – the Monaro Highway (which is located along the northeastern side of the land) and a disused railway line (close to the Monaro Highway (see map above and photographs in Attachment C).

4 FLORA and VEGETATION

4.1 Vegetation Types

Vegetation on part of the Monaro Plains has been described and mapped by Steve Priday (*The Native Vegetation of the Cooma-Monaro Shire* 2007); for use in strategic planning for the Cooma-Monaro Shire Council.

The vegetation on the subject land (and on the surroundaing lands) has been mapped by Priday (2007) as predominantly being 'Temperate Montane Grasslands'; with 'Tableland Clay Grassy Woodlands' located in the eastern and southeastern parts of the subject land – associated with the rocky ridges in that area (see map below).

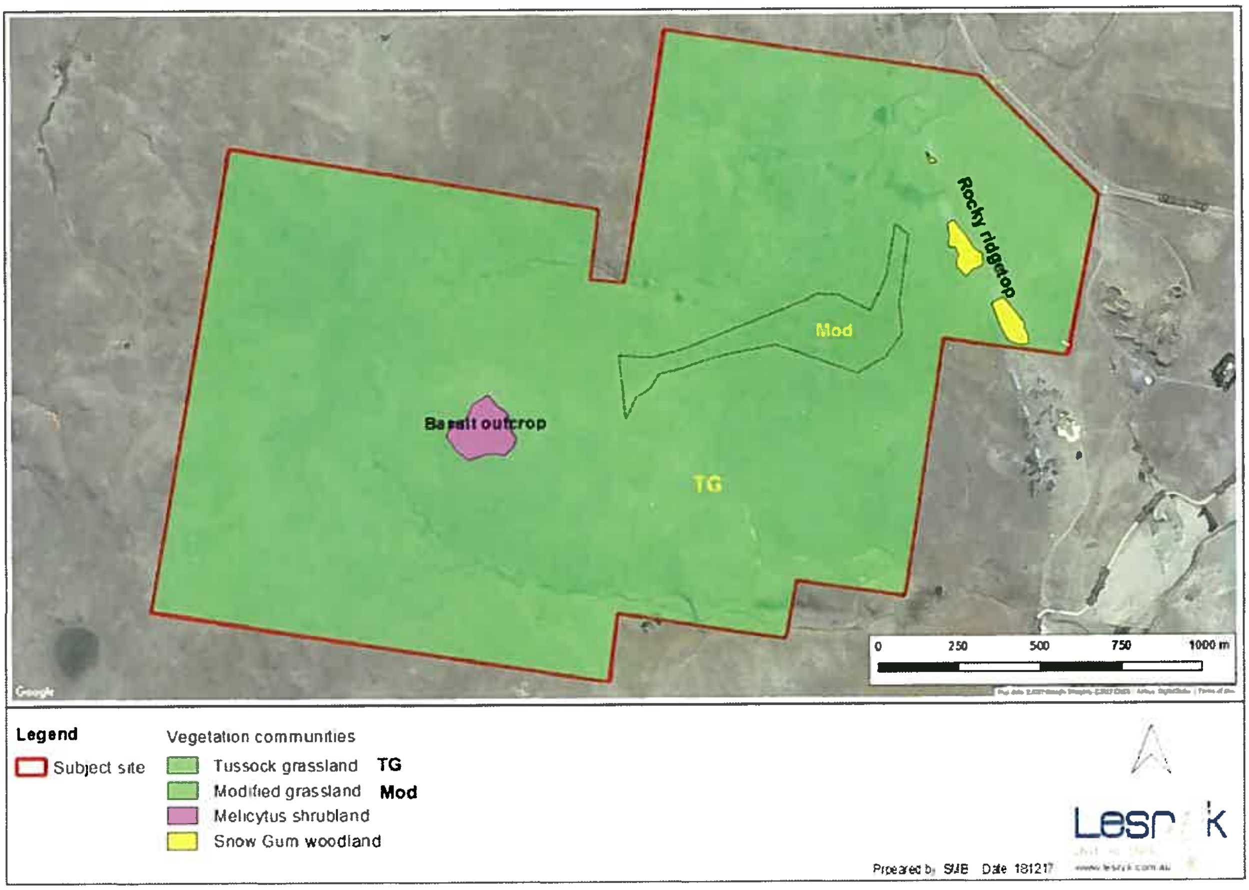


Priday 2007 notes (on page 51) that one of the elements of the 'Temperate Montane Grasslands' vegetation class is the 'Natural Temperate Grasslands of the South Eastern Highlands' *Threatened Ecological* Community (TEC) – as listed in the EPBC Act (see detailed discussion in Chapter 8.2).

However, Priday also notes that "***Only** those remnants of Temperate Montane Grassland that show **high integrity and diversity** are considered to be*" examples of the TEC (emphases added).

From the direct observations of Lesryk (Attachment B) and of the author of this EIAR, the subject land at Rock Flat supports four main vegetation types; albeit all of which have been modified as a result of many decades of grazing and other agricultural pursuits.

- Melicytus shrubland – which occupies the summit of the volcanic plug on which the proposed quarry is located
- Native tussock grassland – which occupies most of the subject land
- Modified grassland (pasture-improved) – which is of limited extent on the subject land; but which has been selected as the alignment of most of the proposed access/haul road
- Low woodland – which is confined to the ridges in the eastern part of the subject land



Vegetation mapping of the subject land – from the Lesryk Report (Attachment B to this EIAR)

Native Tussock Grassland

Native grassland dominated by tussock grasses with other native grasses and forbs characterises most of the subject land and the subject site at Rock Flat.

There are no trees or shrubs within the Native Tussock Grassland at Rock Flat (see photographic essay in Attachment C). As noted in Chapter 3 of this EIAR, this is a characteristic of the Monaro Plains; not a derived feature of the landscape resulting from the removal of previous tree canopy cover.

The Native Tussock Grassland on the subject land is dominated by tussock grasses (predominantly *Poa labillardierei* but also *Poa sieberiana* in depressions and along the watercourses), with other common native groundcover species (*eg* Common Woodruff *Asperula conferta*, *Lepidium sp.*, Kidney Weed *Dichondra repens*, Blue Storksbill *Erodium crinitum* and Jersey Cudweed *Pseudognaphalium luteoalbum*). Common introduced species include Soft Brome *Bromus hordeaceus*, Wheatgrass *Anthosachne scabra*, Medic *Medicago spp.*, Clover *Trifolium spp.* and Common Storksbill *Erodium cicutarium*.

The abundance of introduced species and the relatively small numbers of native species demonstrate the modified nature of the tussock grasslands on the subject land and subject site.

Parts of the Native Tussock Grassland are covered with scattered surface rock lying on the surface or slightly embedded into it. This provides shelter for native reptiles - in particular the threatened Striped Legless Lizard and Grassland Earless Dragon, which were recorded at several locations on the subject land. The records of the Grassland Earless Dragon in the central part of the subject land (along the original proposed access/haul road route) resulted in the alignment being altered into the Modified Grassland area (see below).

Modified Grassland

The Modified Grassland on the subject land at Rock Flat appears to have been 'raked' (only small stones remain) and pasture-improved (see photographic essay in Attachment C).

The Modified Grassland is characterised by introduced pasture species (such as Soft Brome *Bromus hordeaceus*, Wheatgrass *Anthosachne scabra*, Medic *Medicago spp.*, Clover *Trifolium spp.* and Common Storksbill *Erodium cicutarium*), and has been deliberately selected for the majority of the access/haul road through the property.

Melicytus Shrubland

The Melicytus Shrubland vegetation is located on the upper parts of the basalt outcrop (the hill which is to be quarried); and occupies an area of approximately 2.7 hectares.

The only shrub present is the Tree Violet *Melicytus* sp. aff. *dentatus* (Snowfields variant), which becomes increasingly dense towards the top of the basalt outcrop (see photographic essay in Attachment C). Surface rock is abundant through this area, and there are scattered native and introduced grasses also present.

As noted elsewhere, the rocks on the upper parts of the basalt hill are more deeply embedded into the soil than those on the lower slopes and flatter parts of the subject land; and provide less suitable habitat for the grassland reptiles discussed below.

Low Open Woodland

The Low Open Woodland is confined to the small rocky ridgeline in the eastern part of the subject land – just west of the Monaro Highway (see map above and maps in Attachment A).

This vegetation type consists of a sparse canopy of Snow Gum *Eucalyptus pauciflora*, that reaches 8-10m in height. A number of the trees present contain small hollows (diameter ~150mm).

There is a sparse shrub layer of *Cassinia aculeata* subsp. *aculeata*, as well as scattered individuals of *Daviesia leptophylla*, Violet Daisy-bush *Olearia iodochroa* and Tree Violet *Melicytus sp.* aff. *dentatus* (Snowfields variant). The groundcover consists of Snowgrass *Poa sieberiana* var. *sieberiana*, *Austrostipa sp.*, Australian Stonecrop *Crassula sieberiana*, and other grasses, herbs and forbs. In addition, loose surface rock and rock outcrops are common, along with fallen branches and hollow logs.

It is to be noted that the Low Open Woodland will not be affected by the proposed development, as the access/haul road is located in a small 'pass' through the ridgeline and the quarry operations are not located close to the ridgeline.

Watercourses

As noted elsewhere in this EIAR, there is an array of narrow (incised channels generally <1m wide) drainage lines or watercourses present on the subject land, some of which contained small amounts of water. These drainage lines are generally dry or contain only scattered small pools of water.

There is generally no riparian vegetation present; with no riparian trees or shrubs along the drainage lines on the subject land. Plant species recorded in association with these drainage lines, in addition to the tussock grasses and other groundcover species, were *Juncus sp.*, *Eleocharis acuta*, Knotweed *Persicaria sp.* and *Azolla filiculoides.*

There is also a small 'bog' adjacent to the watercourse in the northwestern part of the subject land (see photographs in Attachment C), with small pools of water and a slow trickle of water downstream into the watercourse. This feature was the focus of amphibian activity; although it is heavily affected by cattle and sheep, with several sheep carcasses present at the time of the surveys (Attachment C).

4.2 Flora Assemblage

Data from the Lesryk *Flora & Fauna Audit Report* (FFAR – Attachment B) indicates a flora assemblage of 54 plant species, of which a significant number (23 or 43%) are introduced species; including a number of pasture grasses and herbs.

As indicated in the vegetation map above, the majority of the subject land supports a tussock grassland – predominantly of native species. The tussock grassland has long been grazed; and has a relatively low diversity of native species and a high presence (in terms of species numbers) of introduced species. The flora assemblage on the subject land and subject site is typical of the general landscape at this location.

None of the introduced species is listed in Schedule 3 of the NSW *Biosecurity Regulation 2017*; or as a 'priority weed' in the South East region (DPI 2017); or as a Weed of National Significance (Commonwealth government).

4.3 Threatened Biota

Threatened Species

No threatened plant species have been recorded on the subject land by Lesryk (Attachment B) or by the author of this EIAR, despite searches during suitable weather conditions and at an appropriate time (see details in Attachment B).

Threatened species identified by the OEH[3] and the BioNet Atlas[4] as potentially being present on the subject land include the following –

- Mauve Burr-daisy, Michelago Parrot-pea, Creeping Hop-bush, Black Gum, Aromatic Peppercress, Hoary Sunray, Dwarf Kerrawang, Monaro Golden Daisy, Button Wrinklewort, Small Purple-pea, Silky Swainson-pea and Austral Toadflax.

Whilst a number of these threatened plant species are known from the locality or "*are likely to occur in the vicinity*" (BioNet Atlas and OEH submission[5]), the long-term grazing pressures on the subject land are likely to militate against the presence of most such species.

As noted above, the field surveys were undertaken at times conducive to the identification of such species; but no individuals were located. Further, given the extent of the main landscape elements (the grasslands) and/or the narrow confinement of the open woodland vegetation (along the stony ridges away from any proposed development activities), there is no likelihood that any such species would be located primarily or solely within the areas to be affected by the proposed quarry operations

Endangered Populations

There are no "*endangered populations*" of native plants listed in the TSC Act that are of any potential relevance to the proposed activities on the subject land at Rock Flat.

Threatened Ecological Communities

The OEH identifies two *Threatened Ecological Communities* (TECs)[6] as "*likely to occur in the vicinity*" –

- White Box Yellow Box Blakely's Red Gum Grassy Woodland
- Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions.

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3 OEH submission to the Department of Planning & Environment (DP&E) regarding the *Secretary's Environmental Assessment Requirements* (SEARs) for the quarry EIS – dated 06 March 2017

4 Only 3 of those species have records within approximately 5km of the subject site – the Hoary Sunray, Monaro Golden Daisy and Silky Swainson-pea (Appendix 2 in Attachment B)

5 OEH submission to the Department of Planning & Environment (DP&E) regarding the *Secretary's Environmental Assessment Requirements* (SEARs) for the quarry EIS – dated 06 March 2017

6 TECs ("*threatened ecological communities*") include relevantly "*endangered ecological communities*" (EECs) and "*critically endangered ecological communities*" (CEECs) listed in the TSC Act and EECs and CEECs listed in the EPBC Act

Both of those TECs are listed as *Endangered Ecological Communities* (EECs) in the TSC Act.

The White Box Yellow Box Blakely's Red Gum Grassy Woodland EEC is not present on either the subject land or the subject site.

None of the relevant tree species are present; and there is no indication that this vegetation type ever existed at this location.

The Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC may be represented by the open woodland along the small ridgeline in the eastern part of the subject land; despite the *Final Determination* for this EEC stating that it "*mainly occurs on valley floors, margins of frost hollows, footslopes and undulating hills*".

On that basis, this woodland vegetation does not appear to meet the locational criterion[7] for the Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC.

Relevantly, in any case, the woodland vegetation along the ridgeline will not be affected in any way by the proposed quarrying operations on the subject land or on subject site; including for the access/haul road to the quarry. Whether or not the EEC is present is therefore of no consequence.

7 See the judgement of Preston CJ in Gales Holdings P/L v Tweed Shire Council [2008] NSWLEC 209.

5 FAUNA and FAUNA HABITATS

5.1 Fauna Habitats

As documented in the Lesryk Consulting *Report* (Attachment B) and as indicated in the photo essay of the subject land and environs (Attachment C), the subject land (and in particular the subject site) contains only a modest array of habitat features and resources for native fauna.

As discussed above, most of the area to be affected by the proposed quarry and its ancillary activities is characterised by a tussock grassland – which is the natural vegetation type in this part of the Monaro (see Chapter 3). There are small rocks throughout much of the native grassland, although the improved pasture areas appear to have been 'raked' and contain fewer and smaller rocks than elsewhere (see photographic essay in Attachment C).

There are extensive areas of grassland with surface rocks around the hill proposed for the quarry. Comprehensive searches for reptiles and other fauna were undertaken throughout the tussock grasslands, including on the hill, during the November and December 2017 field investigations (see Attachment B).

Several areas were identified as supporting populations of the Grassland Earless Dragon, and a Striped Legless Lizard was also located in an area of tussock grassland with rocks; although none are now in areas to be disturbed for the proposed quarry and its ancillary activities. It is noted that the route of the access road has been altered to avoid an area in which specimens of the Grassland Earless Dragon were located.

The basalt hill has somewhat different characteristics – with low shrubs becoming more prevalent towards the summit, and the rocks being more embedded than on the lower slopes (providing less suitable habitat for the reptiles). Searches on the hill in both November and December failed to locate any of the reptiles, despite significant success on the lower slopes at the same times.

The small rocky ridgelines in the eastern part of the subject land (close to the Monaro Highway) support a greater array of habitats and resources for native fauna – including small trees, larger rocks and small cliffs, logs (some hollow) and fallen branches, and greater variety of flowering shrubs. There are no caves, however, and thus no breeding sites or significant roosting sites for hollow-dependent species. The two hollow-dependent microchiropteran bats recorded (the Eastern Bent-wing Bat and Southern Myotis) are likely to be roosting in artificial structures through the landscape.

As noted elsewhere in this EIAR, the ridgelines and their associated habitats and resources are not to be affected by the proposed quarrying operations.

The watercourses which traverse the subject land provide only limited habitat – as they are more often dry than not, and they support no resources of particular value. For example, there are no trees along the watercourses in the vicinity of the proposed quarry site and no significant permanent pools. The farm dams on the subject land and nearby are affected by regular trampling by stock; and have only limited semi-aquatic vegetation (see photographs in Attachment C).

In any case, the proposed quarrying operations will not affect the farm dams or their vegetation (and the project will result in additional water bodies being created).

The only other wildlife habitat on the subject land is a small 'bog' – adjacent to a small mostly dry watercourse to the west of the quarry works area and northwest of the quarry site. This feature does not appear to rely on water flows down the watercourse, and indeed discharges into the watercourse (see photographs in Attachment C).

Other than the farm dams and a few small pools along the same watercourse, this was the only element of the subject land containing water during the field surveys in November and December 2017. It was the focus of substantial amphibian activity at the time.

5.2 Fauna Assemblage

The field surveys of the subject land at Rock Flat (Attachment B) have recorded a total of 36 native fauna species (7 mammals, 16 birds, 8 reptiles and 5 amphibians), and an additional 6 introduced species - the domestic cow and sheep, feral fox (scats only) and rabbit, and the Common Starling and European Goldfinch (Lesryk did not include the cow and sheep in their inventory).

The native mammal and avian fauna assemblage on the subject land is limited.

This is primarily a consequence of the nature of the land and the habitats that it supports. Bird and mammal species recorded and/or likely to occur on the subject land and subject site are confined primarily to species of open grasslands or which are capable of utilising open and exposed environments (given the lack of trees, rock outcrops or water within the subject site).

The variety of reptiles recorded is also unsurprising – given the nature of the local environment. Open grasslands with rocks often support substantial reptile assemblages, and the array of reptile species on the subject land was as anticipated.

Amphibians were also present in notable numbers – albeit located in discrete sites through the subject land. Significant numbers of Eastern Banjo Frog, Spotted Grass Frog and Common Eastern Froglet were heard calling from the small 'bog' in the northwestern part of the subject land, and Peron's Tree Frog was recorded along the small stony ridgeline in the eastern part of the land.

5.3 Threatened Biota

Species identified by the OEH[8] and the BioNet Atlas[9] include the following –

- Pink-tailed Legless Lizard, Striped Legless Lizard, Grassland Earless Dragon, Rosenberg's Goanna, Little Whip Snake.
- Spotted Harrier, Little Eagle, Black Falcon, Square-tailed Kite, Gang Gang Cockatoo, Varied Sittella, Hooded Robin (southeastern form), Scarlet Robin, Flame Robin, Brown Tree-creeper, White-fronted Chat, Dusky Wood-swallow, Diamond Firetail, Blue-billed Duck.
- Spotted-tailed (Tiger) Quoll, Koala, Eastern Bent-wing Bat.

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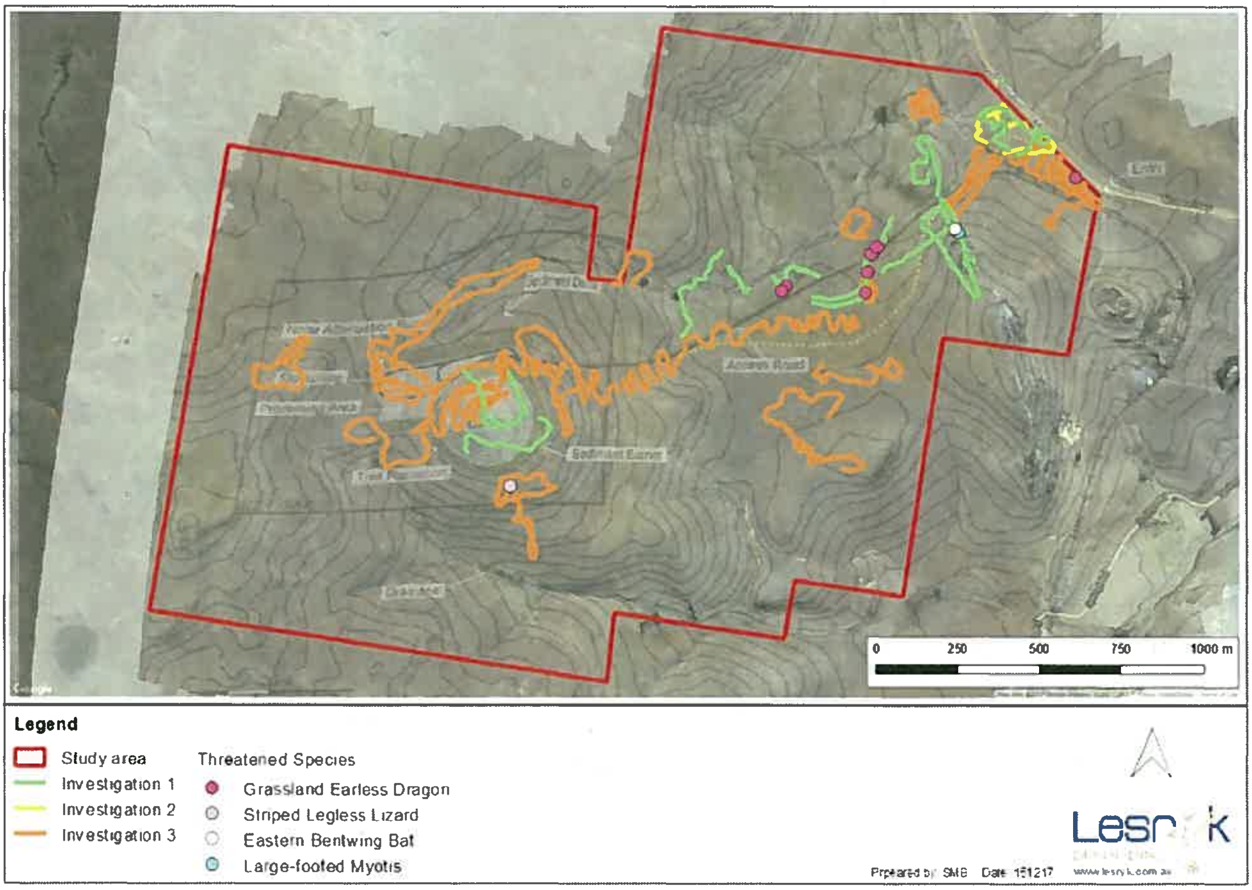
8 OEH submission to the Department of Planning & Environment (DP&E) regarding the *Secretary's Environmental Assessment Requirements* (SEARs) for the quarry EIS – dated 06 March 2017

9 Only 2 of those species have records within approximately 5km of the subject site – the Grassland Earless Dragon and Dusky Woodswallow (Attachment B)

- Golden Sun Moth.
- Green & Golden Bell Frog, Southern Bell Frog, Alpine Tree Frog.

Of the 36 native fauna species recorded on the subject land at Rock Flat (Attachment B), two mammal species (the Large-footed Myotis *Myotis macropus* and the Eastern Bent-wing Bat *Miniopterus orianae oceansensis*) and two reptile species (the Striped Legless Lizard *Delma impar* and Grassland Earless Dragon *Tympanocryptis pinguicolla*) are listed in the TSC Act as '*threatened species*'. Of these, that latter is listed as "*endangered*" whilst the other 3 are listed as "*vulnerable*".

As detailed in the Lesryk Report (Attachment B), Grassland Earless Dragons were recorded at three locations on the subject land; and the Striped Legless lizard at one (see map below).



The Striped Legless lizard was located on the southern flank of the basalt hill on the subject site; south of the proposed extent of the quarry. Measures to protect this species and its habitat, and to supplement habitat resources for the Striped Legless Lizard, have been incorporated into the project (as documented in Chapter 10).

The Grassland Earless Dragon was recorded at two locations along the original access/haul road alignment and near the entrance to the land at the Monaro Highway (see plan above). The alignment of the access/haul road has subsequently been altered to remove it from the habitat for this species. Specifically, the Dragons were located in an area characterised by tussock grasses and substantial surface rock, on gentle slopes above an ephemeral drainage line. The access/haul road has been relocated into an area of improved pasture with few rocks (see photographic essay in Attachment C) that does not constitute suitable habitat for this species.

As for the Striped Legless Lizard, measures to protect this species and its habitat, and to supplement habitat resources for the Grassland Earless Dragon have been incorporated into the project (as documented in Chapter 10).

The Pink-tailed Legless Lizard *Aprasia parapulchella* also inhabits native grasslands and open grassy woodlands with surface rocks, beneath which it shelters in ant nests and burrows. The Pink-tailed Legless Lizard appears to prefer grasslands dominated by *Themeda* and similar grasses, rather than the tussock grassland dominated by *Poa* species as is typical of the subject land and surrounding environs.

As indicated in the Lesryk Flora & Fauna Audit of the subject land, no specimens of the Pink-tailed Legless Lizard were recorded during the extensive field investigations of the land, despite the collection of specimens of both the Grassland Earless Dragon and Striped Legless Lizard.

Because of the nature of the subject land and the subject site (being predominantly a treeless grassland and a small area of low shrubland), most of the additional threatened species listed by the OEH would not be likely to occur. The small area of open woodland on the subject land provides only minimal potential habitat for any woodland species; and is not to be disturbed in any case. There are no notable water bodies present on the land.

There is no suitable potential habitat on the subject land or the subject site for species such as the Gang Gang Cockatoo, Varied Sittella, Hooded Robin (southeastern form), Scarlet Robin, Flame Robin, Brown Tree-creeper, White-fronted Chat, Diamond Firetail, Blue-billed Duck, Spotted-tailed (Tiger) Quoll, Koala, Golden Sun Moth, Rosenberg's Goanna, Little Whip Snake, Green & Golden Bell Frog, Southern Bell Frog or Alpine Tree Frog.

Whilst highly mobile and wide-ranging threatened raptors (such as the Spotted Harrier, Little Eagle, Black Falcon, Square-tailed Kite) could potentially occur (on occasions at least), the subject land does not possess any particular resources or habitat features upon which even individuals of any such species could be reliant. The subject land, and particularly the subject site, represent only a miniscule proportion of any potential habitat for any such species in the locality.

PART C **IMPACT ASSESSMENT and AMELIORATION**

6 SECTION 79C of the EP&A ACT

Section 79C(b) of the EP&A Act requires (relevantly) that a "*consent authority is to take into consideration .. the likely impacts of that development, including environmental impacts on both natural and built environments, and social and economic impacts in the locality*".

The application of Section 79C of the EP&A Act, therefore, is a matter of balancing the "*environmental impacts*" of a development proposal against the development outcomes; including *inter alia* the "*social and economic*" benefits of the proposed development.

From the perspective of Section 79C of the EP&A Act, the proposed hard rock quarry and its ancillary activities on the subject site at Rock Flat on the Monaro Plains will impose only limited impacts on the natural environment at this location, on the following basis.

- The proposal has been devised and designed *inter alia* to avoid the potential for significant or adverse impacts to be imposed on the natural environment (including, in particular, threatened biota).
- Measures to limit and/or to manage environmental impacts have been incorporated into the project as integral elements of the proposal (pre-clearing searches for reptiles, stormwater management regimes, vegetation plantings *etc*).
- The proposed quarry and its ancillary operations will occupy an area of just 14 hectares within a landholding of approximately 2,000ha; located within a much larger broad landscape. The footprint of the proposal, therefore, is extremely small by reference to the locality and landscape.
- There are no unique or significant habitat elements, features or resources within the footprint of the proposed quarry project or in the vicinity. Rather, the area to be affected by the proposal is typical of a large tract of the landscape at this location.
- The design of the quarry project has been responsive to environmental circumstances and discoveries. For example, the location of the access/haul road has been altered to avoid habitat for the Grassland Earless Dragon.

The "*Precautionary Principle*" is one of the four elements of *Ecologically Sustainable Development* (ESD) – the achievement of which is one of the underlying objectives of the environmental and planning legislation in NSW.

The *Precautionary Principle* states 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 order to apply the *Precautionary Principle* to the proposed Rock Flat Quarry project, therefore, there must be "*threats of serious or irreversible environmental damage*"; and there must be a "*lack of full scientific certainty*" leading to an intention to postpone "*measures to prevent environmental degradation*".

It is the positon of the author of this EIAR that neither of those 'conditions precedent' exists with respect to the proposed Rock Flat Quarry project.

Serious or Irreversible Environmental Damage

The Rock Flat Quarry project has been designed *inter alia* to avoid the imposition of "*serious or irreversible environmental damage*".

Whilst some "*environmental damage*" will occur as a result of the proposal, the following considerations are particularly relevant.

- The impacts on the environment will largely be temporary (with the exception of the created quarry pit and the lowering of the hill, of course). However, the remainder of the quarry operations area is to be rehabilitated as native tussock grassland – with a lower level of weeds and introduced species than is currently the case.
- Suitable and known habitat for and populations of the Grassland Earless Dragon have been avoided be re-locating the access/haul road.
- The known location of the Striped Legless Lizard is to be retained; and supplementary habitat for this species is to be created.
- The area of vegetation and habitat to be affected, even ignoring the proposed rehabilitation program, is extremely small compared to the extent of those resources in the immediate vicinity and general locality.

On the basis of those considerations, the Rock Flat Quarry project will avoid the imposition of "*serious or irreversible environmental damage*".

Measures to Prevent Environmental Degradation

Even were the Rock Flat Quarry project to impose "*serious or irreversible environmental damage*" (which is not conceded), the project has been specifically designed to implement an array of relevant "*measures to prevent environmental degradation*" (see Chapter 10 of this EIAR and the EIS for the project).

Relevant measures in this regard include *inter alia* - the protection of existing habitat for threatened biota; the collection, stockpiling and re-use of topsoil and surface rock and stones; the collection of native plant seeds for regeneration activities; the specific supplementation and creation of habitat for the threatened reptiles; the protection of watercourse; and the rehabilitation of the quarry works areas on completion of the quarrying operations.

7 SECTION 5A ASSESSMENT of SIGNIFICANCE

7.1 The Statutory Regime

The *Environmental Planning & Assessment Act 1979* (EP&A Act) includes a requirement to determine "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*". The relevant factors contained in Section 5A of the EP&A Act "*must be taken into account*" by a consent or determining authority when considering a *Development Application*, and, relevantly, in administering Sections 79C, 111 and 112 of the EP&A Act (as discussed above).

In addition to the seven factors which "*must be taken into account*" (where relevant) pursuant to Section 5A(2) of the EP&A Act, Section 5A(1)(b) of the EP&A Act requires that "*any* [relevant] *assessment guidelines*" promulgated by the relevant authorities (particularly in this instance the OEH) also "*must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*".

In considering the relevant factors of Section 5A of the EP&A Act, it is relevant and appropriate to take into account the nature and condition of the land to be affected, and its context – in considering what threatened biota may be present, what their use of the site might be, and what might be the effect on any such biota of undertaking the proposed development.

7.2 Relevant Threatened Biota

Threatened biota listed in the TSC Act that are of real or potential relevance to the proposed activities on the subject land (see discussions in Chapters 4 and 5 above) are principally the threatened reptiles recorded, and to a lesser extent a few aerial species.

- The Striped Legless Lizard *Delma impar* and Grassland Earless Dragon *Tympanocryptis pinguiciolla* (recorded in tussock grassland; but outside the project footprint).
- Two threatened microchiropteran bats - the Large-footed Myotis *Myotis macropus* and the Eastern Bent-wing Bat *Miniopterus orianae oceansensis* (recorded along the wooded ridgeline outside the project footprint and beyond the subject site).
- Possible wide-ranging avian raptors – the Spotted Harrier, Little Eagle, Black Falcon and Square-tailed Kite.

Except for the two reptiles, all of these and any potential additional species would not be dependent on the tussock grassland and/or Melicytus shrubland habitats and resources for their survival in the locality. On even an individual basis.

There are no resources or habitat features present on the subject site or in its immediate vicinity that could conceivably be of any significance for even an individual of any of the known or potential microchiropteran bats or avian raptors. Indeed, the final rehabilitated quarry has the potential to provide a substantial area of suitable habitat and resources for such species in the future.

As discussed in Chapter 4 of this EIAR, there is no 'Threatened Ecological Community' (TEC) within the subject site or in its immediate vicinity. Even if the woodland on the low ridgeline in the eastern part of the subject land does constitute an example of the Tablelands Snow Gum, Black Sallee, Candlebark and

Ribbon Gum Grassy Woodland EEC, none of this vegetation will be affected by the proposed quarry operations in any way.

7.3 Section 5A Factors for Consideration

A comprehensive set of *Assessments of Significance* pursuant to Section 5A of the EP&A Act has been prepared for the two reptiles relevance to the proposed quarry project at Rock Flat (Attachment E to this EIAR). Further consideration of the seven factors of Section 5A for other threatened species that could potentially occur, or which have been recorded but do not rely on the resources within the project footprint, is provided below.

- There is no likelihood that a "*viable local population*" of any of the additional threatened species (birds and microchiropteran bats) that could potentially occur in the vicinity of the subject site would be placed "*at risk of **extinction***" (emphasis added) as a consequence of the proposed quarry development Factor (a).

  For most such species, the project footprint contains no habitat or resources of relevance at all; whilst for others (*eg* the raptors) the grassland present represents only a minute fraction of that in the locality and region. It is not possible for even an individual of any such species to be reliant upon the subject site.

- There is no "*endangered population*" of any relevance, or even potential relevance, to the proposed quarry project at Rock Flat - Factor (b).

- The only "*threatened ecological community*" (TEC) in the vicinity of the proposed quarry development at Rock Flat is the Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC – which may be represented by the low open woodland on the small ridgeline in the eastern part of the subject land (see Chapter 4).

  However, the quarry project will have no impact whatsoever on the vegetation along the ridgeline; and there is no potential for the proposal to impose a "*significant effect*" (nor indeed any "*effect*"") on this EEC, even if it is present - Factor (c).

- With respect to Factor (d) of section 5A of the EP&A Act, the following considerations apply.

  - Only an extremely small area of potential habitat for any additional threatened biota will be "*removed or modified*" for the proposed quarry, relative to the very substantial areas of such habitats and resources available in the vicinity and locality – Factor (d)(i).

  - No habitat for any threatened biota will become "*fragmented or isolated*" by the proposed quarry development, given the very small footprint of the project in the surrounding landscape and the mobility of the potentially relevant threatened biota – Factor (d)(i).

  - None of the habitat or resources for any threatened biota that would be affected by the proposed development would be "*important for the survival*" of any of the relevant or potentially relevant biota "*in the locality*" – Factor (d)(i).

- There is no "*critical habitat*" for any threatened biota present in the location of the proposed quarry development at Rock Flat - Factor (e).

- The proposed quarry development at Rock Flat would not contravene the goals or desired outcomes of any *Recovery Plans* or *Threat Abatement Plans* for any threatened biota present or likely to occur - Factor (f).

The project will not prevent the implementation of or contradict any of the objectives of the *National Recovery Plan for the Striped Legless lizard.*

- The proposed quarry development at Rock Flat will involve the imposition of two "*key threatened processes*" (KTPs) – "*the clearing of native vegetation*" and "*bushrock removal*". The latter of these KTPs specifically identifies the Striped Legless Lizard and Grassland Earless Dragon as species affected by the KTP.

  As discussed above, the proposed quarry project will involve the removal of only an extremely small area of tussock grassland and Melicytus shrubland by reference to the extent of these vegetation types in the locality and region. Further, the areas to be affected by the project do not support populations of any threatened biota.

  The project will involve the removal of bushrock from some areas during site clearing activities. However, bushrock is to be stockpiled for re-use during site rehabilitation activities (noting that there will be no shortage of rock at the completion of the quarrying activities).

  The proposed quarry development at Rock Flat could potentially involve the imposition of the KTP "*invasion of native plant communities by exotic perennial grasses*". However, the project includes measures (to be documented in the VMP for the quarry) to ensure that no such grasses are introduced onto the site.

  It is not likely that the proposed quarry development at Rock Flat would result in the imposition of or exacerbation of any "*key threatened processes*" such that a "*significant effect*" would be imposed on any threatened biota or their habitats - Factor (g).

7.4 Conclusions

The following matters are of relevance in considering the potential for a "*significant effect*" to be imposed upon any threatened biota or their habitats as a consequence of the proposed quarry at Rock Flat.

- Only an extremely small area of vegetation is to be affected by the proposed activities – relative to the extent of those vegetation types in the immediate vicinity and locality.
- No hollow-bearing trees or other such habitat features of significance are to be affected by the proposal.
- The proposed quarry project at Rock Flat has incorporated measures to avoid disturbance to habitat for threatened biota (by relocating the access/haul road) and to protect other habitats and resources in the vicinity (by the management of stormwater and other discharges).
- The proposal also includes measures to protect individual fauna (pre-clearing surveys and relocation where necessary) and to rehabilitate and supplement habitat for the threatened reptiles within the subject land (see Chapter 10).

It is not "*likely*" that the proposed quarry at Rock Flat and/or its ancillary activities would impose a "*significant effect*" on any "*threatened species, populations or ecological communities, or their habitats*" - pursuant to the relevant considerations in Section 5A of the EP&A Act.

8 ENVIRONMENT PROTECTION & BIODIVERSITY CONSERVATION ACT

8.1 Introduction

The *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) requires consideration of the potential for a "*significant impact*" to be imposed by an activity on a *Matter of National Environmental Significance* (MNES).

In the event that such an "*impact*" is "*likely*" to be imposed, the proposed activity must be referred to the Commonwealth for determination as to whether it constitutes a "*controlled action*". Where a development activity does constitute a "*controlled action*", an approval from the Commonwealth Minister of the Environment is required.

The MNES listed in the EPBC Act include *inter alia*:

- world heritage properties;
- national heritage places;
- wetlands of international importance (listed under the Ramsar Convention);
- listed threatened species and ecological communities;
- migratory species protected under national agreements;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mines); and
- "*where actions proposed are on, or will affect, Commonwealth land and environment*".

8.2 Relevant MNES

The proposed activities on the subject land at Rock Flat have no potential to affect any MNES other than (theoretically at least):

- a few listed threatened species and ecological communities; and/or
- a few (alleged or real) migratory species.

Migratory Species

A number of "*migratory species protected under international agreements*" listed in the EPBC Act that have been recorded within 5km of the subject site include migratory wetland species (which are of no relevance to the project); highly aerial species – such as the Fork-tailed Swift and White-throated Needletail (which could not be reliant on the subject site); and less mobile species - such as the Black-faced monarch, Yellow Wagtail, Rufous Fantail and Satin Flycatcher (for which the subject site does not represent suitable habitat).

With respect to the migratory species cited above (Appendix 2 in Attachment B), the subject land at Rock Flat is not regarded as of any significance, given the following considerations.

- The widespread and cosmopolitan distribution of any such species which might occur on the subject land or subject site from time to time.
- The nature and habits of any such species, including their ability to travel over very large distances.
- The extremely small area of even potential habitat for any "*migratory species*" present on the subject site - compared to the extent of such habitat in the locality and region.

There is no likelihood of a "*significant impact*" being imposed by the proposed activities on the subject land at Rock Flat upon even individuals of any "*migratory species*" listed in the EPBC Act.

Threatened Species

Similar considerations would apply to "*threatened species*" listed in the EPBC Act as discussed above with respect to "*migratory species*".

The threatened fish, amphibian or mammal species listed in Appendix 2 to Attachment B are of no relevance to the subject site at Rock Flat – as there are no habitats or resources for any of these species in the areas to be affected by the project.

Of the threatened birds listed in Appendix 2 to Attachment B, only the Regent Honeyeater, Painted Honeyeater and Swift Parrot could potentially occur in the vicinity or general locality. However, there is no habitat of relevance for any of these species on the subject site at Rock Flat.

Two of the three threatened reptile species identified in the EPBC Act database (the Striped Legless Lizard *Delma impar* and Grassland Earless Dragon *Tympanocryptis pinguicolla*) have been recorded on the subject land at Rock Flat.

Striped Legless Lizard

A single specimen of the Striped Legless Lizard was located on the southern flank of the hill; albeit outside of the proposed quarry footprint (see Chapter 5).

On the basis that this individual is part of a viable local population of the species, it is assumed that the species would occupy grassland habitats in the vicinity of the recorded individual. However, the higher parts of the hill appear less suitable habitat for this species – given the greater densities of shrubs and the more deeply embedded nature of the surface rock and stone.

The Rock Flat Quarry proposal incorporates a range of measures to protect the Striped Legless Lizard and its habitat in the vicinity of the quarry operations, including the following.

- Supplementary surveys of all areas to be directly affected by the project prior to any clearing or earthworks – with the collection of animals and their relocation within the property to more remote suitable habitat.
- Enhancement of habitat further from the quarry site (*ie* downslope from the existing known location of the species) by the placement of additional stone and rock removed from the quarry operations footprint.

- Creation of new habitat following the cessation of quarrying operations.

On the basis of the impact amelioration measures identified above, the Rock Flat Quarry proposal is considered unlikely to result in a "*significant impact*" being imposed upon the Striped Legless Lizard at this location (see detailed *Assessment of Significance* in Attachment F).

Grassland Earless Dragon

Several specimens of the Grassland Earless Dragon were detected in two areas on the subject land (see figure in Chapter 5) – to the northeast of the proposed quarry and near the current entrance onto the property (near the Monaro Highway).

The first of these records caused a re-design and relocation of the access/haul road - to avoid the habitat for this species (the areas of tussock grassland with scattered surface rocks and stones); and the second has resulted in an alternative location for the entrance point for the quarry project. Importantly, the access/haul road is now located principally through an area of 'improved pasture' – with a preponderance of introduced pasture species and a notably lower abundance of surface stones and rock. Neither the access/haul road nor any other elements of the Rock Flat Quarry project are located in areas occupied by the Grassland Earless Dragon.

On the basis of the field surveys to date and the relocation of the access/haul road, as well as the impact amelioration measures (as detailed above for the Striped Legless Lizard), the Rock Flat Quarry proposal is considered unlikely to adversely affect the Grassland Earless Dragon at this location (see detailed *Assessment of Significance* in Attachment FD).

Threatened Ecological Communities

The EPBC Act database identifies three *Threatened Ecological Communities* (TECs) as occurring or potentially occurring in the area –

- 'Natural Temperate Grasslands of the South Eastern Highlands'
- 'Upland Wetlands of the New England Tablelands and the Monaro Plateau'
- 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland'.

Of those TECs, neither the 'Upland Wetlands' nor the 'Box-Gum Grassy Woodlands and Derived Native Grassland' is present on the subject land or subject site, or in the near vicinity (see discussion in Chapters 3 and 4 of this ERIAR).

At first glance, the tussock grassland on the subject land and subject site appears to conform to the 'Natural Temperate Grasslands of the South Eastern Highlands' TEC – as listed in the EPBC Act. The grassland, where not 'pasture-improved' (see Chapter 4), is dominated by the native tussock grass *Poa labillardieri*, with an array of other native species.

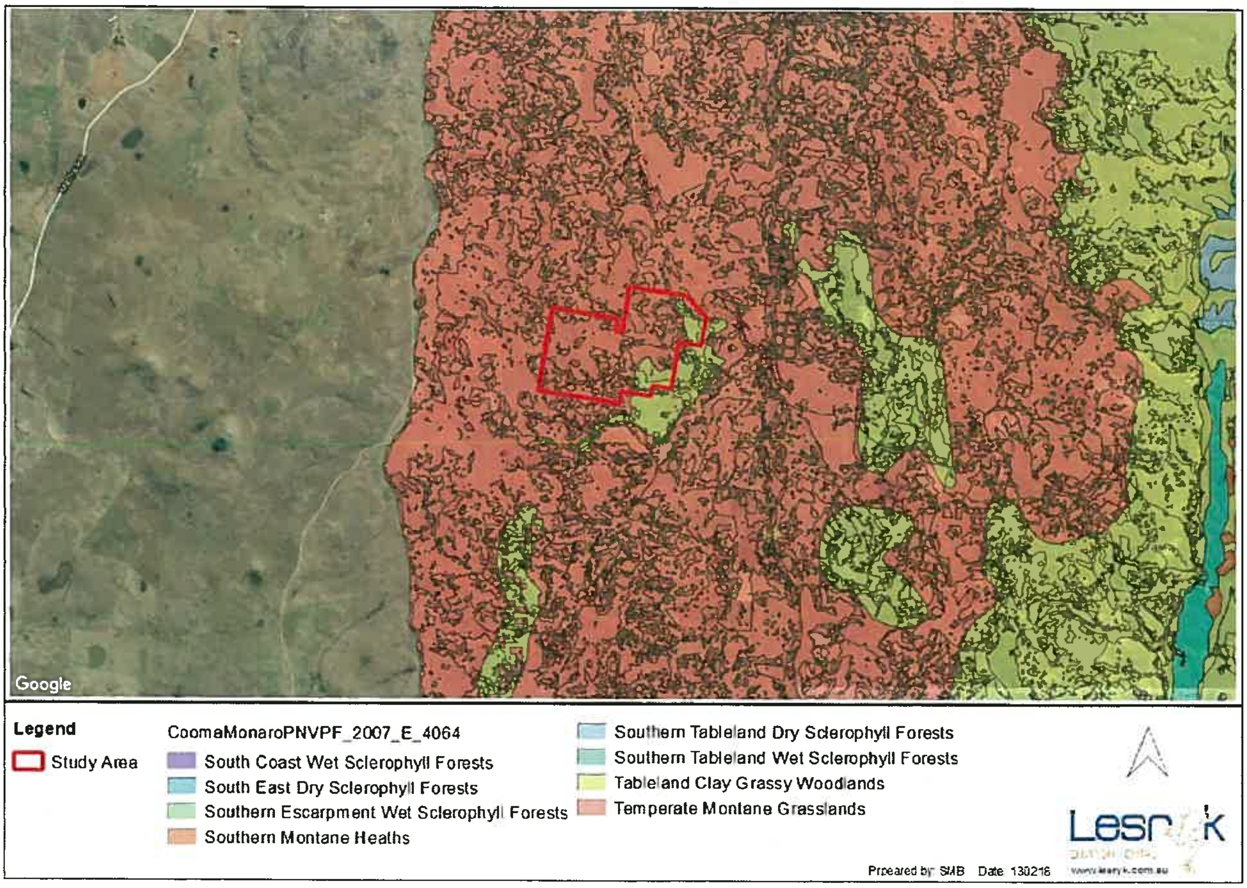
It is relevant to note, however, that this vegetation type is characteristic of a large proportion of the surrounding landscape, where the land has been grazed but not pasture-improved or cropped (see photographs in Attachment C). This vegetation type is widespread at this locality.

However, the long history of grazing of the land and the presence of introduced pasture and weed species in variable densities indicates that the tussock grassland does not satisfy the criteria for the 'Natural Temperate Grasslands of the South Eastern Highlands' TEC; for the following reasons.

- The tussock grassland ('Montane Temperate Grasslands' of Priday 2007) is widespread at this locality - see Chapter 4 and extract from the Priday 2007 vegetation map below (as also provided in Attachment A).
- The 'Natural Temperate Grasslands of the South Eastern Highlands' TEC is regarded as scarce and scattered; rather than the widespread tussock grassland at this locality. If the tussock grassland on the subject site and subject land does constitute the TEC, then there would appear to be much more of that TEC than has hitherto been assumed.
- As noted by Priday (2007), "***Only** those remnants of Temperate Montane Grassland that show **high integrity and diversity** are considered to be*" examples of the TEC.
- The *Conservation Advice* for the 'Natural Temperate Grasslands of the South Eastern Highlands' TEC from DoEE is accompanied by a list of "*indicator species*" that "*are native plant species that are useful surrogates for the conservation value of a patch, and are typically disturbance sensitive species*".

  It is noted that none of those 209 "*indicator species*" were definitively recorded on the subject site or subject land; with just 3 plant species that could be included in the list which were identified to genus level only.

  On that basis, the tussock grassland on the subject land does not conform to the conservation value criteria for the 'Natural Temperate Grasslands of the South Eastern Highlands' TEC.



Further, if it were the case that that the tussock grassland on the subject land is the 'Natural Temperate Grasslands of the South Eastern Highlands' TEC, the following considerations are pertinent.

- The tussock grassland is widespread at this locality - as indicated in the vegetation map of Priday (2007) above.
- The community has survived the effects of grazing over a long period (in excess of 100 years), and still provides suitable habitat for the two threatened reptiles noted above.
- The proposed quarry operations will occupy less than 10 hectares of the tussock grassland on the subject site.
- The Rock Flat Quarry proposal includes an array of measures to protect and/or regenerate the tussock grassland – see details in Chapter 10.

Given the considerations detailed above, it is the conclusion of this EIAR that the tussock grassland on the subject site and subject land at Rock Flat does not constitute an example of the 'Natural Temperate Grasslands of the South Eastern Highlands' TEC; although it is clearly a component community of the 'Temperate Montane Grasslands' of Priday (2007).

Further, it is the conclusion of this EIAR that the proposed Rock Flat Quarry will not impose a "*significant impact*" upon the 'Natural Temperate Grasslands of the South Eastern Highlands' TEC (even if present); notwithstanding the temporary removal of approximately 10 hectares of the native tussock grassland from the subject site (see detailed *Assessment of Significance* for this TEC in Attachment F).

8.3 EPBC Act Conclusions

On the basis of the impact amelioration measures which have been incorporated into the Rock Flat Quarry project, it is the conclusion of this EIAR that it is not likely that a "*significant impact*" would be imposed upon any relevant MNES as a consequence of the proposal.

Nevertheless, for the purpose of 'abundant caution', a '*Referral*' of the Rock Flat Quarry project proposal has been made to the Commonwealth via the Department of Environment & Energy (DoEE) - pursuant to the EPBC Act. The *Referral* has been made in respect of the Striped Legless Lizard *Delma impar* and Grassland Earless Dragon *Tympanocryptis pinguicolla*, and the 'Natural Temperate Grasslands of the South Eastern Highlands' TEC.

9 OTHER STATUTORY CONSIDERATIONS

9.1 Cooma-Monaro Local Environmental Plan 2013

The *Cooma-Monaro Local Environmental Plan 2013* (LEP 2013) zones the subject land as XXX – which permits the proposed quarry activity. Additionally, LEP 2013 identifies portions of the subject land on the *Terrestrial Biodiversity Map* (see below and in Attachment A).

Clause 6.3 of LEP 2013 states that, in respect of land identified on the *Terrestrial Biodiversity Map*, a consent authority must consider whether a proposed development "*is likely to have*":

(i) any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and

(ii) any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and

(iii) any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and

(iv) any adverse impact on the habitat elements providing connectivity on the land

The proposed Flat Rock Quarry project has been designed *inter alia* to achieve the following objectives – as discussed in Chapter 10.

- To minimise or avoid, wherever possible, imposing adverse impacts "*on the condition, ecological value and significance of the fauna and flora on the land*".
- To limit adverse impacts on the vegetation present within the subject site.
- To avoid any fragmentation of habitat and to limit the "*biodiversity structure, function and composition of the land*"; including *inter alia* by the proposed habitat and vegetation regeneration and creation proposed.

A consent authority is also required - pursuant to Clause 6.3(3)(b) – to consider "*any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development*". Additionally, the consent authority is to be satisfied that:

(a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or

(b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or

(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

As indicated throughout this EIAR, and particularly in Chapters 7, 8 and 10, the Flat Rock Quarry project has been designed specifically *inter alia* to achieve the following outcomes.

- The avoidance of "*any significant adverse environmental impact*" – by confining the project footprint and avoiding, wherever possible, habitats of value or relevance to threatened biota and biodiversity values generally.
- The implementation of the impact amelioration and environmental management measures

detailed in Chapter 10 of this EIAR – in order to minimise and mitigate the impacts of the proposal.

9.2 SEPP 44 – Koala Habitat Protection

Application of SEPP 44

The aims of SEPP 44 are to protect the Koala and its habitat by identifying matters for consent authorities to consider during the assessment of proposals. In particular, SEPP 44 contains definitions of "*potential koala habitat*" and "*core koala habitat*" to be applied in the consideration of developments within those Local Government Areas (LGAs) listed in Schedule 1 of the *Policy*.

The Cooma-Monaro LGA is listed in Schedule 1 of SEPP 44 as an area to which the *Policy* applies, and the subject site is greater than 1 hectare in area. Consequently, SEPP 44 applies (at least theoretically) to the subject site at Rock Flat.

Potential Koala Habitat

SEPP 44 defines "*potential koala habitat*", as native vegetation in which trees listed in Schedule 2 of the SEPP "*constitute at least 15% of the total number of trees in the upper or lower strata of the tree component*". Schedule 2 of SEPP 44 provides a list of tree species recognised as Koala food trees.

None of trees listed in Schedule 2 of SEPP 44 are present on the subject site at Rock Flat.

Core Koala Habitat

SEPP 44 defines "*core koala habitat*" as "*an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population*".

There is no relevant habitat for the Koala on the subject site at Rock Flat, and there is no evidence for a "*resident population*" of Koalas on the subject site.

Furthermore, given that the site does not represent "*potential koala habitat*", it cannot constitute "*core koala habitat*" pursuant to SEPP 44.

SEPP 44 Conclusions

The subject site at Rock Flat does not represent "*core koala habitat*" as defined in SEPP 44.

There is no requirement to fulfil any requirements of SEPP 44 in respect of the proposed quarry at Rock Flat.

9.3 Water Management Act 2000

The Statutory Regime

The *Water Management Act 2000* defines "*waterfront land*" relevantly as:

> "*the bed of any river, together with any land lying between the bed of the river and a line drawn parallel to, and the prescribed distance inland of, the highest bank of the river*".

The "*prescribed distance*" is defined in the *Water Management Act* as (relevantly) "*40 metres*".

The *Water Management Act* also describes a "*river*", relevantly, as:

> "*any watercourse, whether perennial or intermittent and whether comprising a natural channel or a natural channel artificially improved*".

Future development activities along or adjacent to watercourses that constitute "*rivers*" (*ie* within 40m of the upper bank of a "*river*"), including the construction of roads, stormwater treatment features and adjoining development, may require a *Controlled Activity Approval* (CAA) from the NSW Department of Primary Industries – Water (DPI Water).

The relevant department[10] had previously:

- identified the Strahler (1957) System for the stratification of watercourses as the appropriate system in NSW; and
- provided a set of "*Guidelines for Riparian Corridors on Waterfront Land"* (NOW 2012).

Relevance of the Subject Site

There are several small watercourses on the subject land at Flat Rock; but none are located on the subject site *per se*. The Flat Rock Quarry project has been specifically located more than 40 metres from any watercourse, and the *Water Management Act* 2000 is therefore of no relevance to the project.

Nevertheless, the Flat Rock Quarry project has been designed in cognisance of the surrounding drainage landscape and watercourses; and has incorporated specific measures to avoid any adverse impacts on watercourse through the subject land.

There is no requirement for the provision of a *Controlled Activity Approval* (CAA) from DPI - Water for the proposed Flat Rock Quarry project.

10 DPI Water – previously NSW Office of Water (NOW)

10 IMPACT AMELIORATION and ENVIRONMENTAL MANAGEMENT MEASURES

It is the basis of the considerations contained in this *Report* that all of the standard and legally required current 'best practice' measures for development activities in NSW would be implemented as integral elements of the quarrying operations and associated activities on the subject land at Rock Flat. Such measures would include *inter alia* the protection of soils; the use of sediment fences to prevent sediment discharge; the management of contaminants to avoid discharges into the surrounding environment; and the management of dust.

These measures have been incorporated into the project – as detailed in the EIS prepared by Outline Planning Consultants.

In addition, an array of specific measures for threatened biota and biodiversity generally has been incorporated into the project – including the following actions.

- The relocation of the access/haul road into improved pasture and the relocation of the access onto the Monaro Highway - to avoid habitat for the Grassland Earless Dragon.
- The collection, stockpiling (where necessary) and re-use of top-soils where possible - to be re-used to promote the regeneration of native groundcover plants in rehabilitated areas.
- The use of top-soils in the bunds required for the project, with the planting of native grasses and forbs – to replace lost grasslands and to provide supplementary habitat for native biota (particularly the threatened reptiles).
- The collection and re-use of surface rock material, including on the bunds; in areas to provide additional habitat for the Striped Legless Lizard; and in rehabilitation areas - to provide supplementary habitat on the subject land.
- The collection of groundcover seeds prior to clearing in the quarry and stockpile/processing portions of the subject site.
- The regeneration of tussock grassland on the stockpiling/processing areas after the cessation of the quarrying activities - by the removal of the overburden, the re-grading of the topsoil, and the planting of native grasses and other groundcovers (according to a detailed *Vegetation Management Plan* for the project).
- The conduct of supplementary surveys of all areas to be directly affected by the project prior to any clearing or earthworks – with the collection of animals (particularly threatened reptiles) and their relocation within the property to more remote suitable habitat.
- The enhancement of habitat further from the quarry site (*ie* downslope from the existing known location of the Striped Legless Lizard) by the placement of additional stone and rock removed from the quarry operations footprint.

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GLOSSARY

Biota	"*Biota*" means the animals and plants, and other organisms, of a geographic region or locality
DA	*Development Application* - prepared pursuant to the EP&A Act
DEC	Department of Environment & Conservation (NSW)
DECC	Department of Environment & Climate Change (NSW)
DPI Water	Department of Primary Industries - Water (NSW)
EEC	Endangered Ecological Community - "*an ecological community specified in Part 3 of Schedule 1*" of the TSC Act
Ecological Community	TSC Act - "*an assemblage of species occupying a particular place*"
Endangered Population	A "*population specified in Part 2 of Schedule 1*" of the TSC Act
EP&A Act	*Environmental Planning & Assessment Act 1979*
EPBC Act	*Environment Protection & Biodiversity Conservation Act 1999*
KTP	Key Threatening Process - "*a threatening process specified in Schedule 3*" of the TSC Act
LEP	*Local Environmental Plan*
LGA	Local Government Authority
MNES	Matters of National Environmental Significance - as listed in the EPBC Act
NOW	NSW Office of Water – now relevantly part of DPI Water
NPWS	NSW National Parks & Wildlife Service
OEH	NSW Office of Environment & Heritage
Recovery Plan	A "*plan prepared and approved under*" Part 4 of the TSC Act and/or Division 5 of Part 7A of the *Fisheries Management Act*
Region	A "*bioregion defined in a national system of bioregionalisation that is determined (by the Director-General by order published in the Gazette) to be appropriate for those purposes*" (TSC Act)
SIS	*Species Impact Statement* - prepared pursuant to Sections 109, 110 and 111 of the TSC Act
Subject Land	Lots 62, 76, 78, 106 and 120 in DP 750540 (known as No. 278 Springs Road, Rock Flat). The "*subject land*" is referred to in the EIS as the "*Project Site*" (see plan from the EIS above); and occupies a total area of ~ 304 hectares. The "*subject land*" (or "*Project Site*") is part of a much larger landholding of approximately 2000ha (including the historic 'Milton Park' homestead) owned by Mr Peter Devereux.

Subject Site	The area to be occupied by the hard rock quarry and all of its associated works and activities (including theaccess/haul road, crushing and stockpiling facilities, office and sheds, water treatment dams and electricity supply).
TEC	A "*threatened ecological community*" – as specified in Schedule 1 of the TSC Act and/or in the EPBC Act
Threatening Process	A "*process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*" (TSC Act)
Threatened Species	A "*species specified in Part 1 or 4 of Schedule 1 or in Schedule 2*" of the TSC Act
TSC Act	*Threatened Species Conservation Act 1995*

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