SNOWY MONARO REGIONAL COUNCIL

ATTACHMENTS TO REPORTS

(Under Separate Cover)

Part 1 of 3

Ordinary Council Meeting

16 May 2019

ATTACHMENTS TO REPORTS
FOR
ORDINARY COUNCIL MEETING
THURSDAY 16 MAY 2019

Page No.

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Statement of Environmental Effects

Bombala Quarry Modification 2

Production Increase

Prepared for Boral Resources (Country) Pty Ltd | 23 November 2018

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Statement of Environmental Effects

Final

Report J17353RP1 | Prepared for Boral Resources (Country) Pty Ltd | 23 November 2018

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Signature		Signature	
Date	23 November 2018	Date	23 November 2018

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

Document Control

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1 Introduction

1.1 Development context

Bombala Quarry is a hard rock quarry owned by Boral Resources (Country) Pty Limited (Boral), which operates under Development Consent No. DA.07.0013 issued by the then Bombala Council (now Snowy Monaro Regional Council) on 21 March 2007.

The site is approximately 6 km north-east of Bombala and 81 km south of Cooma, in the south-eastern regional of NSW. Both the regional and local context of the Bombala Quarry site is illustrated in Figure 1.1 and Figure 1.2 respectively.

Development Consent No. DA.07.0013 is proposed to be modified under Section 4.55(2) within Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). EMM Consulting Pty Limited (EMM) has been engaged by Boral to prepare this Statement of Environmental Effects (SEE) that will accompany a modification application to Council as the consent authority.

1.2 Overview and justification of proposed modification

Boral's Bombala Quarry operations were suspended in 2012 owing to a downturn in market conditions. There is now a renewed demand for high-quality products, such as that produced at Bombala, owing to major infrastructure developments in the region, and secondary demand for road-base product.

Bombala Quarry is currently approved to produce and transport up to 100,000 tonnes per annum (tpa) of hard rock products. Given the market conditions and operational factors, Boral proposes to reopen the Quarry under the existing development consent and increase the maximum production volume to 200,000 tpa. The additional production would be achieved by running the in-pit mobile plant for a longer period of time within the approved hours of operation. Boral is also proposing to install a small pre-coat plant to produce products for regional road works.

The proposed modification is highlighted in **bold** in Table 1.1.

Table 1.1 Proposed modification

	Existing	Proposed
Production volume		
Hard rock	100,000 tpa	**200,000 tpa**
Maximum production dispatch		
via road	Up to 100,000 tpa	**Up to 200,000 tpa**
Hours of operation		
Extraction and processing	Monday to Friday: 7:00 am to 5:00 pm No extraction allowed on weekends and public holidays.	No change
Product loading	Monday to Friday: 6:00 am to 5:00 pm Saturday: 7:00 am to 12:00 pm No loading allowed on Sundays and public holidays.	No change
Employment		
Site personnel	5	No change
Operation		
Blasting	Maximum 2 per year; Monday to Friday: 9:00 am to 3:00 pm	**Maximum 6 per year;** Monday to Friday: 9:00 am to 3:00 pm
Drilling	Maximum 2 campaigns per year: Monday to Friday: 7:00 am to 5:00 pm	**Maximum 6 campaigns per year;** Monday to Friday: 7:00 am to 5:00 pm
Transportation		
Truck movements (average production)	15 loaded trucks per weekday, representing a total of 30 truck movements per weekday.	**An average of 31 loaded trucks per weekday, representing a total of 62 truck movements per weekday.**
Truck movements (maximum production)	40 loaded trucks per weekday, representing a total of 80 truck movements per weekday.	**80 loaded trucks per weekday, representing a total of 160 truck movements per weekday.**

1.3 Proponent

Bombala Quarry is owned by Boral Resources (Country) Pty Limited (Boral), a wholly owned subsidiary of Boral Limited.

Boral Limited is an Australian owned international building and construction materials group, headquartered in Sydney, Australia. Worth more than $5.2 billion in annualised sales, Boral Limited primarily serves customers in the building and construction industries with operations concentrated in three key geographical markets – Australia, the USA and Asia. Boral Limited has around 16,475 full-time equivalent employees.

In Australia, Boral Limited has over 500 operating sites. Boral Limited produces and distributes a broad range of construction materials, including quarry products, cement, fly ash, pre-mix concrete and asphalt, and building products, including clay bricks and pavers, clay and concrete roof tiles, concrete masonry products, plasterboard and timer.

The Boral Australian division employs around 5,000 people alone in its quarry, concrete, asphalt, concrete placing, cement, timber, roofing and masonry operations.

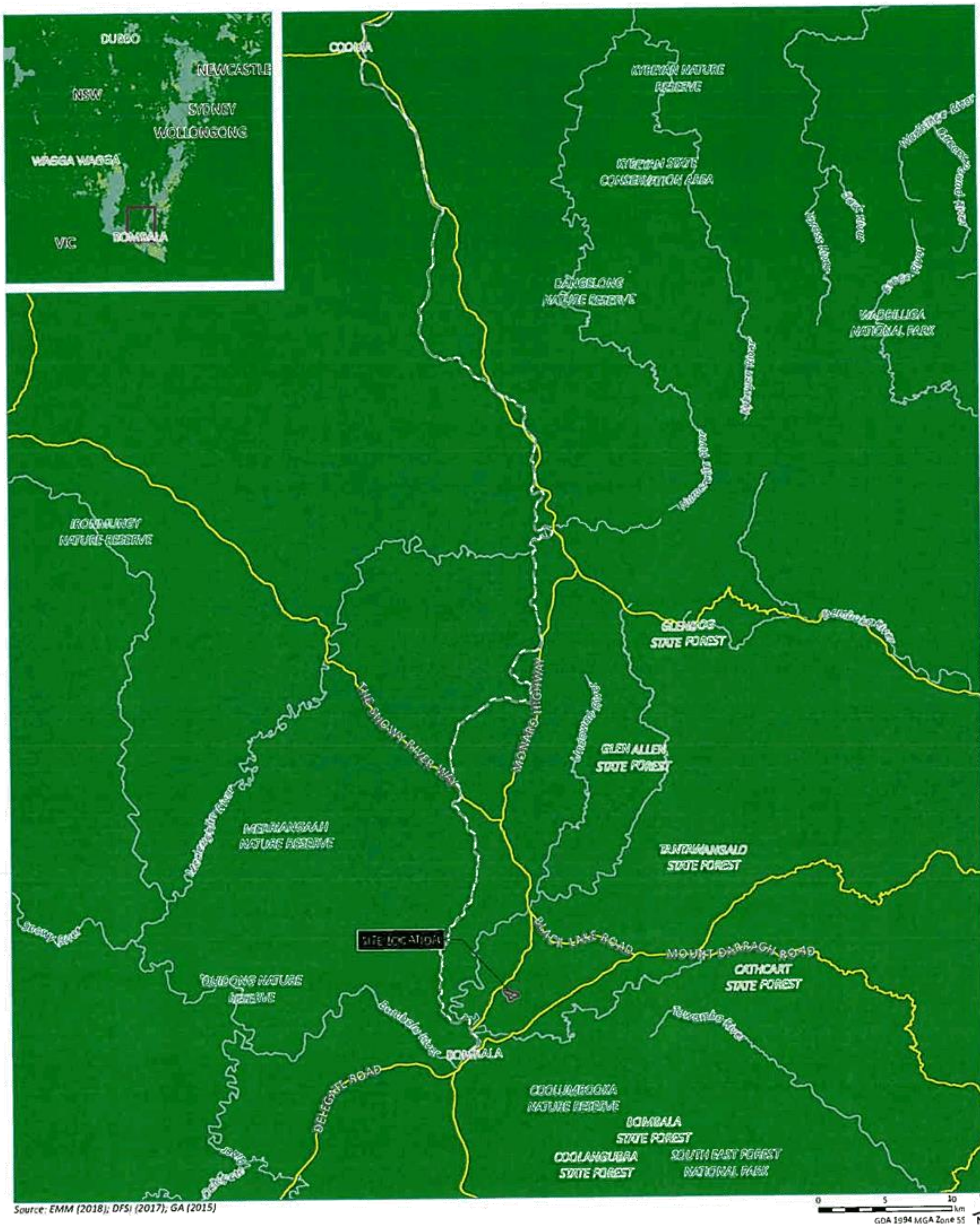
Boral operates 32 quarries across NSW and ACT. These quarries extract hard rock, sand and gravel with products being supplied to both internal and external customers for the production of:

- asphalt and concrete, for the construction of road pavement by government, major private civil engineering companies and smaller road building contractors;
- general construction materials for small and large builders and developers; and
- general landscaping materials and related products.

1.4 Report structure

The modification application has been prepared in consideration of Section 4.15(1) of the EP&A Act and Clauses 35 and 36 within Schedule 3 of the Environmental Planning and Assessment Regulation 2000 (the Regulation). This SEE describes the site, existing operations, the proposed modification, the legislative context of the application and provides an environmental assessment of the likely impacts over and above the existing impacts. It is accompanied by the following technical reports:

- a Noise Impact Assessment (NIA) prepared by EMM (Appendix A);
- an Air Quality Impact Assessment (AQIA) prepared by Ramboll Environ Pty Ltd (Appendix B);
- a Traffic Impact Assessment (TIA) prepared by EMM (Appendix C); and
- Community newsletter issued 19 November 2018 (Appendix D).



KEY

- Site boundary
- Rail
- Main road
- NPWS reserve
- State forest
- Watercourse

Regional context

Bombala Quarry Modification
Statement of Environmental Effects
Figure 1.1

[redacted]

Source: EMM (2018); DFSI (2017); ESRI (2018)

GDA 1994 MGA Zone 55

KEY

- Study area
- Rail line
- Main road
- Local road
- Watercourse
- Waterbody
- Cadastral boundary

Local context

Bombala Quarry Modification
Statement of Environmental Effects
Figure 1.2

[redacted]

2 Existing operations

2.1 Approvals history

Bombala Council established the Bombala Quarry in 1950-51 to provide their Works and Services Division with construction materials as needed. The Council operated the quarry on an ad hoc basis until Development Consent No. DA 14/93 was issued on 31 August 1993 which allowed extraction up to 50,000 tpa.

In September 2005, Boral entered into a one year lease to operate the quarry site on behalf of the Council. Boral subsequently purchased the property after the lease expired.

Development Consent No. DA.07.0013 was granted following an application to increase production to 100,000 tpa. The application was for designated and integrated development pursuant to Schedule 3 and Section 91 of the EP&A Act, respectively. The application was accompanied by an Environmental Impact Statement (EIS) prepared by ERM Australia (ERM 2006).A modification to DA.07.2003 was granted on 7 July 2008 which added a umber of conditions.

2.2 Site layout

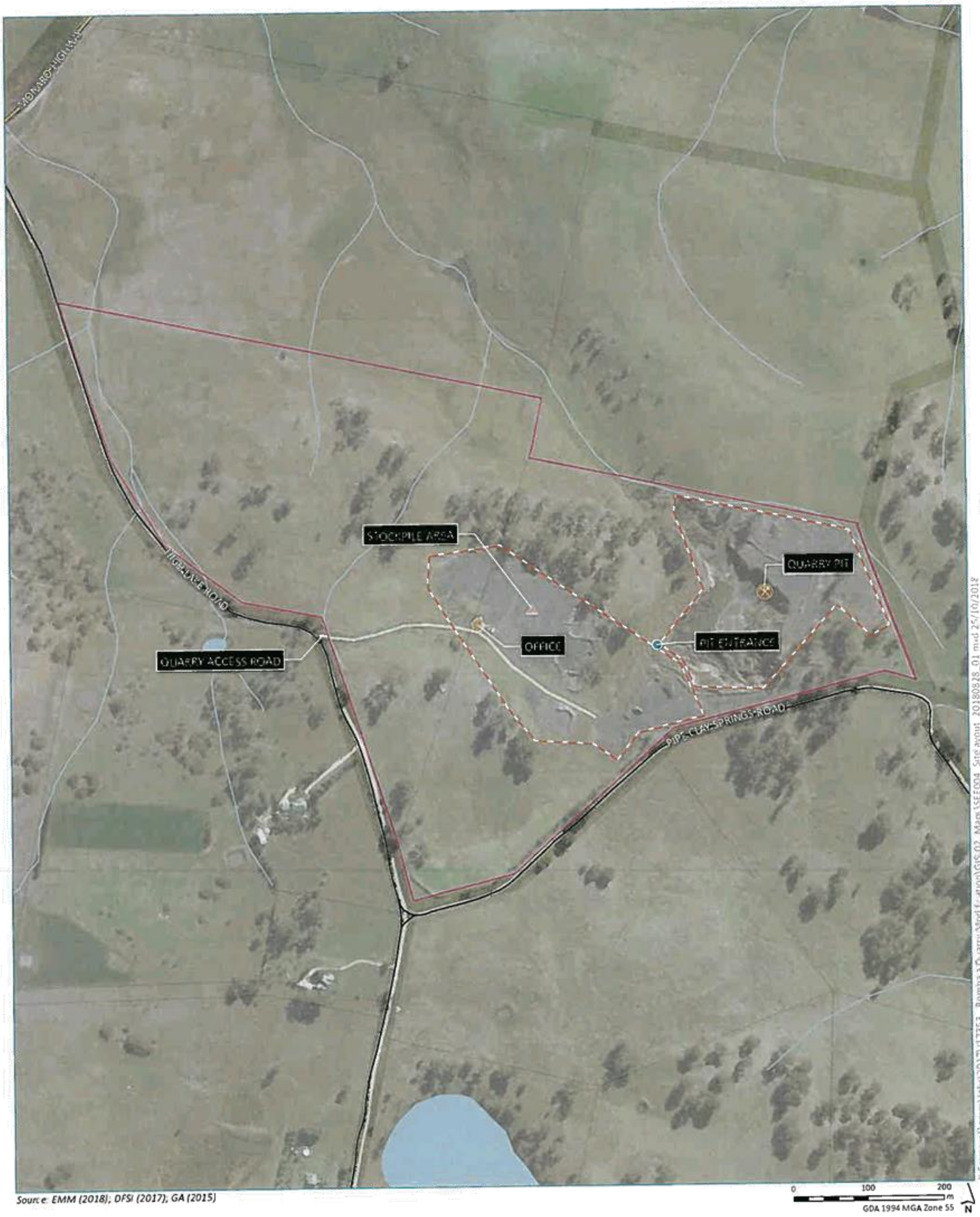
The site covers approximately 42 ha and comprises two land parcels, legally identified as Lot 229 and Lot 230 of Deposited Plan 756819. The approved quarry footprint occupies approximately 7.5 ha within part of Lot 230. A site layout map is illustrated in Figure 2.1. The main site features include the quarry pit, office building, and stockpile area. The site access road connects the quarry to High Lake Road and the Monaro Highway.

2.3 Extraction methods

The quarry extracts basalt, a type of hard rock, using drilling and blasting extraction methods where holes are drilled from surface level into the rock. The holes are filled with explosives and triggered to provide loose rock for processing. Blasting and drilling currently occurs twice a year. Extraction is approved within the quarry pit to a depth of 789 m AHD (32 m below the surface).

2.4 Production rate and output

Loose rock is transferred by a front end loader to a raw feed stockpile where it is loaded into the primary jaw crusher by an excavator. Following primary crushing, the product is transferred to a series of secondary crushers and screens to produce the various size fractions required. Bombala Quarry produces a range of products for commercial use, namely 4 mm dust to be used in concrete plants, 5 mm grit, 7 mm, 10 mm, 14 mm and 20 mm aggregate and unspecified 20 mm scalps which can be used as road base for the local market. Products are transferred to the stockpile area prior to transportation off site.



Site layout

KEY

- Study area
- Quarry boundary
- Site layout
  - Office
  - Pit entrance
  - Quarry pit
  - Stockpile area
  - Quarry access road
- Main road
- Local road
- Watercourse/drainage line
- Waterbody
- Cadastral boundary

Bombala Quarry Modification
Statement of Environmental Effects
Figure 2.1

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2.5 Product transportation

Trucks are loaded with products from the stockpile area using a front end loader. Daily movements are, on average, 30 truck movements (15 truck loads) per day with a maximum 80 truck movements (40 truck loads) per day. Trucks travel via the quarry access road and High Lake Road onto the Monaro Highway, and then travel either to the north or to the south depending on the customer location.

2.6 Hours of operation

Bombala Quarry is currently approved to operate five days per week from 7:00 am to 5:00 pm and loading occurs as needed from 6:00 am to 7:00 am. Loading of materials also occurs on Saturdays from 7:00 am to 12:00 pm. In accordance with the development consent, no operations or loading occurs on Sundays and Public Holidays.

2.7 Employment

The site workforce comprises up to five site personnel, a Boral Production Manager and three to four plant and equipment operators.

2.8 Environmental management

Environmental management procedures at the Bombala Quarry are designed to ensure compliance with the existing development consent (DA.07.0013) and all relevant government legislation and requirements. Bombala Quarry operates in accordance with Environment Protection Licence (EPL) No. 12891 issued under the *Protection of the Environment Operations Act 1997* (POEO Act).

Water used in quarry operations is trucked onto the site by a contractor on an 'as required' basis. This water is for dust suppression via microsprays on the screens. Clean water is diverted around disturbed areas by use of contour drains or modified channels. Dirty water from stockpile areas is retained in the pit. No groundwater is intercepted by the quarry pit.

A number of management plans and monitoring programs have been prepared for the quarry in accordance with Development Consent No. DA.07.0013 including:

- a Landscape Plan;
- an Air Quality Monitoring Plan; and
- a Noise Management Plan.

Blasting and air quality monitoring data is published by Boral in an Annual Environmental Monitoring Report (AEMR). There are no recent instances on non-compliances as the quarry has not operated since 2012.

A pollution incident response management plan for the quarry was also published in July 2018. The document is used to provide direction on how to report, manage and communicate incidents to all staff. This document is reviewed every 12 months, with the next scheduled review date in July 2019.

3 Proposed modification

3.1 Objectives of modification

The proposed modification involves an increase in the production limit to enable an effective and financially viable quarry to continue for the foreseeable future.

The objectives of the proposed modification are to:

- continue extracting high quality basalt from the identified resources to realise the economic potential of the site and maximise resource recovery and yield;
- improve the efficiency of the operations to obtain approved resources within current operational hours;
- comply with the expectations of the community and the imperatives of legislation in environmental protection and management;
- provide environmental safeguards and ongoing environmental monitoring programs in order to achieve an environmentally acceptable quarrying operation;
- contribute to local, regional and state economies through capital expenditure, employment and economic supply of construction materials; and
- provide for financial viability of the operation.

3.2 Production rate increase

The proposed modification includes an increase in the maximum production from the currently approved 100,000 tpa to 200,000 tpa. The additional production would be achieved by running the in-pit mobile plant for a longer period within the approved hours of operation. There would be no changes to the approved site layout or quarry pit boundary.

The production rate increase would require an increase to the number of blasts and drilling campaigns per year. In an effort to address community concerns, it is proposed to increase the number of blasts to six per year, which would allow for smaller blast volumes. Drilling campaigns (to prepare for blasting) would consequently increase to six per year. The duration of each drilling campaign would remain at up to two weeks.

3.3 Traffic generation

As a result of the increase in annual production volume, the number of truck movements would increase to an average 62 truck movements (31 truck loads) with a maximum 160 truck movements (80 truck loads) per weekday. The additional quarry products will continue to be transported by road via High Lake Road west of the site access road, the Monaro Highway and other connecting routes.

There would be no change to the current number of employees and, therefore, no change to light vehicle movements.

3.4 Other operational aspects

Equipment numbers will change slightly from the current operation with one less screen, one cone crusher which replaces the two mini crushers and inclusion of a small mobile pre-coat plant to produce products for regional road works. Materials for the pre-coat plant would be stored on site in a bunded tank.

3.5 Consideration of alternatives

The alternative to an increase in the annual production volume to service market demand is to establish a new quarry site in another location. However, establishing a new quarry site will have a greater environmental and social impact to the community and would not be an economically viable alternative to this proposed modification.

Under a do-nothing scenario, if the production volume is not increased, there would be a gap in the local supply market. Resources would need to be sourced and transported from elsewhere in NSW, likely from greater distances, which would increase transportation costs and affect the cost of construction of projects currently supplied by Bombala Quarry.

4 Legislative context

4.1 Environmental Planning and Assessment Act 1979

4.1.1 Modification applications

Development consents granted under Part 4 of the EP&A Act may be modified under Section 4.55 of the Act. The proposed modification is proposed to be modified under Section 4.55(2) which states:

> Other modifications
>
> A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:
>
> a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and
>
> b) it has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 4.8) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent, and
>
> c) it has notified the application in accordance with:
>
> i) the regulations, if the regulations so require, or
>
> ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and
>
> d) it has considered any submissions made concerning the proposed modification within the period prescribed by the regulations or provided by the development control plan, as the case may be.
>
> Subsections (1) and (1A) do not apply to such a modification.

The proposed modification is considered to be substantially the same development for which the consent was originally granted.

4.1.2 Matters for consideration

In accordance with Section 4.55(3) of the EP&A Act, when determining a modification of development consent, the consent authority must take into consideration matters referred in Section 4.15(1) of the Act. The Section 4.15(1) matters and where they are addressed in this SEE are detailed in Table 4.1.

Table 4.1 EP&A Act Section 4.15(1) matters for consideration

Matter	Where addressed
(a) the provisions of:	
(i) any environmental planning instrument, and	Sections 4.3 and 4.4
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred definitely or has not been approved), and	None applicable
(iii) any development control plan, and	Section 4.5
(iv) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and	Not applicable to the proposed modification
(v) the regulations (to the extent that they prescribe matters for the purposes of this paragraph)	Section 4.2
that apply to the land to which the development application relates,	
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,	Chapter 6
(c) the suitability of the site for the development,	Chapter 7
(d) any submissions made in accordance with this Act or the regulations,	The local community and relevant government agencies will be invited to make submissions on the proposed modification following submission of this SEE to Council. Council will consider any submissions received during determination of the application.
(e) the public interest.	Chapter 7

4.1.3 Integrated development

Section 4.46 of the EP&A Act identifies development that is 'integrated development'. Integrated development is development (not being State significant development (SSD) or complying development) that, in order for it to be carried out, requires development consent and one or more approvals under certain NSW legislation.

Bombala Quarry currently operates in accordance with EPL 12891 and the provisions of the POEO Act for extractive activities in the scale of 5,000 to 100,000 tpa, crushing, grinding or separating of quarry materials in the scale of 3,000 to 100,000 tpa, and noise limits as outlined under L3.1 of the EPL. The proposed modification to increase maximum production loads up to 200,000 tpa, increased number of blasting campaigns and new noise limits exceeds the scale approved under EPL 12891.

Therefore, variation of EPL 12891 is required under section 58 of the POEO Act. A variation of an existing EPL does not itself trigger the proposed modification being considered 'integrated development' as defined under Section 4.46 of the EP&A Act. This is because Section 4.46 does not reference Section 58 of the POEO Act which relates to variations to EPLs.

As none of the approvals identified in Section 4.46 of the EP&A Act would be required for the proposed modification, it is not 'integrated development'.

4.2 Environmental Planning and Assessment Regulation 2000

Under Section 4.10, Part 4 of the EP&A Act, a designated development is a development that is declared to be designated development by an environmental planning instrument or the regulations. A designated development does not include state significant development despite any such declaration.

Clause 19 of Schedule 3 of the Regulation lists the following as designated development:

19 Extractive industries

(1) Extractive industries (being industries that obtain extractive materials by methods including excavating, dredging, tunnelling or quarrying or that store, stockpile or process extractive materials by methods including washing, crushing, sawing or separating):

(a) that obtain or process for sale, or reuse, more than 30,000 cubic metres of extractive material per year, or

(b) that disturb or will disturb a total surface area of more than 2 hectares of land by:

(i) clearing or excavating, or

(ii) constructing dams, ponds, drains, roads or conveyors, or

(iii) storing or depositing overburden, extractive material or tailings, or

(c) that are located:

(i) in or within 40 metres of a natural waterbody, wetland or an environmentally sensitive area, or

(ii) within 200 metres of a coastline, or

(iii) in an area of contaminated soil or acid sulphate soil, or

(iv) on land that slopes at more than 18 degrees to the horizontal, or

(v) if involving blasting, within 1,000 metres of a residential zone or within 500 metres of a dwelling not associated with the development, or

(vi) within 500 metres of the site of another extractive industry that has operated during the last 5 years.

Clause 35 of Schedule 3 outlines circumstances when alteration or additions are designated development:

35 Is there a significant increase in the environmental impacts of the total development?

Development involving alterations or additions to development (whether existing or approved) is not designated development if, in the opinion of the consent authority, the alterations or additions do not significantly increase the environmental impacts of the total development (that is the development together with the additions or alterations) compared with the existing or approved development.

This SEE details the predicted increase in environmental impacts as compared to the impacts of the approved development. The findings throughout the SEE, which are summarised in Chapter 7 are that there is no significant increase in the environmental impacts of the total development. Accordingly, the proposed modification is not designated development. Consultation with Snowy Monaro Regional Council supports this position.

Clause 36 of Schedule 3 outlines factors that the consent authority must take into consideration in forming its opinion as to whether or not the development is a designated development:

(a) the impact of the existing development having regard to factors including:

- i) previous environmental management performance, including compliance with the conditions of any consents, licences, leases or authorisations by a public authority and compliance with any relevant codes of practice, and
- ii) rehabilitation or restoration of any disturbed land, and
- iii) the number and nature of all past changes and their cumulative effects, and

b) the likely impact of the proposed alterations or additions having regard to factors including:

- i) the scale, character or nature of the proposal in relation to the development, and
- ii) the existing vegetation, air, noise and water quality, scenic character and special features of the land on which the development is or is to be carried out and the surrounding locality, and
- iii) the degree to which the potential environmental impacts can be predicted with adequate certainty, and
- iv) the capacity of the receiving environment to accommodate changes in environmental impacts, and

(c) any proposals:

- i) to mitigate the environmental impacts and manage any residual risk, and
- ii) to facilitate compliance with relevant standards, codes of practice or guidelines published by the Department or other public authorities.

Section 6.4 of this SEE provides an assessment of the proposed modification against the factors outlined in Clause 36. The proposed modification can be considered as an alteration or addition to an approved development and, therefore, is not designated development.

4.3 State Environmental Planning Policy

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

One of the primary aims of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Extractive Industries SEPP) is to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State. It establishes appropriate planning controls to encourage ecological sustainable development. The proposed modification is consistent with the aims of this policy.

Under Part 2 of the Extractive Industries SEPP, an extractive industry may be carried out on land on which development for the purposes of industry may also be carried out with development consent. Therefore, the proposed modification is permitted with consent.

Part 3 of the Extractive Industries SEPP sets out a number of matters that the consent authority must consider before determining a development application for the purposes of an extractive industry. Of relevance to the proposed modification is Clause 16 Transport, which states:

> 16 Transport
>
> (1) Before granting consent for development for the purposes of mining or extractive industry that involves the transport of materials, the consent authority must consider whether or not the consent should be issued subject to conditions that do any one or more of the following:
>
> (a) require that some or all of the transport of materials in connection with the development is not to be by public road,
>
> (b) limit or preclude truck movements, in connection with the development, that occur on roads in residential areas or on roads near to schools,
>
> (c) require the preparation and implementation, in relation to the development, of a code of conduct relating to the transport of materials on public roads.

Additional products will be solely transported via road. Alternative transport options, such as rail, are not available. The nearest railway line is 5 km west of the quarry but was closed in the 1980s. For the past 10 years, Boral has been using the existing transport route from Bombala Quarry to other local destinations (Pambula, Jindabyne and Bega). Boral will continue to monitor its code of conduct relating to the transportation of quarry materials on public roads.

4.3.2 State Environmental Planning Policy No 33 – Hazardous and Offensive Development

State Environmental Planning Policy No 33 – Hazardous and Offensive Development (SEPP 33) aims to ensure any measures proposed to be employed to reduce the impact of the development are taken into consideration when considering any application to carry out potential hazardous or offensive development.

The 2006 EIS (ERM 2006) carried out as part of the original development application indicated that the quarry would not present a significant risk or offence to the environment or public health and, therefore, was neither a potentially hazardous nor offensive development.

The proposed modification does not involve additional hazardous activities such additional storage, handling or transport of dangerous goods. Materials for the pre-coat plant, while not classified as dangerous goods under the Australian Code for the Transport of Dangerous Goods by Road and Rail – Edition 7.6, would be stored on site in a bunded tank. Further, the proposed modification will not significantly contribute to the current environmental impacts from the existing works carried out in the quarry (as demonstrated in Chapter 6). Therefore, the proposed modification is not considered to be a potentially hazardous and/or offensive development.

4.4 Bombala Local Environmental Plan 2012

The site is zoned RU1 Primary Production under Bombala Local Environmental Plan 2012 (Bombala LEP). Extractive industries are permissible with development consent in this zone. The objectives of the RU1 zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To enable other land uses that are associated with primary industry and that require an isolated or rural location or that support the tourism industry.

The proposed modification is consistent with these objectives.

No other provisions of the Bombala LEP are relevant to the proposed modification.

4.5 Bombala Development Control Plan

Bombala Development Control Plan (DCP) 2012 is the applicable DCP for the site. No development control requirements are applicable to the proposed modification.

5 Consultation

During preparation of this SEE, Boral and EMM have undertaken consultation with relevant stakeholders, including the neighbouring community, Snowy Monaro Regional Council, NSW Environment Protection Authority (EPA) and NSW Roads and Maritime Services (RMS). The matters raised during consultation with the relevant stakeholders are detailed in the following sections.

5.1 Snowy Monaro Regional Council

Boral consulted with Snowy Monaro Regional Council (the Council) to determine the planning approval pathway for the proposed modification. Following a meeting with the Council on 18 October 2017, the Council agreed that the proposed modification would be substantially the same development as the development for which consent was originally granted and can be modified under Section 4.55 of the EP&A Act.

5.2 Environment Protection Authority

A letter summarising the details of the proposed modification was issued by EMM, on behalf of Boral, to the EPA's South and West Branch on 24 October 2018. EPA was invited to provide any feedback or concerns regarding the proposed modification and Boral offered to meet with EPA officers to discuss the application and results of draft technical assessments.

A response from EPA was received on 14 November 2018 where it was noted that the EPA would not provide specific comments at this time and intends to provide comment after conducting a site inspection and receiving copies of the completed noise and air assessments associated with the modification application. Copies of the SEE, including the NIA and AQIA, will be provided to EPA by Council once the modification application has been lodged.

5.3 Roads and Maritime Services

A letter summarising the details of the proposed modification was issued by EMM, on behalf of Boral, to RMS's Land Use Southern Region team on 24 October 2018. RMS was invited to provide any feedback or concerns regarding the proposed modification and Boral offered to meet with RMS officers to discuss the application and results of draft technical assessments.

A response from RMS was received on 14 November 2018 requesting the following to be considered in the application:

- the route taken by additional movements pictorially;
- for any intersections on the Monaro Highway where turn movements will be increased, an intersection assessment needs to be carried out in accordance with *Austroads Guide to Road Design – Part 4, Appendix A.8 Warrants for BA/AU and CH Turn Treatments* to determine whether the existing intersection treatments are adequate to cater for the increased movements. Consideration also needs to be given to the sight distance available at these intersections.

- Should an intersection upgrade be warranted, a strategic design for the identified junction access treatment needs to be prepared to clarify the scope of works, demonstrate the works can be constructed within the road reserve at the proposed access location and allow the consent authority to consider any environmental impacts of the works as part of their Part 4 assessment. These impacts include traffic and road safety impacts as well as other impacts such noise, flora and fauna, heritage and impact to community.

The above has been addressed in the TIA (Appendix C).

5.4 Community consultation

Boral recognises the importance of maintaining open and effective communications with the community and has been proactive in approaching the neighbouring community in relation to the proposed modification.

Recent community consultation was held on 21 August 2018 with one-on-one meetings and a larger group meeting at the Bombala Community Centre, with immediate neighbours of the quarry. The purpose of the community consultation activities was to seek feedback on the past operations and advise the local community of the intention to recommence quarrying under the existing development consent and increase the production capacity of the quarry. The outcomes of this community consultation and the response is summarised in Table 5.1. It is noted that the quarry operations have been suspended for six years (21012-2018), however most of the neighbours were still living adjacent to the quarry during the former operational period.

Table 5.1 Summary of community feedback

Area of concern	Community's feedback	Response
Pest management	• Bad rabbit problem emanating from the quarry site may have affected previous rehabilitation of tree planting.	• Vermin such as rabbits were not noted at the site during the active quarry operations. Rabbit populations may have flourished during the subsequent inactive period. • Boral would work with Council or the Department of Primary Industries to identify and undertake pest species control programs appropriate for the locality.
Noise and vibration	• Truck reverse beep from stockpiling operations behind site office. • Noise monitor was installed on property without permission/notification. • Significant vibration felt while performing blasting (window shaking). • Resident note there was no notification of blasts in the past. • Crusher is very noisy. • Resident is interested in how noise modelling is undertaken.	• Broad band reversing alarms eg. 'squashed duck' will be used by trucks reversing on site. • The proposed modification would increase the number of blasts to allow smaller 'shots' more frequently. • Quarry operator will give residents two weeks' notice prior to blasting events. Former operations had a process to notify residents in the immediate vicinity of the quarry. This notification will be extended to all sensitive receptors identified in this SEE (see Figure 6.1). • Boral offered to provide access to technical specialist (acoustics) if required.

Table 5.1 Summary of community feedback

Area of concern	Community's feedback	Response
Air quality	• Dust coming from east is problematic and unpleasant, would appreciate more vegetation screening and/or bunding along High Lake Road. • Three residents reported that dust is a big problem when blowing into their water tanks (some residents are on tank water only). • Resident request more screening or mounding at top of the quarry (opposite house).	• Boral noted there is existing small mounding in place at junction of High Lake Road and Pipe Clay Springs Road but section that is devoid of vegetation would be good for revegetation. • Boral will undertake replanting in sections along the High Lake Road fenceline where vegetation has died as part of site re-establishment
Security	• Resident reported locals accessing the quarry in weekend for product pick up.	• Security is in place, and will be monitored when quarry reopens. Quarry will only be open during consented hours.
Road maintenance	• High Lake Road affected by previous storm. Inadequate road repairs have resulted in potholes which cause empty trucks to rattle.	• Council is responsible for road maintenance.
Operating hour	• Resident is concerned about working on weekends.	• Boral clarified that loading activities on Saturday mornings is permissible under the existing Development Consent.
Road access	• Resident is concerned that local trucks are using Pipe Clay Springs Road on weekends intermittently and would like to request restrictions on road to stop this as Pipe Clay Springs Road is narrow.	• Boral noted that the existing Development Consent requires trucks to be limited to High Lake Road only. Road limits for non-quarry related trucks may be required to be installed by Council.
Consultation	• Residents are keen to know when Council will consult with neighbours. • Residents are interested in the EIA and consultation process.	• Boral explained Council's notification process and the planning approval process. Council will notify residents of the modification application and invite comment during the formal exhibition period.
Flora and fauna	• Resident enquired about flora and fauna effects and asked whether there is protocol in place for any animals that may have moved into the locality.	• Boral explained the aspect in relation to flora and fauna was considered in the original development application. • Quarry operator is to take care of any disrupted native animals where possible, ie check if there is a local WIRES contact before operations recommence.
Other	• Local resident would like to obtain product from quarry for driveway maintenance.	• Any local transactions of product are managed by the quarry site manager. For good governance purposes, all transactions are recorded and receipted for Boral operations.

A community newsletter was issued to neighbouring properties on 19 November 2018. The newsletter provided an update of the reopening of the quarry and the proposed modification status. A copy of the newsletter is provided in Appendix D.

6 Environmental assessment

This chapter provides an assessment of the proposed modification's potential environmental impacts. Detailed summaries are provided of the technical assessments undertaken to support this SEE; namely, for noise, air quality and traffic.

6.1 Noise and vibration

6.1.1 Introduction

A NIA to assess potential noise impacts associated with the proposed modification was undertaken by EMM. The NIA was conducted with reference to the following policies and guidelines:

- NSW Department of Environment, Climate Change and Water (DECCW)'s *Road Noise Policy 2011* (the RNP);
- NSW Environment Protection Authority (EPA)'s *Noise Policy for Industry 2017* (the NPfI) (which replaced the former *Industrial Noise Policy 2000*); and
- Australian and New Zealand Environment Council (ANZEC)'s *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration 1990*.

A summary of the NIA is provided below (refer to Appendix A for the complete report).

6.1.2 Existing environment

Assessment locations referenced in the NIA are shown in Figure 6.1.

Given the area and surrounding agricultural land uses, existing ambient noise levels at assessment locations are likely to be dominated by rural noise sources and road traffic. The rating background noise levels (RBLs) are expected to be 35 dB or below for the day time.

6.1.3 Noise criteria

i Operational noise

Condition 8 of DA.07.0013 and Condition L3.1 of EPL 12891 detail the site generated noise limits for the nearest affected receivers surrounding the site. These noise limits were determined in 2006 using the *Industrial Noise Policy* (EPA 2000), which has since been replaced with the NPfI. The objective of the NPfI is to protect the community from excessive intrusive noise and preserve amenity for specific land uses. To ensure these objectives are met, the EPA provides two separate noise trigger levels: intrusiveness and amenity. The fundamental difference being intrusiveness noise levels apply over 15 minutes in any period (day, evening or night), whereas the amenity noise levels apply to the entire assessment period (day, evening or night).

The intrusiveness noise trigger level requires that $L_{Aeq,15\,minute}$ noise levels from the quarry during the day period do not exceed the rating background level (RBL) by more than 5 dB. Therefore, the intrusiveness noise trigger levels for all privately-owned assessment locations are $L_{Aeq,15\,minute}$ 40 dB during the day period.

The assessment of amenity is based on noise levels specific to the land use. The noise levels relate only to industrial noise and exclude road or rail noise. Where the measured existing industrial noise approaches recommended amenity noise levels, it needs to be demonstrated that noise levels from new industry will not contribute to existing industrial noise such that target amenity noise levels are exceeded.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level for new industrial developments is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB.

Residential assessment locations potentially affected by the quarry have been categorised in the NPfI rural amenity category. As per the definitions provided in the NPfI, residential assessment locations were classified as "rural" since they were deemed to be in "an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry".

The corresponding project amenity noise levels for the quarry are given in Table 6.1.

Table 6.1 Project amenity noise levels

Assessment location type	Indicative area	Assessment period[1]	Recommended amenity noise level, $L_{Aeq,period}$, dB
Residential	Rural	Day	45 (50 minus 5)

Note: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays

The project-noise trigger level (PNTL) is the lower of the calculated intrusive or amenity noise level and is provided in Table 6.2 for all assessment locations.

Table 6.2 Project noise trigger levels

Assessment location	Period[1]	Intrusive noise level, dB	Amenity noise level, dB	Project noise trigger level (PNTL), dB
Residential (R1-R9)	Day	40 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$

Note: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays

The project noise trigger levels outlined in Table 6.2 have been derived in accordance with current industry standards (NSW NPfI) and should replace those currently referenced in the development consent and EPL.

The NPfI states that project noise trigger levels should not be applied as mandatory noise limits to existing sites. The project noise trigger level is the level used to assess noise impact and drive the process of assessing all feasible and reasonable control measures.

ii Road traffic noise

The principal guidance for assessing the impact of road traffic noise on receivers is in the Road Noise Policy (RNP). The section of High Lake Road leading to the quarry is classified as a local road, whilst the Monaro Highway is classified as an arterial road. Table 6.2 details the applicable road traffic noise criteria in accordance with the RNP.

Table 6.3 Road traffic noise assessment criteria for residential land use

Road category	Type of project/development	Assessment criteria, dB	
		Day (7 am to 10 pm)	**Night (10 pm to 7 am)**
Local roads (Highway Lake Road)	Existing residences affected by additional traffic on existing local roads generated by land use developments.	$L_{Aeq,1\ hour}$ 55 (external)	$L_{Aeq,1\ hour}$ 50 (external)
Freeway/arterial/sub-arterial roads (Monaro Highway)	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15\ hour}$ 60 (external)	$L_{Aeq,9\ hour}$ 55 (external)

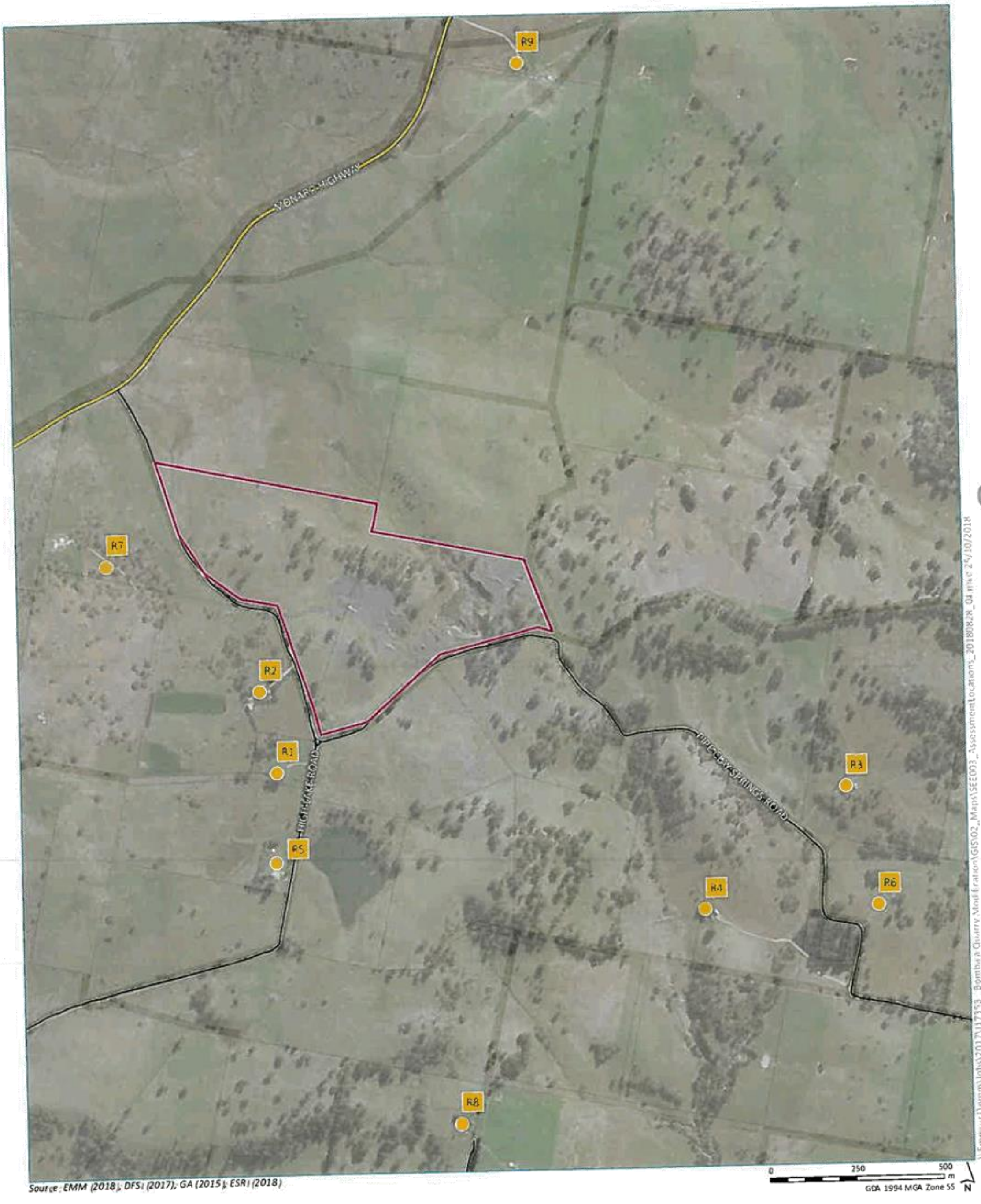
The RNP states that where existing road traffic noise criteria are already exceeded, any additional increase in the total traffic noise level should be limited to 2 dB.

iii Airblast and ground vibration

A summary of airblast and ground vibration limits adopted by the EPA for blasting are provided in the Australian and New Zealand Environment Council (ANZEC 1990) guidelines, *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground* Vibration, are provided in Table 6.4.

Table 6.4 Airblast (overpressure) and ground vibration limits

Airblast level dB(L_{peak})	Allowable exceedance
115	5% of the total number of blasts over 12 months
120	0%
Ground vibration (Peak particle velocity (mm/s))	**Allowable exceedance**
5	5% of the total number of blasts over 12 months
10	0%



KEY

- Study area
- Assessment location (residence)
- Main road
- Local road
- Cadastral boundary

Assessment locations

Bombala Quarry Modification
Statement of Environmental Effects
Figure 6.1

EMM
creating opportunities

6.1.4 Results

i Operational noise

Results of the noise modelling as shown in Table 6.5, demonstrate that, under normal operations, noise levels are predicted to be below the relevant NPfI noise trigger levels at all assessment locations. During campaign operations (include drilling), noise levels are predicted to exceed applicable criterion at assessment location R2 by 2 dB. The main contributor to this slight exceedance is the operation of the drilling rig in addition to other plant. This is a minor exceedance, as a 1-2 dB change in noise levels is typically indiscernible to the human ear. Therefore, changes of 1-2 dB are unlikely to be perceivable to nearby residents.

Table 6.5 Predicted operational noise levels

Location	Receiver type	Period[1]	Predicted noise level, dB		Project noise trigger level (PNTL), dB
			Typical operations	Campaign operations	
R1	Residential	Day	35 $L_{Aeq,15\ minute}$	38 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R2	Residential	Day	40 $L_{Aeq,15\ minute}$	**42** $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R3	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R4	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R5	Residential	Day	<35 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R6	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R7	Residential	Day	37 $L_{Aeq,15\ minute}$	39 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R8	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R9	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$

ii Road traffic noise

Road traffic noise levels generated by the proposed quarry traffic are predicted to marginally increase by up to 1.5 dB on top of the current road traffic noise levels, as shown in Table 6.6, however, all assessment locations will remain well under the assessment criterion. Therefore, road related traffic noise levels are predicted to satisfy the relevant RNP noise requirements at all assessment locations.

Table 6.6 Existing and future road traffic noise

Extraction scenario	Road section	Distance[1] (m)	Speed (km/h)	Road traffic noise level, dB			Criterion, dB	Change, dB
				Existing (inc. Boral)	Proposed	Future[2]		
Average	High Lake Rd	≥220	50	42 $L_{Aeq,1\ hour}$	34 $L_{Aeq,1\ hour}$	43 $L_{Aeq,1\ hour}$	55 $L_{Aeq,1\ hour}$	0.6
	Monaro Hwy (North)	≥15	60	54 $L_{Aeq,15\ hour}$	46 $L_{Aeq,15\ hour}$	54 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	0.6
		≥20	100	55 $L_{Aeq,15\ hour}$	47 $L_{Aeq,15\ hour}$	56 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	0.5
	Monaro Hwy (South)	≥15	60	54 $L_{Aeq,15\ hour}$	44 $L_{Aeq,15\ hour}$	54 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	0.4

Table 6.6 Existing and future road traffic noise

Extraction scenario	Road section	Distance[1] (m)	Speed (km/h)	Road traffic noise level, dB			Criterion, dB	Change, dB
				Existing (inc. Boral)	Proposed	Future[2]		
Maximum	High Lake Rd	≥220	50	42 $L_{Aeq,1\ hour}$	38 $L_{Aeq,1\ hour}$	44 $L_{Aeq,1\ hour}$	55 $L_{Aeq,1\ hour}$	1.4
	Monaro Hwy (North)	≥15	60	54 $L_{Aeq,15\ hour}$	50 $L_{Aeq,15\ hour}$	55 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	1.5
		≥20	100	55 $L_{Aeq,15\ hour}$	51 $L_{Aeq,15\ hour}$	57 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	1.2
	Monaro Hwy (South)	≥15	60	54 $L_{Aeq,15\ hour}$	48 $L_{Aeq,15\ hour}$	55 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	1.0

iii Blasting noise and vibration

Noise and vibration emitted from blasting is predicted to comply with relevant airblast and vibration criteria by limiting the maximum instantaneous charge in each blast or by adopting conventional blast design practices, as shown in **Error! Reference source not found.**. Monitoring of blast events is recommended to continue to check compliance with airblast and vibration criteria.

Table 6.7 Ground vibration and airblast results

Assessment location	Airblast criteria (dB(L)peak)	Ground vibration criteria PPV (mm/s)	Approx. distance to potential blasting (m)	Limiting MIC (kg) based on	
				Vibration	Airblast
R1	≤115	≤5	600	398	272
R2	≤115	≤5	490	266	148
R3	≤115	≤5	1,050	1,219	1,457
R4	≤115	≤5	1,000	1,106	1,259
R5	≤115	≤5	790	690	621
R6	≤115	≤5	1,330	1,956	2,962
R7	≤115	≤5	920	936	980
R8	≤115	≤5	1,380	2,106	3,309
R9	≤115	≤5	1,420	2,230	3,605

6.1.5 Conclusion

The assessment found that, under normal operations, noise levels are predicted to satisfy the relevant NPfI noise trigger levels. During campaign operations, noise levels are predicted to exceed criterion at assessment location R2 by 2 dB. However, 2 dB is considered a minor exceedance and predictions satisfy the site's existing consent condition and EPL limit for R2. Hence, it is unlikely that project noise emissions would cause adverse impacts at any assessment locations. Road traffic noise levels also satisfy the relevant RNP noise requirements. Noise and vibration emitted from blasting is also predicted to comply with relevant criteria. Therefore, it is reasonable to conclude that the proposed modification will not cause adverse impact in noise and vibration.

6.2 Air quality

6.2.1 Introduction

An AQIA to assess potential air quality impacts for the proposed modification was undertaken by Ramboll Australia Pty Ltd to support the SEE. The AQIA is presented in full in Appendix B with a summary provided below.

Existing environment conditions were quantified using the Bureau of Meteorology (BoM) monitoring resources in Bombala and the ACT Environment Protection Authority air quality monitoring stations. The assessment focused on emissions and impacts of particulate matter less than 10 microns (PM_{10}). If compliance for PM_{10} is predicted, compliance can be inferred for TSP, $PM_{2.5}$ and dust deposition, based on established ratios for different particle size fractions.

The AQIA was prepared in accordance with the EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (2016).

6.2.2 Air quality criteria

Air quality impacts from the proposed modification are determined by the level of compliance with the air quality criteria set by the EPA as part of their Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2016). These criteria are provided in Table 6.8.

Table 6.8 EPA air quality assessment criteria

Substance	Averaging period	Criterion
PM_{10}	24 hour	50 µg/m³
	Annual	25 µg/m³
$PM_{2.5}$	24 hour	25 µg/m³
	Annual	8 µg/m³
TSP	Annual	90 µg/m³
Deposited dust	Maximum increase in dust deposition	2 g/m²/month
	Maximum total dust deposition level	4 g/m²/month

6.2.3 Existing environment

Boral undertakes dust deposition monitoring at two locations at the quarry site as required under the EPL 12891. One monitor is located at the eastern boundary of the site while the other is located at the southern boundary of the site. Monitoring results were provided by Boral for the period between November 2015 and May 2018.

The annual average dust deposition rates recorded at both monitoring locations was 2.3 g/m²/month, which is well below the EPA air quality criteria of 4 g/m²/month.

To understand the potential background concentrations of PM_{10}, air quality monitoring data has been sourced from the closest ACT EPA air quality monitoring network. The closest monitoring station is at Monash, approximately 160 km north of the quarry. The recorded PM_{10} concentrations at the Monash station shown there were no criteria exceedances recorded during 2017. The highest PM_{10} concentration was 33.4 µg/m³ and the average recorded PM_{10} was 10.5 µg/m³.

6.2.4 Results of impact assessment

Air quality concentrations were predicted for the proposed modification using dispersion modelling. A summary of the modelling results is provided in Table 6.9.

Table 6.9 Predicted quarry-only PM_{10} increment impacts

Receptor ID	Predicted quarry-only incremental PM_{10} concentration (µg/m^3)		Predicted cumulative (quarry + background) PM_{10} concentration (µg/m^3)	
	24 hour	Annual	24 hour	Annual
1	2.0	0.1	33.5	10.6
2	3.3	0.3	33.9	10.8
3	1.7	0.1	33.4	10.6
4	3.0	0.2	33.4	10.7
5	1.3	0.1	33.4	10.6
6	1.1	0.1	33.4	10.6
7	2.1	0.1	33.7	10.6
8	1.2	0.1	33.4	10.6
9	1.1	<0.1	33.4	10.5
Criterion	**50**	**25**	**50**	**25**

Source: Ramboll Australia Pty Ltd

The results presented above shown that the proposed modification would generate quarry-only incremental PM_{10} concentrations well below the EPA's criteria for both the 24 hour period and annually. The increase in PM_{10} is relatively minor (1% increase of the annual criterion) and indicates that the risk for the proposed modification is low.

Concentrations of $PM_{2.5}$, TSP and deposited dust are also predicted to comply with relevant criteria.

6.2.5 Cumulative impact

Nearby industrial operations to the quarry include the Bombala Sawmill located approximately 8 km southwest and a small quarry located on Gunningrah Road in Bombala, approximately 6.5 km west-southwest. Due to the separation distances from the quarry, it is considered that emissions from these operations would not cause significant direct cumulative impacts with the quarry.

6.2.6 Mitigation measures

Mitigation measures to minimise dust emissions include:

- dust suppression;
- revegetation of exposed surfaces where possible;
- compliance with the site speed limit and road speed limit;
- covering loads to prevent dust being released during road transport;
- load and unload vehicles on site;

- use of water carts at stockpiling areas and pit area; and
- water sprays at crushing/screening components.

6.2.7 Conclusion

The predicted quarry-only incremental PM_{10} concentrations results associated with the proposed modification are well below the EPA's criteria for both 24 hour period and annually. Therefore, it is unlikely that emissions from the proposed modification, combined with background concentrations would result in significant air quality emissions.

Based on similar low risk operations to the Bombala Quarry, if compliance for PM_{10} is predicted, then compliance can be inferred for $PM_{2.5}$, TSP and dust deposition.

6.3 Traffic and transport

6.3.1 Introduction

A TIA has been prepared by EMM Consulting (EMM) to assess the road network traffic impacts of the proposed quarry modification.

The quarry access is located off the eastern side of High Lake Road, mid-way between the Monaro Highway and Pipe Clay Springs Road. The quarry product materials are currently exclusively transported via High Lake Road and the Monaro Highway. Usage of Pipe Clay Springs Road is prohibited by the quarry's development consent.

The TIA was prepared in accordance with the Roads and Maritime Services (RMS) *Guide to Traffic Generating Development (2002)*, which is the relevant guidance for TIAs in NSW.

6.3.2 Existing environment

i Current road network – Monaro Highway

The annual average daily traffic volumes for Monaro Highway was obtained from RMS data. The survey location is just outside the urban area of Bombala, approximately 4 km south of the quarry access intersection at High Lake Road. Table 6.10 shows the annual average daily traffic data from 2007 to 2018.

Table 6.10 Annual average daily traffic data

Year	Annual average daily traffic data (vehicles)	Number of vehicle growth to previous year	Percentage of vehicle growth to previous year
2018	1,141	+47	+4.30%
2017	1,094	+48	+4.59%
2016	1,046	+43	+4.29%
2015	1,003	+22	+2.24%
2014	981	+50	+5.37%
2013	931	-51	-5.19%
2012	982	+69	+7.55%
2011	913	-7	-0.76%
2010	920	+20	+2.22%

Table 6.10 Annual average daily traffic data

Year	Annual average daily traffic data (vehicles)	Number of vehicle growth to previous year	Percentage of vehicle growth to previous year
2009	900	+49	+5.76%
2008	851	-3	-0.35%
2007	854	-	-

The long term traffic growth trend from the average of the two oldest years (2007 and 2008) surveys to the average of the two newest years (2017 and 2018) surveys, shows an average traffic growth of +26.5 vehicles each year, representing a 3.1% annual traffic growth over the ten year period. Percentage of heavy vehicles is not recorded.

ii Baseline peak hour and daily traffic volumes – Monaro Highway/High Lake Road intersection

For the Monaro Highway, in the vicinity of the quarry access via High Lake Road, the current peak hourly traffic volumes and the heavy vehicle traffic proportion were recorded by a six hour intersection traffic count conducted on 4 July 2018 (3:00 pm – 6:00 pm) and 5 July 2018 (6:00 am – 9:00 am). The quarry was not operating during the week of the traffic survey so the traffic volumes recorded are the baseline peak hour and estimated equivalent daily traffic volumes.

Table 6.11 Baseline peak hour and equivalent daily traffic volumes

	Morning peak hour traffic (6:00 am – 9:00 am)	Afternoon peak hour traffic (3:00 pm – 6:00 pm)	Equivalent daily traffic (estimate)
Monaro Highway – north of the quarry access intersection			
Vehicle movements	78	96	1,044
Trucks	11	15	156
Monaro Highway – south of the quarry access intersection			
Vehicle movements	77	96	1,038
Trucks	11	15	156
High Lake Road			
Vehicle movements	1	2	18
Trucks	0	0	0

iii Existing quarry production traffic

When Bombala Quarry is operating at the currently approved production rate of 100,000 tpa, it operates on 47 weeks per year with normal Monday to Friday operations and a half day on Saturday mornings, which represents 259 operating days per year effectively, with an average daily production of 386 t.

With typical average 25 t truckloads, this represents just over 15 loaded trucks per day travelling from the quarry with a corresponding daily number of empty truck movements, an average of 30 daily truck movements in total.

The existing daily light vehicle traffic generated by the quarry workforce and site visitors is generally low and is normally three vehicles per day visiting the site, or six daily car movements in total.

iv Road width and condition

The quarry access road within the site was sealed and the section of High Lake Road between the access road and Monaro Highway was upgraded after Development Consent No. DA.07.0013 was granted. The former quarry site access intersection near the junction of High Lake Road with Pipe Clay Springs Road has been closed. Furthermore, the Monaro Highway/High Lake Road intersection has been widened and improved so that it meets the minimum Austroads rural type BAR/BAL intersection design with sealed shoulder widening, as per Figure 6.2.

The current width of the sealed section on High Lake Road has been designed to allow regular heavy vehicle traffic without the risk of road pavement deterioration.

Monaro Highway is a state funded road and is also constructed to a high structural standard so it is able to carry significant daily heavy vehicle traffic on a regular basis without any risk of increased road pavement wear or other surface deterioration.

The road surfaces of the Monaro Highway and High Lake Road are currently in generally good condition, with no visible signs of major surface defects or other road pavement damage as a result of the use by quarry truck traffic.

6.3.3 Assessment results

The proposed production increase from 100,000 tpa to 200,000 tpa will double the average daily production from 386 t to 773 t. As a result, the average daily loaded truck movement will increase from 15 to 31 per day and the average daily number of truck movements will increase from 30 to 62 movements per day. On a maximum production day, the maximum loaded truck movement will increase from 40 to 80 per day and the maximum daily number of truck movements will increase from 80 to 160 movements per day.

The future distribution of the additional quarry truck is anticipated to remain the same proportionately as the existing quarry production:

- 35% travelling to and from the south and east via Bombala and Cathcart Road travelling to and from Pambula;
- 32.5% travelling to and from the north via Monaro Highway travelling to and from Jindabyne; and
- 32.5% travelling to and from the Bega area travelling via Monaro Highway north and then via Snowy Mountains Highway.

The number of employees at the quarry will not increase with the proposed modification. Therefore, the number of light vehicle movement at the quarry will remain the same.

KEY

- Site boundary
- Main road
- Local road
- Watercourse/drainage line

Current design of the High Lake Road and Monaro Highway access intersection

Bombala Quarry Modification
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Figure 6.2

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i Additional daily traffic via Monaro Highway

Assume 65% of the additional daily truck movement which are generated by the proposed modification will be travelling via Monaro Highway towards Cooma or Bega, and 35% travelling towards Bombala or Pambula.

The additional number of daily truck movement from the quarry using Monaro Highway north of High Lake Road will be +22 additional daily truck movements on an average production day and +52 additional daily truck movements on a maximum production day. The effects of this additional traffic will be a 2% increase in the existing daily traffic using Monaro Highway north of High Lake Road on an average production day and a 4% increase on a maximum production day.

The additional number of daily truck movement from the quarry using Monaro Highway south of High Lake Road will be +10 additional daily truck movements on an average production day and +28 additional daily truck movements on a maximum production day. The effects of this additional traffic will be a 1% increase in the existing daily traffic using Monaro Highway south of High Lake Road on an average production day and a 3% increase on a maximum production day.

Monaro Highway is a major rural highway, which is a well constructed road carriageway with sealed shoulders on most sections and this route will be able to accommodate this traffic increase with no adverse impacts on the traffic flow, road width design and traffic safety for the route.

ii Additional daily traffic via High Lake Road

The adjusted baseline daily traffic is calculated as 54 daily vehicle movements on an average production day at the quarry and 104 daily vehicle movements on a maximum production day.

All the additional daily truck traffic movements generated by the proposed modification will travel via High Lake Road, between the quarry access and Monaro Highway. The additional number of daily truck movement from the quarry will be +32 movements on an average production day and +80 movements on a maximum production day.

The effects of this additional traffic will be a 59% increase in the existing daily traffic using High Lake Road on an average production day and a 77% increase on a maximum production day. However, this road is a well constructed sealed road and will be able to accommodate this traffic increase with no adverse impacts on the traffic flow, road width design or traffic safety for the route.

iii Additional daily traffic via Cathcart Road

The adjusted baseline daily traffic is calculated as 492 daily vehicle movements on an average production day at the quarry and 512 daily vehicle movements on a maximum production day.

The relevant number of additional daily truck traffic movement travelling via Bombala using Cathcart Road to travel to and from Pambula will be +10 movements on an average production day and +28 movements on a maximum production day.

The effects of this additional traffic will be a 2% increase in the existing daily traffic using Cathcart Road on an average production day and a 6% increase on a maximum production day. However, this road is a well constructed sealed road and able to accommodate this traffic increase with no adverse impacts on the traffic flow, road width design or traffic safety for the route.

iv Future Monaro Highway/High Lake Road intersection peak hour operations

There will be an approximate doubling of the future peak hourly site generated traffic movements at the Monaro Highway/High Lake Road intersection. The future intersection turning traffic movements are shown in Table 6.12.

Table 6.12 Summary of future Monaro Highway/High Lake Road intersection peak hour operation

Peak traffic movements for	Direction of traffic	Hourly vehicles (in)	Hourly vehicles (out)	Distribution
Morning peak hour	Trucks to and from the north	5	5	65% north
	Trucks to and from the south	3	3	35% south
Afternoon peak hour	Trucks to and from the north	5	5	65% north
	Trucks to and from the south	3	3	35% south

Even though there will be increases in the future peak hour intersection turning movements, future intersection through and turning traffic movements on the Monaro Highway will still remain below 120 vehicles per hour. As a result, there will be no need for additional turning lanes or sealed shoulder widening at this intersection.

6.3.4 Conclusion

The additional traffic volumes as a result of the proposed modification would have no adverse impacts to the traffic flow, road width design or traffic safety of the local road network. Furthermore, these roads are well constructed sealed roads and will be able to accommodate the traffic increase. Road widening or shoulder widening is also not required.

6.4 Consideration of Clause 36 within Schedule 3 of the EP&A Regulation

The following environmental factors outlined in Table 6.13 were assessed in accordance to Clause 36, Schedule 3 of the EP&A Regulations.

Table 6.13 Consideration of Clause 36 against the proposed modification

Clause reference	Consideration against the proposed modification
(a) the impact of the existing development having regard to factors including:	
i) previous environmental management performance, including compliance with the conditions of any consents, licences, leases or authorisation by a public authority and compliance with any relevant codes of practice.	Bombala Quarry has had no regulatory action from Council or the EPA. Boral undertakes internal environmental audits to ensure compliance against environmental and consent obligations. Recommended actions from these audits are implemented to ensure ongoing compliance. Boral holds EPL 12891 for the quarry. The EPL is administered by the EPA and licenses the extraction of between 50,000 to 100,000 tpa of quarry material. There have been no exceedances of dust criteria recorded by the onsite dust deposition gauges in any years the quarry has been operational. The quarry site is located within the headwaters of an ephemeral tributary of Shoemakers Creek which flows to the Bombala River. A number of overland flow paths traverse the site, with surface flows from the site flowing to a number of small settlement ponds on the northern edge of the property, or offsite to downstream farm dams. Any water runoff within the pit will be directed to a settling pond in the bottom of the quarry pit for reuse onsite or transfer to the nearby settlement ponds. The impact to offsite water quality will be minimal.
ii) rehabilitation or restoration of any disturbed land.	Boral has established a native tree corridor along Clay Springs Road. The design of the quarry does not allow progressive rehabilitation at this time as the entire quarry footprint is an active extraction zone. As the quarry expands into the final footprint and excavates towards the final pit floor level, rehabilitation can commence.
iii) the number and nature of all past changes and their cumulative effects.	DA.07.0013 has not been modified to date. No changes to the hours of operation will occur for the proposed modification.
(b) the likely impact of the proposed alterations or additions having regard to factors including:	
i) the scale, character or nature of the proposed modification in relation to the development.	The proposed modification includes: • an increase in production from 100,000 tpa to 200,000 tpa; and • installation of a small asphalt pre-coat plant to produce products for regional road works. No changes to the site layout or disturbance footprint are proposed. The additional production would be achieved by running the in-pit mobile plant for a longer period of time within the approved hours of operation. Under the proposed modification the operational procedures of the quarry will remain substantially the same as the approved operations. The proposed modification will not change the extraction footprint or operational and extraction processes. The existing production dispatch is via road. The additional production will also be dispatched via road. Truck movements will double as a result of the proposed modification though no significant impacts to the road network are expected.

Table 6.13 Consideration of Clause 36 against the proposed modification

Clause reference	Consideration against the proposed modification
ii) the existing vegetation, air, noise and water quality, scenic character and special features of the land on which the development is or is to be carried out and the surrounding locality.	<u>Biodiversity</u> There are two main types of vegetation communities in the Bombala Quarry site boundary: • snow gum / ribbon gum grassy woodland, which is listed as an endangered ecological community (EEC); and • disturbed grassland, the reminder of the site, apart from quarry operations areas. A landscape plan was developed in 2007 to outline the requirements for the planting of vegetation to screen the quarry operations from identified offsite viewpoints over time and to stabilise earth bunds onsite. Vegetation clearing is not proposed with this modification. <u>Air quality</u> There are many background sources contribute to the existing air quality in the vicinity of the quarry site: dust entrainment due to vehicle movement on unsealed and sealed road; petrol and diesel emission from vehicle movements; wind generated dust from exposed areas; general farming practices; local vegetation burning, seasonal emissions from household wood burning fires and a Bombala Sawmill, which locates approximately 8 km southwest of the quarry. The recorded air quality monitoring data sourced from ACT Monash station indicated there were no criteria exceedances recorded during 2017. An air quality monitoring plan was developed for the quarry in 2007 to monitor deposited dust levels generated and establish ongoing dust monitoring program. <u>Noise</u> Noise associated with the quarry's operation includes use of crushing plant; haul trucks; front end loaders; excavators; and blasting. A noise management plan was developed for the quarry in 2007 to provide effective mitigation and management of noise and vibration from the operation of the quarry and to provide measures for ongoing noise monitoring program. <u>Traffic</u> The road surfaces of the Monaro Highway and High Lake Road are in generally good condition, although potholes on High Lake Road cause empty trucks to rattling, as identified by a resident during community consultation. No other visible signs of major surface defects or other road pavement damage as a result of the existing quarry truck traffic. <u>Water quality</u> The quarry site is located within the headwaters of an ephemeral tributary of Shoemakers Creek which flows to the Bombala River. A number of overland flow paths traverse the site, with surface flows from the site flowing to a number of small settlement ponds on the northern edge of the property, or offsite to downstream farm dams. Any water runoff within the pitwill be directed to a settling pond in the bottom of the quarry pit for reuse onsite or transfer to the nearby settlement ponds. The impact to offsite water quality will be minimal. <u>Scenic character and special features of the land</u> The surrounding land is mainly used for grazing and agriculture. Special features of the land within the site include the existing quarry pit. Adjacent to Boral's property is High Lake Road and Pipe Clay Springs Road to the south, and Monaro Highway to the west.

Table 6.13 Consideration of Clause 36 against the proposed modification

Clause reference	Consideration against the proposed modification
iii) the degree to which the potential environmental impacts can be predicted with adequate certainty.	The main potential environmental impacts of the proposed modification include those associated with air quality, noise and traffic. These impacts are quantifiable and are currently monitored by Boral as required by the site's EPL and consent requirements. The proposed changes to dust and noise emissions have been modelled using government accepted methods and compared against relevant industry criteria.
iv) the capacity of the receiving environment to accommodate changes in environmental impacts.	<u>Built environment</u> Extraction is undertaken wholly within the approved quarry pit boundary, located to the north east of the site. <u>Transport network</u> Additional vehicle movements on High Lake Road and the Monaro Highway can be accommodated within the existing transport network. The proposed modification would increase the daily volume of heavy vehicles on Cathcart Road, High Lake Road and the Monaro Highway. These roads are currently in generally good condition and are suitable to accommodate the proposed levels of heavy vehicles. <u>Local community</u> Predicted dust emissions are within acceptable levels at all private residences in the vicinity of the quarry. Noise emissions are within acceptable levels at all private residences except one which would experience a minor exceedance during drilling campaigns. No additional employment is proposed, therefore, local community services will not be affected. <u>Other</u> The proposed modification would not have any significant impacts to biodiversity, cultural heritage, visual amenity, water, soils and land capability, or rehabilitation.
(c) any proposed modifications:	
i) to mitigate the environmental impacts and manage any residual risk.	Current mitigation measures at the quarry which are relevant to the proposed modification include: • dust suppression; • revegetation of exposed surfaces where possible; • limiting load size to minimise spillage; • compliance with the site speed limit of 15 km/hr; • covering loads to prevent dust being released during road transport; • speed limit to 40 km/hr on High Lake Road; • vehicles will be loaded and unloaded on site; Recommended mitigation measures under the proposed modification include: • use of water carts at stockpiling areas and pit area; and • water sprays at crushing/screening plant.
ii) to facilitate compliance with relevant standards, codes of practice or guidelines published by the Department or other public authorities.	Boral regularly undertakes internal environmental monitoring to monitor environmental performance against obligations including development consent conditions and EPL conditions.

In consideration of the EP&A Regulation Clause 36 factors, the proposed modification would not significantly increase the environmental impacts of the total development compared with the approved development and, therefore, is for alterations or additions and is not designated development under the EP&A Act.

7 Conclusion

The proposed modification involves an increase in the annual production at Bombala Quarry from the approved 100,000 tpa to 200,000 tpa. The additional production would be achieved by running the in-pit mobile plant for longer within the approved hours of operation. The proposed modification would also result in minor changes to equipment including and changes to the frequency of blasting. The hours of operation, disturbance footprint and all other operational aspects remain unchanged.

The proposed modification will provide an increased production limit and enable an effective and financially viable quarry to continue operating for the foreseeable future. While the annual production volumes would increase, the proposed modification would not result in significant environmental impacts to the local road network or nearby sensitive receivers compared to the original development. Further, the existing quarry implements a number of mitigation strategies as a part of the quarry's ongoing environmental management.

The proposed modification is of minimal environmental impact and, therefore, it is considered that the development, as modified, would be substantially the same development as the development for which the consent was originally granted and can be modified under Section 4.55(2) of the EP&A Act.

Abbreviations

AQIA	Air Quality Impact Assessment
BoM	Bureau of Meteorological
DA	Development Application
dB	decibel
DCP	Development Control Plan
DECCW	Department of Climate Change and Water
EIS	Environmental Impact Statement
EMM	EMM Consulting Pty Ltd
EP&A Act	*Environmental Planning & Assessment Act 1979*
EPA	Environment Protection Authority
EPL	Environment Protection Licence
LEP	Local Environmental Plan
NIA	Noise Impact Assessment
$PM_{2.5}$	particulate matter with an equivalent aerodynamic diameter of 2.5 microns or less
PM_{10}	particulate matter with an equivalent aerodynamic diameter of 10 microns or less
POEO Act	*Protection of the Environment Operations Act 1997*
RNP	Road Noise Policy
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy
TIA	Traffic Impact Assessment
tpa	tonnes per annum
TSP	total suspended particulates

References

Environmental Resources Management Australia (ERM) 2006, *Bombala Quarry Expansion – Environmental Impact Statement.*

Boral Resources (Country) Pty Ltd 2018, *Bombala Quarry Environmental Monitoring Report.*

Boral Resources (Country) Pty Ltd 2018, *Community Consultation meeting 21 August 2018.*

Australian and New Zealand Environment Council (ANZEC) 1990; *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.*

NSW Department of Environment, Climate Change and Water (DECCW) 2011, *NSW Road Noise Policy.*

NSW Environment Protection Authority (EPA) 2017, *NSW Noise Policy for Industry.*

NSW Environment Protection Authority (EPA) 2016, *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.*

Roads and Maritime Services (RMS) 2002, *Guide to Traffic Generating Developments.*

Appendix A

Noise Impact Assessment

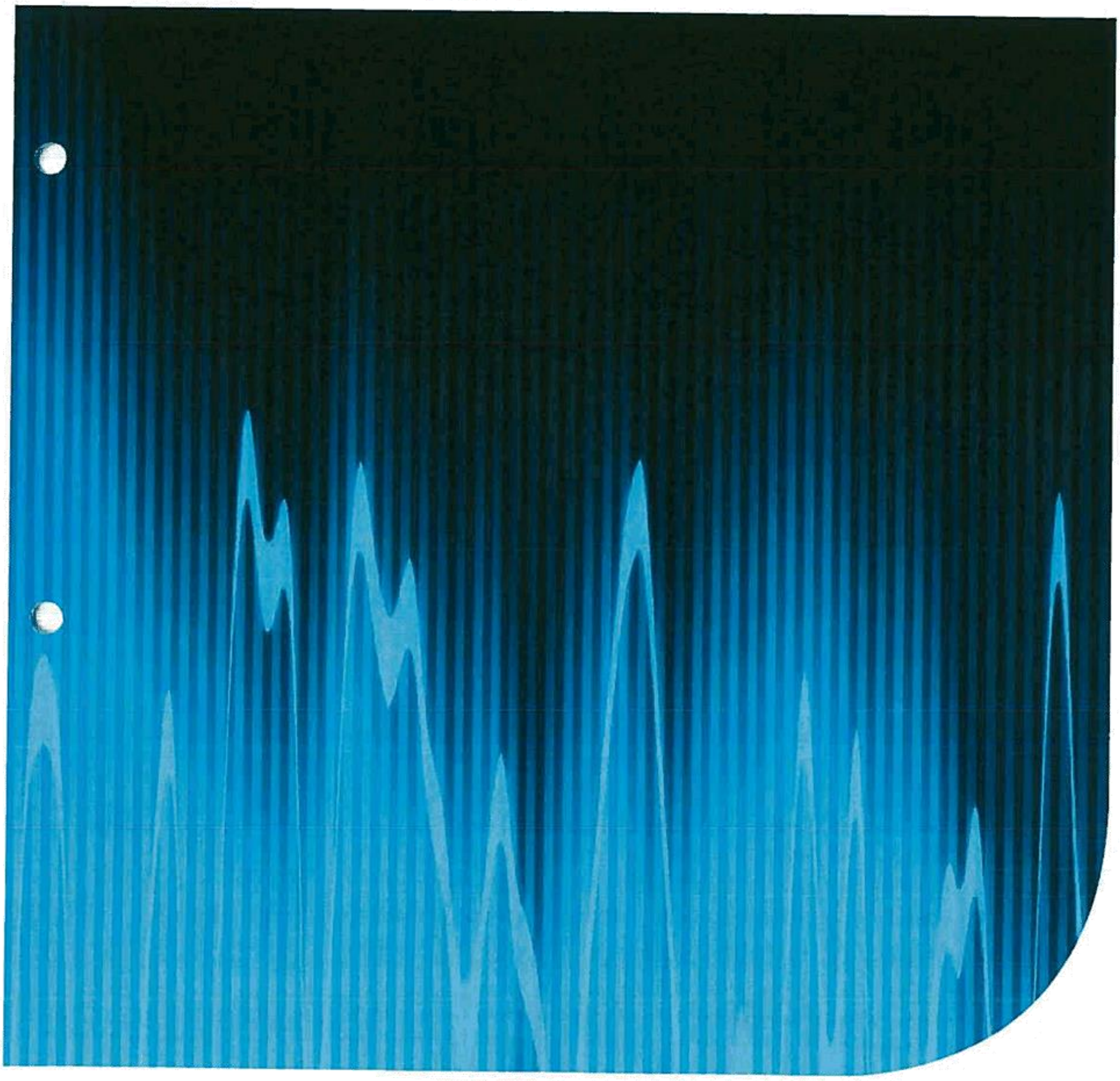
EMM

Noise Impact Assessment

Bombala Quarry

Proposed Modification

Prepared for Boral Resources (Country) Pty Ltd | 21 November 2018



EMM

Noise Impact Assessment

Bombala Quarry

Proposed Modification

Prepared for Boral Resources (Country) Pty Ltd | 21 November 2018

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Noise Impact Assessment

Draft Report

Report J17353RP1 | Prepared for Boral Resources (Country) Pty Ltd | 12 September 2018

Prepared by	**Lucas Adamson**	Approved by	**Najah Ishac**
Position	Acoustic Consultant	Position	Director
Signature		Signature	
Date	21 November 2018	Date	21 November 2018

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

Document Control

Version	Date	Prepared by	Reviewed by
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Appendices

Tables

Figures

1 Introduction

Boral Resources (Country) Pty Ltd (Boral) is seeking to modify Bombala Quarry's (the quarry) development consent to increase the maximum production volume to 200,000 tpa. The additional production would be achieved by running the in-pit mobile plant for a longer period of time within the approved hours of operation. Boral also propose to install a small asphalt pre-coat plant to produce products for regional road works.

The quarry is consented to extract and transport up to 100,000 tonnes per annum (tpa) of hard rock under the consent (DA 07/0013) issued by the then Bombala Council (now Snowy Monaro Regional Council) on 7 July 2008. Boral seeks to modify the consent to increase this limit by 100,000 tpa to a total of 200,000 tpa (the proposed modification).

The proposed modification includes no changes to:

- the current development footprint;
- the quarry consent area; or
- the quarry's operating hours.

EMM Consulting Pty Limited (EMM) has been commissioned by Boral Resources (Country) Pty Ltd (Boral) to prepare this noise assessment of the proposed modification. This noise assessment forms part of the statement of environmental effects (SEE) to accompany the application to modify the quarry's development consent.

This noise assessment has been prepared with reference to the following policies:

- NSW Environment Protection Authority (EPA) (2017) *NSW Noise Policy for Industry* (NPfI); and
- NSW Department of Environment, Climate Change and Water (DECCW) (2011) *NSW Road Noise Policy* (RNP).

A number of technical terms are required for the discussion of noise. These are explained in Appendix A.

2 Approved operations

Bombala Quarry is located approximately 6 km north-east of Bombala, 81 km south of Cooma and 504 km south west of Sydney. The main access to the quarry is via High Lake Road and the Monaro Highway. Bombala Quarry currently operates under Development Consent No. DA.07.0013 issued by the then Bombala Council (now Snowy Monaro Regional Council) on 7 July 2008.

The site covers approximately 42 ha and comprises two land parcels, legally identified as Lot 229 and Lot 230 of Deposited Plan 756819. The quarry footprint occupies part of Lot 230. A site layout is shown in Figure 2.1.

Bombala Quarry produces a range of products for commercial use, namely 4 mm dust to be used in concrete plants, 5 mm grit, 7 mm, 10 mm, 14 mm and 20 mm aggregate and unspecified 20 mm scalps which can be used as road base for the local market. The current approval is for a production rate of up to 100,000 tpa.

Bombala Quarry is currently approved to operate from 7:00 am to 5:00 pm Monday to Friday. The site also loads out material on Saturdays from 7:00 am to 12:00 pm. No operations or loading is allowed on Sundays and Public Holidays.

Source: EMM (2018); DFSI (2017); GA (2015)

0 100 200 m
GDA 1994 MGA Zone 55

KEY

- Study area
- Quarry boundary
- Site layout
  - Office
  - Pit entrance
  - Quarry pit
  - Stockpile area
  - Quarry access road
- Main road
- Local road
- Watercourse/drainage line
- Waterbody
- Cadastral boundary

Site layout

Bombala Quarry Modification
Noise impact assessment
Figure 2.1

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3 Existing environment

3.1 Assessment locations

The nearest representative noise sensitive receivers to the quarry are described in Table 3.1 and shown in Figure 3.1. They are all residential receivers and are referred to in this report as assessment locations.

Table 3.1 Assessment locations

ID	Description	Approximate distance from quarry[1] (km)	Easting	Northing
R1	High Lake Road –south-west of the quarry ('High Lake' in ERM 2006)	0.8	701916	5916427
R2	High Lake Road –south-west of the quarry ('Oxley' in ERM 2006)	0.6	701898	5916665
R3	Pipe Clay Springs Road –east-south-east of the quarry ('Inglewood' in ERM 2006)	1.2	703546	5916352
R4	Pipe Clay Springs Road –south-east of the quarry	1.1	703137	5916007
R5	High Lake Road – south-south-west of the quarry ('Gadara' in ERM 2006)	0.9	701908	5916166
R6	Pipe Clay Springs Road –east-south-east of the quarry	1.4	703635	5916010
R7	High Lake Road –west of the quarry	1.0	701438	5917030
R8	Crankies Plains Road – south of the quarry	1.5	702424	5915404
R9	Monaro Highway – north of the quarry	1.5	702645	5918456

Notes: 1. Approximate distance from the site's processing area.

3.2 Noise environment

Given the area and surrounding agricultural land uses, existing ambient noise levels at assessment locations are likely to be dominated by rural noise sources and road traffic. The rating background noise levels (RBLs) are expected to be low (35 dB or below for the daytime) and, therefore, the NPfI minimum RBLs of 35 dB and 30 dB have been adopted for this assessment for the daytime and evening/night-time periods respectively in accordance with the NPfI (EPA 2017).

This is consistent with the noise assessment prepared for the quarry by Environmental Resources Management Australia (ERM) in 2006, which identified that background noise levels at residential receivers surrounding the quarry were in the order of 30 to 35 dB and characteristic of a rural environment generally controlled by natural, agricultural and local traffic noise sources.

KEY

- Study area
- Assessment location (residence)
- Main road
- Local road
- Cadastral boundary

Assessment locations

Bombala Quarry Modification
Noise impact assessment
Figure 3.1

EMM
creating opportunities

3.3 Meteorology

3.3.1 Introduction

Noise propagation over distance can be significantly affected by the prevailing weather conditions. Of most interest are source to receiver winds, the presence of temperature inversions and drainage flow effects, as these conditions can enhance received noise levels. To account for these phenomena, the NPfI specifies the following two options in regard to meteorological analysis procedures to determine the prevalent weather conditions:

1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night; or

2. Determine the significance of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30% determined in accordance with the provisions in this policy. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for the assessment.

3.3.2 Prevailing winds

The NPfI recommends consideration of wind effects if they are "significant". The NPfI defines "significant" as the presence of source-to-receiver wind speed (measured at 10 m above ground level) of 3 m/s or less, occurring for 30% of the time in any assessment period and season.

This is further clarified by defining source-to-receiver wind direction as being the directional component of wind. The NPfI states that where wind is identified to be a significant feature of the area then assessment of noise impacts should consider the highest wind speed below 3 m/s, which is considered to prevail for at least 30% of the time.

A thorough review of the vector components of hourly wind data was undertaken for data obtained during 2013 to 2018 (five calendar years) from Boral's on-site meteorological station at the Bombala Quarry. No prevailing winds were identified during the daytime period as part of this review and, thus, have not been assessed further.

3.3.3 Temperature inversions

The NPfI states that the assessment of the impact of temperature inversions be confined to the night time noise assessment period where temperature inversions occur.

As the quarry does not operate during the night-time period, temperature inversions have not been assessed further.

3.3.4 Assessed meteorological conditions

Noise emission levels from operation of the quarry at all assessment locations have been calculated based on the meteorological parameters shown in Table 3.2.

Table 3.2 Weather conditions considered in noise modelling

Assessment Period	Meteorological condition	Air temperature	Relative humidity	Wind speed	Direction	Stability category
Day	Calm	20ºC	70%	0.5 m/s	All	D class

4 Noise criteria

4.1 Development Approval DA.07.0013 & EPL 12891

Condition 8 of DA.07.0013 and Condition L3.1 of EPL 12891 detail the site generated noise limits for the nearest affected receivers surrounding the site. Both the DA and EPL conditions reference the same noise limit table, which is reproduced as follows:

Noise from the premises must not exceed the noise limits presented in the table below:

Location	Daytime Quarry Operations, $L_{Aeq,15\ minute}$, dB	
	All equipment excluding 'campaign drilling operations'	During designated 'campaign drilling operations' periods as permitted by Condition L4*
'Oxley' during Operational Stages 1-7	40 dB(A)	42 dB(A)
'High Lake' during Operational Stages 1-7	37 dB(A)	39 dB(A)
Any other residence excluding 'Oxley' and 'High Lake' during Operational Stages 1-7	35 dB(A)	35 dB(A)
'Oxley' during Operational Stages 8-10	39 dB(A)	39 dB(A)
Any other residence excluding 'Oxley' during Operational Stages 8-10	35 dB(A)	35 dB(A)

Notes: **Incorrect reference in condition. Should refer to Condition L5.*

It is noted that these noise limits were determined by ERM (2006) using the *Industrial Noise Policy* (EPA 2000) which has since been replaced with the NPfI.

Condition L5 of EPL 12891 details the 'campaign drilling operations' referenced in condition L3.1. This condition is reproduced as follows:

L5 Other limit conditions

Drilling Campaigns

L5.1 Campaign drilling operations are permitted in up to 2 week campaigns with a maximum 2 campaigns permitted in each annual reporting period.

L5.2 For the purposes of this condition, 'drilling operations' includes any activity associated with drilling that generates noise that is audible outside of the premises, including engine running and mobilisation of equipment to the drill area.

L5.3 Campaign drilling operations may only take place between 7:00am to 5:00pm Monday to Friday, with no campaign drilling operations permitted on weekends or public holidays.

4.2 Noise Policy for Industry

Noise from industrial sites or processes in NSW are regulated by the local council, Department of Planning and Environment (DPE) and/or the EPA and usually have licence and/or development consent conditions stipulating noise limits. These limits are normally derived from operational noise levels applied at assessment locations. They are based on EPA guidelines (ie NPfI or the previous Industrial Noise Policy) or noise levels that can be achieved at a specific site following the application of all feasible and reasonable noise mitigation.

The NPfI guidelines for assessing existing industrial facilities have been used for this assessment. With respect to the industrial noise trigger levels, the guidelines state:

> The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community.

Regarding decisions on developments, the NPfI also states:

> Planning decisions for proposed developments take into account social, economic and environmental factors. Noise impact is one factor taken into account and decisions can be made that result in residual noise impacts.

The objectives of noise trigger levels for industry are to protect the community from excessive intrusive noise and preserve amenity for specific land uses. It should be noted that the audibility of a noise source does not necessarily equate to disturbance at an assessment location.

To ensure these objectives are met, the EPA provides two separate noise trigger levels: intrusiveness and amenity. The fundamental difference being intrusiveness noise levels apply over 15 minutes in any period (day, evening or night), whereas the amenity noise levels apply to the entire assessment period (day, evening or night).

4.2.1 Intrusiveness noise levels

The intrusiveness noise trigger levels require that $L_{Aeq,15\,minute}$ noise levels from the quarry during the relevant operational periods (ie day only) do not exceed the RBL by more than 5 dB.

By adopting the NPfI minimum background noise levels for all assessment locations, the intrusiveness noise trigger levels for all privately-owned assessment locations are, therefore, $L_{Aeq,15\,minute}$ 40 dB during the day period.

4.2.2 Amenity noise levels

The assessment of amenity is based on noise levels specific to the land use. The noise levels relate only to industrial noise and exclude road or rail noise. Where the measured existing industrial noise approaches recommended amenity noise levels, it needs to be demonstrated that noise levels from new industry will not contribute to existing industrial noise such that target amenity noise levels are exceeded.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level for new industrial developments is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB.

Residential assessment locations potentially affected by the quarry have been categorised in the NPfI rural amenity category. As per the definitions provided in the NPfI, residential assessment locations were classified as "rural" since they were deemed to be in "an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry".

The corresponding project amenity noise levels for the quarry are given in Table 4.1.

Table 4.1 Project amenity noise levels

Assessment location type	Indicative area	Assessment period[1]	Recommended amenity noise level, $L_{Aeq,period}$, dB
Residential	Rural	Day	45 (50 minus 5)

Note: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays

4.2.3 Project noise trigger level

The project-noise trigger level (PNTL) is the lower of the calculated intrusive or amenity noise level and is provided in Table 4.2 for all assessment locations.

To standardise the time periods for the intrusiveness and amenity noise levels, the NPfI assumes that the $L_{Aeq,15\ minute}$ will be taken to be equal to the $L_{Aeq,period}$ + 3 decibels (dB), unless robust evidence is provided for an alternative approach for the particular project being considered.

Table 4.2 Project noise trigger levels

Assessment location	Period[1]	Intrusive noise level, dB	Amenity noise level, dB	Project noise trigger level (PNTL), dB
Residential (R1-R9)	Day	40 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$

Note: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays

It is of note that, for the purposes of this assessment, the project noise trigger levels outlined in Table 4.2 have been derived in accordance with current industry standards (NSW NPfI) and should replace those currently referenced in the development consent and EPL.

4.3 Applying the NPfI to existing industrial premises

The NPfI also provides guidance on the policy's application to existing industrial premises such as the quarry. It states:

> Many existing industrial sources were designed for higher noise emission levels than the project noise trigger levels outlined in this policy. In other cases, industries may have been in existence before neighbouring noise-sensitive developments and even before noise-control legislation was introduced. The range of mitigation measures available for these sites can be limited or costly.

The NPfI states that project noise trigger levels should not be applied as mandatory noise limits. The project noise trigger level is the level used to assess noise impact and drive the process of assessing all feasible and reasonable control measures.

Where noise emissions from the site exceed the project noise trigger levels, the regulatory authorities and the noise-source manager will determine achievable noise limits for the site, taking into account matters that must be considered in accordance with the relevant legislation or process, including negotiation with proponents and discussion with stakeholders as required. For sites with limited mitigation measures available, the achievable noise limits can be above the project noise trigger levels.

Further, for the assessment of modifications to existing premises, the noise from the existing premises should be excluded from background noise measurements. The exception is where the premises has been operating for a significant period of time and is considered a normal part of the acoustic environment; it may be included in the background noise assessment under the following circumstances:

- the development must have been operating for a period in excess of 10 years in the assessment period/s being considered and is considered a normal part of the acoustic environment; and
- the development must be operating in accordance with noise limits and requirements imposed in a consent or licence and/or be applying best practice.

The existing emissions from the site have not been considered in establishing the background noise, a possibly conservative approach, otherwise this assessment has adopted the procedures outlined in the NPfI for existing industrial sites.

4.4 Road traffic noise

The principle guidance for assessing the impact of road traffic noise on receivers is in the EPA's RNP.

The proposed modification will include an increase in truck movements on the transport route. The site will be accessed from High Lake Road via the Monaro Highway, with the majority (65%) of vehicles heading to the north, towards Cooma, with the remaining vehicles (35%) heading to the south, towards Bombala.

The section of High Lake Road leading to the quarry has been classified as a local road, whilst the Monaro Highway has been classified as an arterial road. Table 4.3 presents the road noise assessment criteria for these road categories and are reproduced from Table 3 of the RNP.

Table 4.3 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria, dB	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Local roads (High Lake Rd)	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1\ hour}$ 55 (external)	$L_{Aeq,1\ hour}$ 50 (external)
Freeway/arterial/sub-arterial roads (Monaro Hwy)	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15\ hour}$ 60 (external)	$L_{Aeq,9\ hour}$ 55 (external)

The RNP states that where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB, after consideration of all feasible and reasonable noise mitigation and management measures.

In addition to meeting the assessment criteria, any significant increase in total traffic L_{Aeq} noise level at residences where existing road traffic noise is low or below the relevant assessment criteria (refer Table 4.3) must be considered. Residences likely to experience an increase in total traffic noise level above the criteria in Table 4.4 should be considered for mitigation. It should be noted that the relative increase criterion does not apply to local roads, as per Section 2.4 of the RNP.

Table 4.4 Relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase, dB	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/sub-arterial roads and transit ways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq,15\ hour}$+12 dB (external)	Existing traffic $L_{Aeq,9\ hour}$+12 dB (external)

4.5 Blasting

The limits adopted by the EPA for blasting are provided in the Australian and New Zealand Environment Council (ANZEC 1990) guidelines, *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*. The intent of the ANZEC criteria is to minimise annoyance and discomfort to persons at noise sensitive sites (eg residences, hospitals, schools etc.) caused by blasting.

The blasting limits address two main effects of blasting:

- airblast (overpressure); and
- ground vibration.

It is noted that airblast and ground vibration criteria exist for Bombala Quarry as specified in Condition L4 of EPL 12891. These are consistent with the ANZEC (1990) guidelines and are described in the following sections.

4.5.1 Airblast

The recommended maximum level for airblast is 115 dB linear peak. This level may be exceeded on up to 5% of the total number of blasts over 12 months. However, the level should not exceed 120 dB linear peak at any time. A summary of airblast limits is provided in Table 4.5.

Table 4.5 Airblast (overpressure)

Airblast level, dB (L_{peak})	Allowable exceedance
115	5% of the total number of blasts over 12 months
120	0%

4.5.2 Ground vibration

Peak particle velocity (PPV) from ground vibration should not exceed 5 mm/s for more than 5% of the total number of blasts over 12 months. Further, the maximum level should not exceed 10 mm/s at any time. A summary of ground vibration limits are provided in Table 4.8.

Table 4.6 Ground vibration limits

PPV (mm/s)	Allowable exceedance
5	5% of the total number of blasts over 12 months
10	0%

4.5.3 Timing and frequency of blasts

As per the site's EPL, blasting operations are permitted to occur between 9:00 am and 3:00 pm Monday to Friday, while the development consent (DA.07.0013) states that blasting operations are permitted to occur between 9:00 am and 5:00 pm Monday to Friday. The ANZEC guidelines state that blasting should generally be limited to the hours of 9:00 am to 5:00 pm Monday to Saturday and should not take place on Sundays or public holidays.

5 Noise assessment

5.1 Operational noise

5.1.1 Method overview

This section presents the methods and base parameters used to model and assess noise emissions from the proposal.

Quantitative modelling of operational noise was completed using the Brüel & Kjær Predictor noise prediction software. This software calculates total noise levels at receptors from the concurrent operation of multiple noise sources. The model incorporates factors such as:

- the lateral and vertical location of plant and equipment;
- source-to-receptor distances;
- ground effects;
- atmospheric absorption;
- topography; and
- meteorological conditions.

Three-dimensional digitised ground contours of the quarry and surrounding land were incorporated to model topographic effects. Equipment was modelled at locations and heights representative of potential operating scenarios for the proposal.

The model was used to predict noise levels at each of the assessment locations identified in Table 3.1 and shown in Figure 3.1. The modelling results were then compared against the relevant noise levels described in Chapter 4 to determine potential impacts.

5.1.2 Acoustically significant plant and equipment

Noise sources considered for the operations at the quarry include typical mobile plant and equipment, and road trucks for product transportation. Sound power levels for the noise sources considered in this assessment were provided by the proponent. The data was obtained from a survey in June 2018 at an existing quarry having plant likely to be used at this quarry. Operational noise sources are shown in Table 5.1. The only additional noise sources are the increased road truck movements transporting product in and out of site and the proposed pre-coat plant. Importantly, the approved quarry operated relatively noisier and older plant as evident in the sound power data adopted in the ERM 2006 assessment. The expectation therefore is that the proposed operations will result in a significant improvement on the approved quarry emissions. Refer to Figure 3.1 for an indicative site layout.

Table 5.1 Operational noise source sound power levels

Noise source Model)	L_{Aeq} sound power level per unit, dB	Quantity[1]			
		Approved operations		Proposed operations	
		Typical	Campaign	Typical	Campaign
Jaw crusher	106	1	1	1	1
Screen (Powerscreen 1400T)	104	1	1	1	1
Screen (Powerscreen 2100)	104	1	1	1	1
Screen (Finlay 891)	107	1	1	1	1
Cone crusher	110	1	1	1	1
Gen-set	83	1	1	1	1
Excavator (Volvo EX22)	100	1	1	1	1
Excavator (Volvo EX33)	110	1	1	1	1
Haul Truck	102	1	1	1	1
Front End Loader (FEL)	99	1	1	1	1
Pre-coat plant	99[2]	0	0	1	1
Transport truck (Driving)	103	1	1	2	2
Transport truck (Idling)	97				
Drill	114[3]	0	1	0	1
Forklift	85	1	1	1	1
Pressure Washer	92	1	1	1	1
Fuel Truck	94	1	1	1	1

Notes: *1. Within any 15-minute period.*

2. Sourced from "Lynwood Quarry minor modification – Noise Impact Assessment" prepared by Heggies Pty Limited dated 1 September 2010.

3. Sourced from the EMM sound power level database for similar equipment.

5.1.3 Operating assumptions

In addition to the sound power levels and quantities provided in Table 5.1, main operating assumptions adopted for the purpose of modelling noise emissions are as follows:

- all plant (excluding haul truck and transport trucks) was conservatively assumed to operate continuously in any 15 minute period;
- haul trucks and transport trucks were assumed to be driving on the site for 3 minutes and idling for 12 minutes in any 15 minute period; and
- all onsite vehicle movements are 20 km/hr or less.

5.2 Operational noise modelling results

Noise level predictions have been generated for proposed quarry operations under calm meteorological conditions. The modelling results for noise emissions from the proposal are provided in Table 5.2 for both "typical operations" and "campaign operations" which consists of typical operations plus drilling. Exceedances have been bolded and highlighted in grey.

Table 5.2 Predicted operational noise levels

Location	Receiver type	Period[1]	Predicted noise level, dB		Project noise trigger level (PNTL), dB
			Typical operations	Campaign operations	
R1	Residential	Day	35 $L_{Aeq,15\ minute}$	38 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R2	Residential	Day	40 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R3	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R4	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R5	Residential	Day	<35 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R6	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R7	Residential	Day	37 $L_{Aeq,15\ minute}$	39 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R8	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R9	Residential	Day	<35 $L_{Aeq,15\ minute}$	<35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays

Results of noise modelling demonstrate that, under normal operations, noise levels are predicted to be satisfy the relevant NPfI noise trigger levels at all assessment locations. During campaign operations, noise levels are predicted to satisfy the relevant NPfI noise trigger levels at most assessment locations. The exception is assessment location R2, with noise levels predicted to be up to 2 dB above the relevant NPfI noise trigger level.

This exceedance can be attributed to operation of the drilling rig being operated in addition to typical operations plant. As per the NPfI, a noise level of, or less than, 2 dB above the relevant project noise trigger level is deemed to be a minor exceedance. Further, and as discussed in Appendix A, a 1–2 dB change in noise levels is deemed 'typically indiscernible' to the human ear. Thus, changes of 1–2 dB are unlikely to be perceivable to nearby residences.

It is noted that the existing noise limits for R2 in the consent and EPL is 42dB during campaign operations. Given this, and the NPfI approach to 'existing operations', it is reasonable to maintain this noise limit for this receiver location.

With these factors taken into account, it is unlikely that project noise emissions would cause adverse impacts at any assessment locations.

5.3 Road traffic noise

5.3.1 Site related traffic

The proposed modification will include an increase in road truck movements on transportation routes. Other traffic movements generated by the quarry, including movements from the workforce, will not change as a result of the proposed modification.

Current and proposed average and maximum daily road truck movements generated by the quarry are summarised in Table 5.3. Site generated road trucks travel via the Monaro Highway, north or south from the High Lake Road intersection.

Table 5.3 Site road trucks

Operation	Extraction scenario	Daily road trucks	
		Loads	Movements
Current	Average	15	30
	Maximum	40	80
Proposed	Average	31	62
	Maximum	80	160

It is expected that the majority (approximately 65%) of quarry product will be transported to the north on the Monaro Highway (towards Cooma/Jindabyne), with the remainder (approximately 35%) travelling to the south on the Monaro Highway (towards Bombala/Pambula).

It should be noted that these daily traffic movements do not include site employee traffic movements which would normally occur independently of the road truck traffic, either earlier or later, at the beginning and the end of each working day.

5.3.2 Existing traffic movements

Existing traffic volumes on High Lake Road and the Monaro Highway were referenced from the report *Bombala Quarry – Traffic Impact Assessment* prepared by EMM to accompany the SEE. The traffic report provides existing traffic volumes based on two three-hour intersection traffic surveys completed by EMM at the quarry access intersection on 4 and 5 July 2018.

The existing daily traffic volumes for High Lake Road and the Monaro Highway, sourced from EMM's traffic report are shown in Table 5.4. These volumes were estimated based on the July 2018 peak hourly traffic counts at the High Lake Road/Monaro Highway intersection, and hence were adopted for the calculation of existing road traffic noise.

Table 5.4 Summary of existing daily traffic volumes

Road	Location	Existing average daily traffic[1] (inc. Boral)	Existing average daily heavy vehicles[1] (inc. Boral)	Percentage of heavy vehicles[1]
Monaro Highway	North (towards Cooma)	1,067	176	16%
Monaro Highway	South (towards Bombala)	1,051	166	16%
High Lake Road	North of site access	50	32	64%

Notes: 1. Existing daily vehicle numbers have been sourced from the EMM's traffic report. Boral trucks were not represented in these counts and have been subsequently added.

2. For the purposes of this assessment, existing traffic volumes are assumed to be 90% during the day period and 10% during the night-time period.

5.3.3 Assessment

On High Lake Road, north of the site access, the nearest residential facades (roadside) that could be affected by an increase in road traffic noise are set back approximately 220 m (or greater) from the road in the 50 km/h speed zone.

To the north on the Monaro Highway (towards Cooma), the nearest residential facades (roadside) that could be affected by an increase in road traffic noise are set back approximately 15 m and 20 m (or greater) from the road in the 60 km/h and 100 km/h speed zones, respectively.

To the south on the Monaro Highway (towards Bombala), the nearest residential facades (roadside) that could be affected by an increase in road traffic noise are set back approximately 15 m (or greater) from the road in a 60 km/h speed zone.

Results of the road traffic noise assessment are summarised in Table 5.4.

Table 5.5 Existing and future road traffic noise

Extraction scenario	Road section	Distance[1] (m)	Speed (km/h)	Road traffic noise level, dB			Criterion, dB	Change, dB
				Existing (inc. Boral)	Proposed	Future[2]		
Average	High Lake Rd	≥220	50	42 $L_{Aeq,1\ hour}$	34 $L_{Aeq,1\ hour}$	43 $L_{Aeq,1\ hour}$	55 $L_{Aeq,1\ hour}$	0.6
	Monaro Hwy (North)	≥15	60	54 $L_{Aeq,15\ hour}$	46 $L_{Aeq,15\ hour}$	54 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	0.6
		≥20	100	55 $L_{Aeq,15\ hour}$	47 $L_{Aeq,15\ hour}$	56 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	0.5
	Monaro Hwy (South)	≥15	60	54 $L_{Aeq,15\ hour}$	44 $L_{Aeq,15\ hour}$	54 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	0.4
Maximum	High Lake Rd	≥220	50	42 $L_{Aeq,1\ hour}$	38 $L_{Aeq,1\ hour}$	44 $L_{Aeq,1\ hour}$	55 $L_{Aeq,1\ hour}$	1.4
	Monaro Hwy (North)	≥15	60	54 $L_{Aeq,15\ hour}$	50 $L_{Aeq,15\ hour}$	55 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	1.5
		≥20	100	55 $L_{Aeq,15\ hour}$	51 $L_{Aeq,15\ hour}$	57 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	1.2
	Monaro Hwy (South)	≥15	60	54 $L_{Aeq,15\ hour}$	48 $L_{Aeq,15\ hour}$	55 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	1.0

Notes: 1. Distance from the relevant road to the nearest residential facade found within the relevant speed zone.
2. Existing noise levels + proposed site-generated noise levels

The results show that road traffic noise levels satisfy the relevant RNP noise requirements at all assessment locations on High Lake Road and the Monaro Highway (north and south of the High Lake Road intersection). Road traffic noise levels generated by the proposed site movements are predicted to marginally increase (by up to 1 dB) the current average road traffic noise levels. Therefore, road traffic noise impacts associated with the modification are unlikely at all residential receivers.

6 Blasting assessment

The proposed modification does not increase the approved disturbance area. Hence, impacts will not be materially different when considering off-site noise and vibration from blasting. Nonetheless, potential blasting impacts have been considered for the extremities of quarry blasting.

The minimum distance between the pit boundary and the nearest residences has been determined based on current site drawings provided by Boral and are presented in Table 6.1.

Table 6.1 Blast locations

ID	Location	Minimum blast separation distance (m)
R1	High Lake Road –south-west of the quarry	600
R2	High Lake Road –south-west of the quarry	490
R3	Pipe Clay Springs Road –east-south-east of the quarry	1,050
R4	Pipe Clay Springs Road –south-east of the quarry	1,000
R5	High Lake Road – south-south-west of the quarry	790
R6	Pipe Clay Springs Road –east-south-east of the quarry	1,330
R7	High Lake Road –west of the quarry	920
R8	Crankies Plains Road – south of the quarry	1,380
R9	Monaro Highway – north of the quarry	1,420

Drilling and blasting operations are expected to occur approximately six times per year.

As per the site's EPL, blasting operations are permitted to occur between 9:00 am and 3:00 pm Monday to Friday, while the site's DA states that blasting operations are permitted to occur between 9:00 am and 5:00 pm Monday to Friday. The ANZEC guidelines state that blasting should generally be limited to the hours of 9:00 am to 5:00 pm Monday to Saturday and should not take place on Sundays or public holidays.

Drilling operations would precede blasting events and are permitted to take place between 7:00 am to 5:00 pm Monday to Friday, with no campaign drilling operations permitted on weekends or public holidays.

The blast design will be actively managed by the operator. Hence, corresponding airblast level and ground vibration will be minimised. Blast management procedures will be implemented to ensure appropriate charge masses are used for blasting.

Given the lack of available recorded data for the subject site (one sample was available), blast emission monitoring data captured at Boral's existing Dunmore Quarry operations were supplied to EMM for analysis. This data is considered appropriate for estimating likely emissions from the Bombala Quarry. The data sourced from Dunmore hard rock quarry included blast ID information, maximum instantaneous charge (MIC) and measured vibration and airblast levels at a number of monitoring locations. Blast results between January 2005 and October 2018 were used to develop prediction laws for ground vibration and airblast for this assessment. A total of 175 samples were provided for analysis and include measurements at distances of 365m to 1200m.

Relationships between the level of blast emissions and scaled distances have been developed based on the measured data (refer Figures 5.2 and 5.3). This approach is considered more representative than using empirical formulae such as that found in the Imperial Chemical Industries (ICI) Explosives Blasting Guide (ICI Technical Services 1995). Furthermore, the formulae developed below result in comparable outcomes to the ICI formulae.

The scaled distance is determined from the following equation:

$$SD = \frac{D}{\sqrt[3]{MIC}}$$

Where *D* is the distance between the monitoring location and the blast site and *MIC* is the maximum explosive charge mass (kg) detonated in an eight-millisecond interval.

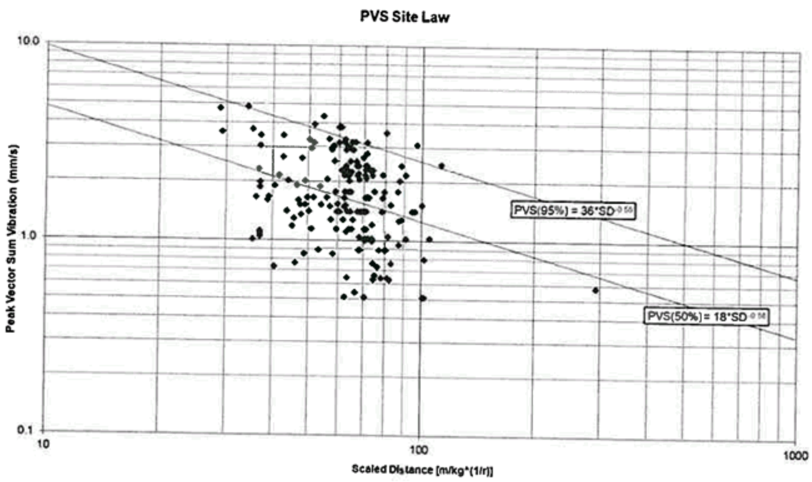


Figure 6.1 Ground vibration monitoring data and site law

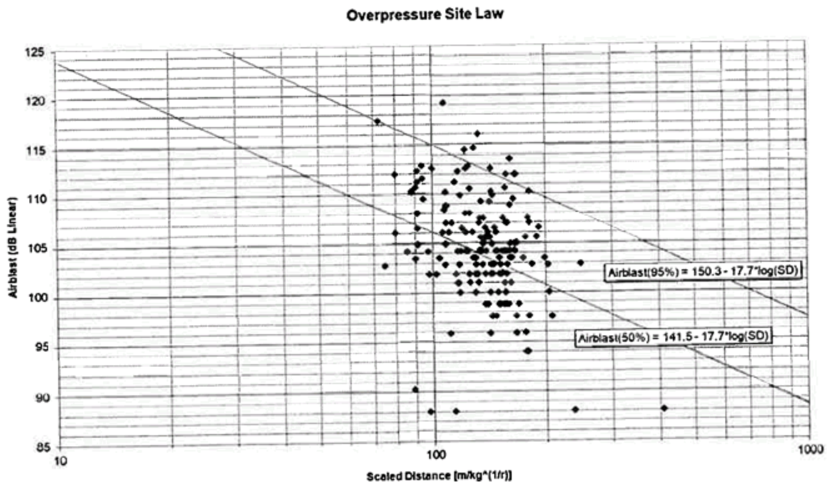


Figure 6.2 **Airblast monitoring data and site law**

The laws for ground vibration and airblast emissions have been calculated to be:

$$PVS(95\%) = 36SD^{-0.58}$$

$$Airblast(95\%) = 150.3 - 17.7 \log SD$$

Where *PVS(95%)* and *Airblast(95%)* are the levels of ground vibration (peak vector sum, mm/s) and airblast level (dB Linear peak), respectively, below which 95% of the total population of data points reside, assuming that the population has the same statistical distribution as the underlying measured sample.

The purpose of this assessment was to determine the limiting factors to the blast design for the modification with the aim of achieving the relevant criteria outlined in Section 4.5. Calculations were conducted using the respective blast emissions site law equations developed based on measured data, in order to determine the allowable MICs and the resulting potential impacts at surrounding sensitive receptors. Note that site specific conditions will alter these results somewhat and hence all blasts will be monitored to provide inputs that will be used to improve such predictions over time.

Table 6.2 contains the results of the allowable MIC calculations based on the laws developed for ground vibration and airblast predictions.

Table 6.2 **Ground vibration and airblast results**

Assessment location	Airblast criteria (dB(L)peak)	Ground vibration criteria PPV (mm/s)	Approx. distance to potential blasting (m)	Limiting MIC (kg) based on	
				Vibration	Airblast
R1	≤115	≤5	600	398	272
R2	≤115	≤5	490	266	148
R3	≤115	≤5	1,050	1219	1457
R4	≤115	≤5	1,000	1106	1259

Table 6.2 Ground vibration and airblast results

Assessment location	Airblast criteria (dB(L)peak)	Ground vibration criteria PPV (mm/s)	Approx. distance to potential blasting (m)	Limiting MIC (kg) based on	
				Vibration	Airblast
R5	≤115	≤5	790	690	621
R6	≤115	≤5	1,330	1956	2962
R7	≤115	≤5	920	936	980
R8	≤115	≤5	1,380	2106	3309
R9	≤115	≤5	1,420	2230	3605

Data from a single blasting event at the Bombala quarry in March 2010 was available and provided for comparison. This facilitated a limited 'check' against the derived formulae. At a distance of 600 m and with a MIC of 301 kg, the measured peak overpressure reading was 114.8 dB(L) and the peak particle velocity was 0.81 mm/s. Using the developed formulae, the same inputs (301 kg at 600 m) result in a peak overpressure reading of 115.8 dB(L) and a peak particle velocity of 4.61 mm/s. The airblast result, although conservative, correlates well with the data provided. The measured vibration results do not correlate as well, with the formula providing a highly conservative result compared to the measured value. However, the airblast is of higher relative importance to the assessment as it is shown to be the limiting factor at the nearest assessment locations, which is often the case with blasting.

Blast monitoring should continue to be undertaken for all blast events at the nearest residential location. This will provide the opportunity to refine the equations for predicting airblast and vibration from blasting at the quarry. It is recommended that blast monitoring is continued for the life of the project and that the quarry operator actively manages and monitors blast overpressure and ground vibration in accordance with current best practice.

7 Conclusion

EMM has completed a noise impact assessment for the proposed increase in production at Boral's Bombala Quarry, NSW. Boral proposes to modify the existing development consent to increase the maximum production volume to 200,000 tpa and install a relatively small asphalt pre-coat plant.

Operational noise levels were assessed for the daytime period in accordance with contemporary practice. The assessment found that, under normal operations, noise levels are predicted to satisfy the relevant NPfI noise trigger levels at all assessment locations. During campaign operations, that includes drilling, noise levels are predicted to satisfy the relevant NPfI noise trigger levels at most assessment locations and are predicted to be up to 2 dB above the relevant NPfI noise trigger level at assessment location R2. However, 2 dB is considered a minor exceedance and predictions satisfy the site's existing consent condition and EPL limit for R2. Hence, it is unlikely that project noise emissions would cause adverse impacts at any assessment locations.

Road traffic noise impacts from truck movements along High Lake Road and the Monaro Highway (north and south of the High Lake Road intersection) have been assessed. The assessment demonstrated that noise levels from the additional truck movements will satisfy the relevant RNP criteria. Therefore, road traffic noise impacts associated with the proposed modification are considered unlikely at the nearest residential receivers.

Noise and vibration emitted from blasting is predicted to comply with relevant airblast and vibration criteria by limiting the maximum instantaneous charge in each blast or by adopting conventional blast design practices. Monitoring of blast events is recommended to continue to check compliance with airblast and vibration criteria.

References

Australian and New Zealand Environment Council (ANZEC) 1990; *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*

Environmental Resources Management Australia (ERM) 2006, *Bombala Quarry Expansion - Noise Impact Assessment*.

Heggies Pty Ltd (Heggies) 2010, *Lynwood Quarry Minor Modification - Noise Impact Assessment*.

Imperial Chemical Industries (ICI) 1995, *Explosives Blasting Guide*

NSW Department of Environment, Climate Change and Water (DECCW) 2011, *NSW Road Noise Policy*.

NSW Environment Protection Authority (EPA) 2017, *NSW Industrial Noise Policy*.

NSW Environment Protection Authority (EPA) 2017, *NSW Noise Policy for Industry*.

Appendix A

Glossary of acoustic terms

A.1 Glossary of acoustic terms

A number of technical terms are required for the discussion of noise. These are explained in Table A1.

Table A.1 Glossary of acoustic terms

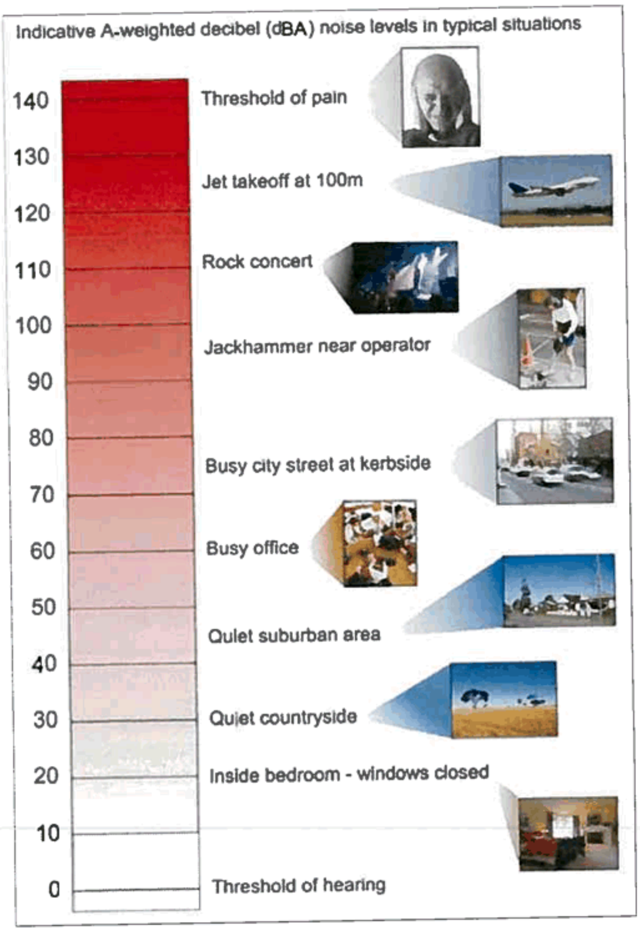
Term	Description
dB	Noise is measured in units called decibels (dB).
A-weighting	There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
ANZEC	Australian and New Zealand Environment Council
L_{A1}	The A-weighted noise level exceeded for 1% of a measurement period.
L_{A10}	The A-weighted noise level which is exceeded 10% of the time. It is approximately equivalent to the average of maximum noise levels.
L_{A90}	Commonly referred to as the background noise, this is the A-weighted level exceeded 90% of the time.
L_{Aeq}	The A-weighted energy average noise from a source, and is the equivalent continuous sound pressure level over a given period. The $L_{Aeq,15min}$ descriptor refers to an L_{Aeq} noise level measured over a 15-minute period.
L_{Amax}	The maximum root mean squared A-weighted sound pressure level received at the microphone during a measuring interval.
L_{peak}	The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.
RBL	The Rating Background Level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period (as defined in the INP).
Sound power level	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.
Vibration	A motion that can be measured in terms of its displacement, velocity or acceleration. The common unit for velocity is millimetres per second (mm/s).

It is useful to have an appreciation of decibels (dB), the unit of noise measurement. Table A2 gives an indication as to what an average person perceives about changes in noise levels:

Table A.2 Perceived change in noise

Change in sound level (dB)	Perceived change in noise
1 to 2	typically indiscernible
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times (or quarter) as loud

Examples of common noise levels are provided in Figure A.1.



Source: *Road Noise Policy (DECCW 2011).*

Figure A.1 **Common noise levels**

SYDNEY
Ground floor, Suite 01, 20 Chandos Street
St Leonards, New South Wales, 2065
T 02 9493 9500 F 02 9493 9599

NEWCASTLE
Level 1, Suite 6, 146 Hunter Street
Newcastle, New South Wales, 2300
T 02 4907 4800 F 02 4907 4899

BRISBANE
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Appendix B

Air Quality Impact Assessment

Intended for
EMM Consulting Pty Ltd

Document type
Report

Date
September 2018

AIR QUALITY IMPACT ASSESSMENT
BOMBALA QUARRY MODIFICATION

RAMBØLL

AIR QUALITY IMPACT ASSESSMENT
BOMBALA QUARRY MODIFICATION

Revision	Date	Made by	Checked by	Approved by	Signed
Final	05/09/2018	S Fishwick	R. Kellaghan	S Fishwick	

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APPENDICES

EXECUTIVE SUMMARY

Ramboll Australia Pty Ltd was commissioned by EMM Consulting Pty Ltd on behalf of Boral Resources (Country) Pty Ltd to conduct an air quality impact assessment for the proposed modification to the Bombala Quarry (the quarry).

Existing environment conditions were quantified using the Bureau of Meteorology monitoring resources in Bombala and the ACT Environment Protection Authority air quality monitoring stations.

The assessment focused on emissions and impacts of particulate matter less than 10 microns in aerodynamic equivalent diameter (PM_{10}). Based on Ramboll's experience with similar sized hard rock quarry operations, the most relevant pollutant with regards to potential adverse impacts and criteria compliance is PM_{10}.

Emissions of PM_{10} associated with the proposed modified operations of the quarry were quantified using publicly available emission estimation techniques. Atmospheric dispersion modelling predictions of air pollution emissions for proposed activities were undertaken using the AERMOD dispersion model.

Dispersion modelling predicts that the quarry will meet the applicable PM_{10} impact assessment criteria at any of the surrounding assessment locations.

Based on Ramboll's experience with similar low risk operations, if compliance for PM_{10} is predicted, compliance can be inferred for TSP, $PM_{2.5}$ and dust deposition, based on established ratios for different particle size fractions. The relatively minor incremental increase in predicted PM_{10} (i.e. 1% of the annual criterion) indicates that the risk for the proposed modification is low.

1. INTRODUCTION

Boral Resources (Country) Pty Ltd (Boral) is seeking to modify Bombala Quarry's (the quarry) development consent (DA 07/0013) to increase the maximum production volume. The quarry currently operates under Development Consent No. DA.07.0013 issued by the then Bombala Council (now Snowy Monaro Regional Council) on 7 July 2008.

The quarry is located approximately 6 km north-east of Bombala, 81 km south of Cooma and 504 km south west of Sydney. The main access to the quarry is via High Lake Road and the Monaro Highway. The site is approximately 42 ha and comprises two land parcels, identified as Lot 229 and Lot 230 of Deposited Plan 756819. The quarry footprint occupies part of Lot 230. The layout of the quarry is illustrated in **Figure 1-1**.

The quarry produces a range of products for commercial use, namely 4 mm dust to be used in concrete plants, 5 mm grit, 7 mm, 10 mm, 14 mm and 20 mm aggregate and unspecified 20 mm scalps which can be used as road base for the local market. The quarry is consented to extract and transport up to 100,000 tonnes per annum (tpa) of hard rock under the consent (DA 07/0013).

The quarry is approved to operate from 7:00 am to 5:00 pm Monday to Friday and can also load out material on Saturdays from 7:00 am to 12:00 pm. No operations or loading is allowed on Sundays and Public Holidays.

Boral is seeking to modify the consent to increase the production limit by 100,000 tpa to a total of 200,000 tpa (the proposed modification). The additional production would be achieved by running the in-pit mobile plant for a longer period of time within the approved hours of operation. Boral is also proposing to install a small asphalt pre-coat plant to produce products for regional road works.

The proposed modification includes no changes to:

- the current development footprint;
- the quarry consent area; or
- the quarry's operating hours.

Ramboll Australia Pty Ltd (Ramboll) has been engaged by EMM Consulting Pty Limited (EMM) on behalf of Boral to prepare this air quality impact assessment of the proposed modification. This air quality impact assessment forms part of the statement of environmental effects (SEE) to accompany the application to modify the quarry's development consent.

This air quality impact assessment will cover the following aspects:

- characterisation of the existing environment, specifically the existing air quality, prevailing meteorology and regulatory context;
- review and quantification of potential emission sources associated with the quarry and applicable mitigation measures; and
- a quantitative assessment of likely impacts from the quarry using atmospheric dispersion modelling. The assessment will focus on emissions and impacts of particulate matter less than 10 microns in aerodynamic equivalent diameter (PM_{10}).

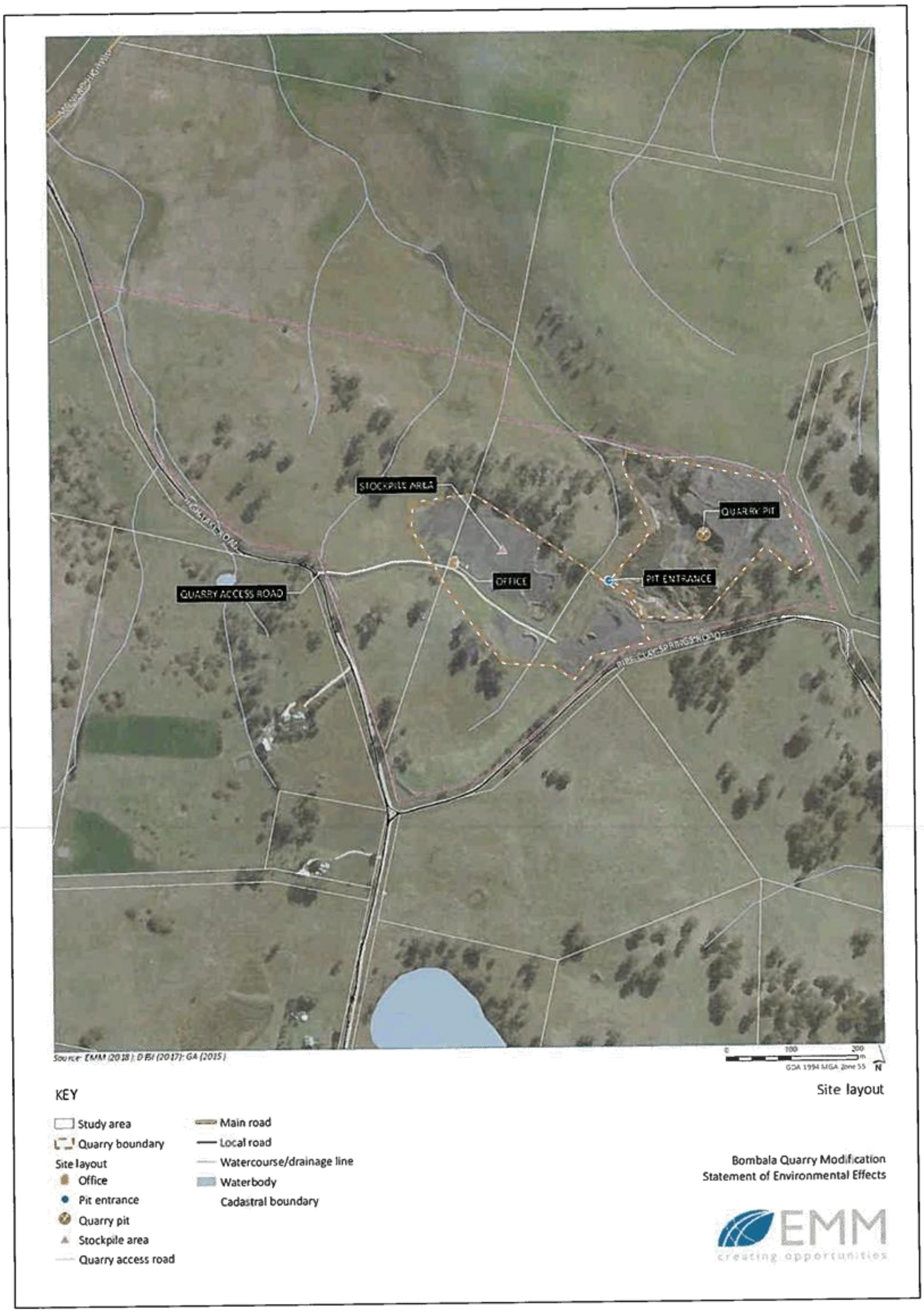


Figure 1-1: Layout of the quarry site

Source: EMM (2018)

2. PROJECT SETTING

2.1 Land use and topography

The quarry is located in a largely rural environment surrounded by scattered rural-residential properties surrounded by largely cleared agricultural land. The town of Bombala is located approximately 10km to the southwest of the quarry.

The area surrounding the quarry features rolling terrain. The quarry site is located at an elevation of between 790m AHD at the western boundary and 840m AHD at the southern and eastern boundaries. The elevation beyond the site boundary decreases to 720m AHD to the northwest towards the Bombala River and Shoemakers Creek and to 700m AHD to the south towards the Coolumbooka River. A three-dimensional representation of the local topographic features is illustrated in **Figure 2-1**. A vertical exaggeration of two has been applied to assist with the visualisation of terrain features.

2.2 Nearest residences

The quarry is located in the vicinity of several scattered rural-residential properties. The closest receptors to the quarry have been identified and selected as assessment locations for this report, with relevant details listed within **Table 2-1**. **Figure 2-2** illustrates the location of these sensitive receptor locations relative to the quarry.

Table 2-1: Details of surrounding receptor locations

Receptor ID	Location (m, MGA55S)		Elevation (m, AHD)
	Easting	Northing	
R1	701916	5916427	853
R2	701872	5916661	844
R3	703546	5916352	794
R4	703137	5916007	781
R5	701908	5916166	857
R6	703635	5916010	791
R7	701438	5917031	831
R8	702424	5915405	794
R9	702640	5918450	788

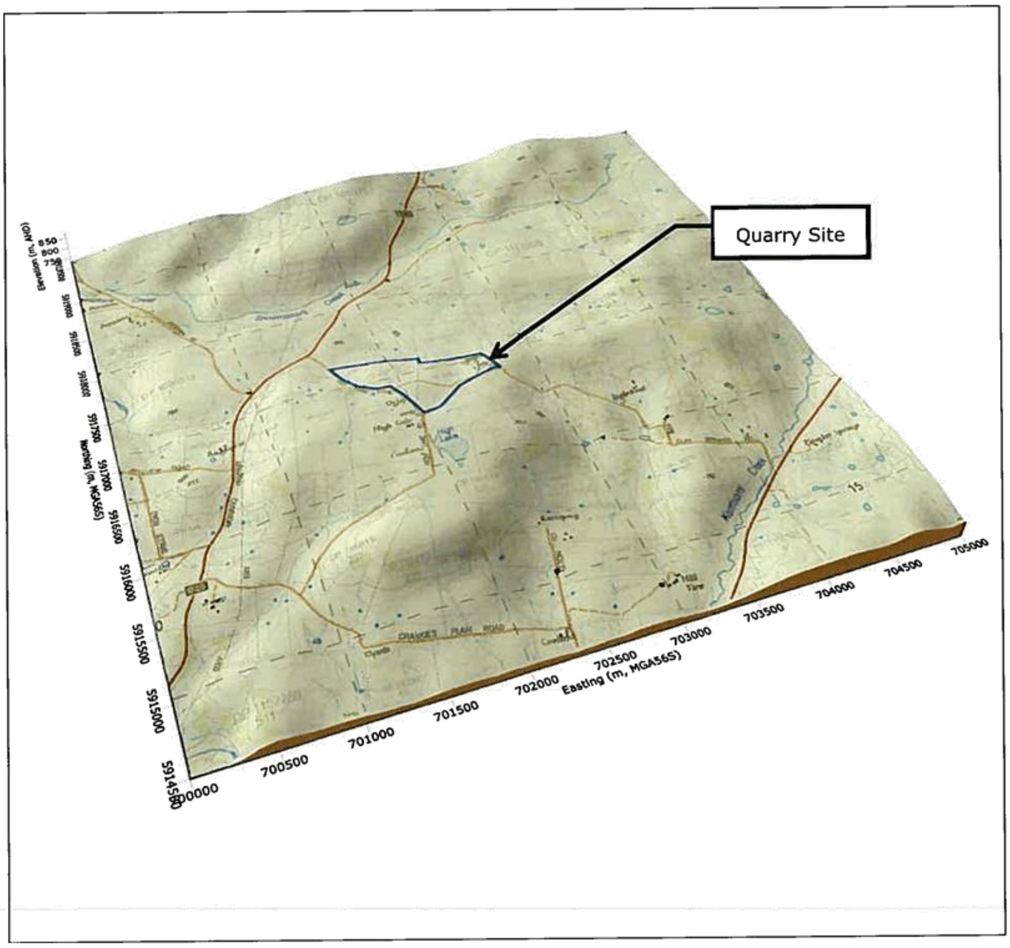


Figure 2-1: Local topographic features – quarry site

Note: Vertical exaggeration of 2 applied

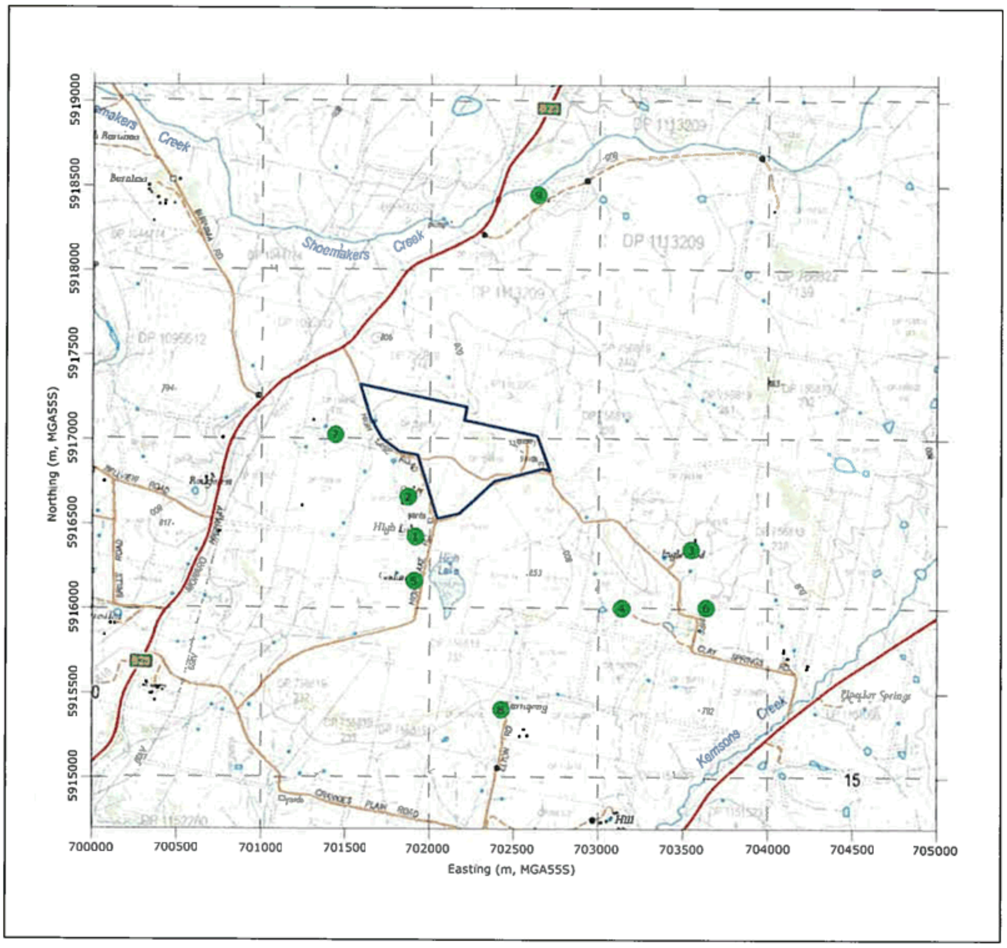


Figure 2-2: Surrounding receptor locations

3. AIR QUALITY ASSESSMENT CRITERIA

The quarry must demonstrate compliance with the impact assessment criteria outlined in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* ("the Approved Methods for Modelling", EPA 2016). The impact assessment criteria are designed to maintain ambient air quality that allows for the adequate protection of human health and well-being.

Particulate matter pollutants, specifically total suspended particulate matter (TSP), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}) and particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), are the primary pollutants from hard rock extractive operations like the quarry.

The NSW EPA's impact assessment criteria for particulate matter concentrations are presented in **Table 3-1**.

Table 3-1: Impact assessment criteria for particular matter

PM metric	Averaging period	Concentration (µg/m³)
TSP	Annual	90
PM_{10}	24 hour	50
	Annual	25
$PM_{2.5}$	24 hour	25
	Annual	8

Additionally, the NSW EPA (2016) establishes impact assessment criteria for dust deposition, summarised in **Table 3-2**. Total dust deposition rates at residential receptors in excess of 4g/m²/month are generally considered to indicate that nuisance dust impacts may occur. Dust deposition impacts are derived from particle deposition calculations in the dispersion modelling process and are derived from TSP emission rates.

Table 3-2: Impact assessment criteria for nuisance dust

Pollutant	Maximum Increase in Dust Deposition	Maximum Total Dust Deposition Level
Deposited dust	2 g/m²/month	4 g/m²/month

For this air quality impact assessment, focus is given to the quantification of emissions and impacts related to PM_{10}. Based on Ramboll's experience with similar sized hard rock quarry operations, the most relevant pollutant with regards to potential adverse impacts and criteria compliance is PM_{10}.

The impact assessment criteria for PM_{10} are applicable to cumulative air pollutant concentrations. Consequently, this assessment will look at both the quarry-only incremental concentrations and the combination of quarry-only increments with ambient background concentrations.

Annual PM_{10} emissions from the quarry were quantified in this assessment using published PM_{10} emission factors, see **Section 6** for further details. The adopted PM_{10} emission factors also have corresponding emission factors for TSP and $PM_{2.5}$.

The PM_{10} emission factors adopted for the assessment of the quarry are on average 44% of the corresponding TSP emission factors, while the corresponding $PM_{2.5}$ emission factors are on average 20% of adopted PM_{10} emission factors. For low risk projects, impacts for other size fractions can be inferred based on these relationships, and the following screening level conclusions are made in relation to impacts from TSP, $PM_{2.5}$ and dust deposition from quarry operations:

- Assuming a PM_{10}/TSP relationship of 0.44, compliance with the annual average TSP criterion of 90µg/m^3 will be achieved if predicted cumulative annual average PM_{10} concentrations from the quarry are below the criterion of 25µg/m^3;
- Assuming a $PM_{2.5}$/PM_{10} relationship of 0.2, compliance with the 24-hour average and annual average $PM_{2.5}$ criteria (25µg/m^3 and 8µg/m^3 respectively) will be achieved if predicted 24-hour average and annual average PM_{10} concentrations from the quarry are below the criteria of 50µg/m^3 and 25µg/m^3; and
- Dust deposition levels are derived from TSP emissions. From Ramboll's experience in dispersion modelling for extractive industries, dust deposition criteria are satisfied when compliance with TSP impact assessment criterion is achieved. Therefore, if the TSP concentrations are excepted to comply based on the screening analysis described above, dust deposition impacts from the quarry are also assumed to comply with applicable criteria.

4. CLIMATE AND DISPERSION METEOROLOGY

Meteorological mechanisms govern the generation, dispersion, transformation and eventual removal of pollutants from the atmosphere. Dust generation rates are particularly dependent on wind energy and on the moisture budget, which is a function of rainfall and evaporation rates.

No meteorological observations are recorded at the quarry. In the absence of onsite data, a combination of regional Bureau of Meteorology (BoM) meteorological monitoring datasets were drawn upon, comprising of the following:

- 1-minute average meteorological data for 2017 from the BoM Automatic Weather Stations (AWS) at Bombala (station number 070328,), located 14.7km south-southwest of the quarry;
- 1-hour average meteorological data from the BoM Bombala AWS for the period between 2013 and 2017; and
- Long-term climate statistics (1885 to 2018) obtained from the BoM Bombala (Therry Street) climate station (station number 070005), located 5.2km south-southwest of the quarry.

In order to review the likely dispersion meteorology for the quarry area, analysis of prevailing wind regime, temperature and moisture budget has been undertaken.

Monitoring data from the BoM Bombala AWS was supplemented by meteorological modelling (**Section 4.1**).

4.1 Overview of meteorological modelling

Section 4.1 of the *Approved Methods for Modelling* (EPA 2016) specifies that meteorological data should cover a period of at least one year with a percentage completeness of at least 90%. From the BoM Bombala AWS, the calendar year of 2017 contains the most complete and current continuous twelve months of data at the time of reporting. The 2017 calendar year has therefore been used as the baseline for this assessment.

The CSIRO meteorological model TAPM was used to generate cloud cover and net radiation which are not recorded by the BoM Bombala AWS, to fill data gaps in the BoM Bombala AWS monitoring dataset and generate the vertical temperature profile. TAPM was configured and run in accordance with the Section 4.5 of the Approved Methods for Modelling, with the following refinements:

- Modelling to 300 m grid cell resolution (beyond 1 km resolution specified).
- Inclusion of high resolution (90 m) regional topography (improvement over default 250 m resolution data).

The TAPM generated vertical temperature profile was adjusted for every hour by first substituting the predicted 10 m above ground temperature with hourly recorded temperature at 10 m from the BoM Bombala AWS dataset. The vertical layer temperature difference predicted by TAPM was then adjusted relative to the 10 m observation temperature for each hour.

4.2 Prevailing wind regime

A wind rose showing wind speed and direction data recorded at the BoM Bombala AWS for 2017 is presented in **Figure 4-1**. Inter-annual (2013 to 2017) wind roses for the BoM Bombala AWS are presented in **Appendix 1** and demonstrate that the 2017 calendar year dataset is representative of wind speed and direction profiles for the location.

The annual recorded wind pattern is dominated by airflow from the northwesterly quadrant. Less frequent southwesterly, southeasterly and northeasterly components are also recorded. The strongest wind speeds recorded are experienced from the west of the north-south axis. The average recorded wind speed for the analysed period was 3.8 m/s, with a frequency of calm conditions (wind speeds less than 0.5 m/s) occurring in the order of 10% of the time.

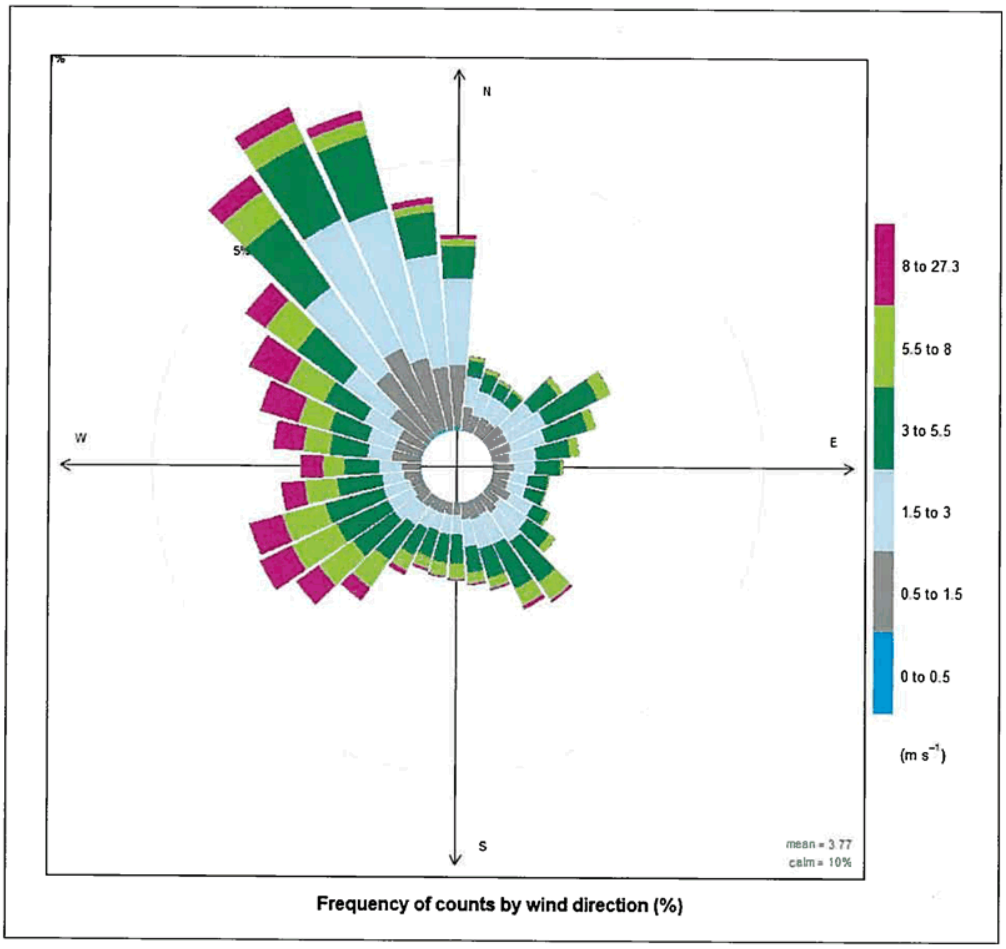


Figure 4-1: Annual average wind rose – BoM Bombala AWS – 2017

Seasonal and diurnal (dividing the day into night and day) wind roses for the meteorological dataset are presented within **Appendix 1**.

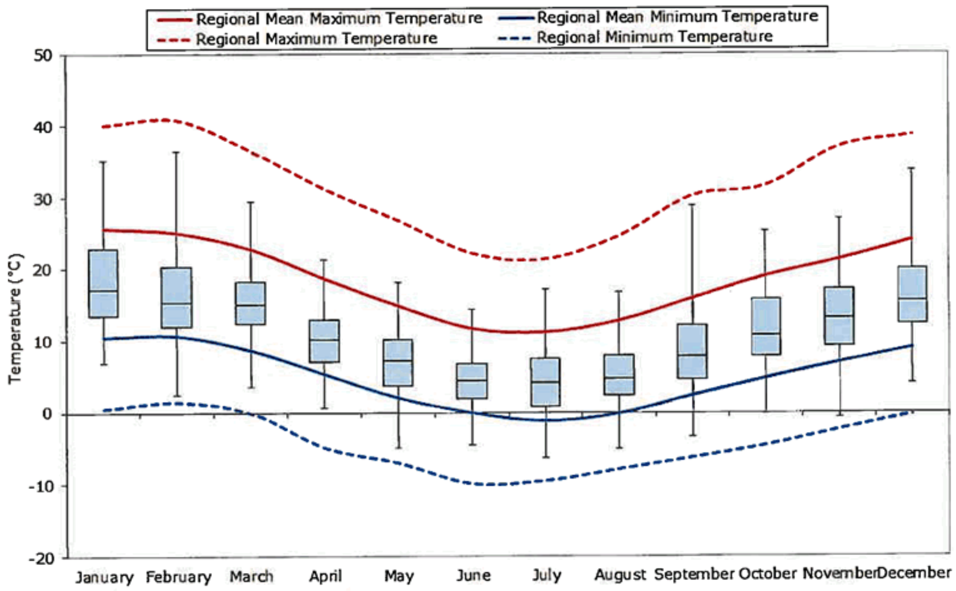
Seasonal variation in wind speed and direction is limited in the BoM Bombala AWS dataset. The dominant northwesterly airflow features across all seasons. Airflow from the southwestern quadrant is more defined in winter and spring, while the northeasterly and southeasterly components are most evident in summer. Wind speeds are typically lowest during autumn, with the lowest average wind speed and highest occurrence of calm conditions featuring at this time.

Diurnal variation is also reasonably minor in the BoM Bombala AWS dataset. Wind direction is relatively consistent across night and day hours. Wind speeds are higher during the daylight hours than at night.

4.3 Ambient Temperature

Monthly mean minimum temperatures are in the range of 11°C to 26°C, with mean maxima of -1°C to 11°C, based on the long-term average record from the BoM Bombala (Therry Street) climate station. Peaks occur during summer months with the highest temperatures typically being recorded between December and February. The lowest temperatures are usually experienced between May and August.

Figure 4-2 presents the monthly variation in recorded temperature recorded at the BoM Bombala AWS between 2017 compared with the mean, minimum and maximum temperatures from the BoM Bombala (Therry Street) climate station. There is good agreement between temperatures recorded at the BoM Bombala AWS and the recorded historical trends, indicating that the 2017 dataset is representative of conditions likely to be experienced in the region.



Note: 2017 temperature data from the BoM Bombala AWS are illustrated by the 'box and whisker' indicators. Boxes indicate 25th, median and 75th percentile temperature values while upper and lower whiskers indicate maximum and minimum values. Maximum and minimum temperatures from long-term measurements at the BoM Bombala (Therry Street) climate station are depicted as line graphs.

Figure 4-2: Temperature Comparison between BoM Bombala AWS 2017 dataset and historical averages (1965 -2018) – BoM Bombala (Therry Street)

4.4 Rainfall

Precipitation is important to air pollution studies since it reduces dust generation and removes atmospheric pollutants.

Based on historical data recorded at the BoM Bombala (Therry Street), the area is characterised by low to moderate rainfall, with a mean annual rainfall of approximately 645 mm, and an annual rainfall range between 305 mm and 1,189 mm. Rainfall is typically higher between November and March, with lower rainfall experience in late winter-early spring. According to the long term records, an average of 110 rain days occur per year.

To provide a conservative (upper bound) estimate of the airborne particulate matter concentrations occurring due to the quarry, wet deposition (removal of particles from the air by rainfall) was excluded from the dispersion modelling simulations undertaken in this report. Model predictions are therefore more representative of dry periods and a conservative overestimate of potential impacts during average weather conditions or wet periods.

4.5 Atmospheric stability

Atmospheric stability refers to the degree of turbulence or mixing that occurs on the atmosphere and is a controlling factor in the rate of atmospheric dispersion of pollutants.

The Monin-Obukhov length (L) provides a measure of the stability of the surface layer (i.e. the layer above the ground in which vertical variation of heat and momentum flux is negligible;

typically about 10% of the mixing height). Negative L values correspond to unstable atmospheric conditions, while positive L values correspond to stable atmospheric conditions. Very large positive or negative L values correspond to neutral atmospheric conditions.

Figure 4-3 illustrates the seasonal variation of atmospheric stability derived from the Monin-Obukhov length calculated by AERMET for the BoM Bombala AWS dataset. The diurnal profile presented illustrates that atmospheric instability increases during daylight hours as convective energy increases, whereas stable atmospheric conditions prevail during the night-time. This profile indicates that the potential for atmospheric dispersion of emissions would be greatest during day time hours and lowest during evening through to early morning hours.

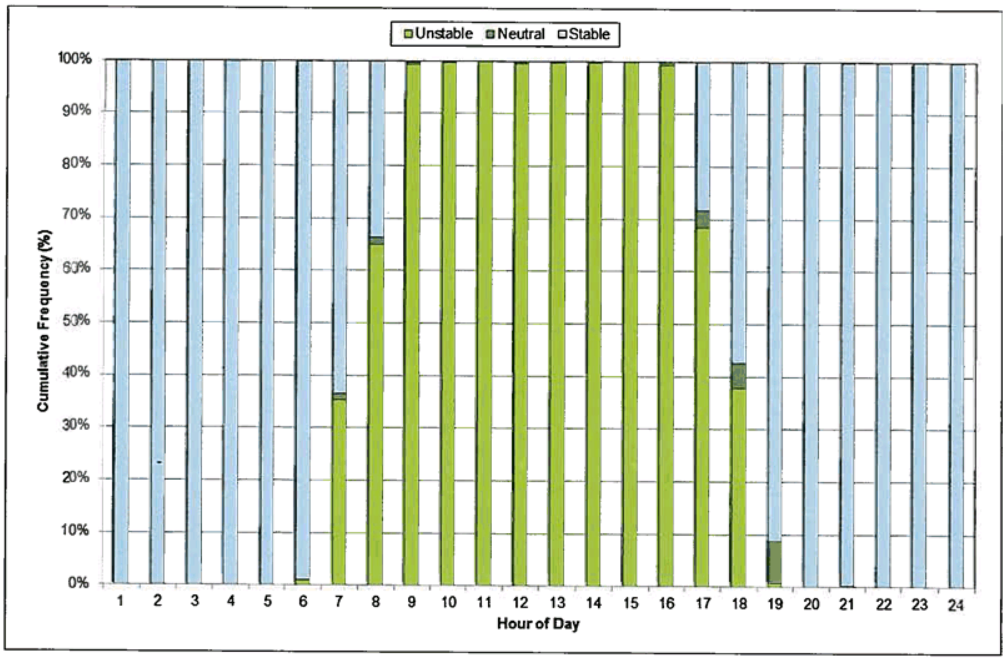


Figure 4-3: AERMET-Calculated Diurnal Variation in Atmospheric Stability– BoM Bombala AWS 2017

4.6 Mixing depth

Hourly-varying atmospheric boundary layer depths were generated for the quarry site by AERMET, the meteorological processor for the AERMOD dispersion model (see **Section 7.1** for further information), using a combination of surface observations at the BoM Bombala AWS and TAPM upper air predictions.

The variation in average boundary layer depth by hour of the day is illustrated in **Figure 4-4**. It can be seen that greater boundary layer depths are experienced during the day time hours, peaking in the mid to late afternoon. Higher day-time wind velocities and the onset of incoming solar radiation increases the amount of mechanical and convective turbulence in the atmosphere. As turbulence increases so does the depth of the boundary layer, generally contributing to higher mixing depths and greater potential for atmospheric dispersion of pollutants.

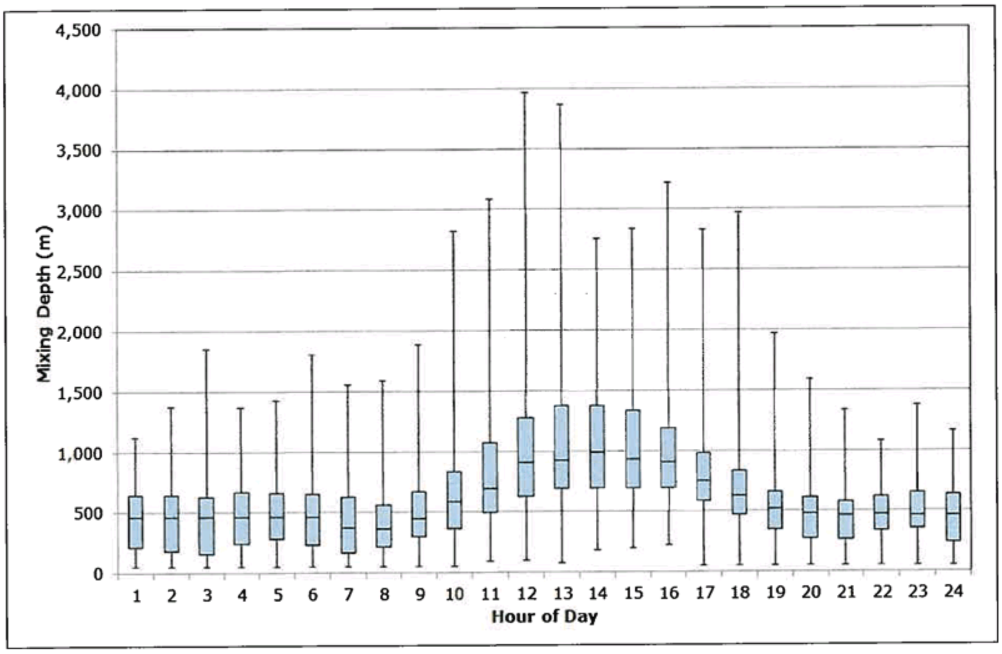


Figure 4-4: AERMET-Calculated Diurnal Variation in Atmospheric Mixing Depth – BoM Bombala AWS 2017

Note: Boxes indicate 25th, Median and 75th percentile of AERMET-calculated mixing height data while upper and lower whiskers indicate maximum and minimum values.

5. EXISTING AIR QUALITY ENVIRONMENT

The quantification of cumulative air pollution concentrations and the assessment of compliance with ambient air quality limits necessitate the characterisation of baseline air quality. Given that particulate matter emissions represent the primary pollutant of concern generated by the quarry, it is pertinent that existing sources and ambient air pollutant concentrations of these pollutants are considered.

5.1 Existing local sources of atmospheric emissions

Review of the National Pollutant Inventory (NPI) database and NSW EPA Environment Protection Licence (EPL) register lists the following operation that has the potential to generate emissions of particulate in the surrounding 10 km from Quarry:

- Bombala Sawmill - approximately 8km southwest of the quarry.

There is also a small quarry located on Gunningrah Road, Bombala, approximately 6.5km west-southwest of the quarry. Due to the separation distance from the quarry, it is considered that emissions from these operations would not cause significant direct cumulative impacts with the quarry.

Additionally, the following 'background' sources contribute to particulate matter emissions in the vicinity of the quarry site:

- Dust entrainment due to vehicle movements along unsealed and sealed public roads;
- Petrol and diesel emission from vehicle movements along public roads;
- Wind generated dust from exposed areas within the surrounding region;
- General farming practices such as ploughing, sowing and harvesting, particularly in summer months;
- Episodic emissions from local vegetation burning (e.g. grass and bush fires); and
- Seasonal emissions from household wood burning fires.

More remote sources which contribute episodically to suspended particulates in the region include dust storms and bushfires.

5.2 Monitoring data available for baseline air quality characterisation

5.2.1 Onsite monitoring data

Boral undertakes dust deposition monitoring at two locations at the quarry site as required under EPL 12891. One monitor is located at the eastern boundary of the site while the other is located at the southern boundary of site. Dust deposition monitoring samples are collected on a 30±2 days sampling regime and sent to an appropriate laboratory for analysis. Monitoring results were provided by Boral for the period between November 2015 and May 2018.

The annual average dust deposition rates recorded at both monitoring locations was 2.3g/m^2/month, which is well below the NSW EPA assessment criteria of 4g/m^2/month.

5.2.2 Ambient particulate matter monitoring data

Ambient particulate matter concentrations are not recorded at the quarry, nor is it a requirement of the EPL to do so. In order to provide an understanding of potential background concentrations of PM_{10}, air quality monitoring data has been sourced from the Australian Capital Territory (ACT) EPA air quality monitoring network in Canberra. In the absence of local monitoring data, the ACT EPA monitoring network provides the closest and most representative ambient air quality monitoring data available in the public domain. Due to the notably higher urban development in the vicinity of the ACT EPA monitoring network, recorded data is viewed as a conservatively high reflection of ambient particulate matter concentrations in Bombala.

The closest ACT EPA monitoring station is Monash, located 160km north of the quarry. Daily-varying PM_{10} concentrations recorded by the Monash station have been adopted as background air quality for the assessment of cumulative PM_{10} impacts from the quarry. Where gaps in the Monash 2017 dataset exist, concentrations from the other ACT EPA monitoring stations (Civic and

Florey) have been substituted. The daily varying PM_{10} concentrations recorded by the ACT EPA Monash monitoring station in 2017 are presented in **Figure 5-1**.

The recorded PM_{10} concentrations at the Monash station vary on a day-to-day basis. There were no criteria exceedances recorded during 2017. The highest PM_{10} concentration contained within the 2017 dataset was 33.4µg/m³. The average recorded PM_{10} concentration during 2017 was 10.5µg/m³.

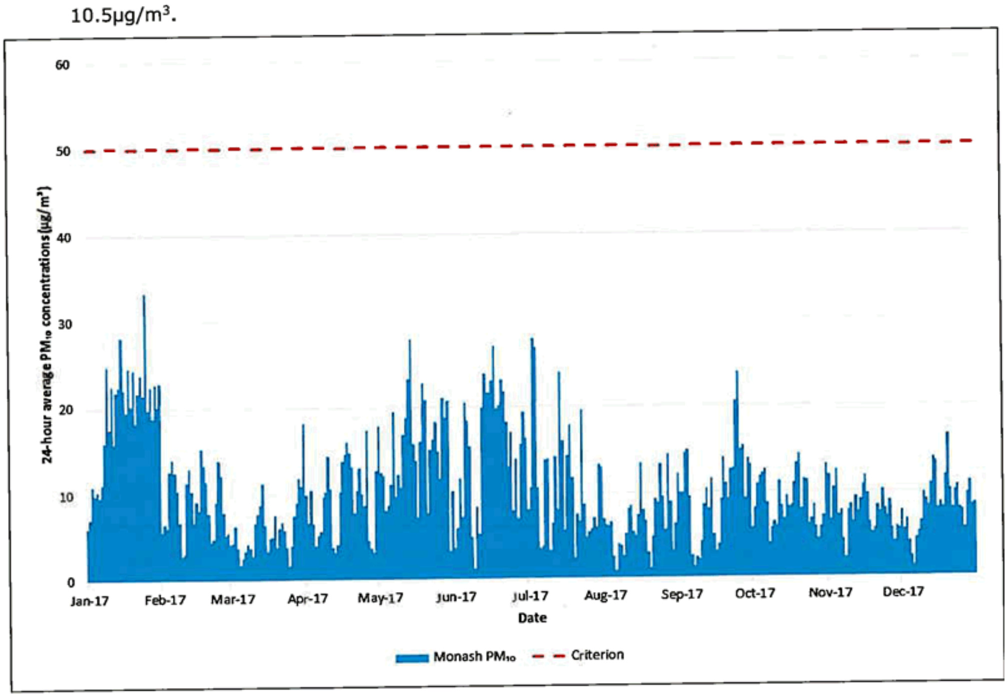


Figure 5-1: Recorded 24-hour Average PM_{10} Concentrations – ACT EPA Monash station –2017

6. EMISSIONS ESTIMATION

Fugitive dust sources associated with the operation of the quarry were principally quantified through the application of NPI emission estimation techniques (specifically the Emission Estimation Technique Manual for Mining and United States Environmental Protection Agency (US-EPA) AP-42 emission factor equations). Predicted particulate emissions were quantified for PM_{10} only.

6.1 Emission sources

Air emissions associated with the quarry would primarily comprise fugitive particulate matter releases. Potential sources of emission were identified as follows:

- Drill and blast activities;
- Extraction and handling of blasted material;
- Crushing, screening and conveying at the processing plant;
- Wheel-generated dust from vehicle movements across unpaved and paved surfaces (internal roads and High Lake Road to Monaro Highway);
- Wind erosion from stockpiles and exposed surfaces across the quarry site; and
- Combustion of diesel fuel by mobile plant and equipment.

A single emission scenario representative of peak annual extraction rate (200,000tpa) and maximum pit haulage distance was developed for the quarry:

Details on the assumptions made for the operational scenario are listed within **Appendix 2.**

6.2 Emission reduction factors

Based on information provided by Boral, the following emission reduction factors were applied to account for proposed controls at the quarry site:

- Use of water carts at stockpiling areas and pit area – 50% reduction for water application (NPI, 2012);
- Water sprays at crushing/screening components – 50% reduction for enclosure (NPI, 2012); and
- Unpaved haul roads – 75% reduction for water application (NPI, 2012).

6.3 Particulate matter emissions

A summary of quarry PM_{10} emissions by source type is presented in **Table 6-1** , while the contribution of source category to total annual PM_{10} emissions is illustrated in **Figure 6-1**. Control measures proposed for implementation, as documented in **Section 6.2**, have been taken into account in the emission estimates.

Table 6-1 and **Figure 6-1** highlight that the most significant sources of emissions are the haulage of material along unpaved haul roads and wind erosion of exposed surfaces and stockpiles.

Table 6-1: Calculated Annual PM_{10} Emissions – Proposed Operations

Emissions Source	Calculated PM_{10} Emissions (kg/annum) by Source
Drilling	248.0
Blasting	34.8
Loading blasted material into haul truck	201.1
Haulage to processing plant	1,656.4
Unloading to processing plant area	201.1
Screening (2 stages)	860.0
Crushing (2 stages)	240.0
Stockpile loading	55.0
Truck loading from stockpiles	110.0
Transport to and from materials storage area	1,822.1
Truck unloading at materials storage area	201.1
FEL in materials storage area	201.1
Loading to precoat plant	50.3
Loading to product trucks	201.1
Product dispatch to and from site exit	2,567.4
Product dispatch site exit to and from Highway	297.7
Wind erosion - Pit area	1,024.3
Wind erosion - Exposed surfaces and stockpiles	947.8
Diesel combustion - plant onsite	1,080.0
Diesel combustion - product trucks	32.9
Total	**12,032.5**

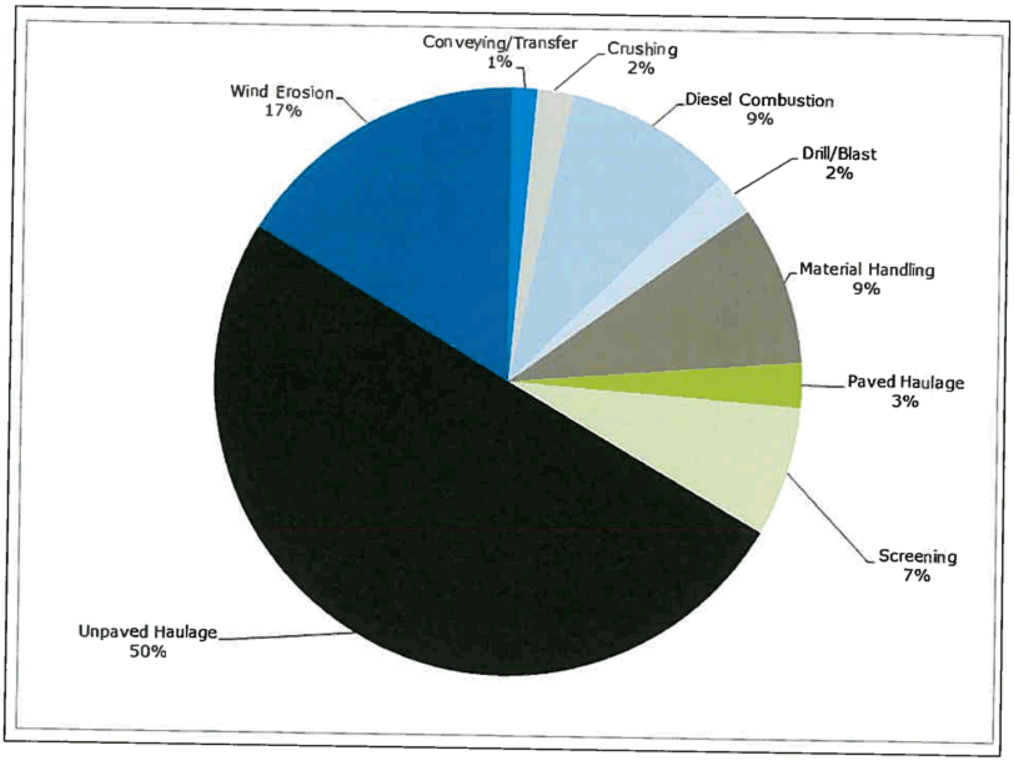


Figure 6-1: Summary of annual PM_{10} emissions by source type

7. OVERVIEW OF MODELLING

7.1 Dispersion model

The atmospheric dispersion modelling completed within this assessment used the AMS/US-EPA regulatory model (AERMOD) (US-EPA, 2004b). AERMOD is designed to handle a variety of pollutant source types, including surface and buoyant elevated sources, in a wide variety of settings such as rural and urban as well as flat and complex terrain. AERMOD replaced the Industrial Source Complex (ISC) model for regulatory purposes in the US in December 2006 as it is considered to provide more realistic results with concentrations that are more representative of actual concentrations compared to the ISC model. Compared to ISC, AERMOD represents an advanced new-generation model which requires additional meteorological and land-use inputs to provide more refined predictions.

Predicted concentrations were calculated at the following levels:

- A Cartesian receptor grid covering a 5km by 5km computational domain centred over the quarry, with a grid resolution of 100m applied; and
- The nine sensitive receptor locations listed in **Error! Reference source not found.**.

Simulations were undertaken for the 12 month period of 2017 using the AERMET-generated file based on the BoM Bombala AWS meteorological monitoring dataset as input (see **Section 4** for description of input meteorology). For the purpose of conservatism, wet removal processes (due to rain) have not been included in the dispersion modelling undertaken for this assessment.

Adopted emission source locations within the model are illustrated in **Figure 7-1**. The majority of sources were input as line-volume sources, with the exception of the stockpiling area and quarry pit area which were modelled as area sources.

7.2 Presentation of model results

Dispersion simulations were undertaken to predict the concentrations of PM_{10} only. As highlighted in **Section** 3, PM_{10} is considered to be the critical pollutant for criteria compliance based on Ramboll's experience in modelling quarrying operations of this size and extent. For reasons detailed in **Section 3**, it is considered that if compliance is demonstrated for PM_{10} at surrounding sensitive receptor locations, compliance would also be achieved for other particulate matter pollutants (i.e. TSP, $PM_{2.5}$ and dust deposition).

Incremental quarry-related PM_{10} concentrations occurring due to the quarry were predicted, with results expressed as the maximum predicted concentration for each averaging period at the selected receptor locations over the 2017 modelling period.

Tabulated results are presented in **Section 8** of concentrations at the selected sensitive receptor locations. Further, isopleth plots illustrating spatial variations in quarry-only incremental PM_{10} concentrations are provided.

The isopleth plots of the maximum 24-hour average concentrations presented do not represent the dispersion pattern on any individual day, but rather illustrate the maximum daily concentration that was predicted to occur at each model calculation point given the range of meteorological conditions occurring over the 2017 modelling period.

7.3 Cumulative impacts assessment

Cumulative impacts in the environment surrounding the quarry have been assessed in the following way:

- For 24-hour average PM_{10}, each predicted quarry-only concentration has been paired in time with the corresponding 24-hour average recorded PM_{10} concentration in the ACT EPA Monash air quality monitoring datasets for 2017 (**Section 5.2.2**). This approach is consistent with the Level 2 Contemporaneous impact and background approach specified by NSW EPA (2016); and
- For annual average pollutants, the annual average quarry-only concentration is paired with the applicable 2017 ambient annual average background concentration (**Section 5.2.2**).

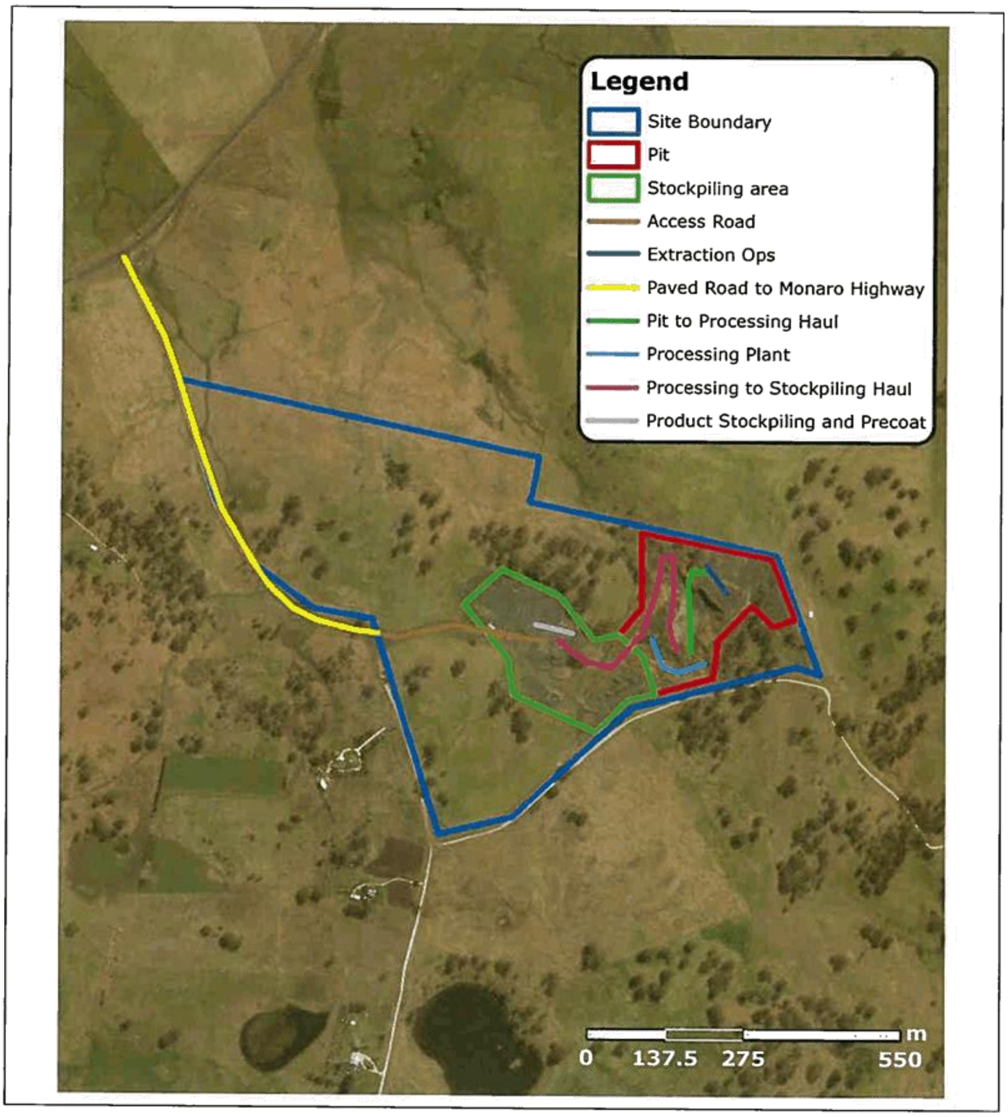


Figure 7-1: Model emission source locations

8. IMPACT ASSESSMENT

The results of the dispersion modelling for proposed quarry operation emissions are presented in **Table 8-1**. Results presented are the quarry-only incremental concentrations and the cumulative (quarry plus background) concentrations at each receptor location.

Table 8-1: Predicted quarry-only increment impacts –PM_{10}

Receptor ID	Predicted quarry-only incremental PM_{10} concentration (µg/m³)		Predicted cumulative (quarry + background) PM_{10} concentration (µg/m³)	
	24-hour	Annual	24-hour	Annual
1	2.0	0.1	33.5	10.6
2	3.3	0.3	33.9	10.8
3	1.7	0.1	33.4	10.6
4	3.0	0.2	33.4	10.7
5	1.3	0.1	33.4	10.6
6	1.1	0.1	33.4	10.6
7	2.1	0.1	33.7	10.6
8	1.2	0.1	33.4	10.6
9	1.1	<0.1	33.4	10.5
Criteria	**50**	**25**	**50**	**25**

It can be seen from the results presented in **Table 8-1** that quarry-only incremental and cumulative concentrations are below applicable NSW EPA impact assessment criteria for 24-hour and annual average PM_{10} concentrations at all surrounding receptor locations. It is therefore unlikely that emissions from the quarry, combined with ambient background concentrations, would result in the exceedance of the 24-hour average PM_{10} criteria at any surrounding receptor, beyond those that would occur in the absence of the project (i.e. days influenced by bushfires, dust storms, etc.).

Based on Ramboll's experience with similar low risk operations, if compliance for PM_{10} is predicted, compliance can be inferred for TSP, $PM_{2.5}$ and dust deposition, based on screening assessment justification from **Section 3**. Furthermore, the relatively minor incremental increase in predicted PM_{10} (i.e. 1% of the annual criterion) indicates that the risk for the proposed modification is low.

Isopleth contour plots of quarry-only incremental concentrations of 24-hour average and annual average PM_{10} are presented in **Figure 8-1** and **Figure 8-2** respectively.

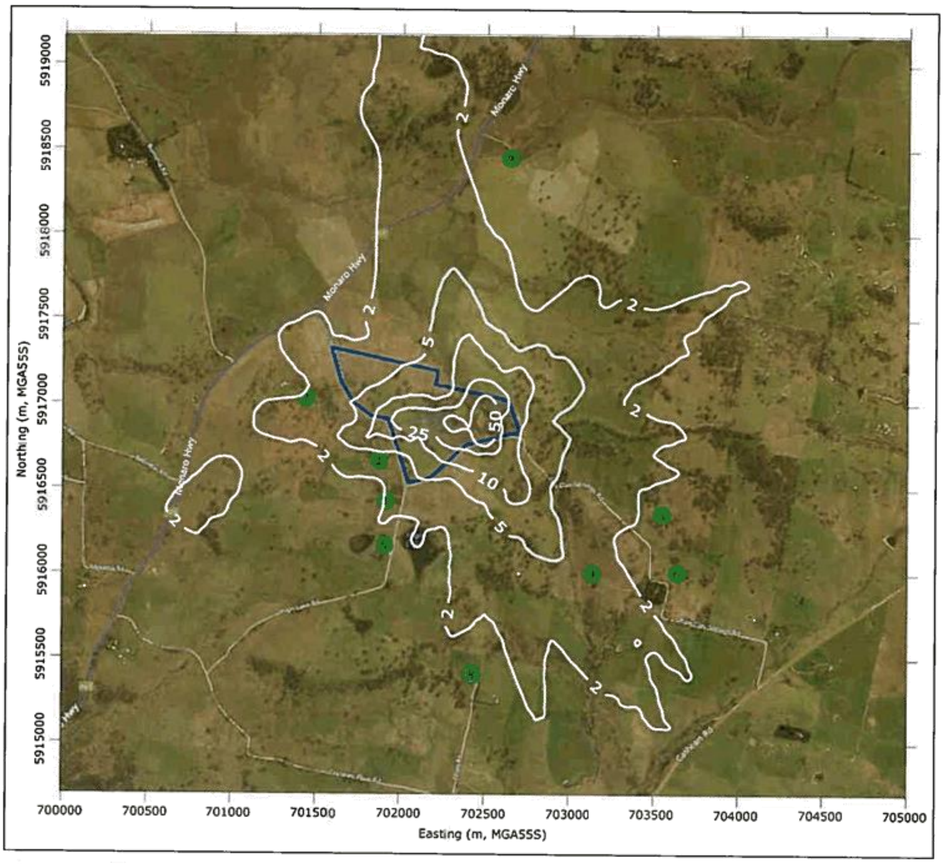


Figure 8-1: Maximum predicted 24-hour average PM_{10} ($\mu g/m^3$) – site only

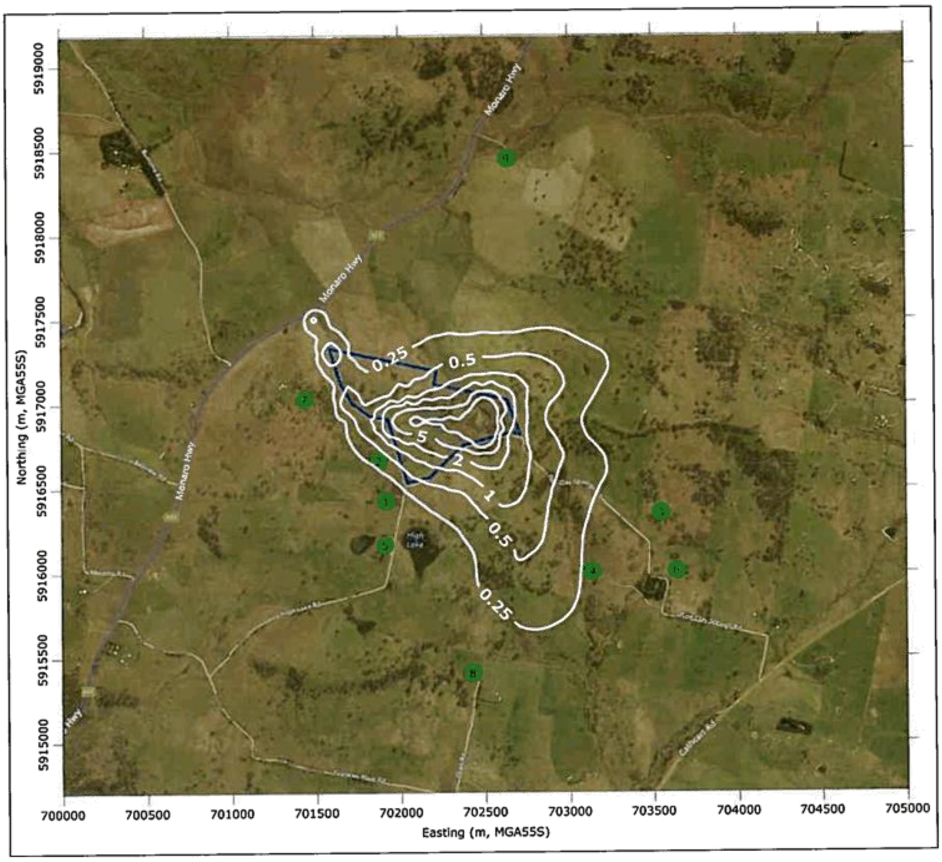


Figure 8-2: Predicted annual average PM_{10} ($\mu g/m^3$) – site only

9. CONCLUSIONS

Ramboll was commissioned by EMM to undertake an AQIA for the proposed modification.

Emissions of PM_{10} associated with the proposed modified operations of the quarry were quantified using publicly available emission estimation techniques. Atmospheric dispersion modelling predictions of air pollution emissions for proposed activities were undertaken using the AERMOD dispersion model.

The results of the dispersion modelling conducted indicated that the operation of the quarry is unlikely to result in exceedances of the applicable PM_{10} impact assessment criteria at any of the surrounding assessment locations.

Based on Ramboll's experience with similar sized hard rock quarry operations, the key limiting pollutant, in terms of compliance, is PM_{10} and if compliance for PM_{10} is predicted, compliance can be inferred for TSP, $PM_{2.5}$ and dust deposition. Furthermore, the relatively minor incremental increase in predicted PM_{10} (i.e. 1% of the annual criterion) indicates that the risk for the proposed modification is low.

10. REFERENCES

The following documents and resources have been used in the production of this report:

ACT EPA (2018). Air quality monitoring data from Monash air quality monitoring station.

Boral (2018). Dust deposition monitoring data from the Bombala Quarry site.

Bureau of Meteorology (2018). Long-term climate statistics and observations from Bombala AWS and Bombala (Therry St) climate station.

NPI EETM (2008). National Pollutant Inventory, Emission Estimation Technique Manual for Combustion Engines, Version 3, Environment Australia.

NPI EETM (2012). National Pollutant Inventory, Emission Estimation Technique Manual for Mining, Version 3, Environment Australia.

NSW EPA (2016), Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.

US-EPA (1998). AP42 Emission Factor Database, Chapter 11.9 Western Surface Coal Mining, United States Environmental Protection Agency, October 1998.

US-EPA (2004). AP42 Emission Factor Database, Chapter 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing, United States Environmental Protection Agency, August 2004.

US-EPA (2006a). AP42 Emission Factor Database, Chapter 13.2.2 Unpaved Roads, United States Environmental Protection Agency, November 2006.

US-EPA (2006b). AP42 Emission Factor Database, Chapter 13.2.4 Aggregate Handling and Storage Piles, United States Environmental Protection Agency, November 2006.

US-EPA (2011). AP42 Emission Factor Database, Chapter 13.2.1 Paved Roads, United States Environmental Protection Agency, January 2011.

11. GLOSSARY OF ACRONYMS AND SYMBOLS

Approved Methods for Modelling	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW
ACT	Australian Capital Territory
AHD	Australian Height Datum
BoM	Bureau of Meteorology
Boral	Boral Resources (Country) Pty Ltd
EMM	EMM Consulting Pty Ltd
EPA	Environment Protection Authority
EPL	Environment Protection Licence
NPI	National Pollutant Inventory
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PM_{10}	Particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in aerodynamic diameter
Ramboll	Ramboll Australia Pty Ltd
The quarry	Bombala Quarry
tpa	Tonnes per annum
TSP	total suspended particulates
US-EPA	United States Environmental Protection Agency
VKT	Vehicle Kilometres Travelled
µg	Microgram (g x 10^{-6})
µm	Micrometre or micron (metre x 10^{-6})
m^3	Cubic metre

APPENDIX 1
INTER-ANNUAL, SEASONAL AND DIURNAL WIND ROSES

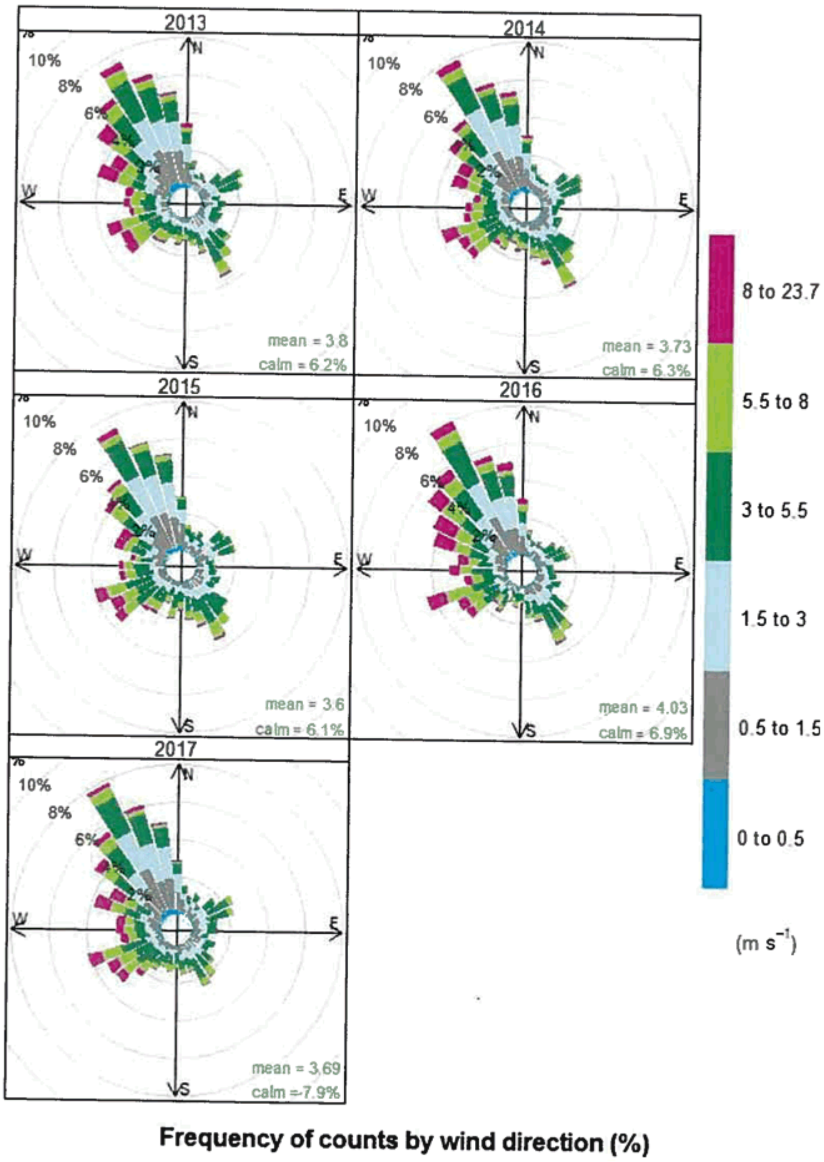


Figure A1-1: Inter-annual wind roses – BoM Bombala AWS –2013 to 2017

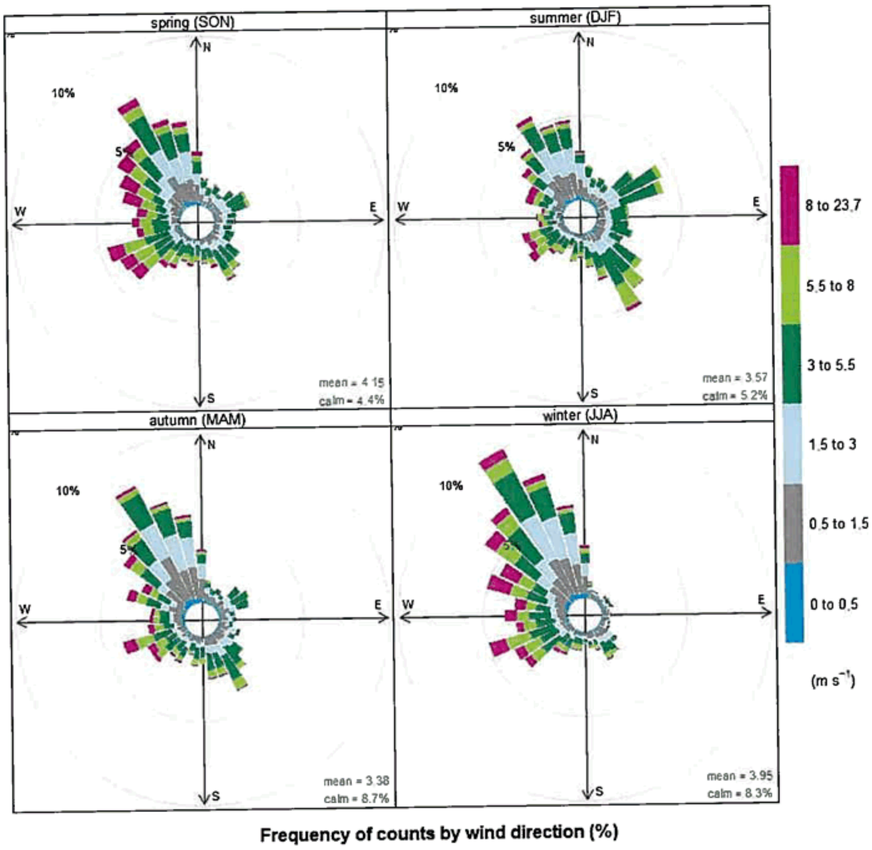


Figure A1-2: Seasonal wind roses – BoM Bombala AWS –2013 to 2017

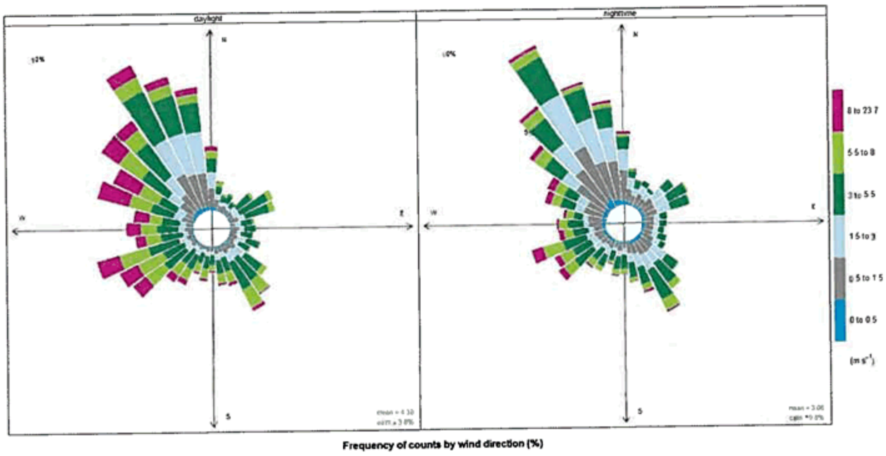


Figure A1-3: Diurnal wind roses – BoM Bombala AWS –2013 to 2017

APPENDIX 2
EMISSIONS INVENTORY BACKGROUND

Introduction

Air emission sources associated with the various phases of the quarry were identified and quantified through the application of accepted published emission estimation factors, collated from a combination of United States Environmental Protection Agency (US-EPA) AP-42 Air Pollutant Emission Factors and NPI emission estimation manuals, including the following:

- NPI Emission Estimation Technique Manual for Mining (NPI, 2012);
- NPI Emission Estimation Technique Manual for Combustion Engines (NPI, 2008);
- AP-42 Chapter 11.19.2 – Crushed Stone Processing and Pulverized Mineral Processing (US-EPA, 2004);
- AP-42 Chapter 13.2.1 – Paved Roads (US-EPA 2011);
- AP-42 Chapter 13.2.2 – Unpaved Roads (US-EPA 2006a);
- AP-42 Chapter 13.2.4 – Aggregate Handling and Storage Piles (US-EPA 2006b); and
- AP-42 Chapter 11.9 - Western Surface Coal Mining (US-EPA 1998).

Particulate releases were quantified for PM_{10} as documented in subsequent sections.

Sources of Particulate Matter Emissions

Air emissions associated with the quarry would primarily comprise fugitive particulate matter releases. Potential sources of emission were identified as follows:

- Drill and blast activities;
- Extraction and handling of blasted material;
- Crushing, screening and conveying at the processing plant;
- Wheel-generated dust from vehicle movements across unpaved and paved surfaces;
- Wind erosion from stockpiles and exposed surfaces across the quarry site; and
- Combustion of diesel fuel by mobile plant and equipment.

Particulate Matter Emission Factors Applied

The emission factor equations applied within the assessment are documented in this subsection. **Table A2.1** lists the uncontrolled emission factors that were applied for the two emission scenarios, references the source of the listed factors and whether the factor is derived from a specific equation or a published default emission factor.

Table A2.1 Emission estimation factors Applied for All Scenarios

Emission Source	PM_{10} Emission Factor	Emission Factor Unit	Source of Factor
Drill	0.31	kg/hole	AP-42 11.9 - Drilling factor
Blast	8.70717322	kg/blast	AP-42 11.9 - Blasting Equation
Blasted material to haul truck	0.00100574	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Haulage to processing plant	0.99386287	kg/Vehicle KM Travelled	AP-42 13.2.2 - Unpaved Road Equation
Unloading to processing plant area	0.00100574	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Screening (2 stages)	0.0043	kg/tonne	USEPA AP-42 11.19.2 - Screening Factor
Crushing (2 stages)	0.0012	kg/tonne	USEPA AP-42 11.19.2 - Tertiary Crushing Factor
Stockpile loading	0.00055	kg/tonne	USEPA AP-42 11.19.2 - Conveyor Transfer
Truck loading from stockpiles	0.00055	kg/tonne	USEPA AP-42 11.19.2 - Conveyor Transfer

Table A2.1 Emission estimation factors Applied for All Scenarios

Emission Source	PM_{10} Emission Factor	Emission Factor Unit	Source of Factor
Transport to materials storage area	0.99386287	kg/Vehicle KM Travelled	AP-42 13.2.2 - Unpaved Road Equation
Truck Unloading to materials storage area	0.00100574	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
FEL in materials storage area	0.00100574	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Loading to precoat plant	0.00100574	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Loading to Product Trucks	0.00100574	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Product dispatch to site exit	0.75869332	kg/Vehicle KM Travelled	AP-42 13.2.2 - Unpaved Road Equation
Product dispatch site exit to Highway	0.00776274	kg/Vehicle KM Travelled	AP-42 13.2.1 - Paved Road Equation
Wind Erosion - Pit area	425	kg/ha/year	AP-42 11.9 - Wind erosion of exposed areas factor
Wind Erosion - Exposed surfaces and stockpiles	425	kg/ha/year	AP-42 11.9 - Wind erosion of exposed areas factor
Diesel Combustion - plant onsite	0.0036	kg/litre	NPI Combustion Engines - Miscellaneous Diesel Industrial Equipment
Diesel Combustion - product trucks	0.584	g/VKT	1996 ADR70/00

Details relating to the emission equations referenced in **Table A2.1** are presented in the following sections.

Paved Roads Equation

The emissions factors for paved roads, as documented within AP42 Chapter 13.2.2 -"Paved Roads" (US-EPA 2011), was applied as follows:

$E = k\ (sL)^{0.91}(W)^{1.02}$

Where:

E = Emissions Factor (g/VKT)

sL = road surface silt loading (g/m^2)

W = mean vehicle weight (tonnes)

k = constant of 0.62 for PM_{10}

Load in offsite transportation trucks was assumed to be 25t, with an average vehicle mass of 28.5t (16t empty, 41t loaded). Material parameters are listed in **Table A2.2**.

Unpaved Roads Equation

The emissions factors for unpaved roads, as documented within AP42 Chapter 13.2.2 -"Unpaved Roads" (US-EPA 2006a), was applied as follows:

$E = k\ (s/12)^a(W*1.1023/3)^b$

Where:

E = Emissions Factor (lb/VMT)

s = surface material silt content (%)

W = mean vehicle weight (tonnes)

The following constants are applicable:

Constant	PM_{10}
K (lb/VMT)	1.5
A	0.9
B	0.45

The metric conversion from lb/VMT to g/VKT is as follows:

1 lb/VMT = 0.2819 kg/VKT

Load in onsite haul trucks was assumed to be 30t, with an average vehicle mass of 38t (30t empty, 53t loaded). Load in offsite transportation trucks was assumed to be 25t, with an average vehicle mass of 28.5t (16t empty, 41t loaded). Material parameters are listed in **Table A1.2**.

Materials Handling

Particulate matter emissions from material transfer operations were calculated through the application of the US-EPA predictive emission factor equation for continuous and batch drop loading and tipping operations (AP42, Section 13.2.4), given as follows:

$$E = k(0.0016) * \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\right)$$

where,

E =Emissions (kg/tonne transferred)

U = mean wind speed (m/s) from Bombala BoM AWS

M = material moisture content (%)

k = 0.74 for TSP, 0.35 for PM_{10} and 0.053 for $PM_{2.5}$

This emission factor was applied to the following sources:

Dumping and loading of assorted materials to/from trucks and stockpiles;

Blasting Equation

The emissions factors for blasting were taken from AP-42 Chapter 11.9 – "Western Surface Coal Mining" (US-EPA 1998).

Units	TSP	PM_{10}
kg/blast	$0.00022(A)^{1.5}$	TSP x 0.52

Where: A= horizontal area (m^2) with blasting depth ≤ 21.

Based on a blast tonnage of 25,000t, a material density of $1.2t/m^3$ and a bench depth of 11.6m, a blast area of $1,796m^2$ was derived. It was assumed that 200 holes per blast would also be required.

Quarry Related Input Data

Material property inputs used in the emission equations presented in **Table A2.1** are detailed in **Table A2.2**. It is noted that minimal details relating to the material properties were available at the time of reporting. To compensate, values were adopted from the literature.

Table A2.2 Material Property Inputs for Emission Estimation Factors Applied for All Scenarios

Material Properties	Units	Value	Source of Information
Silt Loading of Paved Roads – Weighbridge to exit	g/m²	0.6	Default baseline loading for roads with traffic <500 vehicles per day - US-EPA AP42 (2011)
Silt Loading of Paved Roads – Stockpiles to Weighbridge	g/m²	8.2	Default loading for "Quarry" - US-EPA AP42 (2011)
Silt Content of Unpaved Roads - onsite	%	8.3	US-EPA AP42 (2006a) mean value for "haul road to/from pit" for "Stone Quarrying and Processing"
Silt Content of Unpaved Roads materials storage area	%	7.1	US-EPA AP42 (2006a) mean value for "Sand and Gravel Processing - Material Storage Area"
Moisture Content of raw / product material	%	2	Similar quarrying operations

Key operational details by process used in the emission calculations are listed in **Table A2.3**.

Table A2.3 Adopted emission estimation activity rates

Process	Unit	Adopted activity rate
Drill	Holes per year	200
Blast	Blasts per year	4
Truck Loading in Pit - raw material	Tonnes of material	200,000
Blasted material to processing plant haulage	Annual VKT (km)	3,333
Screening (2 points)	Tonnes of material	400,000
Crushing (2 points)	Tonnes of material	400,000
Stockpile loading	Tonnes of material	200,000
Truck loading from stockpiles	Tonnes of material	200,000
Transport to materials storage area	Annual VKT (km)	7,333
Truck Unloading to materials storage area	Tonnes of material	200,000
FEL in materials storage area	Tonnes of material	200,000
Loading to Precoat plant	Tonnes of material	50,000
Loading to Product Trucks	Tonnes of material	200,000
Product Transportation – stockpiles to site exit	Annual VKT (km)	13,536
Product Transportation – exit to Monaro Highway	Annual VKT (km)	38,352
Wind Erosion - Exposed surfaces and stockpiles	Area (ha)	4.82
Wind Erosion - Exposed surfaces and stockpiles	Area (ha)	4.46
Diesel Combustion - trucks and mobile plant	Litres of diesel	300,000

Appendix C

Traffic Impact Assessment

EMM

Traffic Impact Assessment

Bombala Quarry Modification

Prepared for Boral Country (Resources) Pty Limited | 23 November 2018

Traffic Impact Assessment

Bombala Quarry Modification

Prepared for Boral Country (Resources) Pty Limited | 23 November 2018

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Traffic Impact Assessment

Final

Report J17353RPT | Prepared for Boral Country (Resources) Pty Limited | 23 November 2018

Prepared by	**Tim Brooker**	Approved by	**Allan Young**
Position	Associate Transport Planner	Position	National Technical Leader
Signature		Signature	
Date	23 November 2018	Date	23 November 2018

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

Document Control

Version	Date	Prepared by	Reviewed by
V1	6 September 2018	T. Brooker	R. Thelwell M. Shelly A. Young
V2	23 November 2018	T.Brooker	A.Young

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1 Introduction

Boral Resources (Country) Pty Ltd (Boral) is seeking to modify Bombala Quarry's (the quarry) development consent (DA 07/0013) to increase the maximum production volume. The quarry currently holds a Development Consent No. DA.07.0013 issued by the then Bombala Council (now Snowy Monaro Regional Council) on 7 July 2008. The quarry has not operated since 2012, however this DA remains the relevant consent for the site.

The quarry is located approximately 6 km north-east of Bombala, 81 km south of Cooma and 504 km south west of Sydney. The main access to the quarry is via High Lake Road and the Monaro Highway. The site is approximately 42 ha and comprises two land parcels, legally identified as Lot 229 and Lot 230 of Deposited Plan 756819. The quarry footprint occupies part of Lot 230.

Bombala Quarry is consented to produce a range of products for commercial use, namely 4 mm dust to be used in concrete plants, 5 mm grit, 7 mm, 10 mm, 14 mm and 20 mm aggregate and unspecified 20 mm scalps which can be used as road base for the local market. The quarry is consented to extract and transport up to 100,000 tonnes per annum (tpa) of hard rock under the consent (DA 07/0013).

Bombala Quarry is consented to operate from 7:00 am to 5:00 pm Monday to Friday. The site is also permitted to load material on Saturdays from 7:00 am to 12:00 pm. No operations or loading is allowed on Sundays and Public Holidays.

The major road and local road network in the vicinity of the quarry and between the quarry and Bombala via the Monaro Highway is shown in Figure 1.1. The quarry access is located off the eastern side of High Lake Road, mid-way between the Monaro Highway and Pipe Clay Springs Road. Quarry product materials for commercial customers are currently exclusively transported via High Lake Road and the Monaro Highway with no usage of Pipe Clay Springs Road.

The Monaro Highway is the major traffic route between Cooma and Bombala and also continues north of Cooma to Canberra and south of Bombala, crossing the NSW/Victoria state border, to Cann River in East Gippsland where it connects with the Princes Highway. The largest NSW south coast town of Bega, is reached via the Snowy Mountains Highway, which connects to the Monaro Highway approximately 44 km north of Bombala (40 km north of the quarry). South of the quarry, within Bombala, the Monaro Highway connects to Cathcart Road (also known as Mount Darragh Road) which also connects to other towns on the NSW south coast at Merimbula, Pambula and Eden. Within Bombala, the Monaro Highway has an urban type road cross section and street environment, with many local road intersections and property access driveways including the access to the former railway station.

Boral is seeking to modify the consent to increase this limit by 100,000 tpa to a total of 200,000 tpa (the proposed modification). The additional production would be achieved by running the in-pit mobile plant for a longer period of time within the approved hours of operation. Boral is also proposing to install a small pre-coat plant to produce products for regional road works. It is proposed that the additional quarry production – which will primarily be hard rock aggregate used in concrete production– will all be transported by road via the Monaro Highway and the other connecting routes which are described above.

The proposed modification includes no changes to:

- the current development footprint;
- the quarry consent area; or
- the quarry's operating hours.

EMM Consulting Pty Limited (EMM) has been commissioned by Boral to prepare this traffic impact assessment of the proposed modification. This traffic impact assessment forms part of the statement of environmental effects (SEE) to accompany the application to modify the quarry's development consent. This traffic assessment has been prepared for the proposed modification in accordance with the Roads and Traffic Authority (RTA), now Roads and Maritime Services (RMS) *Guide to Traffic Generating Developments* (2002), which is the relevant guidance for traffic impact assessments in NSW.

KEY

- Site boundary
- Rail line
- Main road
- Local road
- Watercourse
- Waterbody
- Cadastral boundary

Road network in the locality of the site and Bombala

Bombala Quarry Modification
Traffic Impact Assessment
Figure 1.1

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2 Existing traffic

2.1 Road network

Current daily traffic volume data from RMS (from the RMS Daily Traffic Volume Viewer website) is only available for the Monaro Highway, where the traffic survey data is available for every year since 2007. The RMS data for the location reference 08.177 which is just outside the urban area of Bombala, approximately 4 km south of the quarry access intersection at High Lake Road, shows the following historic growth trend in the daily traffic movements:

- 2018 – 1,141 vehicles AADT (% heavy vehicles not recorded);
- 2017 – 1,094 vehicles AADT;
- 2016 – 1,046 vehicles AADT;
- 2015 – 1,003 vehicles AADT;
- 2014 – 981 vehicles AADT;
- 2013 – 931 vehicles AADT;
- 2012 – 982 vehicles AADT;
- 2011 – 913 vehicles AADT;
- 2010 – 920 vehicles AADT;
- 2009 – 900 vehicles AADT;
- 2008 – 851 vehicles AADT; and
- 2007 – 854 vehicles AADT.

The long term traffic growth trend from the average of the two oldest (year 2007 and 2008) surveys to the average of the two newest (year 2017 and 2018) surveys, shows an average traffic growth rate of +26.5 vehicles each year, which represents +3.1% annual traffic growth over the ten year period.

On the Monaro Highway, within Bombala, the daily traffic volume has not been surveyed since 2003 when the daily traffic volume was recorded by RTA (now RMS) as 2,556 vehicles. Assuming +3.1% annual traffic growth at this location since 2006, the daily traffic volume would now have increased to approximately 3,500 daily vehicles.

On Cathcart Road, east of the Bombala urban area, the daily traffic volumes was last surveyed by RTA (now RMS) as 351 and 355 vehicles respectively in the years 2006 and 2007, with 8% of traffic being heavy vehicles. Assuming +3.1% annual traffic growth since 2006, this daily traffic volume for Cathcart Road would now have increased to approximately 480 daily vehicles.

For the Monaro Highway, in the vicinity of the quarry access on High Lake Road, the current peak hourly traffic volumes and the heavy vehicle traffic proportion were recorded by a six hour intersection traffic count including both Wednesday 4 July 2018 (from 3-6 pm in the afternoon) and Thursday 5 July 2018 (from 6-9 am in the morning). The quarry was not operating during the week of the traffic survey so the traffic volumes recorded are the reduced baseline peak hour and daily traffic volumes.

The intersection traffic survey results are included in Appendix A and show the following existing peak hourly traffic volumes (with no quarry traffic operating), including truck movements (the morning peak hour is 7.15 to 8.15 am and the afternoon peak hour is 3.45 to 4.45 pm):

- for the Monaro Highway, north of High Lake Road:
  - morning peak hour traffic = 78 vehicle movements (11 trucks);
  - afternoon peak hour traffic = 96 vehicle movements (15 trucks);
  - equivalent daily traffic *estimate = 1044 vehicle movements (156 trucks);
- for the Monaro Highway, south of High Lake Road:
  - morning peak hour traffic = 77 vehicle movements (11 trucks);
  - afternoon peak hour traffic = 96 vehicle movements (15 trucks);
  - equivalent daily traffic *estimate = 1038 vehicle movements (156 trucks);
- for High Lake Road, north of the quarry access intersection:
  - morning peak traffic = 1 vehicle movements (0 trucks);
  - afternoon peak traffic = 2 vehicle movements (0 trucks); and
  - equivalent daily traffic *estimate = 18 vehicle movements (0 trucks).

*The historical RMS traffic data for all major roads in NSW over the past 30-40 years shows the ratio of the peak hourly to the daily traffic volume is normally between one tenth (approximately 10%) to one twelfth (approximately 8%). In urban areas where there are large amounts of commuter traffic, the ratio is usually close to the higher end of this range (one tenth) while in rural areas, the ratios is usually close to the lower end of this range (one twelfth). The equivalent daily traffic volume in a rural locality such as the Monaro Highway near High Lake Road, north of Bombala is approximately 12 times the average peak hourly traffic.

2.2 Road width and condition

As part of the approved expansion consent conditions for the quarry in 2006, the main quarry access route via High Lake Road was sealed and a new quarry site office/carpark constructed closer to the Monaro Highway. The former quarry site access intersection near the junction of High Lake Road with Pipe Clay Springs Road has been closed.

The current width and condition of High Lake Road looking east from the Monaro Highway is shown in Photograph 2.1. The recent sealing of the section of High Lake Road that carries the Boral quarry truck traffic, means that the road is generally able to carry regular heavy vehicle traffic without risk of road pavement deterioration.

Photograph 2.1 **Photograph of the existing sealed condition of High Lake Road looking east**

Photographs 2.2 and 2.3, taken in July 2018, shows the existing condition of the road surface of the Monaro Highway to the north and the south of the intersection with High Lake Road.

The Monaro Highway is a state funded road and is also constructed to a high structural standard such that it is able to carry significant daily heavy vehicle traffic on a regular basis without any risk of increased road pavement wear or other surface deterioration.

The road surface of the Monaro Highway can be observed from Photographs 2.2 and 2.3 to be in a generally good condition with no visible signs of major surface defects or other road pavement damage as a result of the existing Bombala quarry truck traffic, or other truck traffic using the Monaro Highway on the section north of Bombala, in the vicinity of the High Lake Road intersection.

Photograph 2.2 Monaro Highway/High Lake Road intersection looking north

Photograph 2.3 Monaro Highway/High Lake Road intersection looking south

2.3 Existing quarry traffic

It is noted that, during the week of the intersection traffic survey undertaken to establish the provisional locality baseline traffic conditions which are reported in Section 2.1, the quarry was not operating. When the quarry is operating at the currently approved production of 100,000 tonnes, it operates 47 weeks per year with normal Monday to Friday operations and a half day on Saturday mornings (5.5 days per week), which represents 259 operating days per year effectively, with an average daily production of 386 tonnes. With typical average 25 tonne truckloads, this represents just over 15 loaded trucks per day travelling from the quarry with a corresponding daily number of empty truck movements (30 daily truck movements in total).

On busy days there can be a maximum of up to 40 daily loaded trucks travelling from the quarry (80 daily truck movements in total) of which approximately 10% (four trucks per hour travelling inbound and four trucks per hour travelling outbound) would be operating during the morning and afternoon traffic peak hours for the Monaro Highway in this locality, which are normally 7.15 to 8.15 am in the mornings and 3.45 to 4.45 pm in the afternoons.

The existing daily light vehicle traffic generated by the quarry workforce and site visitors is generally low, and normally comprises three vehicles per day visiting the site (six daily car movements in total).

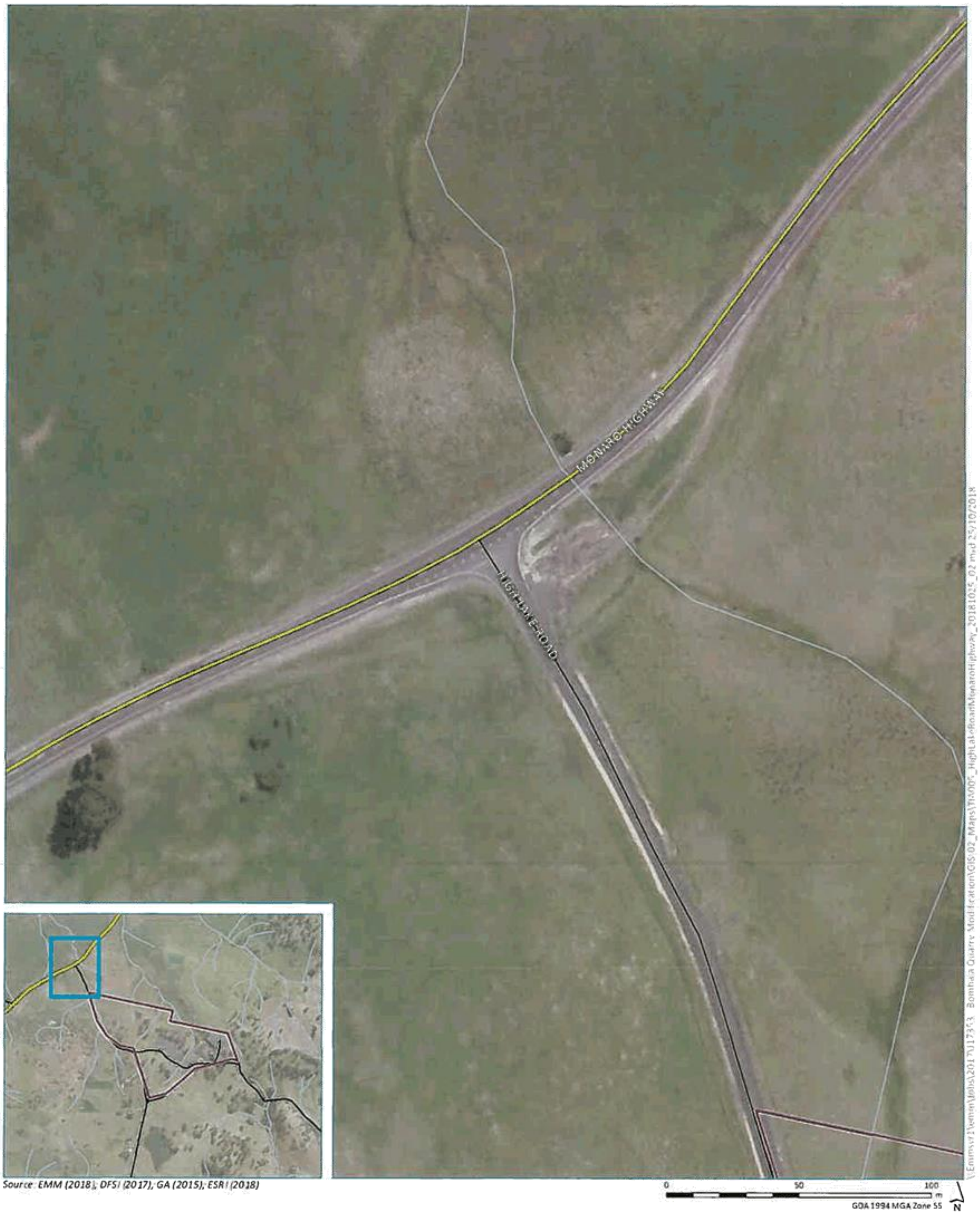
2.4 Monaro Highway/High Lake Road intersection design

For traffic capacity and road safety, rural intersections on major roads are required to provide additional turning lanes and/or sealed shoulder in accordance with the Austroads intersection design standards which are shown in Appendix B.

The current Monaro Highway/High Lake Road intersection design with sealed shoulder widening is shown in Figure 2.1. Since the most recent expansion of the quarry production, which was approved in 2006, the intersection has been widened and improved so that the design now meets the minimum Austroads rural type BAR/BAL intersection design with sealed shoulder widening.

The BAR/BAL intersection design is now the current minimum design standard which is required for heavy vehicle access from a high speed rural highway. The design warrant charts which show the peak hourly traffic volumes which apply to the BAR/BAL intersection design are also included in Appendix B.

The first warrant chart in Appendix B shows the BAR/BAL intersection design is applicable for all levels of turning traffic, where the peak hourly through + turning traffic volume using the major road is less than 120 vehicles per hour and the general traffic speed is either 100 km/hr or greater. The current maximum peak hourly turning traffic movements at High Lake Road are approximately four trucks per hour travelling inbound to the quarry and four trucks per hour travelling outbound from the quarry and these total movements are distributed between the left and the right turning movements at the Monaro Highway.



Source: EMM (2018); DFSI (2017); GA (2015); ESRI (2018)

KEY

- Site boundary
- Main road
- Local road
- Watercourse/drainage line

Current design of the High Lake Road & Monaro Highway access intersection

Bombala Quarry Modification
Traffic Impact Assessment
Figure 2.1

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2.5 Traffic safety

The visibility for traffic safety at the quarry traffic access intersection (at High Lake Road) on the Monaro Highway is relatively good, as is shown in Photographs 2.2 and 2.3.

There is generally good visibility for at least 200 to 250 metres along the Monaro Highway in both directions from the intersection for the minor road traffic to turn either left or right at the intersection. The intersection visibility is better for trucks due to the higher seating position of the truck driver, which provides better visibility along the major road, when the truck is waiting to turn left or right.

Elsewhere along the Monaro Highway, north and south of the High Lake Road intersection, the current level of traffic safety is defined by the most recent five year accident history data. Accident history data for the Monaro Highway south of Cooma from January 2013 to December 2017 is shown in Figures 2.2 and 2.3 for the region and local area, respectively.

The regional accident history map (Figure 2.2) shows there has been a relatively uniform distribution of traffic accidents over the 90 km length of the Monaro Highway between Cooma and Bombala, with no localised concentrations of accidents occurring at any specific location.

The more detailed local accident history map (Figure 2.3) shows the 5 km length of the Monaro Highway north from Bombala to the quarry access intersection at High Lake Road. This map shows a total of four accidents occurred on this section of the Monaro Highway from January 2013 to December 2017. No accidents occurred at the High Lake Road intersection, although one accident is shown occurring approximately 100 to 200 m north of the intersection.

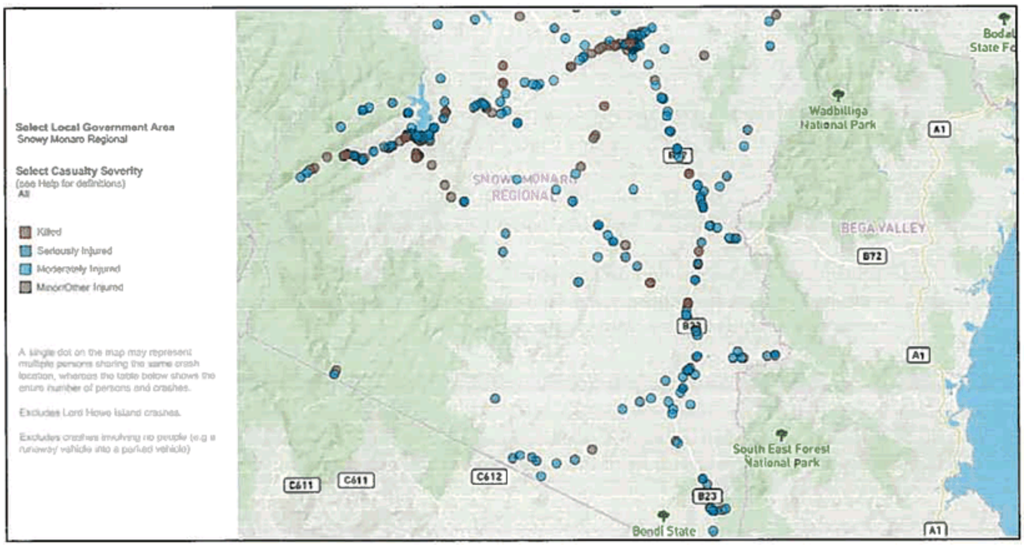


Figure 2.2 Regional accident history for the Monaro Highway south of Cooma

Figure 2.3 **Local accident history map for the Monaro Highway north of Bombala**

The Monaro High/High Lake Road intersection and the overall Monaro Highway route between Cooma and Bombala, which is the primary haulage route for the quarry truck traffic, have good recent safety records with no existing traffic safety issues identified for either light or heavy vehicle traffic.

2.6 Public transport

A coach service along the Monaro Highway from Canberra to Cooma and Bombala is operated by NSW Trainlink (route 776). South of Cooma, the route operates via Jindabyne, to and from Bombala.

There is one coach service in each direction per day on weekdays, which departs from Bombala at 6:50 am travelling northbound and returns to Bombala at 4:00 pm travelling southbound.

These coach services times would be convenient for many travellers travelling to and from the Bombala area to either Canberra or Sydney, but would not generally be able to be conveniently used by persons either working at or visiting the Bombala Quarry.

2.7 Pedestrian and cycling access

No persons were observed during the intersection traffic survey either walking or cycling or cycling along the Monaro Highway, in the vicinity of the High Lake Road intersection.

3 Details of the proposed modification

3.1 Additional daily traffic travelling via High Lake Road

All the additional daily truck traffic movements which are generated by the proposed modification will be travelling via High Lake Road, between the quarry access road and the Monaro Highway, from where it will be using the identified transport routes for the project which are shown in Figure 3.1.

The proposed production increase from 100,000 tpa to 200,000 tpa will double the average daily production from 386 tonnes to 773 tonnes per day. There will be a corresponding increase in the average daily number of truck loads from 15 to 31 per day and the average daily number of truck movements will increase from 30 to 62 movements per day.

On the busiest operating days at the quarry, the maximum daily number of trucks loads will increase from 40 to 80 and the corresponding maximum daily number of truck movements will increase from 80 to 160. There would also potentially be one additional truck movement per week in each direction (two additional daily truck movements in total) to supply pre coated aggregates for road sealing, which would not affect these daily traffic movements.

The future distribution of the additional quarry truck traffic, when travelling to and from the Bombala area, is anticipated to remain the same as for the existing quarry production which is effectively as follows:

- 35% travelling to and from the south and east via Bombala and Cathcart Road travelling to and from Pambula;
- 32.5% travelling to and from the north via the Monaro Highway travelling to and from Jindabyne; and
- 32.5% travelling to and from the Bega area travelling via the Monaro Highway north and then via the Snowy Mountains Highway.

The number of employees at the quarry will not increase under the proposed modification.

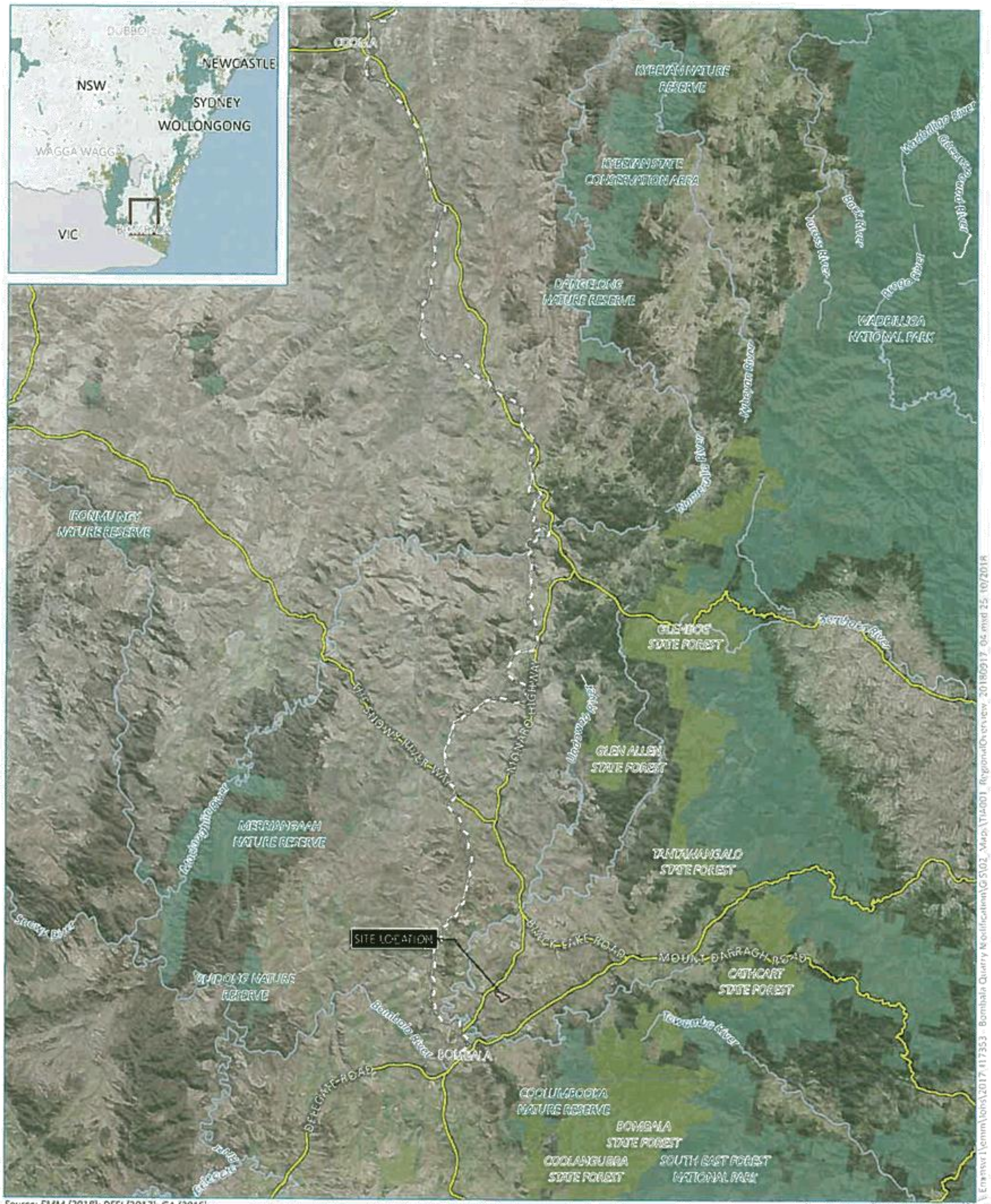
3.2 Additional daily traffic travelling via Monaro Highway

Assuming 65% of the additional daily truck traffic movements which are generated by the proposed modification will be travelling via the Monaro Highway north of High Lake Road, towards Cooma or Bega and 35% will be travelling via the Monaro Highway south of High Lake Road, towards Bombala or Pambula, the additional number of daily truck movements from the quarry will be +32 movements on an average day and +80 movements on a maximum production day, which will be distributed as follows:

- +22 additional daily truck movements on an average day (+52 movements on a maximum production day) travelling to and from the north via the Monaro Highway, travelling towards Cooma and Jindabyne; and
- +10 additional daily truck movements on an average day (+28 movements on a maximum production day) travelling to and from the south via the Monaro Highway to Bombala and then via Cathcart Road travelling to and from Pambula.

3.3 Additional daily traffic travelling via Cathcart Road

Under the proposed modification, the relevant number of additional daily truck traffic movements travelling via Bombala and using Cathcart Road to travel to and from Pambula, will be +12 additional daily truck movements on an average day (+32 movements on a maximum production day).



Source: EMM (2018); DFSI (2017), GA (2015)

0 5 10 km
GDA 1994 MGA Zone 55
N

KEY

- Site boundary
- Rail
- Main road
- Watercourse
- NPWS reserve
- State forest

Road network and transport routes for the project

Bombala Quarry Modification
Traffic Impact Assessment
Figure 3.1

EMM
creating opportunities

4 Assessment of traffic impacts

This chapter discusses the effects of the additional proposed daily truck traffic movements, which are identified in Sections 3.1 and 3.2, on the primary affected roads and intersections.

4.1 Effect of additional daily traffic using High Lake Road

The effects of the additional daily traffic movements using High Lake Road, east of the Monaro Highway have been assessed in comparison to the existing surveyed daily traffic usage of the road, which is shown in Section 2.1, adjusted to include the approved Bombala Quarry truck traffic on the days when the quarry is operating. This adjusted baseline daily traffic is calculated as 54 daily vehicle movements on an average production day at the quarry and 104 daily vehicle movements on a maximum production day.

The additional proposed daily traffic movements which will be using High Lake Road, will be +16 additional daily loads (+32 additional daily truck movements) on an average production day and +40 additional daily loads (+80 additional daily truck movements), on a maximum production day.

The effects of this additional traffic will be a 59% increase in the existing daily traffic using High Lake Road on an average production day and a 77% increase on a maximum production day. However, the road is a well constructed sealed road and will be able to accommodate this traffic increase with no adverse impacts on the traffic flow, design road width requirements, or traffic safety for the route.

4.2 Effect of additional daily traffic using Monaro Highway

The effects of the additional daily traffic movements using the Monaro Highway, north and south of High Lake Road, have been assessed in comparison to the existing traffic usage of the road, which has been adjusted from the intersection traffic survey results in Section 2.1 to include the approved Bombala Quarry truck traffic on the days when the quarry is operating. The adjusted baseline daily traffic volumes are:

- 1,067 daily vehicle movements, north of High Lake Road on an average production day and 1,099 daily vehicle movements on a maximum production day; and
- 1,051 daily vehicle movements, south of High Lake Road on an average production day and 1,069 daily vehicle movements on a maximum production day.

The additional proposed daily traffic movements which will be using the Monaro Highway north of High Lake Road, will be +11 additional daily loads (+22 additional daily truck movements) on an average production day and +26 additional daily loads (+52 additional daily truck movements), on a maximum production day.

The additional proposed daily traffic movements which will be using the Monaro Highway south of High Lake Road, will be +5 additional daily loads (+10 additional daily truck movements) on an average production day and +14 additional daily loads (+28 additional daily truck movements), on a maximum production day.

The effects of this additional traffic will be a 2% increase in the existing daily traffic using the Monaro Highway north of High Lake Road on an average production day and a 4% increase on a maximum production day. The effects of this additional traffic will be a 1% increase in the existing daily traffic using the Monaro Highway south of High Lake Road on an average production day and a 3% increase on a maximum production day.

The road carriageway of the Monaro Highway in this locality is a well constructed major rural highway, with sealed shoulders on most sections and the route will be able to accommodate the proposed truck traffic increases with no adverse impacts on the traffic flow, design road width requirements, or traffic safety for the route.

4.3 Effect of additional daily traffic using Cathcart Road

The effects of the additional daily traffic movements using Cathcart Road, north and east of Bombala, have been assessed in comparison to the existing surveyed daily traffic usage of the road, which is shown in Section 2.1, adjusted for the existing quarry truck traffic on the days when the quarry is operating. This is calculated as 490 daily vehicle movements on an average production day at the quarry and 508 daily vehicle movements on a maximum production day.

The additional proposed daily traffic movements which will be using Cathcart Road, will be +5 additional daily loads (+10 additional daily truck movements) on an average production day and +14 additional daily loads (+28 additional daily truck movements), on a maximum production day.

The effects of this additional traffic will be a 2% increase in the existing daily traffic using Cathcart Road on an average production day and a 6% increase on a maximum production day. However, the road is a well constructed sealed road and will be able to accommodate this traffic increase with no adverse impacts on the traffic flow, design road width requirements, or traffic safety for the route.

4.4 Future intersection operations

From consideration of the existing quarry peak hourly truck traffic movements, which are outlined in Section 2.3, and the traffic increases for the future site transport operations detailed in Sections 3.1 and 3.2, there will be an approximate doubling of the future peak hourly site generated traffic movements at the Monaro Highway/High Lake Road intersection. The future intersection turning traffic movements are summarised in Table 4.1.

Table 4.1 Summary of proposed future peak hourly intersection truck turning movements

Peak traffic movements for	Direction of traffic	Hourly vehicles (in)	Hourly vehicles (out)	Distribution
Morning peak hour	Trucks to and from the north	5	5	65% north and 35% south
	Trucks to and from the south	3	3	
Afternoon peak hour	Trucks to and from the north	5	5	65% north and 35% south
	Trucks to and from the south	3	3	

The current Austroads rural intersection design standards, including the warrant charts for the peak hourly traffic volumes which require additional intersection turning lanes, are shown in Appendix B.

The upper warrant chart shows the current BAR/BAL intersection design is applicable for all levels of turning traffic, where the peak hourly through + turning traffic volume using the major road is less than 120 vehicles per hour and the general traffic speed using the major road is either 100 km/hr or greater.

Therefore, even though there will be some increases in the total future peak hourly intersection turning movements with the proposed modification, the maximum turning traffic movement will be no more than five vehicles per hour and the future intersection turning traffic movements on the Monaro Highway will remain below 120 vehicles per hour (with the inclusion of the existing traffic volumes which are shown in Section 2.1) and there will be no need for additional turning lanes and/or sealed shoulder widening at the Monaro Highway/High Lake Road intersection.

4.5 Traffic safety and traffic management

The Monaro Highway/High Lake Road intersection has good sight lines and a good safety record, with no recorded accidents in the past five years. The intersection should continue to operate with a good safety record for all periods of the day, with the additional daily and peak hourly truck traffic movements generated by the proposed modification.

Elsewhere on the regional major road network, which includes the Monaro Highway, Cathcart Road and other transport routes for the project truck traffic travelling towards either Bega or Jindabyne, the nominated roads all have a good safety record currently and the proposed increases in the quarry's average and maximum daily truck traffic movements will not significantly affect the traffic safety, or require any traffic safety related road improvements to these routes.

4.6 Provision of car parking

On-site parking is provided for the existing employees and visitors at the quarry. The quarry truck fleet is based off site and drivers do not require car parking or overnight truck parking at the quarry. The current parking provision will not need to be increased for the proposed quarry production increase.

4.7 Pedestrian, cycling and public transport access

The number of persons who are currently either walking, cycling or catching public transport to and from the quarry is minimal and this is not likely to change with the proposed modification.

Local public transport will also not need to be improved.

5 Summary and recommendation

This report has assessed the traffic impacts of the proposed modification to the quarry which is accessed via High Lake Road via the intersection with the Monaro Highway approximately 4.5 km north of Bombala. The proposed modification will allow the quarry to continue to supply construction materials to customers in the NSW South Coast and surrounding regional markets.

The approved quarry production of 100,000 tpa is proposed to increase to 200,000 tpa. This corresponds to an average daily production increase from 15 to 31 truck loads per day and a maximum daily production increase from 40 to 80 truck loads per day.

The effects of this additional traffic will be 59% and 77% increases in the existing daily traffic using High Lake Road on an average and a maximum production day, respectively. However, the road is a well constructed sealed road and will be able to accommodate these traffic increases, with no adverse impacts on the traffic flow, design road width, or traffic safety for the route.

The effects of the additional traffic will be 2% to 4% increase in the existing daily traffic using the Monaro Highway north of High Lake Road on an average and a maximum production day. There will be 1% to 3% increases in the existing daily traffic using the Monaro Highway south of High Lake Road on an average and a maximum production day. The road carriageway of the Monaro Highway in this locality is a well constructed major rural highway, with sealed shoulders on most sections and the route will be able to accommodate these traffic increases with no adverse impacts on the traffic flow, design road width, or traffic safety for the route.

The effects of the additional traffic using Cathcart Road will be 2% and 6% increases in the existing daily traffic on an average and a maximum production day. However, this road is a well constructed sealed road and will be able to accommodate the traffic increase with no adverse impacts on the traffic flow, design road width, or traffic safety for the route.

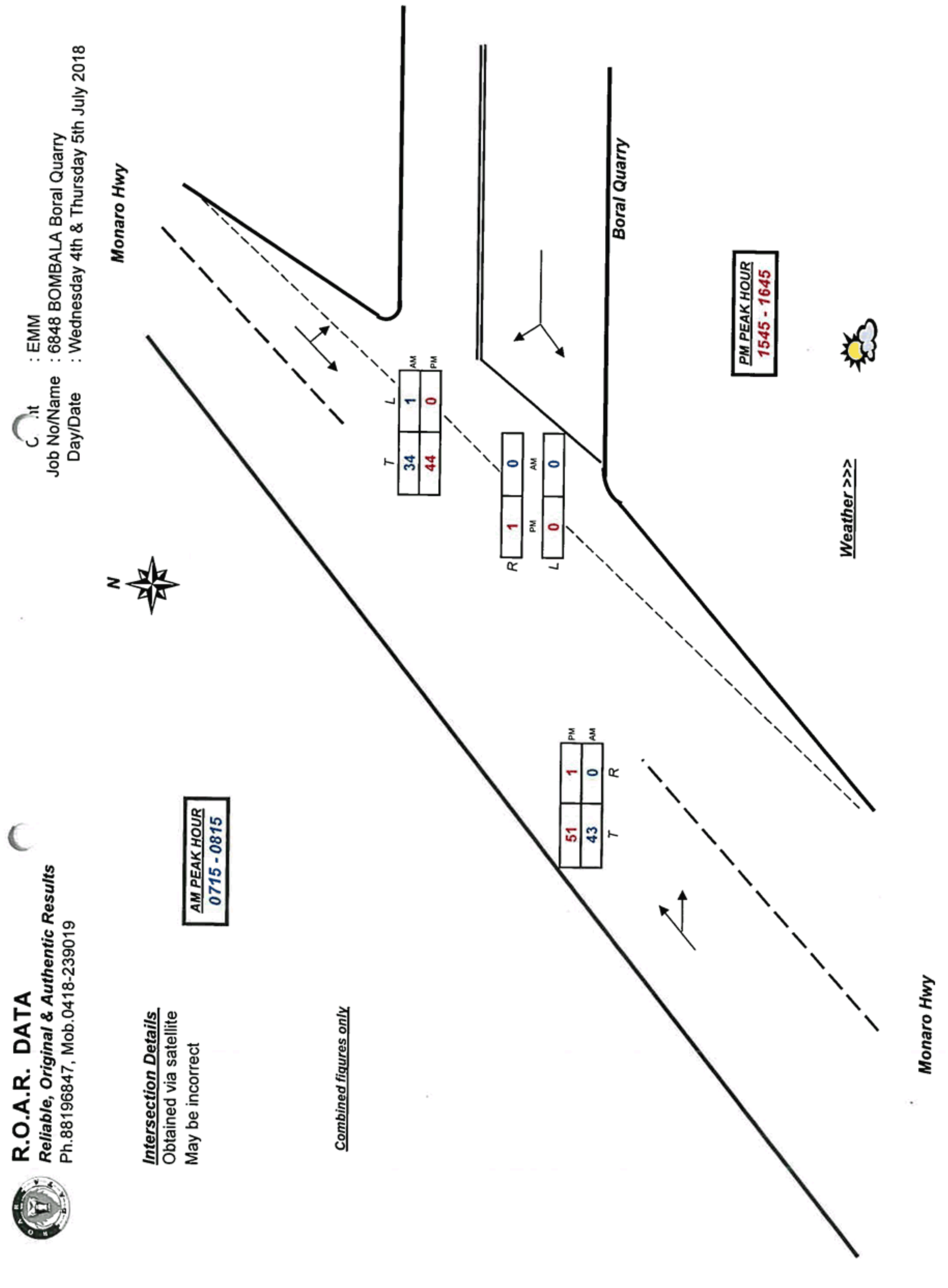
The corresponding maximum hourly increases in truck loads maximum daily production will be from four to eight loads per hour. The Austroads intersection warrant analysis for the Monaro Highway/High Lake Road intersection shows that that the existing intersection type BAR/BAL design will be adequate for both the morning and afternoon traffic peak hours for the quarry traffic using the intersection. The existing intersection operates safely (as supported by accident data) and has good sight lines.

On-site parking at the quarry is adequate to meet the current parking demand and there will be no increase in employees or visitors as a result of the proposed modification.

Cycle, pedestrian and public transport access to the site will not need to be improved as these methods of travel are not generally feasible in the rural area, north of Bombala and there will be no increase in the future numbers of either site employees or visitors.

Appendix A

Traffic survey results


R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019
Job No/Name : 6848 BOMBALA Boral Quarry
Day/Date : Wednesday 4th & Thursday 5th July 2018
Intersection Details
Obtained via satellite
May be incorrect
Combined figures only
AM PEAK HOUR
0715 - 0815
PM PEAK HOUR
1545 - 1645
Weather >>>
Monaro Hwy
Boral Quarry
Monaro Hwy
N
T
L
34
1
44
0
R
L
1
0
0
0
T
R
51
1
43
0
AM
PM

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client : EMM
Job No/Name : 6848 BOMBALA Boral Quarry
Day/Date : Thursday 5th July 2018

PEDS

Time Per	NORTH Monaro Hwy	EAST Boral Quarry	SOUTH Monaro Hwy	TOT
0600 - 0615	0	0	0	0
0615 - 0630	0	0	0	0
0630 - 0645	0	0	0	0
0645 - 0700	0	0	0	0
0700 - 0715	0	0	0	0
0715 - 0730	0	0	0	0
0730 - 0745	0	0	0	0
0745 - 0800	0	0	0	0
0800 - 0815	0	0	0	0
0815 - 0830	0	0	0	0
0830 - 0845	0	0	0	0
0845 - 0900	0	0	0	0
Per End	**0**	**0**	**0**	**0**

PEDS

Peak Per	NORTH Monaro Hwy	EAST Boral Quarry	SOUTH Monaro Hwy	TOT
0600 - 0700	0	0	0	0
0615 - 0715	0	0	0	0
0630 - 0730	0	0	0	0
0645 - 0745	0	0	0	0
0700 - 0800	0	0	0	0
0715 - 0815	0	0	0	0
0730 - 0830	0	0	0	0
0745 - 0845	0	0	0	0
0800 - 0900	0	0	0	0
PEAK HR	**0**	**0**	**0**	**0**

Lights

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Time Per	T	L	R	L	R	T	TOT
0600 - 0615	1	0	0	0	0	1	2
0615 - 0630	5	0	0	0	0	2	7
0630 - 0645	3	0	0	0	0	6	9
0645 - 0700	1	0	0	1	0	2	4
0700 - 0715	2	0	0	0	0	5	7
0715 - 0730	5	0	0	0	0	11	16
0730 - 0745	5	0	0	0	0	5	10
0745 - 0800	11	1	0	0	0	11	23
0800 - 0815	11	0	0	0	0	7	18
0815 - 0830	8	0	0	1	0	2	11
0830 - 0845	7	0	0	0	0	5	12
0845 - 0900	8	0	0	0	0	7	15
Per End	**67**	**1**	**0**	**2**	**0**	**64**	**134**

Heavies

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Time Per	T	L	R	L	R	T	TOT
0600 - 0615	2	0	0	0	0	0	2
0615 - 0630	1	0	0	0	0	1	2
0630 - 0645	2	0	0	0	0	1	3
0645 - 0700	1	0	0	0	0	3	4
0700 - 0715	1	0	0	0	0	4	5
0715 - 0730	1	0	0	0	0	2	3
0730 - 0745	0	0	0	0	0	2	2
0745 - 0800	0	0	0	0	0	3	3
0800 - 0815	1	0	0	0	0	2	3
0815 - 0830	1	0	0	0	0	3	4
0830 - 0845	1	0	0	0	0	0	1
0845 - 0900	1	0	0	0	0	1	2
Per End	**12**	**0**	**0**	**0**	**0**	**22**	**34**

Combined

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Time Per	T	L	R	L	R	T	TOT
0600 - 0615	3	0	0	0	0	1	4
0615 - 0630	6	0	0	0	0	3	9
0630 - 0645	5	0	0	0	0	7	12
0645 - 0700	2	0	0	1	0	5	8
0700 - 0715	3	0	0	0	0	9	12
0715 - 0730	6	0	0	0	0	13	19
0730 - 0745	5	0	0	0	0	7	12
0745 - 0800	11	1	0	0	0	14	26
0800 - 0815	12	0	0	0	0	9	21
0815 - 0830	9	0	0	1	0	5	15
0830 - 0845	8	0	0	0	0	5	13
0845 - 0900	9	0	0	0	0	8	17
Per End	**79**	**1**	**0**	**2**	**0**	**86**	**168**

Lights

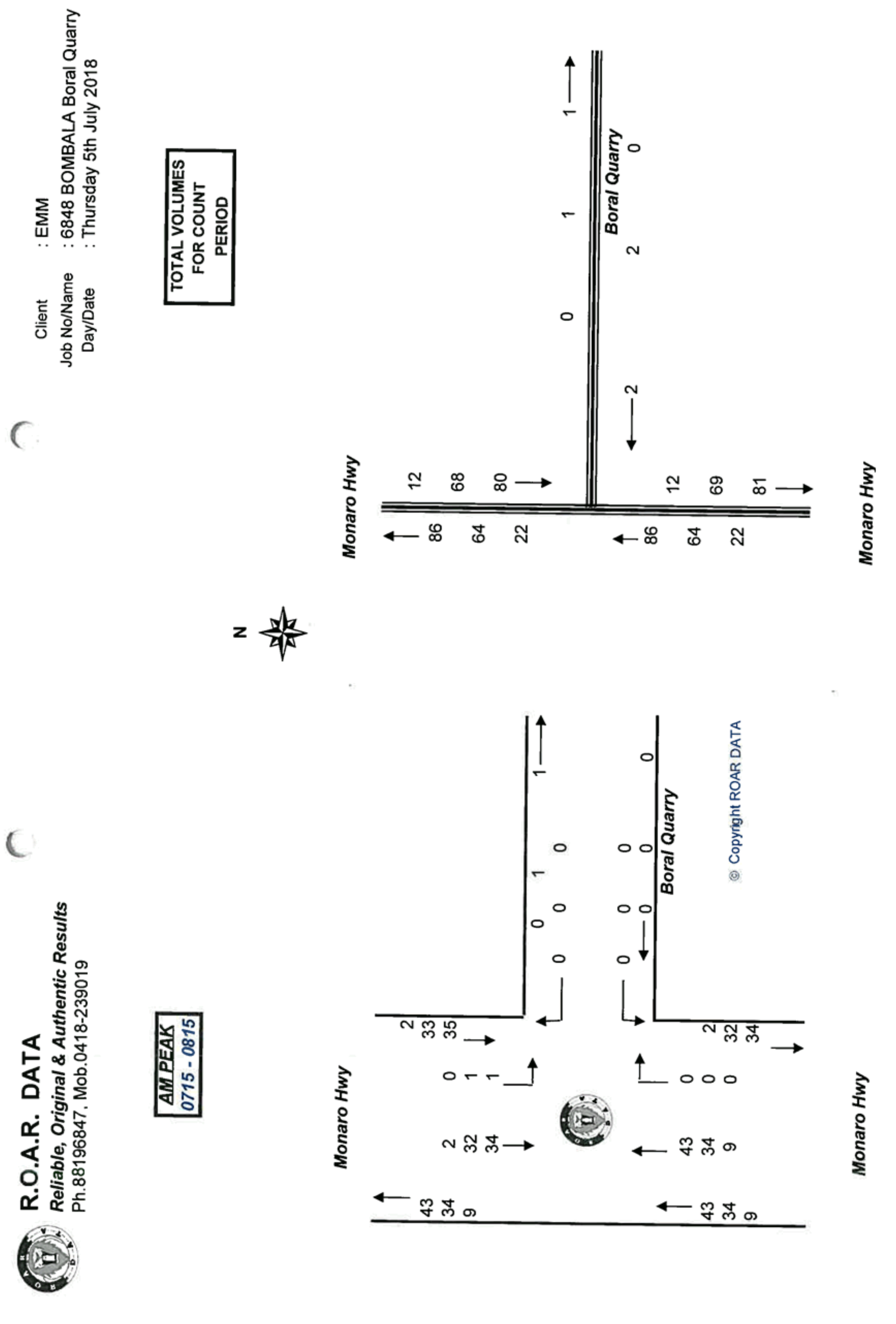
	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Peak Per	T	L	R	L	R	T	TOT
0600 - 0700	10	0	0	1	0	11	22
0615 - 0715	11	0	0	1	0	15	27
0630 - 0730	11	0	0	1	0	24	36
0645 - 0745	13	0	0	1	0	23	37
0700 - 0800	23	1	0	0	0	32	56
0715 - 0815	32	1	0	0	0	34	67
0730 - 0830	35	1	0	1	0	25	62
0745 - 0845	37	1	0	1	0	25	64
0800 - 0900	34	0	0	1	0	21	56
PEAK HR	**32**	**1**	**0**	**0**	**0**	**34**	**67**

Heavies

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Peak Per	T	L	R	L	R	T	TOT
0600 - 0700	6	0	0	0	0	5	11
0615 - 0715	5	0	0	0	0	9	14
0630 - 0730	5	0	0	0	0	10	15
0645 - 0745	3	0	0	0	0	11	14
0700 - 0800	2	0	0	0	0	11	13
0715 - 0815	2	0	0	0	0	9	11
0730 - 0830	2	0	0	0	0	10	12
0745 - 0845	3	0	0	0	0	8	11
0800 - 0900	4	0	0	0	0	6	10
PEAK HR	**2**	**0**	**0**	**0**	**0**	**9**	**11**

Combined

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Peak Per	T	L	R	L	R	T	TOT
0600 - 0700	16	0	0	1	0	16	33
0615 - 0715	16	0	0	1	0	24	41
0630 - 0730	16	0	0	1	0	34	51
0645 - 0745	16	0	0	1	0	34	51
0700 - 0800	25	1	0	0	0	43	69
0715 - 0815	34	1	0	0	0	43	78
0730 - 0830	37	1	0	1	0	35	74
0745 - 0845	40	1	0	1	0	33	75
0800 - 0900	38	0	0	1	0	27	66
PEAK HR	**34**	**1**	**0**	**0**	**0**	**43**	**78**


R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847. Mob.0418-239019
Client : EMM
Job No/Name : 6848 BOMBALA Boral Quarry
Day/Date : Thursday 5th July 2018
AM PEAK
0715 - 0815
TOTAL VOLUMES FOR COUNT PERIOD
Monaro Hwy
Boral Quarry
© Copyright ROAR DATA
N

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client : EMM
Job No/Name : 6848 BOMBALA Boral Quarry
Day/Date : Wednesday 4th July 2018

PEDS

Time Per	NORTH Monaro Hwy	EAST Boral Quarry	SOUTH Monaro Hwy	TOT
1500 - 1515	0	0	0	0
1515 - 1530	0	0	0	0
1530 - 1545	0	0	0	0
1545 - 1600	0	0	0	0
1600 - 1615	0	0	0	0
1615 - 1630	0	0	0	0
1630 - 1645	0	0	0	0
1645 - 1700	0	0	0	0
1700 - 1715	0	0	0	0
1715 - 1730	0	0	0	0
1730 - 1745	0	0	0	0
1745 - 1800	0	0	0	0
Per End	**0**	**0**	**0**	**0**

PEDS

Peak Per	NORTH Monaro Hwy	EAST Boral Quarry	SOUTH Monaro Hwy	TOT
1500 - 1600	0	0	0	0
1515 - 1615	0	0	0	0
1530 - 1630	0	0	0	0
1545 - 1645	0	0	0	0
1600 - 1700	0	0	0	0
1615 - 1715	0	0	0	0
1630 - 1730	0	0	0	0
1645 - 1745	0	0	0	0
1700 - 1800	0	0	0	0
PEAK HR	**0**	**0**	**0**	**0**

Lights

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Time Per	T	L	R	L	R	T	TOT
1500 - 1515	10	0	0	0	0	5	15
1515 - 1530	8	1	0	0	0	9	18
1530 - 1545	6	0	0	0	0	8	14
1545 - 1600	11	0	0	0	0	9	20
1600 - 1615	5	0	0	0	1	12	18
1615 - 1630	13	0	0	0	0	13	26
1630 - 1645	7	0	1	0	0	10	18
1645 - 1700	4	0	0	0	0	10	14
1700 - 1715	8	0	0	0	0	11	19
1715 - 1730	7	0	0	0	1	7	15
1730 - 1745	6	0	0	0	1	7	14
1745 - 1800	9	0	0	0	0	6	15
Per End	**94**	**1**	**1**	**0**	**3**	**107**	**206**

Heavies

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Time Per	T	L	R	L	R	T	TOT
1500 - 1515	1	0	0	0	0	1	2
1515 - 1530	0	0	0	0	0	0	0
1530 - 1545	3	0	0	0	0	3	6
1545 - 1600	3	0	0	0	0	2	5
1600 - 1615	1	0	0	0	0	2	3
1615 - 1630	1	0	0	0	0	3	4
1630 - 1645	3	0	0	0	0	0	3
1645 - 1700	3	0	0	0	0	6	9
1700 - 1715	2	0	0	0	0	1	3
1715 - 1730	2	0	0	0	0	0	2
1730 - 1745	3	0	0	0	0	2	5
1745 - 1800	0	0	0	0	0	4	4
Per End	**22**	**0**	**0**	**0**	**0**	**24**	**46**

Combined

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Time Per	T	L	R	L	R	T	TOT
1500 - 1515	11	0	0	0	0	6	17
1515 - 1530	8	1	0	0	0	9	18
1530 - 1545	9	0	0	0	0	11	20
1545 - 1600	14	0	0	0	0	11	25
1600 - 1615	6	0	0	0	1	14	21
1615 - 1630	14	0	0	0	0	16	30
1630 - 1645	10	0	1	0	0	10	21
1645 - 1700	7	0	0	0	0	16	23
1700 - 1715	10	0	0	0	0	12	22
1715 - 1730	9	0	0	0	1	7	17
1730 - 1745	9	0	0	0	1	9	19
1745 - 1800	9	0	0	0	0	10	19
Per End	**116**	**1**	**1**	**0**	**3**	**131**	**252**

Lights

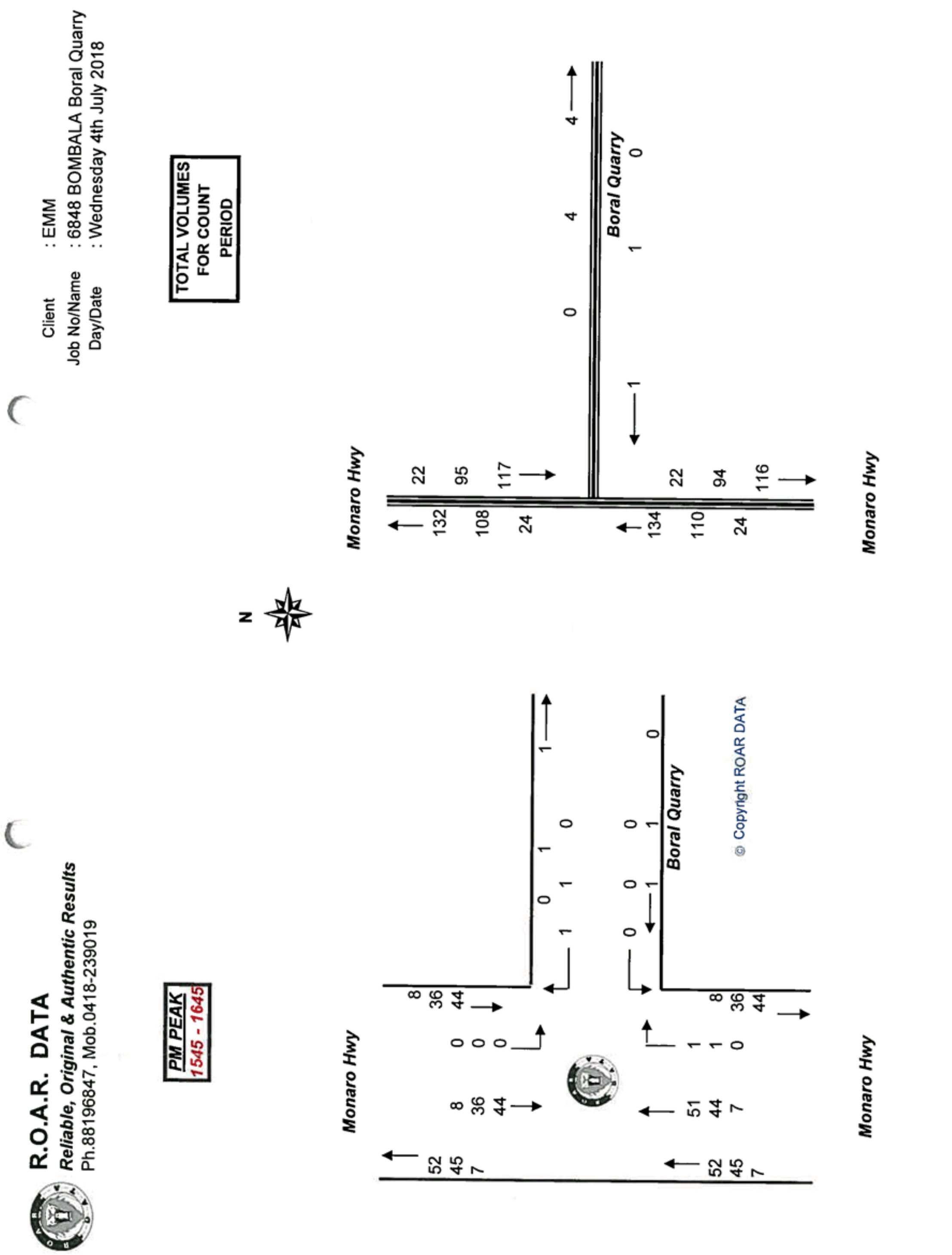
	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Peak Per	T	L	R	L	R	T	TOT
1500 - 1600	35	1	0	0	0	31	67
1515 - 1615	30	1	0	0	1	38	70
1530 - 1630	35	0	0	0	1	42	78
1545 - 1645	36	0	1	0	1	44	82
1600 - 1700	29	0	1	0	1	45	76
1615 - 1715	32	0	1	0	0	44	77
1630 - 1730	26	0	1	0	1	38	66
1645 - 1745	25	0	0	0	2	35	62
1700 - 1800	30	0	0	0	2	31	63
PEAK HR	**36**	**0**	**1**	**0**	**1**	**44**	**82**

Heavies

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Peak Per	T	L	R	L	R	T	TOT
1500 - 1600	7	0	0	0	0	6	13
1515 - 1615	7	0	0	0	0	7	14
1530 - 1630	8	0	0	0	0	10	18
1545 - 1645	8	0	0	0	0	7	15
1600 - 1700	8	0	0	0	0	11	19
1615 - 1715	9	0	0	0	0	10	19
1630 - 1730	10	0	0	0	0	7	17
1645 - 1745	10	0	0	0	0	9	19
1700 - 1800	7	0	0	0	0	7	14
PEAK HR	**8**	**0**	**0**	**0**	**0**	**7**	**15**

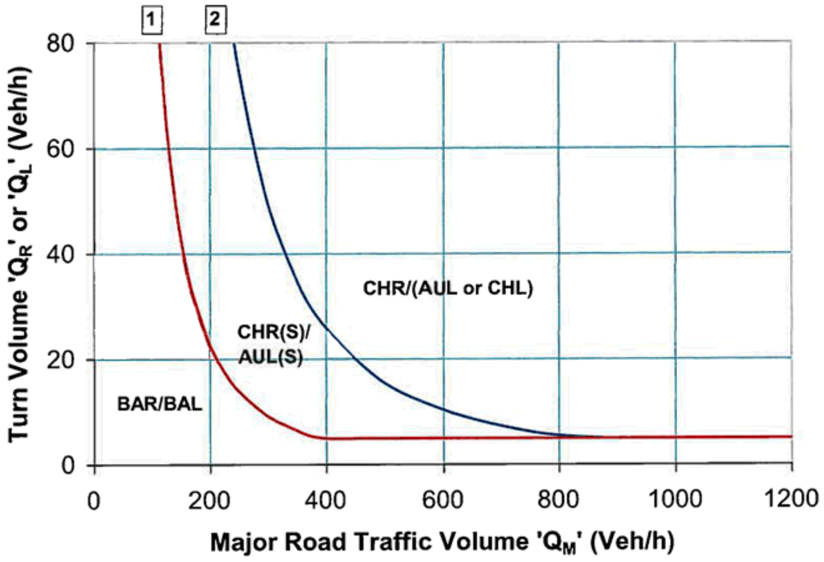
Combined

	NORTH		EAST		SOUTH		
	Monaro Hwy		Boral Quarry		Monaro Hwy		
Peak Per	T	L	R	L	R	T	TOT
1500 - 1600	42	1	0	0	0	37	80
1515 - 1615	37	1	0	0	1	45	84
1530 - 1630	43	0	0	0	1	52	96
1545 - 1645	44	0	1	0	1	51	97
1600 - 1700	37	0	1	0	1	56	95
1615 - 1715	41	0	1	0	0	54	96
1630 - 1730	36	0	1	0	1	45	83
1645 - 1745	35	0	0	0	2	44	81
1700 - 1800	37	0	0	0	2	38	77
PEAK HR	**44**	**0**	**1**	**0**	**1**	**51**	**97**

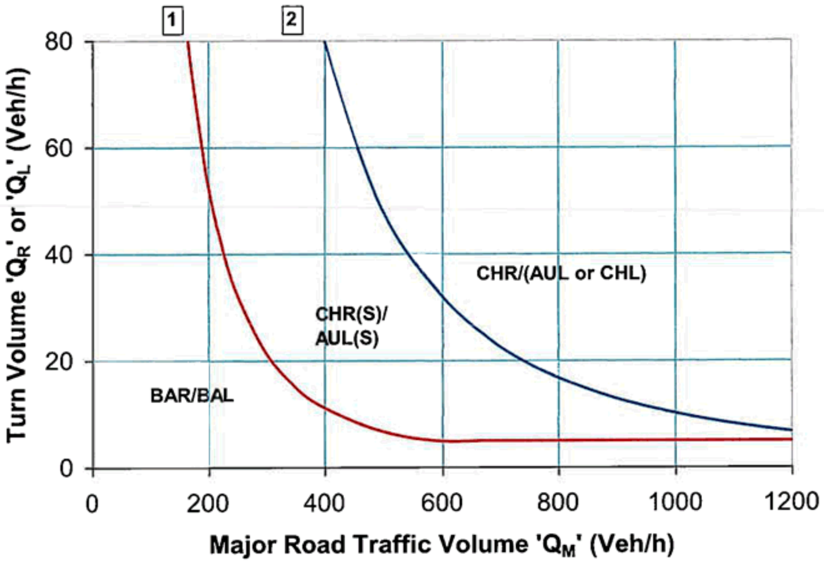

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019
Client : EMM
Job No/Name : 6848 BOMBALA Boral Quarry
Day/Date : Wednesday 4th July 2018
TOTAL VOLUMES FOR COUNT PERIOD
PM PEAK
1545 - 1645
N
Monaro Hwy
Monaro Hwy
Boral Quarry
Monaro Hwy
Monaro Hwy
Boral Quarry
© Copyright ROAR DATA

Appendix B

Austroads Intersection Design Guide Extract



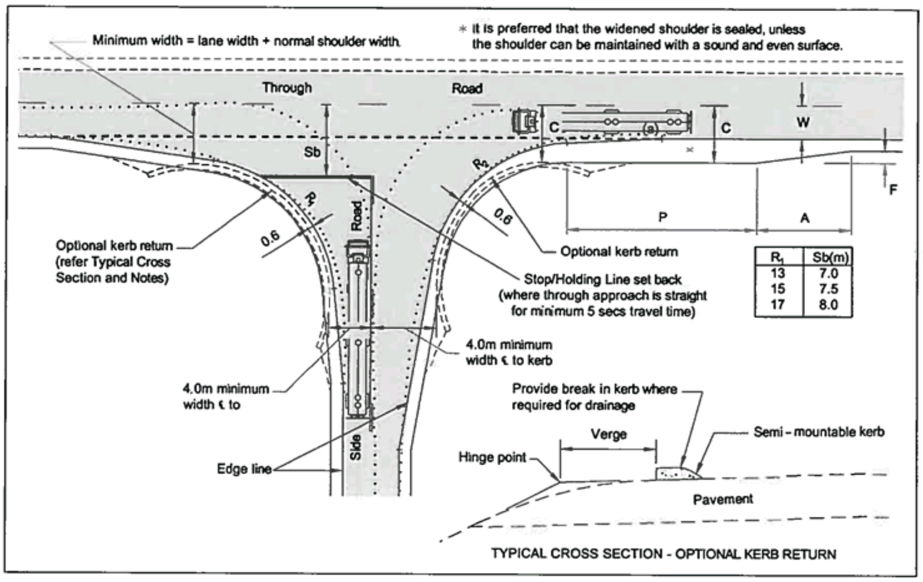
(a) Design speed ≥100 km/h



(b) Design speed < 100 km/h

Source: Arndt and Troutbeck (2006).

Figure 4.9: Warrants for turn treatments on the major road at unsignalised intersections



Notes:

1. R1 and R2 are determined by the swept path of the design vehicle.
2. 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).

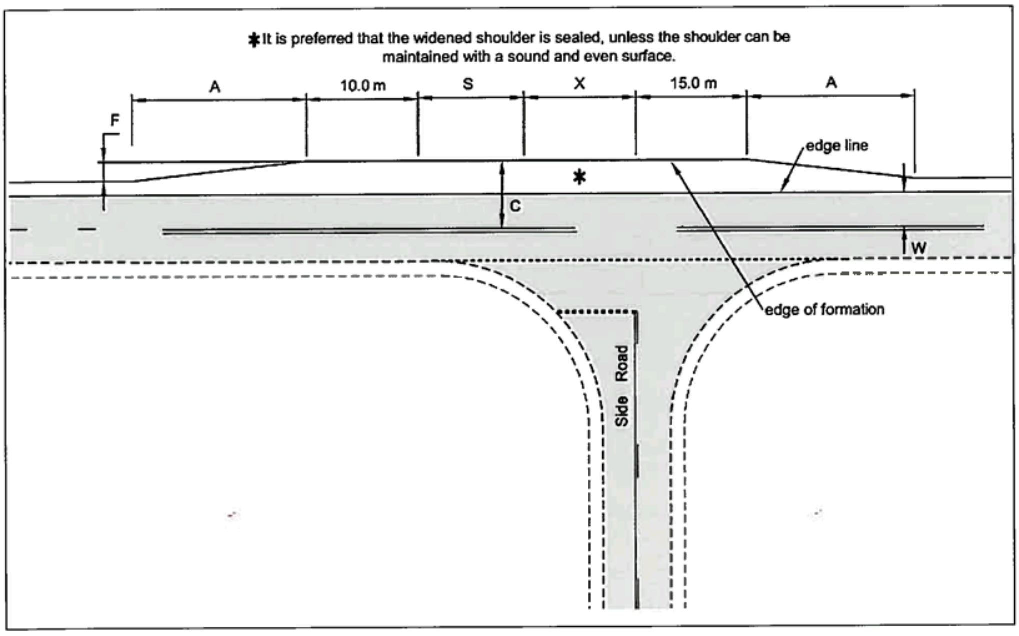
Source: QDMR (2006).

Figure 8.2: Rural basic left-turn treatment (BAL)

Table 8.1: Minimum length of widened parallel shoulder

Design speed of major road approach (km/h)	Minimum length of parallel widened shoulder P (m)
50	0
60	5
70	10
80	15
90	20
100	25
110	35
120	45

Note: Adjust the length for grade using the 'correction to grade' factor in Table 5.3
Source: QDMR (2006).



Notes:

1. This treatment applies to the right turn from a major road to a minor road.
2. 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 – 6.5 m minimum

7.0 m minimum for Type 1 & 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 = $\frac{0.5VF}{3.6}$

Increase length A on tighter curves (e.g. those with a side friction demand 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).

F = Formation/carriageway widening (m).

S = Storage length to cater for one design turning vehicle (m) (minimum length 12.5 m).

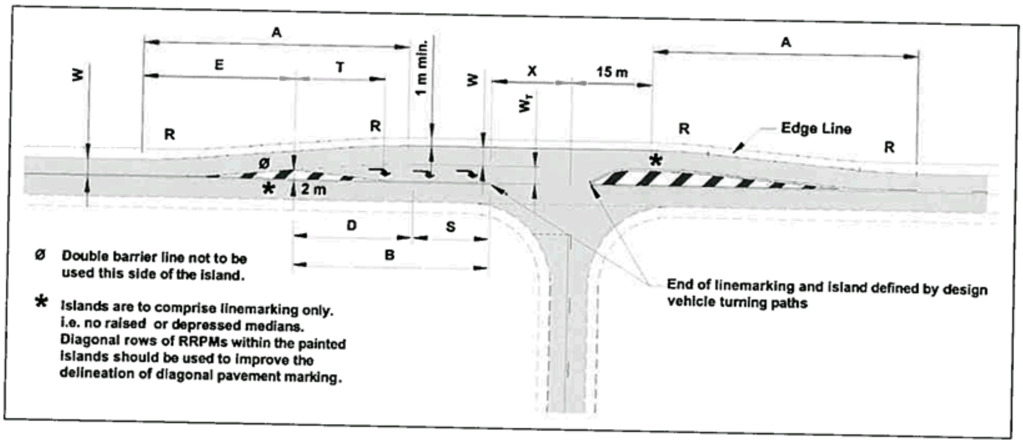
X = Distance based on design vehicle turning path, typically 10–15 m.

Source: QDMR (2006).

Figure 7.5: Basic right (BAR) turn treatment on a two-lane rural road

7.5.2 Rural Channelised T-junction – Short Lane Type CHR(S)

The CHR(S) turn treatment shown in Figure 7.6 is a more desirable treatment than the BAR treatment because it provides greater protection for vehicles waiting to turn right from the centre of the road. This treatment is suitable where there are low to moderate through and turning volumes. For higher volume sites, a full-length CHR turn treatment (Figure 7.7) is preferred.



Note: The dimensions of the treatment are defined below and values of A, D, R and T are shown in Table 7.1:

W = Nominal through lane width (m) (including widening for curves). For a new intersection on an existing road, the width is to be in accordance with the current link strategy.

W_T = Nominal width of turn lane (m), including widening for curves based on the design turning vehicle = 3.0 m minimum.

B = Total length of auxiliary lane including taper, diverge/deceleration and storage (m).

E = Distance from start of taper to 2.0 m width (m) and is given by:

$$E = 2\left(\frac{A}{W_T}\right)$$

T = Taper length (m) and is given by:

$$T = \frac{0.33xVxW_T}{3.6}$$

S = Storage length to cater for one design turning vehicle (m).

V = Design speed of major road approach (km/h).

X = Distance based on design vehicle turning path, typically 10–15 m.

Source: QDMR (2006).

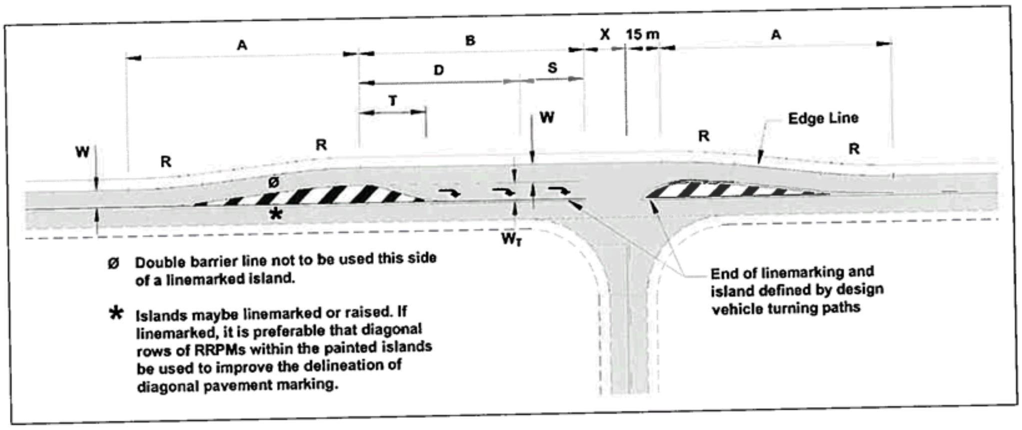
Figure 7.6: Channelised right-turn treatment with a short turn slot [CHR(S)] two-lane rural road

7.5.3 *Rural Channelised T-junction – Full Length (CHR)*

For this layout, all traffic is required to deviate and therefore the road alignment for the through movement must be designed to suit the operating speed. This deviation requires the pavement to be widened to provide a full-length right-turn lane as shown in Figure 7.7.

The minimum lengths of deceleration (D) for different design speeds are shown in Table 5.2 and should be based on the comfortable deceleration rate of 2.5 m/s^2. The storage length (S) is usually determined through the use of computer programs such as aaSIDRA.

Details of the departure end of the right-turn lane should be determined using turning path templates (minimum radius 15.0 m). This will depend on the width and the angle of intersection of the road that the turning vehicle is entering.



Notes:

1. An alternative to the double white line on the offside edge of the right-turn slot is a 1.0 m painted median. The 1.0 m median is particularly useful when the major road is on a tight horizontal curve and oncoming vehicles track across the centreline. Provision of this median will require the dimension 'A' to be increased.
2. A raised concrete median on the minor road may be used with this treatment to minimise 'corner cutting', particularly for higher turning volumes.
3. The dimensions of the treatment are defined below and values of A, D, R and T are shown in Table 7.2:

W = **Nominal through lane width (m) (including widening for curves). For a new intersection on an existing road, the width is to be in accordance with the current link strategy.**

W_T = **Nominal width of turn lane (m), including widening for curves based on the design turning vehicle. Desirable minimum = W, absolute minimum = 3.0 m.**

B = **Total length of auxiliary lane including taper, diverge/deceleration and storage (m).**

D = **Diverge/deceleration length including taper. Adjust for grade using the 'correction to grade' factor (Section 5)**

T = **Physical taper length (m) and is given by:**

$$T = \frac{0.33VW_T}{3.6}$$

S = **Storage length (m) should be the greater of:**

1. **the length of one design turning vehicle or**
2. **(calculated car spaces –1) x 8 m (*Guide to Traffic Management – Part 3: Traffic Studies and Analysis* (Austroads 2009h), or use computer program e.g. aaSIDRA).**

V = **Design speed of major road approach (km/h)**

X = **Distance based on design vehicle turning path, typically 10–15 m**

Source: Based on QDMR (2006).

Figure 7.7: Channelised right turn (CHR) on a two-lane rural road

7.5.4 Rural Right-Left Staggered T

Basic two-lane two-way road

This layout should be designed to ensure that:

- the stagger distance between the minor legs is large enough to discourage drivers from 'taking a short-cut on the wrong side of the traffic islands (e.g. at least 15 m to 25 m depending on the site characteristics)
- the island treatments in the minor roads are long enough to also discourage wrong way movements
- sufficient width is provided on the major road within the intersection to enable through vehicles to pass slowly to the left of vehicles waiting to turn right (e.g. 12 m), a similar principle to the BAR treatment.

EMM

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St Leonards, New South Wales, 2065
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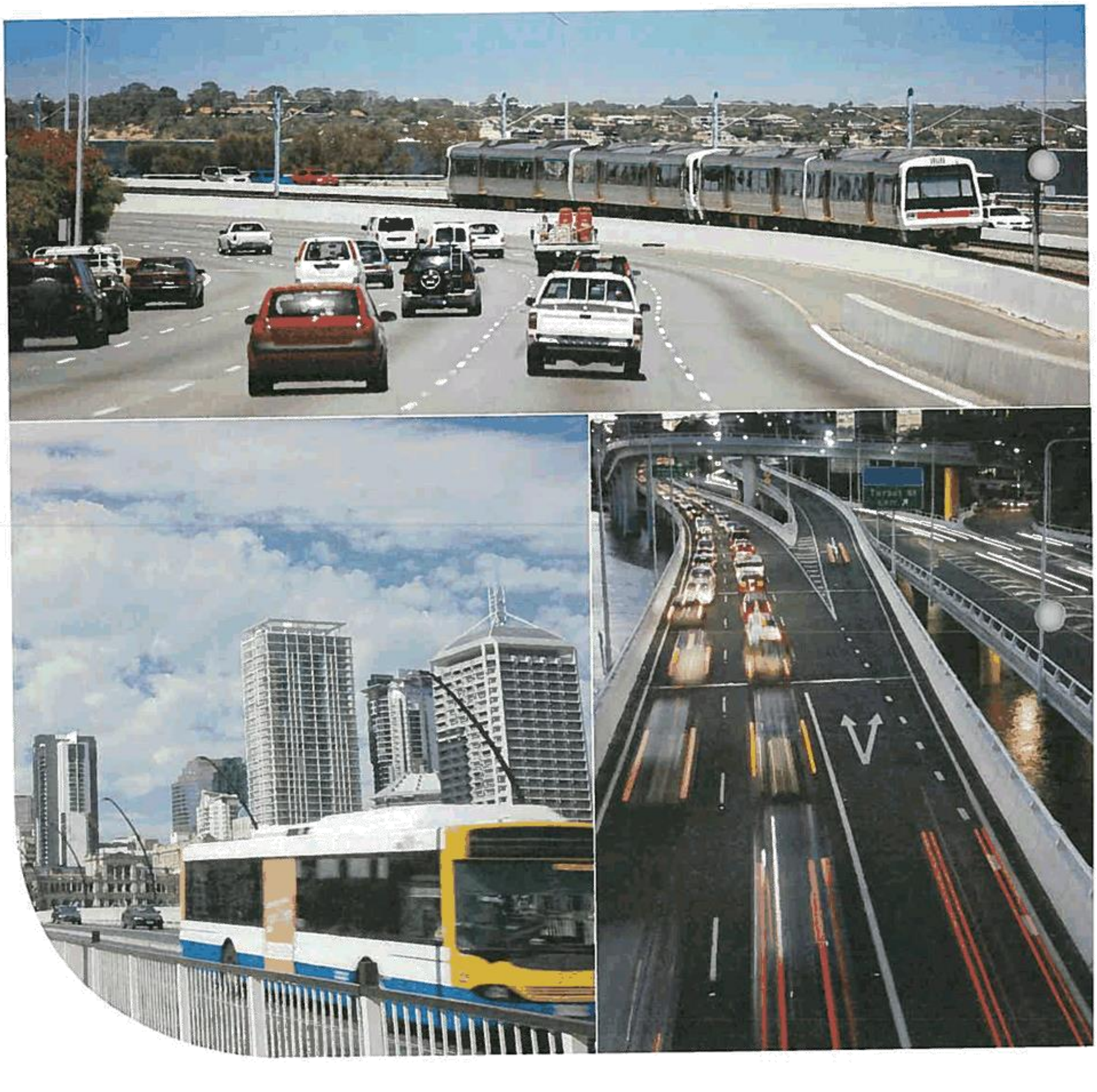
NEWCASTLE
Level 1, Suite 6, 146 Hunter Street
Newcastle, New South Wales, 2300
T 02 4907 4800

BRISBANE
Level 10, Suite 01, 87 Wickham Terrace
Spring Hill, Queensland, 4000
T 07 3648 1200

ADELAIDE
Level 1, 70 Pirie Street
Adelaide, South Australia, 5000
T 08 8232 2253



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Appendix D

Community newsletter

Build something great™

Boral Bombala Quarry

High Lake Road Neighbourhood Update

BORAL®

November 2018

Boral Quarries is pleased to provide this update to neighbours of our Bombala site in High Lake Road on matters associated with the quarry during the past few months.

Since our team last visited Bombala in August, there have been a number of actions implemented in association with the proposed re-opening of the quarry:

- Reopening is now likely by early 2019. Some interim re-establishment works, such as the installation of equipment, may be undertaken around December and January.

- Snowy Monaro Council has agreed to assess the proposed quarry production increase from 100,000 to 200,000 tonnes per annum. This means that Council will be the development consent authority. Council will notify you when they receive our modification application.

- Boral is finalising commercial arrangements with the potential quarry lessee.

Next steps:

- Boral will contact each neighbour as a courtesy prior to the re-opening of the quarry, and will introduce the new Quarry Manager to provide a point of contact for any operational queries.

- Council will notify residents about Boral's application to increase the quarry production rate and provide details on how to have your say about the proposal.

Further information?

Contacts:

- Michael Holz, Operations Manager (Country South), Boral Quarries NSW/ACT
  Ph: 02 9033 4206 Mb: 0418 423 032
  Email: michael.holz@boral.com.au

- Fiona Gainsford, Planning and Development Manager, Boral Land & Property Group
  Mb: 0414 400 352 *(Mon/Wed/Thu)* Email: fiona.gainsford@boral.com.au

- Paul Jackson, Stakeholder Relations Manager, Boral Land & Property Group
  Ph: 02 4677 2946 (Mon/Tue/Fri) Mb: 0401 894 097 (Wed/Thu) Email: paul.jackson2@boral.com.au

i_drm078 - Payment Request Entry - Snowy Monaro Bombala - 5572 - 6.10

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1 of 1

Document Details

10 Development Applications 2018 130 1

Total 1542.00 Outstanding 1542.00 Over Payments 0.00

Fees

Type	Description	Qty	From	Until	Fee
DA_MO	Modification of Consent	1	28/11/2018		154

Created 2018-11-28 10:33:25 Modified 2018-11-28 10:34:26 Operator 329 Penelope White

BOMBALA COUNCIL
BOMBALA

MERCHANT COPY

Acquirer
Merchant ID
Terminal ID
Country Code
Date/Time
RRN
VISA
Credit A/C

HAB
26793240
KZF160
AU
28/11/18 11:17
000001040964
471614 938 (K)

AUTH ID 381003
APPROVED 00

PURCHASE $1542.00
TOTAL AUD $1542.00

PLEASE RETAIN AS
RECORD OF PURCHASE

ABN #:72906802034
Snowy Monaro Regional Council
PO Box 105
BOMBALA NSW 2632
Ph 02 6458 3555 Fax 02 6458 3777
Email: council@bombala.nsw.gov.au
Website: www.bombala.nsw.gov.au

Date 28/11/2018 11:18
Receipt 00069338:0001 Terminal 1:37349
Boral Land and Property Group
PO Box 6041
NORTH RYDE NSW 2113

Details

Application fees - M	Amount
Total Value:	1542.00
Tendered	1542.00
Credit	1542.00
Change	0.00

Thank you for your payment

BORAL®

Gainsford, Fiona <fiona.gainsford@boral.com.au>

Cost of Modification

Sophie Ballinger <Sophie.Ballinger@snowymonaro.nsw.gov.au> 26 October 2018 at 10:02
To: "Gainsford, Fiona" <fiona.gainsford@boral.com.au>

Hello Fiona,

The original da fee was $3084.00 so the fee for the modification will be $1542.00

Regards

Sophie

Sophie Ballinger
Manager Development Assessment

SNOWY MONARO
REGIONAL COUNCIL
Stronger together Better together

PO Box 714
COOMA NSW 2630

Direct (02) 6451 1555
Phone 1300 345 345
Fax (02) 6456 3337

snowymonaro.nsw.gov.au

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20 February 2019

Snowy Monaro Regional Council
PO Box 714
COOMA NSW 2630

Dear Sharon

RE: Modified Development Proposal – High Lake Rd Bombala
Application No. 10.2018.130.1

of the High Lake Quarry we would like to raise some concerns in regard to the reopening and expansion of this site. Non – compliance and disregard for neighbour issues by previous Boral managers had a direct impact on the quality of the lives and mental health of the residents of the High Lake community. We hope that we have the support of Council and Boral so that this does not occur again.
When the quarry was previously open there were issues with noise from plant and vehicles predominately, but also dust from operations and truck movements. Our concerns have recently been raised with Boral at a neighbours meeting and we have been told that under the current consent and the proposed expansion that these will be resolved as far as practical.

Road maintenance:
With the doubling of the production volume of the quarry an increase in truck movements is inevitable. The impact on High Lake Rd will be substantial and will require an increase in maintenance.

Quarry Noise:
Noise carries incredibly in this area, which we understand makes noise reduction difficult. We hope that with the compliance of operating hours, the use of 'squashed duck' reversing beepers and the location of the crushing plant and screens in the quarry pit noise will be reduced to and not exceed the levels stated in the Environment Protection Licence issued by the EPA.

Blasting:
We are concerned that if two main blasts a year are performed that damage to residences may occur and would ask that more frequent blasts may be possible with a smaller charge.

Dust Suppression:
As stated in the Environment Protection Licence 'activities in or on the premises must be carried out in a manner that will minimise the generation, or emission from the premises, of wind blown or traffic generated dust'. We realise that water can have a negative effect on the resource being extracted but would appreciate some attempt (that does not include the use of chemicals) to use water as a dust suppressor both on the dirt entry road and the plant and equipment.

Yours faithfully

TO

SNOWY MONARO REGIONAL COUNCIL, REF. 10.2018.130.1

7TH FEB 2019.

RE DEVELOPMENT CONSENT APPLICATION LOT 229 & 230 DP 756819
HIGH LAKE ROAD BOMBALA. APPLICATION NO. 10.2018.130.1 BY BORAL LAND AND PROPERTY GROUP.
TO INCREASE MAXIMUM PRODUCTION FROM 100,000 PER ANNUM TO 200,000 TONNES PER ANNUM.

SIR _

WE THE RESIDENTS SITUATED CLOSE TO THIS QUARRY WISH IT TO BE PLACED ON RECORD THAT WE STRONGLY OPPOSE THE RE OPENING OF THE QUARRY; OUR REASONS ARE LISTED BELOW.

1, EXCESSIVE NOISE LEVEL OF JAW CRUSHER AND SCREENING PLANT.
2, TRUCK MOVEMENT NOISE EARLY IN MORNING 6-30 AM AS THEY LINE UP AT QUARRY GATE, DELIVERY TO SITE LONG AFTER HOURS.
3, EXCESSIVE LEVELS OF AIRBORNE DUST CAUSED BY TRUCK AND LOADER OPERATIONS, GENERAL AIR POLLUTION ALL AROUND.
3, TRUCKS SHORT CUTTING TO QUARRY ON THE ANCILLARY ROADS.
4, AND THE CLOUDS OF DEADLY SILICA DUST FROM THE JAW CRUSHER, THE WIND SPREADS THIS DUST ALL AROUND THE AREA CLOSE TO QUARRY, HOW WILL BE PROTECTED WE PEOPLE THAT ALL LIVE IN CLOSE PROXIMITY TO THE CRUSHER FROM SILICOSIS, A VERY DEADLY LUNG DISEASE??
5 DRILLING MACHINES WORKING ALL HOURS ON WEEKENDS ETC.
SO YOU SEE WE WILL HAVE TO FIGHT THESE PROBLEMS ALL OVER AGAIN.-

Draft conditions of consent DA10.2018.130.1

Integrated Approval Bodies

The application was not integrated development

Reasons for Decision

Pursuant to Schedule 1 cl 20(1)(c)

The reasons for the decision were:

1. The proposal adequately satisfies the application provisions and objectives of the Bombala LEP 2012 and the Bombala DCP 2012
2. The proposed development adequately satisfies the relevant State Environment Planning Policies.
3. The proposed development, subject to the conditions below, will have no unacceptable adverse impacts on the natural or built environments including heritage items, local waterways or drainage systems or the operation of the local road system. Further it is considered that developments of the subject site does not prevent future reasonable development of adjoining allotments
4. The application was notified to adjoining landowners and publicly advertised in accordance with the Bombala DCP 2012 and the relevant statutory regulations. The proposal received “2” submissions.
5. In consideration of conclusions 1 – 4 above it is considered the proposed development is a suitable and planned use of the site and approval of the proposal is in the public interest.

Conditions

ADMINISTRATIVE CONDITIONS

1. The development being carried out substantially in accordance with the applications and accompanying documents submitted (including the Statement of Environmental Effects, dated November 2018, prepared by EMM Consulting), as modified by any conditions of this consent.
   Reason: Ensure that the development is completed in accordance with Council’s consent.

2. NO WORK IS TO COMMENCE on the erection of structures until a Construction Certificate is issued by Council or a private Principal Certifying Authority.

Reason: Requirement of the Environmental Planning and Assessment Act and Regulations.

3. That by 30th March 2009 the section of High Lake Road used to access the development be upgraded in both pavement and geometric design as follows:

   - In general road is to be designed in accordance with the Roads and Traffic Authority's Road Design Guide.
   - A Pavement design is to be completed in accordance with the requirements of the Austroads publication "Pavement Design - A Guide to the Structural Design of Road Pavements" and shall be designed by a qualified Engineer.
   - Pavement shall be designed using 1 X 10^7 Equivalent Standard Axles with a minimum 20-year design life.
   - As a minimum the finished pavement it is to have a 6.2m wide sealed Carriageway, consisting of a single-coat 14mm sprayed seal over a 7mm prime seal, which has had adequate curing time.
   - A Design for the upgrade of Council's road including a Pavement and Seal Design is to be submitted to Council for Approval prior to commencement of work.
   - Council is to inspect the constructed pavement prior to sealing.

   Reason: Provision of adequate access to the development.

4. Cost of all roading upgrades shall be bourne wholly by the developer.
   Reason: Provision of adequate access to the development.

5. The developer shall attain Section 138 of the Roads Act approval prior to commencement of works within Council road reserves.
   Reason: Request for Roads Act.

6. That by the 30th of July each year a report detailing the quantities of materials produced on the site for the previous 12 months ending 30th June be provided to the General Manager of Bombala Council.
   Reason: Monitoring of compliance with the consent.

7. That by 31 August 2008 a landscaping plan is prepared by the applicant and approved by Bombala Council.
   Reason: Protection of visual amenity.

8. That the development comply with the General Terms of Approval provided by the Department of Environment and Conservation (attached) modified as follows:

   1. Condition L9.3 b) which reads *"b) A system that allows for periodic assessment of Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) to minimise noise impacts over the life of the proposal;"* should now read *"b) A system that allows for periodic assessment of Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) to minimise noise impacts over the life of the proposal; including measures to ensure that*

noise is considered, to the greatest extent practicable, when procuring new equipment ie implementation of "buy quiet" practices."

2. Table L6.1 should be replaced with the table below which shows the revised noise levels predicted based on the additional information provided to EPA. The EPA has assessed these noise levels and determined that the activity can hold an Environment Protection Licence (EPL) as the revised noise levels are within 5 dB(A) of the Project Specific Noise Level.

L6. Noise limits
L6.1 Noise from the premises must not exceed the noise limits presented in the table below:

Location	***Daytime Quarry Operations***	
	$L_{Aeq(15\ minute)}$ ***All equipment excluding 'campaign drilling operations'***	***$L_{Aeq(15\ minute)}$*** ***During designated 'campaign drilling operations' periods as permitted by condition L7***
(R2) 'Oxley' during Operational Stages 1-7	*40 dB(A)*	*42 dB(A)*
(R1) 'High Lake' during Operational Stages 1-7	*40 dB(A)*	*40 dB(A)*
Any other residence excluding 'Oxley' and 'High Lake' during Operational Stages 1-7	*40 dB(A)*	*40 dB(A)*
'Oxley' during Operational Stages 8-10	*40 dB(A)*	*40 dB(A)*
Any residence excluding 'Oxley' during Operational Stages 8-10	*40 dB(A)*	*40 dB(A)*

Please note that all other conditions as set out in the GTA's remain valid.
Reason: Protection of the Environment.

9. Prior to clearing or disturbing of any individual *Eucalyptus pauciflora* and *Eucalyptus viminalis* species separate application is to made to Bombala Council to be approved by Council.
Reason: Protection of the Environment.

10. Adequate staff amenities in accordance with the Building Code of Australia shall be provided including appropriate disposal of sanitary wastes from the site.
Reason: Compliance with the Building Code of Australia.

11. The developer is advised that the *Eucalyptus pauciflora* and *Eucalyptus viminalis* woodland communities are currently proposed as an Endangered Ecological Community under the Threatened Species Conservation Act (1995) and may, in future, require additional approvals for clearing or disturbing.
Reason: Advice to the applicant.

12. All building work will comply with the requirements of the Building Code of Australia.
Reason: Safety of patrons.

13. That by 30th March 2009 the developer shall provide roading in accordance with the requirements from the Roads and Traffic Authority as follows:

    - The junction of the Monaro Highway (HW4) and High Lake Road should be upgraded to a sealed Type BAL left turn together with a sealed Type BAR right turn configuration as per Section 4 of the *RTA Road Design Guide* and include a verge in accordance with Section 3.6 of the *RTA Road Design Guide.*

    - Geometric road design shall be in accordance with *RTA Road Design Guide.* Pavement design shall be in accordance with the *AUSTROADS Pavement Design Guide.*

    - All roadwork's associated with this development will be at no cost to the RTA.
    - The developer shall attain Section 138 Approval from Council with RTA concurrence for works within the Classified Road Reserve.
    - The developer shall apply for a Road Occupancy Licence (ROL) from the RTA Traffic Operations Unit (TOU) prior to commencing work within the classified road reserve. The application will require a Traffic Management Plan (TMP) to be prepared by a person who is certified to prepare Traffic Control Plans. Should the TMP require a reduction of the speed limit, a Direction to Restrict will also be required from the TOU. Please allow 2 weeks prior to commencement of work to process the Road Occupancy Licence.
    Reason: Safety of the public.

14. The use of High Lake Road and Pipeclay Springs Road East of the new site entry to the Mount Darragh Road (MR91) by quarry product haulage vehicles leaving the site is prohibited.
    Reason: Safety of the public.

15. That an application is made to surrender Development Consent 14/93 by the 1 January 2009.
    Reason: To contain operations on the site under a single approval.

16. That each year an annual noise compliance audit is completed when the drilling campaign is underway and all other site activities are being carried out to assess compliance with the Industrial Noise Policy. A copy of the audit report is to be provided to the General Manager within 28 days of the commencement of the relevant drilling campaign.
    Reason: To determine compliance with the Industrial Noise Policy.

17. That the developer establish a vegetation corridor enclosed by a stock proof fence within the High Lake road reserve by 1st January 2009. The corridor is to extend from the corner of Pipeclay Springs road to a point 100m West of the site entry point with an open section adjacent to the site access road. The fencing and planting is to be in accordance with a plan supplied by Council and the plantings are to be maintained by the developer until 1st January 2010.
    Reason: Control impacts on visual amenity.

18. That the internal site haulage road from the weighbridge to the entry onto High Lake Road is to be either bitumen sealed or concrete paved and shall be maintained to provide a dust free running surface.
Reason: To control dust emissions from the site.

19. That the use of compression braking (exhaust brakes) by quarry product haulage vehicles leaving or entering the site is prohibited while the vehicles are on High Lake Road.
Reason: Control impacts on local amenity.

20. The section of High Lake Road required to be upgraded by this consent shall continue eastwards from the new entry to the site a sufficient distance to adequately prevent gravel washing from the unsealed section onto the quarry truck haulage section of the road.
Reason: Minimise nuisance caused by dust.

General Terms of Approval

Notice No: 1069988

ADMINISTRATIVE CONDITIONS

A1. Information supplied to the EPA

A1.1 Except as expressly provided by these General Terms of Approval, works and activities must be carried out in accordance with the proposal contained in:

- the Development Application DA.07.0013 submitted to Bombala Council on 26 September 2006;
- the document "Bombala Quarry Expansion Environmental Impact Statement" (prepared by Environmental Resources Management Australia, August 2006) relating to the development; and
- all additional documents supplied to the EPA in relation to the development, including the following additional information that was requested by the EPA:
  a) correspondence received from Bombala Shire Council and accompanying information titled "Bombala Quarry Expansion Representations Report" from Environmental Resources Management Australia, dated 12 February 2007 (DEC file ID DOC07/5950 – FIL06/682).

A2. Fit and Proper Person

A2.1 The applicant must, in the opinion of the EPA, be a fit and proper person to hold a licence under the Protection of the Environment Operations Act 1997, having regard to the matters in s.83 of that Act.

DISCHARGES TO AIR AND WATER APPLICATIONS TO LAND

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Description of Location
1	Dust Monitoring		Dust deposition gauge located at a site to be determined[1] representative of receptors to the south-west of the site
2	Dust Monitoring		Dust deposition gauge located at a site to be determined[1] representative of receptors to the south-east of the site
3	Meteorological Monitoring		To be determined[1]

[1] To be determined in an air monitoring plan to be prepared by the proponent.

P1.2 The licensee must prepare an air quality monitoring plan and submit this to the DEC prior to commencement of operations. This plan must detail the air quality and meteorological monitoring locations and provide justification for the selection of these locations.

General Terms of Approval

Notice No: 1069988

LIMIT CONDITIONS

L1. Pollution of waters

L.1.1 Except as may be expressly provided by a licence under the Protection of the Environment Operations Act 1997 in relation of the development, section 120 of the Protection of the Environment Operations Act 1997 must be complied with in and in connection with the carrying out of the development.

L5. Waste

L5.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997.

L5.2 This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if it requires an environment protection licence under the Protection of the Environment Operations Act 1997.

L6. Noise limits

L6.1 Noise from the premises must not exceed the noise limits presented in the table below:

Location	Daytime Quarry Operations	
	$L_{Aeq(15\ minute)}$ **All equipment excluding 'campaign drilling operations'**	$L_{Aeq(15\ minute)}$ **During designated 'campaign drilling operations' periods as permitted by condition L7**
'Oxley' during Operational Stages 1-7	39 dB(A)	41 dB(A)
'High Lake' during Operational Stages 1-7	35 dB(A)	39 dB(A)
Any other residence excluding 'Oxley' and 'High Lake' during Operational Stages 1-7	35 dB(A)	35 dB(A)
'Oxley' during Operational Stages 8-10	36 dB(A)	36 dB(A)
Any residence excluding 'Oxley' during Operational Stages 8-10	35 dB(A)	35 dB(A)

For the purposes of this condition, Daytime is defined as the period from 7:00am to 6:00pm Monday to Saturday, and 8:00am to 6:00pm Sundays and Public Holidays.

For the purposes of this condition Operational Stages 1-10 are as described in correspondence received from Bombala Shire Council and accompanying information contained in the documents described in condition A1.1.

L6.2 Noise from the premises is to be measured at the nearest affected receiver at the most affected point on or within the residential boundary or at the most affected point within 30m of the dwelling (rural situations) where the dwelling is more than 30m from the boundary to determine compliance with the $L_{Aeq(15\ minute)}$ noise limits in condition L6.1.

General Terms of Approval

Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance. See Chapter 11 of the NSW Industrial Noise Policy.

The modification factors presented in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise level where applicable.

L6.3 The noise emission limits identified in condition L6.1 apply under meteorological conditions of:

- Wind speed up to 3m/s at 10 metres above ground level; or
- Temperature inversion conditions of up to 3°C/100m and wind speed up to 2m/s at 10 metres above the ground.

Hours of operation

L6.4 All construction work at the premises must only be conducted between 7:00am and 5:00pm Monday to Friday and no time on weekends and public holidays, unless inaudible at any residential premises.

L6.5 Activities at the premises, other than construction work, may only be carried on between 7:00am and 5:00pm Monday to Friday, and between 7:00am and 12:00pm Saturdays and at no time on Sundays and public holidays.

L6.6 This condition does not apply to the delivery of material outside the hours of operation permitted by condition L6.4 or L6.5, if that delivery is required by police or other authorities for safety reasons; and/or the operation or personnel or equipment are endangered. In such circumstances, prior notification is to be provided to the EPA and affected residents as soon as possible, or within a reasonable period in the case of emergency.

L6.7 The hours of operation specified in conditions L6.4 and L6.5 may be varied with written consent if the EPA is satisfied that the amenity of the residents in the locality will not be adversely affected.

L7. Drilling Campaigns

L7.1 Campaign drilling operations are permitted in up to 2 week campaigns with a maximum 2 campaigns permitted in each annual reporting period.

L7.2 For the purposes of this condition, 'drilling operations' includes any activity associated with drilling that generates noise that is audible outside of the premises, including engine running and mobilisation of equipment to the drill area.

L7.3 Campaign drilling operations may only take place between 7:00am to 5:00pm Monday to Friday, with no campaign drilling operations permitted on weekends or public holidays.

L8. Blasting

L8.1 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5mm/sec for more than five per cent of the total number of blasts over a period of 12 months.

L8.2 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10mm/sec at any time.

L8.3 The overpressure level from blasting operations on the premises must not exceed 115 dB (Lin Peak) for more than five per cent of the total number of blasts over a period of 12 months.

L8.4 The overpressure level from blasting operations on the premises must not exceed 120 dB (Lin Peak) at any time.

L8.5 For the purpose of determining compliance with blasting limits in conditions L8.1 to L8.4 inclusive, the ground vibration or the overpressure must be measured at:

- The residential boundary of the affected residence; or
- 30 metres from residences in rural situations where the boundary is more than 30 metres from residences.

Airblast overpressure levels should not be measured within 3.5 metres of any building.

Ground vibration levels should not be measured with the longest dimension of the foundations of a building or structure away from such building or structure.

Time of blasting

L8.6 Blasting operations at the premises may only take place between 9:00am and 5:00pm Monday to Friday.

L8.7 Where compelling safety reasons exist, the EPA may permit a blast to occur outside the abovementioned hours with prior written (or facsimile) notification made to the EPA.

L9. Noise Management Plan

L9.1 The proponent must prepare a Noise Management Plan that addresses all quarry extraction, processing and transport operations.

L9.2 The plan must be submitted to the EPA's 'Manager, South East Region' for approval prior to commissioning of the operational phase.

L9.3 The plan must include but need not be limited to the following:

a) For locations where the limits in L6.1 exceed the Project Specific Noise Levels, an assessment of feasible and reasonable noise mitigation measures which seek to achieve a reduction of noise emissions over time to satisfy the Project Specific Noise Levels;

b) A system that allows for periodic assessment of Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) to minimise noise impacts over the life of the proposal;

c) Measures to monitor noise performance and respond to complaints;

d) Measures for community consultation including site contact details;

e) Noise monitoring, and reporting procedures.

OPERATING CONDITIONS

O2. Dust

O2.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

O2.2 Activities occurring in or on the premises must be carried out in a manner that will minimise the generation, or emission from the premises, of wind-blown or traffic generated dust.

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MONITORING AND RECORDING CONDITIONS

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by the EPA's general terms of approval, or a licence under the Protection of the Environment Operations Act 1997, in relation to the development or in order to comply with the load calculation protocol must be recorded and retained as set out in conditions M1.2 and M1.3.

M1.2 All records required to be kept by the licence must be:
in a legible form, or in a form that can readily be reduced to a legible form;
kept for at least 4 years after the monitoring or event to which they relate took place; and
produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected: the date(s) on which the sample was taken;
the time(s) at which the sample was collected;
the point at which the sample was taken; and
the name of the person who collected the sample.

M2. Requirement to monitor concentration of pollutants discharged

M2.1 For each ambient monitoring point specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency specified opposite in the other columns:

Points 1 & 2 Air

Pollutant	Units of measure	Frequency	Sampling Method
Particulates – Deposited Matter	g/m^2/month	Continuous	AM-19

M3. Requirement to monitor volume or mass

M3.1 For each monitoring point specified in the table below, the applicant must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The applicant must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns.

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Point # (monitoring point to be determined following submission of air quality monitoring plan)

Parameter	Units of measure	Frequency	Averaging Period	Sampling Method
Rainfall	mm	Continuous	1 hour	AM-4
Wind speed @ 10 metres	m/s	Continuous	15 minute	AM-2 & AM-4
Wind direction @ 10 metres	°	Continuous	15 minute	AM-2 & AM-4
Temperature @ 2 metres	°C	Continuous	15 minute	AM-4
Temperature @ 10 metres	°C	Continuous	15 minute	AM-4
Sigma theta @ 10 metres	°	Continuous	15 minute	AM-2 & AM-4
Solar radiation	W/m2	Continuous	15 minute	AM-4
Additional requirements				
- Siting				AM-1 & AM-4
- Measurement				AM-2 & AM-4

M4. Testing methods - concentration limits

M4.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by the EPA's General Terms of Approval, or a licence under the Protection of the Environment Operations Act 1997, in relation to the development or in order to comply with a relevant local calculation protocol must be done in accordance with:

- any methodology which is required by or under the POEO Act 1997 to be used for the testing of the concentration of the pollutant; or
- if no such requirement is imposed by or under the POEO Act 1997, any methodology which the General Terms of Approval or a condition of the licence or the protocol (as the case may be) requires to be used for that testing; or
- if no such requirement is imposed by or under the POEO Act 1997 or by the General Terms of Approval or a condition of the licence or the protocol (as the case may be), any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place.

REPORTING CONDITIONS

R1.1 The applicant must provide an annual return to the EPA in relation to the development as required by any licence under the Protection of the Environment Operations Act 1997 in relation to the development. In the return the applicant must report on the annual monitoring undertaken (where the activity results in pollutant discharges), provide a summary of complaints relating to the development, report on compliance with licence conditions and provide a calculation of licence fees (administrative fees and, where relevant, load based fees) that are payable. If load based fees apply to the activity the applicant will be required to submit load-based fee calculation worksheets with the return.

ATTACHMENT – MANDATORY CONDITIONS FOR ALL EPA LICENCES

ADMINISTRATIVE CONDITIONS

OPERATING CONDITIONS

Activities must be carried out in a competent manner

Licensed activities must be carried out in a competent manner.

- This includes:

  the processing, handling, movement and storage of materials and substances used to carry out the activity; and

  the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

Maintenance of plant and equipment

- All plant and equipment installed at the premises or used in connection with the licensed activity:

  must be maintained in a proper and efficient condition; and

  must be operated in a proper and efficient manner.

MONITORING AND RECORDING CONDITIONS

Recording of pollution complaints

The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

- The record must include details of the following:

  the date and time of the complaint;

  the method by which the complaint was made;

  any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;

  the nature of the complaint;

  the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and

  if no action was taken by the licensee, the reasons why no action was taken.

The record of a complaint must be kept for at least 4 years after the complaint was made.

The record must be produced to any authorised officer of the EPA who asks to see them.

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Telephone complaints line

The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

This condition does not apply until 3 months after this condition takes effect.

REPORTING CONDITIONS

Annual Return documents

What documents must an Annual Return contain?

- The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

    a Statement of Compliance; and

    a Monitoring and Complaints Summary.

A copy of the form in which the Annual Return must be supplied to the EPA accompanies this licence. Before the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

Period covered by Annual Return

An Annual Return must be prepared in respect of each reporting, except as provided below

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

- Where this licence is transferred from the licensee to a new licensee,

    the transferring licensee must prepare an annual return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and

    the new licensee must prepare an annual return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

- Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an annual return in respect of the period commencing on the first day of the reporting period and ending on

    in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or

    in relation to the revocation of the licence – the date from which notice revoking the licence operates.

Deadline for Annual Return

The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

Notification where actual load can not be calculated

(Licences with assessable pollutants)
Where the licensee is unable to complete a part of the Annual Return by the due date because the licensee was unable to calculate the actual load of a pollutant due to circumstances beyond the licensee's control, the licensee must notify the EPA in writing as soon as practicable, and in any event not later than the due date.

- The notification must specify:

  the assessable pollutants for which the actual load could not be calculated; and

  the relevant circumstances that were beyond the control of the licensee.

Licensee must retain copy of Annual Return

The licensee must retain a copy of the annual return supplied to the EPA for a period of at least 4 years after the annual return was due to be supplied to the EPA.

Certifying of Statement of Compliance and Signing of Monitoring and Complaints Summary

Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:

(a) the licence holder; or

(b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

A person who has been given written approval to certify a Statement of Compliance under a licence issued under the Pollution Control Act 1970 is taken to be approved for the purpose of this condition until the date of first review this licence.

Notification of environmental harm

Note: The licensee or its employees must notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act

Notifications must be made by telephoning the EPA's Pollution Line service on 131 555.

The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Written report

Where an authorised officer of the EPA suspects on reasonable grounds that:

(a) where this licence applies to premises, an event has occurred at the premises; or

(b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,

and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

- The request may require a report which includes any or all of the following information:

  the cause, time and duration of the event;

the type, volume and concentration of every pollutant discharged as a result of the event;

the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event; and

the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;

action taken by the licensee in relation to the event, including any follow-up contact with any complainants;

(details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event;

(any other relevant matters.

The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

GENERAL CONDITIONS

Copy of licence kept at the premises or on the vehicle or mobile plant

A copy of this licence must be kept at the premises or on the vehicle or mobile plant to which the licence applies.

The licence must be produced to any authorised officer of the EPA who asks to see it.

The licence must be available for inspection by any employee or agent of the licensee working at the premises or operating the vehicle or mobile plant.

ATTACHMENT A

NSW Environment Protection Authority General Terms of Approval

Application No. 10.2018.130.1 – Modification to Extractive Industry, High Lake Quarry

Table L6.1 should be replaced with the table below which shows the revised noise levels predicted based on the additional information provided to the EPA. The EPA has assessed these noise levels and determined that the activity can hold an Environment Protection Licence (EPL) as the revised noise levels are within 5 dB(A) of the Project Specific Noise Level.

L6. Noise limits

L6.1 *Noise from the premises must not exceed the noise limits presented in the table below:*

Location	*Daytime Quarry Operations*	
	$L_{Aeq(15\ minute)}$ ***All equipment excluding 'campaign drilling operations'***	$L_{Aeq(15\ minute)}$ ***During designated 'campaign drilling operations' periods as permitted by condition L7***
(R2) 'Oxley' during Operational Stages 1-7	*40 dB(A)*	*42 dB(A)*
(R1) 'High Lake' during Operational Stages 1-7	*40 dB(A)*	*40 dB(A)*
Any other residence excluding 'Oxley' and 'High Lake' during Operational Stages 1-7	*40 dB(A)*	*40 dB(A)*
'Oxley' during Operational Stages 8-10	*40 dB(A)*	*40 dB(A)*
Any residence excluding 'Oxley' during Operational Stages 8-10	*40 dB(A)*	*40 dB(A)*

M8.1 Compliance with Condition L6.1 must be assessed by attended noise monitoring in accordance with condition L6.5:

a) at R2 and R1 in Condition L6.1;
b) for one whole day of typical operations.

Reporting Conditions

R4 Noise Monitoring Report

A noise compliance assessment report must be submitted to the EPA within 90 days of the commencement of operation. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

a) an assessment of compliance with noise limits presented in Condition L6.1; and
b) an outline of any management actions taken within the monitoring period to address any exceedances of the limits contained in Condition L6.1.

Bombala Quarry Expansion
Environmental Impact Statement

Draft Final for Stakeholder Review
Volume I

Boral Resources (Country) Pty Ltd

July 2006

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ERM

Delivering sustainable solutions in a more competitive world

Approved by:	*Alex McDonald*
Position:	Project Manager
Signed:	
Date:	*July 2006*
Approved by:	*Karl Rosen*
Position:	Project Director
Signed:	
Date:	*July 2006*

Environmental Resources Management Australia Pty Ltd Quality System

www.erm.com

FINAL DRAFT REPORT

Boral Resources (Country) Pty Ltd

Bombala Quarry Expansion

Environmental Impact Statement

July 2006

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GLOSSARY OF TERMS AND ACRONYMS

Term	Description
AADT	Annual Average Daily Traffic
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHP	Australian Heritage Places
ANZECC	Australian and New Zealand Environment Conservation Council
ARI	Average Recurrence Interval
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AST	Above-ground storage tank
BoM	Bureau of Meteorology
DA	Development Application
dB(A)	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(LinPeak)	The peak sound pressure level (not RMS) expressed as decibels with no frequency weighting.
DEC	Department of Environment and Conservation
DEH	Department of the Environment and Heritage
DNR	Department of Natural Resources
DoP	Department of Planning
ECRTN	Environmental Criteria for Road Traffic Noise
EEC	Endangered Ecological Community
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
ENM	Environmental Noise Model
EPA	Environmental Protection Authority
ERM	Environmental Resources Management (Australia) Pty Ltd
ESD	Ecologically Sustainable Development
glc	Ground level concentration
JSRA	Job Safety Risk Analysis
INP	Industrial Noise Policy
L10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
L90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
Leq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LEP	Local Environment Plan
LGA	Local Government Area
Lmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
MIC_{8MS}	Maximum Instantaneous Charge (with a minimum 8 milli-sec delay).
MP	Major Projects
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
NES	National Environmental Significance
NPI	National Pollutant Inventory
PDS	PDS Multimedia and Consultancy Service
$PM_{2.5}$	Particulate Matter less than 2.5 microns in diameter
PM_{10}	Particulate Matter less than 10 microns in diameter

Term	Description
ppv	Peak Particle Velocity. The maximum velocity of a particle of the transmission medium, used in assessment of vibration.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
SoE	State of the Environment
Sound power level	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment.
RL	Relative Level
RTA	NSW Roads and Traffic Authority
SEPP	State Environmental Planning Policy
STP	Sewage Treatment Plant
Temperature inversion	A positive temperature gradient. A meteorological condition where atmospheric temperature increases with altitude to some height.
tpa	tonnes per annum
TSP	Total Suspended Particulates

EXECUTIVE SUMMARY

Overview

This Environmental Impact Statement (EIS) has been prepared by the Environmental Resources Management (ERM) on behalf of Boral Resources (Country) Pty Ltd (Boral) for their proposals to gain development approval to extend its existing Bombala Quarry operation and facilitate year-round basalt gravel extraction at slightly increased extraction rates for 20 years.

The quarry site was previously operated by Bombala Council since the 1950's, however, in 2005 Boral entered into a one year lease to operate the quarry, and has subsequently purchased the property.

The Bombala Quarry is located wholly within the local government area of Bombala, approximately six kilometres northeast of the village of Bombala, which is situated in the south-eastern region of New South Wales. The site is within the headwaters of a tributary of Shoemakers Creek which flows into Bombala River, which forms part of the headwaters of the Snowy River Catchment. The main access to the site is via Clay Pipe Springs Road, High Lake Road and the Monaro Highway.

The existing consent allows the extraction of 50,000 tonnes (33,000 m3) per annum. The proposed quarry expansion will involve the progressive excavation of the existing pit over an approximate 16 to 20 year period, with extraction of 1.66 million tonnes of the resource (from a total identified resource of 4.5 million tonnes) over the duration of the application. The proposal will involve increasing the annual production rate to 100,000 tonnes per annum.

The property is approximately 42 hectares, of which the quarry operations area currently occupies about 4 hectares and is proposed to occupy about 7.6 hectares at its end life. The depth of the completed pit will range between 8 and 32 metres below the surface.

The purpose of the proposed quarry expansion is to meet the demand for construction materials in the far south coast and surrounding areas. Bombala Quarry's basaltic resource will largely supply Boral's regional concrete batching plants at Jindabyne, Bega and Pambula, and to a lesser extent provide deliveries of aggregates and fines to the local construction market. The existing and proposed quarry layouts are presented in *Figure ES.1*.

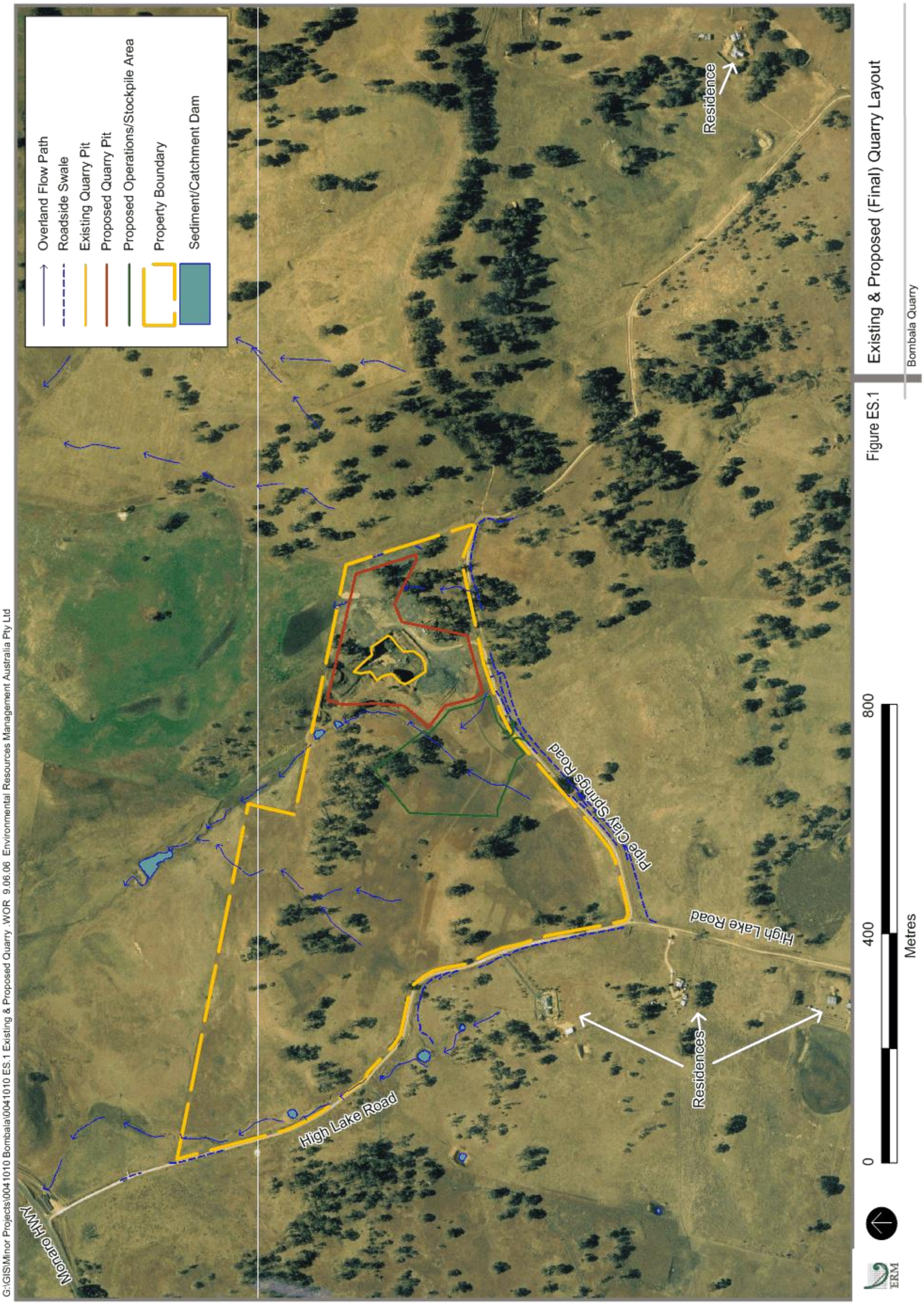

Figure ES.1 Existing & Proposed (Final) Quarry Layout

Bombala Quarry

Planning Framework

The proposed development will be assessed in accordance with the *Environmental Planning and Assessment Act, 1979 (EP&A Act)* and the *Environmental Planning and Assessment Regulation, 2000.* The proposed quarry expansion is classified as a designated development under Schedule 3 of the EP&A Act and an EIS is therefore required to accompany the DA in compliance with Section 78(8) of the EP&A Act. Bombala Council is the consent authority for the development.

The proposal is also designated development under Section 91 of the EP&A Act. Approval and consent is required from both the Bombala Council as the consent authority, and the NSW Department of Environment and Conservation for an Environmental Protection Licence under the *Protection of the Environment Operation Act, 1997.*

The proposed works are located within the Bombala LGA and fall under the provision of the Bombala Local Environment Plan (LEP), 1990. In assessing the proposed expansion of the Bombala Quarry against the general objectives of the Bombala LEP, it is considered that the proposal is generally in accordance as it:

- will not impact on prime agricultural land nor change the existing use of the site;
- will increase the provision of aggregate product for industries within the region; and
- incorporates appropriate mitigation measures to reduce potential impacts on the environment and neighbouring residences.

The proposed development also meets the relevant zoning objectives (zone 1(a) Rural) as it will not significantly impact agricultural land within the local area and will utilise the existing services and utilities available to the site.

Assessment of Alternatives

The quarry site was identified as an ideally located potential site for purchase to supply Boral's operations in the southern NSW. The key benefits with regard to selection of the Bombala quarry site included it's status as an active quarry with an identified resource and existing consent for extraction.

The selected expansion plan was devised based on the site and resource constraints and the estimated tonnage of product required to supply Boral's southern region operations for the next two decades, within the environmental and social constraints of the property. Other options for expansion of the quarry included excavating a second pit to the west of the existing pit, as well as extending the existing pit into the adjacent properties to the north and east of the site. Whilst these options would further ensure the longterm sustainability of the operation, the impacts to the environment and social amenity were considered to outweigh the economic benefits.

A number of additional haulage route and access options were considered during the quarry planning phase, however, the existing haulage route was considered to provide the safest and most amenable route to both the south coast (Pambula) and Jindabyne and provide minimal contribution to environmental and social impacts associated with the proposal.

As the existing plant was identified as a significant noise source on the site, options were considered for replacement or relocation of the plant to address residents concerns. Relocation of the processing plant was accepted as the optimum solution for noise reduction and has already been partially implemented, with the primary crusher relocated to the pit. Future relocation of the remaining plant into the pit will be undertaken as feasible.

Existing Operations

Existing operations on site are considered typical for a small operating quarry. In compliance with current licensed extraction quota, current production is 50,000 tpa of rock product.

The existing pit floor is currently fixed at an elevation of RL 809m. Blasting is undertaken to provide the rock for processing and involves drilling of shafts from surface level, which are then filled with explosives. At present, drilling and blasting activities occur once a year over a two week period, with two blasts undertaken providing approximately 25,000 tonnes each.

The blasted rock is then transferred to a raw feed stockpile where it is loaded into the primary jaw crusher for initial processing, before being transported to a series of secondary crushers and screens out of the pit to produce the various size fractions required for commercial use. Overburden is stockpiled on site and used for safety mounds around the pit and for noise attenuation earth bunds.

The processed gravel is then hauled off site by truck via Clay Pipe Springs Road, High Lake Road and onto the Monaro Highway. On average there are currently 16 truck movements per weekday.

The plant currently operates 5 days per week from 7am to 5pm and loading occurs as needed from 6am to 7am. Deliveries from the site are also undertaken on Saturday mornings from 7am to 12pm. The workforce comprises up to 5 site personnel.

Proposal Description

Resource

A geotechnical investigation was undertaken in December 2005, identifying the basalt flow across a large proportion of the eastern part of the site, extending beyond the property boundary to the north and east, with an additional large basalt resource also identified in the south-western corner of the property.

The hard rock resource to be extracted from the proposed Bombala quarry site is Tertiary olivine basalt. A partially decomposed clayey basalt layer in the weathered zone (averages 2.4m) is suitable for sub-base or roadbase. This overlies basalt that is fresh, clean and of uniform quality and provides high quality aggregates. This resource varies in thickness from 9.3m to 33.9m (averages 21.7m) and is underlain by altered basalt, some of which may be suitable for roadbase.

Life Of Operation

Project approval is being sought for an area sufficient for up to 20 years of quarrying. At a rate of 100,000 tpa of rock products sold, the quarry in this location will last 16.6 years, however, expected lower sales in the early years would likely extend this to 20 years. Based on the geotechnical investigations carried out at the site, additional resource was identified that could facilitate continued quarrying for a further of 25 years.

Proposed Quarry Operations

During development of the quarry plan, a number of factors were considered, including property setbacks, buffer zones to drainage line, resource extent and quality and economic extraction limits and market requirements.

The proposed extraction plan is a ten stage process that will incorporate total release of approximately 228,700 tonnes of road base quality rock and 1,435,500 tonnes of aggregate quality rock. Approximately 87,700m3 of overburden will be removed. Table 1 shows the proposed extraction volumes and durations of each stage.

During the first three stages of operation, resource extraction will develop to the south and south west. The existing stockpile areas, haul road and pit access will be maintained, with a new access ramp down to the RL 809m level active from stage 2. The primary jaw crusher is currently located in-pit at RL 809m, with the remainder of the processing plant at ground level until it can be relocated in-pit prior to stage 4, approximately 5.8 years into the project.

During stage 4 a new site access and haul road will be constructed to the west of the pit and the stockpile area will be relocated to the west of the pit Extraction will proceed to the northern and eastern limits of extraction during stages 4 and 5, leaving a 20 metre buffer. At the end of stage 6, the resource will have been exhausted at the RL 809m level and a drop cut will be excavated to RL 798m. The plant will be relocated to the eastern end at this time. A weighbridge will be installed to the west of the pit.

Extraction will continue north from the drop cut. Extending out into the identified basal sediments to provide a horizontal floor for relocation of the processing plant back to the south-western corner of the pit at RL 798m at stage 8. Extraction at the RL 798m level will be complete at the end of stage 9, at which point a drop cut will extend to RL 789m in Stage 10 to fully exploit the identified resource.

Table ES1 Proposed Staged Development of Bombala Quarry Expansion

Stage	Overburden Removed (m^3)	Basal Sediment Removed (m^3)	Road Base Quality Rock Released (t)	Aggregate Quality Rock Released (t)	Duration (assuming 100 000tpa rock sold)[1] (years)	Cumulative Duration (years)
1	4,500	0	11,700	58,500	0.7	0.7
2	12,200	0	59,000	175,500	2.3	3
3	19,600	0	62,000	219,000	2.8	5.8
4	12,700	0	50,500	99,000	1.5	7.3
5	38,700	0	39,500	156,000	2	9.3
6	0	57,400	5,000	149,000	1.5	10.8
7	0	0	0	194,500	1.9	12.7
8	0	0	200	205,500	2.1	14.8
9	0	0	500	103,500	1	15.8
10	0	0	300	75,000	0.8	16.6
TOTAL	**87,700**	**57,400**	**228,700**	**1,435,500**	**16.6**	

1. Sales may not have reached 100,000tpa in early stages which could potentially extend estimated duration of Stages 1 and 2.

Haulage of material will continue to use the current entry and exit routes to the site, via Clay Pipe Springs Road, High Lake Road and the Monaro Highway. As the proposal relates to a continuation of the existing use of the site, there is little need for additional infrastructure to be constructed on the site, however a weighbridge and new site shed are planned to be constructed within approximately 5 years of development approval.

This proposal entails retention of existing plant and equipment and processing procedures and the production rate will be the same as for existing operations. The doubling in production will be facilitated by extending the operational period of the quarry to 12 months rather than increasing production rates.

Blasting will be undertaken twice yearly, at six month intervals, in order to extract the 100,000 tpa of resource for processing.

Environmental Management

Environmental management of the site during future operations is described further in Section 18. As part of the proposal a surface water management system will be implemented including additional surface drainage controls, e.g. swales and flow diversions, an additional sediment basin on the drainage channel downstream of the stockpile area and a sump to capture surface water flowing into the pit for reuse. Construction of earth bunds and relocation of plant will assist in noise management. Air quality impacts will be managed by relocation of plant, water spraying and a stop work policy to be employed on windy days.

Rehabilitation

The proposed expansion of the Bombala Quarry would facilitate continued operations on the site for up to 20 years, at which point the final land form of the site will not be dissimilar to its present day condition. The quarry pit will be approximately 4.3 hectares in area, with stepped benches down to a final depth of RL789 metres. The quarry pit will remain as an amphitheatre, open to the north, with 10-11 metre walls between benches at 75% gradient.

Options for final site rehabilitation include a rehabilitated quarry with water in the base of the void and a rehabilitated quarry with a dry free-draining floor. A comprehensive rehabilitation strategy will be developed in consultation with Bombala Council to address final land use of the site. In summary, once quarry operations are completed on the property, the site will be returned to agricultural use, most likely for livestock grazing.

Consultation

Consultation with the community, government authorities and other relevant stakeholders commenced in mid-2005 to contribute to the planning process by assisting in the identification of the main issues to be considered by Boral and ERM in developing the proposed quarry expansion plan and the EIS. Consultation has continued throughout the preparation of this EIS, aiming to keep stakeholders informed about the project and identify any issues of concern that may need to be addressed.

This involvement has ensured that Government, stakeholder and community consultation has been incorporated into both quarry planning and the preparation of the EIS.

Government agency responses were received, with key issues to address in the EIS. Consultation with the local community, including distribution of newsletters and face to face meetings, also raised a number of issues for consideration in the EIS. Based on the consultation undertaken during the project planning and EIA process, the key issues were identified as follows:

- noise impacts from quarry operations;
- air quality (dust) impacts from the processing plant, stockpile areas and haulage roads;
- the impact of the proposed quarry expansion on surface waters and groundwater;
- traffic management and impacts to the existing road and traffic network;
- assessment of heritage impacts;
- assessment of ecological impacts;
- impacts to visual amenity;
- proposed rehabilitation of the site; and
- ongoing environmental management of the quarry operations.

Socio-Economic Considerations

Socio-economic benefits of the proposal include continued direct and indirect employment of local staff contractors, the continued supply of a high quality hard rock resource to the region and continued economic multiplier effects to local and regional businesses and industries over a longer period.

Agriculture and forestry are traditionally the major areas of business in the Bombala area, with extractive industries not yet established as a major contributor to the regional economy. The expansion of the Bombala quarry will boost earnings for this industry for the region, and provide impetus to identify and develop other sites for similar use.

The proposed expansion to the existing quarry will continue to provide a local source of hard rock aggregate and optimise associated economic advantages in terms of long term supply of premium quality rock to Boral's regional batching plants as well as local markets. Long term quarry development and operation would also continue to support indirect employment and local parts and service suppliers.

The extraction of the identified resource will support construction in the southern region, with the provision of a readily available supply of high quality aggregate to Boral's NSW operations on the south coast, as well as for other local and regional customers.

Biophysical Impacts

Soils and Land Capability

The site is typified by a shallow loam overlying the basalt resource that is being quarried. These soils are classified as predominantly Class 4 agricultural suitability land, with a section of Class 3 land on the eastern side of the property, indicating that they are capable of supporting grazing over the majority of the site. Although this is limited by the susceptibility of the soil to erosion hazards and structural breakdown. The proposed expansion of quarry operations will account for approximately 8 ha of the 42 ha site, with the majority of this area, i.e. stockpile and ground level operations areas, able to be returned to Class 4 land, at least, on completion of quarrying onsite. The quarry pit itself will be rehabilitated to include vegetated benches and a water storage, so that ultimately, only a small proportion of the site will be unable to be used for agricultural purposes.

Water Resources and Quality

The quarry site is located within the headwaters of an ephemeral tributary of Shoemakers Creek which flows to the Bombala River in the Snowy River Catchment. A number of overland flow paths traverse the site, with surface flows from the site flowing to a number of small settlement ponds on the northern edge of the property, or offsite to downstream farm dams.

The proposed quarry expansion will incorporate diversion of catchment runoff areas disturbed or affected by quarry activities via diversion drainage and contour drains, designed to cope with at least a 1 in 20 year Average Recurrence Interval (ARI) storm event. Additionally, check dams and sediment basins will be constructed at intervals along diversion drains to minimise potential for erosion. Water runoff within the pit, including groundwater inflow, will be directed to a settling pond in the bottom of the quarry pit for reuse onsite or transfer to the nearby settlement ponds. It is considered that, with the implementation of these control measures, as well as a monitoring program of the sediment ponds, the impact to offsite water quality will be minimal.

Water for use on the site is currently trucked in and used for suppression of dust on the processing plant. This will continue, however, surface runoff collected onsite and in the pit will be used to supplement and, if possible, replace the need to bring water to site.

Flora and Fauna

The quarry site is located within an agricultural rural setting, with the onsite vegetation consisting of two distinct vegetation communities, the snow gum/ribbon gum grassy woodland, part of a preliminary listed endangered ecological community (EEC), and disturbed grassland. The remainder of the site is disturbed area currently in use for quarrying or associated activities.

The proposed expansion area will ultimately result in the clearing of approximately 0.52 ha the grassy woodland which accounts for 3.6 percent of the total EEC on site and 0.003 percent of the overall extent of the community in the region. The proposal is not expected to have an adverse effect on the extent of the ecological community. Threatened species recorded on site was limited to three microchiropteran bat species which may use the site for hunting or roosting. The minimal amount of clearing that will be undertaken over the life of the quarry is not expected to significantly affect these species.

Social and Amenity Impacts

Air Quality

Air quality impacts resulting from quarrying activities predominantly refers to fugitive dust emissions from materials processing, stockpiling and onsite and offsite transport. Modelling of offsite particulate matter migration towards sensitive receivers was undertaken for quarry operations at stages 3 and 8 of the proposed expansion, incorporating meteorology and terrain data. Results indicated that all NSW and NEPM assessment criterion for annual average and 24 hour average ground level concentrations were met. Therefore it is considered that air quality impacts to the general site and surrounds as a result of the continued operations of the quarry will not be significant and will be further minimised by the incorporation of suggested mitigation measures such as wet suppression, revegetation or covering of unsealed areas or stockpiles and implementation of appropriate controls for materials handling and transportation.

Noise & Vibration

An assessment of the proposed expansion of the Bombala quarry site was undertaken and considered the potential noise and vibration impacts of the extension of Bombala Quarry on the four nearest identified receiver locations. The results indicated that currently, under calm conditions, stipulated noise goals were met at all receiver locations apart from a marginal exceedence (2dB) at the McInnes residence. Noise levels were met at all receiver locations in the later stages of the development as processing plant was relocated into the pit. Noise levels associated with road traffic noise was found to comply with stipulated criteria at potentially affected residences. Noise and vibration from blasting has been monitored and was found to comply with criteria for minimising human annoyance and discomfort. Blasting will increase from two events every 12 months to two events every six months, with each pair of blasts occurring within a two-week period.

It is considered that the general amenity of the site and surrounds will be maintained during the ongoing quarry operations, with the implementation of noise mitigation measures such as progressive relocation of plant and equipment and strategic stockpiling of materials to act as noise attenuation screens, means that noise levels at the identified receiver locations are expected to be controlled so as not to have an adverse effect.

Heritage

A survey of Aboriginal and historical heritage has on the proposed expansion area of the Bombala Quarry indicated that there is not expected to be any undetected subsurface Aboriginal or historical heritage material on the site, and hence no impact of the proposal on heritage.

Traffic and Transport

The proposed expansion will not result in any changes to the ongoing quarry activities, including traffic impacts, on a daily basis. At present, there are an average of 16 truck movements per weekday associated with the quarry on roads of the identified haul routes, with these movements spilt between the south coast and southern highlands haulage routes. The contribution of the existing haulage movements to and from the site being considered minimal, with Boral trucks representing a small proportion (generally less than 1%) of traffic on roads along identified haul routes. This will remain the case, with no changes to daily truck movements. Annual truck movements associated with haulage to and from the site is expected to approximately double, however it is considered that this will not significantly impact the existing road network.

Visual

The quarry has been an operating quarry for over 50 years and has therefore been a part of the visual catchment of the surrounding area for some time. The proposed expansion is proposed to occur in stages incrementally over the next 16-20 years, with the area of operations roughly doubling in that time. Retention of much of the existing vegetation cover on the site and the undulating terrain will result in the proposed expansion and continued operation of the site having a low visual impact on the surrounding area. Maintenance of the vegetative cover and screening with strategic placement of stockpiles in the viewshed of particularly sensitive receptor areas will further minimise visual impacts.

Waste

The proposed expansion of the quarry will incorporate waste reduction strategies in accordance with the NSW Waste Management hierarchy: avoid, re-use, recycle/reprocess, dispose. Under the proposal, there will be minimal changes to the day to day operations on-site, particularly with regard to waste management, with the major change being the extending the operations throughout the year. A number of waste management measures were developed to manage the identified waste streams on site.

Environmental Management Plan

A site specific Environmental Management Plan (EMP) will be developed to provide an overall framework for the management of environmental impacts arising from the ongoing operation of the Bombala Quarry site.

The EMP will ensure that all mitigation measures are effectively implemented and sustainable practices are adopted throughout the duration of the project. The EMP will document authorities and procedures for all activities with sufficient information and guidance to enable relevant personnel to:

- understand and act to meet their individual delegated responsibilities in managing environmental issues;
- manage the environmental issues identified in the EMP, applying the issue-specific procedures detailed in the EMP; and
- identify and take appropriate steps to manage environmental risks and exposures associated with their spheres of responsibility.

Project Justification And Conclusion

The EIS presents findings of an environmental impact assessment for the proposed expansion of quarrying operations at the Boral site in Bombala, NSW. The major benefits of the proposal relate to:

- the continued extraction of an identified resource for up to 20 years (until the resource is expended) to realise the economic potential of the site and maximise resource recovery and yield;
- the provision of high-quality gravel to Boral's NSW southern region operations and to other local customers, e.g. Bombala Council, for building and roadworks;
- the long-term maintenance of the site for the dual purposes of quarrying and agricultural (pasture) activities;

- the implementation of effective and feasible environmental management measures to ensure ongoing operations are conducted in an environmentally responsible manner; and

- rehabilitation of the site on cessation of quarrying activities for continued agricultural use.

There were no significant environmental impacts identified during the preparation of the EIS that cannot be mitigated by appropriate safeguards and management strategies, and the proposal is consistent with the principles of ecologically sustainable development.

1 INTRODUCTION

This Chapter provides an introduction and background to the proposal, proposal objectives and the EIA approval process.

1.1 BACKGROUND

Boral Resources (Country) Pty Ltd (Boral) proposes to gain development approval to extend its existing Bombala Quarry operation and facilitate year-round basalt gravel extraction at current extraction rates for 20 years.

Bombala Council established the Bombala Quarry in 1950-51 to provide their Works and Services Division with construction materials as needed. Council operated the quarry on an ad hoc basis from this time and with consent (DA 14/93) since 32 August, 1993. Boral entered into a one year lease in September 2005 to operate on the quarry site, with an option to purchase the property on approval of the Development Application (DA) submitted with this Environmental Impact Statement (EIS).

The existing consent allows the extraction of 50,000 tonnes (33,000 m3) per annum. Boral have been operating the quarry since October 2005 and at present production rates will have quarried their allowable quantity by July 2006.

1.2 PROJECT LOCATION

The Bombala Quarry is located wholly within the local government area of Bombala, approximately six kilometres northeast of the village of Bombala, which is situated in the south-eastern region of New South Wales, 504 kilometres south west of Sydney and 81km south of Cooma (*Figure 1.1*). It lies within the headwaters of a tributary of Shoemakers Creek which flows into Bombala River, which forms part of the headwaters of the Snowy River Catchment.

The site is accessed via Clay Pipe Springs Road, which can be accessed either via High Lake Road off the Monaro Highway to the north or via Mount Darragh Road to the south. Clay Pipe Springs Road and High Lake Road also service a small number of rural properties.

Boral have recently purchased the property, following an initial one year lease agreement. The site is 42 hectares and comprises two land parcels, identified as Lot 229 and Lot 230 of Deposited Plan 756819. The quarry footprint occupies part of Lot 230. The quarry and surrounding area is shown in *Figure 1.2*.

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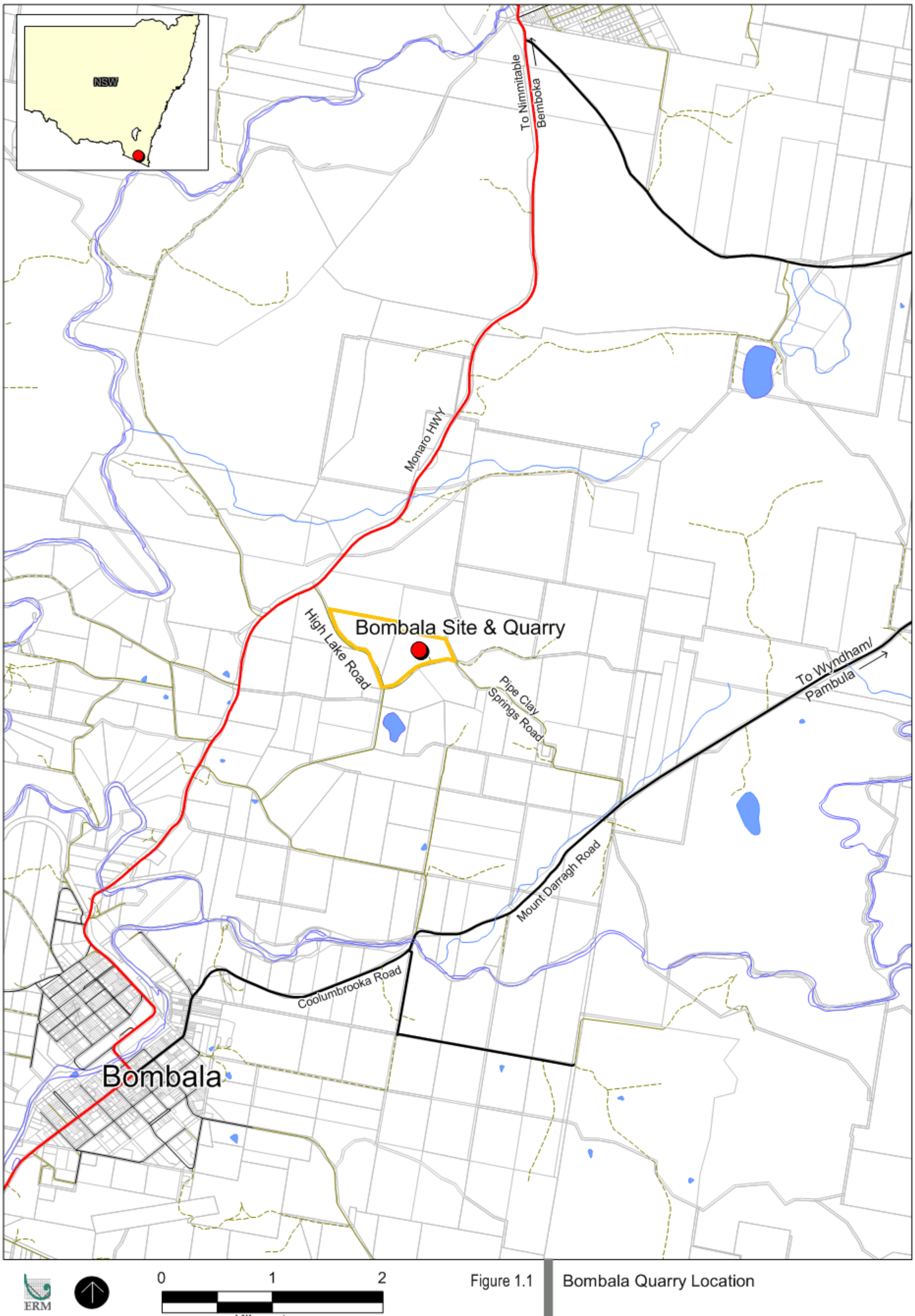

Figure 1.1 Bombala Quarry Location

Bombala Quarry

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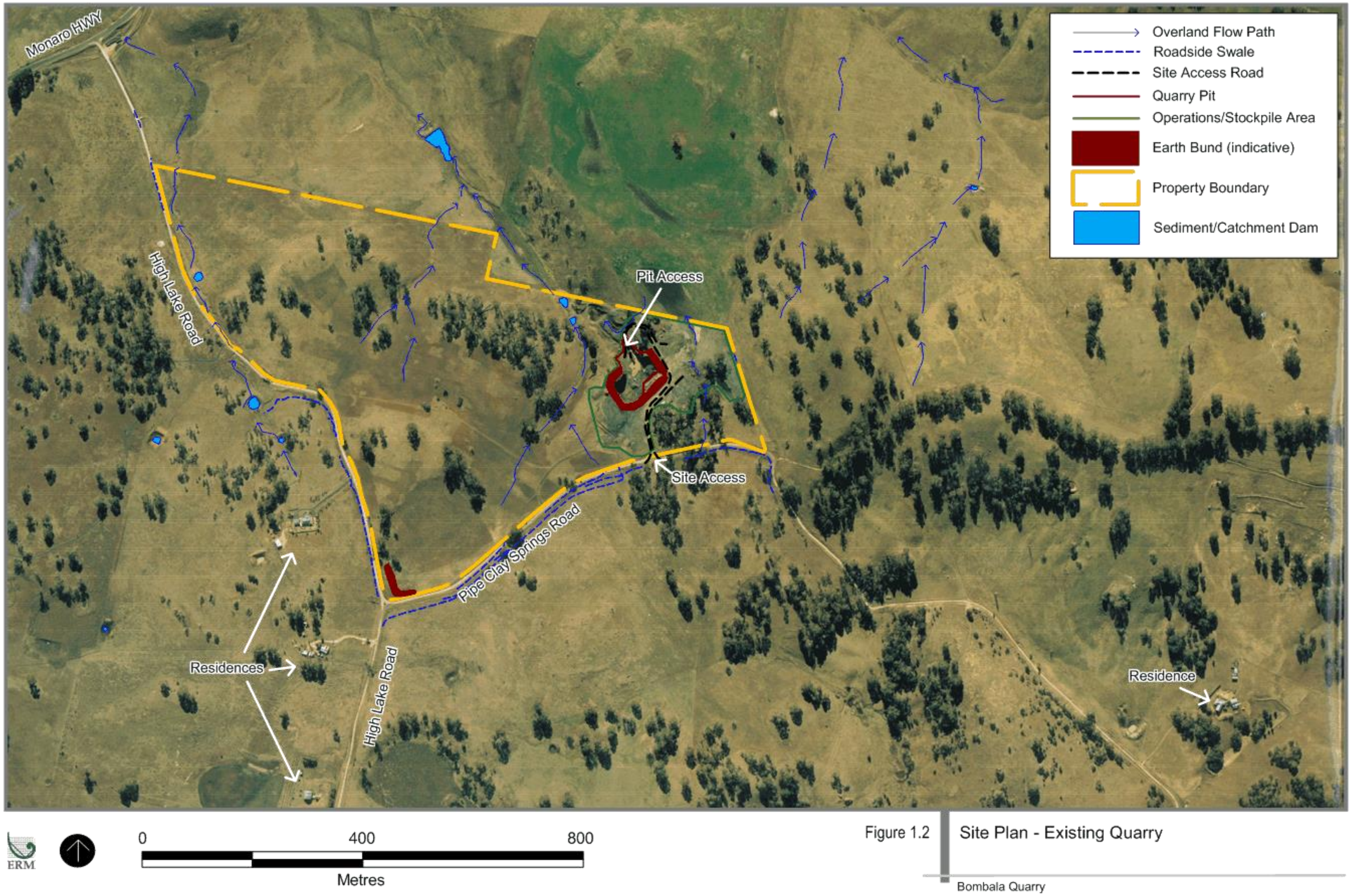

Figure 1.2 Site Plan - Existing Quarry

Bombala Quarry

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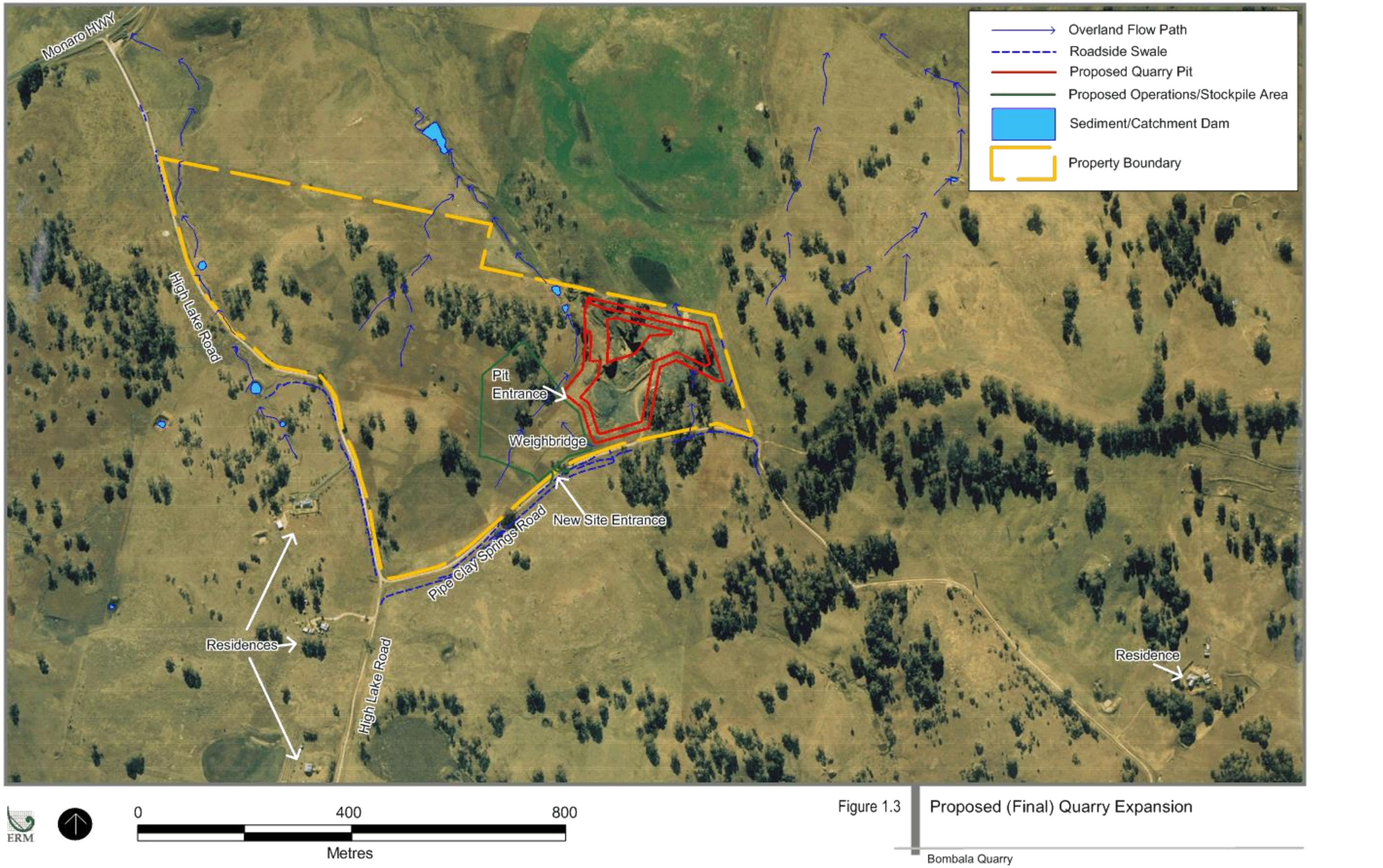

Figure 1.3 Proposed (Final) Quarry Expansion

Bombala Quarry

1.3 BORAL RESOURCES (COUNTRY)

Boral Limited operates internationally and is currently Australia's largest building and construction materials supplier, with 650 operating sites and 15,100 personnel worldwide. Boral Limited produces and distributes a broad range of construction materials, including quarry products, cement, fly ash, pre-mix concrete and asphalt. NSW Boral Resources (Country) Pty Ltd is part of the much larger Boral group and is a major producer of aggregates, sand and concrete in regional and rural NSW. Boral Resources (Country) has operations throughout regional and rural NSW.

Boral's assets in the NSW southern region include the Pambula concrete batching plant, as well as the smaller concrete batching plants at Narooma, Bega, Jindabyne and Bermagui. These plants are both locally and regionally important as they supply roadworks, commercial building projects, house building and renovation and construction of public facilities to much of the NSW far south coast.

1.4 OUTLINE AND OBJECTIVES OF THE PROPOSAL

1.4.1 *Proposal Outline*

The quarry expansion will involve the progressive excavation of the existing pit to the south, west and east of the existing pit over an approximate 16 to 20 year period. The total resource to be extracted is 1.66 million tonnes. Under the current licence extraction is limited to 50,000 tonnes per annum (tpa). Once the extractable quota is reached, quarry production will be scaled back until the beginning of the next year of operations. This potentially comprises about 6 months of non-productive time for the quarry each calendar year under the current consent conditions. Approval of the proposed expansion will increase the annual production quota to 100,000 tpa, allowing production to continue at the current rate on a year round basis.

The property is approximately 42 hectares, of which the quarry operations area currently occupies about 4 hectares and is proposed to occupy about 7.6 hectares at its end life. The depth of the completed pit will range between 8 and 32 metres below the surface, with the final landform comprising an amphitheatre open to the north. The final quarry footprint, including stockpile area, is shown in *Figure 1.3*.

Haulage of material will continue to use the current entry and exit routes to the site, via Clay Pipe Springs Road, High Lake Road and the Monaro Highway. A new site access will be installed after approximately 3 years. As the proposal relates to a continuation of the existing use of the site, there is little need for additional infrastructure to be constructed on the site, however a weighbridge and new site shed are planned to be constructed within approximately 5 years of development approval.

Primary and secondary crushing will continue to be undertaken at the site, with materials stockpiled into size fractions for haulage off-site. Since taking over the operation of the quarry, Boral has relocated the primary crusher into the existing pit to minimise impacts upon local amenity. The secondary crusher and screens, currently positioned out of the pit, will be relocated to join the primary crusher within the pit after 5.8 years. The plant will be further relocated after 9.3 years and again at 12.7 years to allow for the progressive extraction of materials. Crushed materials will be stockpiled in a designated stockpile area at ground level.

The purpose of the proposed quarry expansion is to meet the demand for construction materials in the south coast and southern highlands. Bombala Quarry's basaltic resource will largely supply Boral's regional concrete batching plants at Pambula, Narooma, Bega and Jindabyne, and to a lesser extent provide deliveries of aggregates and fines to the local construction market.

1.4.2 Proposal Objectives

The objectives of the proposed quarry expansion are to:

- continue extracting high quality basalt from the identified resource at the existing production rate for up to 20 years (until the resource is expended), so as to realise the economic potential of the site and maximise resource recovery and yield;
- provide aggregate to Boral operations in the NSW south coast and southern highlands on a supply and demand basis;
- maintain the dual landuses of the site through the continuation of quarrying and agricultural (pasture) activities;
- contribute to local, regional and state economies through capital expenditure, employment and economic supply of construction materials;
- conduct operations in an environmentally responsible manner by understanding and effectively managing environmental impacts; and
- develop an ongoing relationship with the local community through development of effective communication channels.

1.5 APPROVAL PROCESS

The proposed expansion of the Bombala quarry will be assessed in accordance with the *Environmental Planning and Assessment Act, 1979* (EP & A Act) and the Environmental Planning and Assessment Regulation 2000. In accordance with Schedule 3 and Section 91, respectively, of the EP & A Act, the proposed quarry expansion is classified as a designated and integrated development. As it is considered a designated development, an EIS is required to accompany the DA in compliance with Section 78(8) of the EP&A Act.

Pursuant to Part IV of the EP&A Act, Bombala Council is the consent authority for the development and the lodged DA and EIS must be placed on public exhibition for 30 days prior to determination. Once the EIS is lodged, copies will be forwarded to relevant authorities. After consideration of the proposal, these bodies will provide general terms of approval for Bombala Council to consider in regard to development consent. The planning approval framework for the proposed quarry expansion is discussed in detail in Chapter 4.

1.6 SCOPE AND STRUCTURE OF THE EIS

This EIS has been prepared in accordance with the requirements of the EP&A Act, the Environmental Planning and Assessment Regulation 2000 and the requirements of the Director-General of the Department of Planning (DoP). The structure of this EIS is outlined below.

The *Executive Summary* has provided a brief overview of the project, key environmental issues and assessment results, and an outline of proposed environmental management procedures.

Chapter 1 Introduction has provided an overview of the proposal, its objectives, and the approval process.

Chapter 2 Description of the Site and Existing Operations details physical site characteristics and existing quarry operations.

Chapter 3 Description of the Proposed Quarry Expansion provides the proposal description including resource description, extraction plan, production, lifespan, operations, operating hours and workforce. It also includes a justification for the proposal and assessment of alternatives.

Chapter 4 Legislative Requirements details approvals required and the statutory context in which the proposal must be considered.

Chapter 5 Issues Identification and Stakeholder Consultation identifies stakeholders, provides methodology for stakeholder consultation and outlines issues identified by this process.

Chapters 6-15 Environmental Interactions provides a description of the existing environment incorporating landform, soils and geology, air quality, noise, flora and fauna, indigenous and non-indigenous heritage, and social-economic considerations. An assessment of potential upon these features is also provided.

Chapter 16 Hazard Assessment identifies the hazards and risks that may be associated with the extraction operation against criteria detailed in SEPP 33.

Chapter 17 Cumulative Impacts identifies the potential cumulative impacts of the proposed operation.

Chapter 18 Environmental Management provides a consolidated list of environmental management strategies to be employed for the extraction operation.

Chapter 19 Project Justification and Conclusion provides justification for the proposal with regard to biophysical and socio-economic considerations and the principles of sustainable development.

Chapter 20 includes a list of references for literature and documents used in the preparation of this EIS.

2 DESCRIPTION OF THE SITE AND EXISTING OPERATIONS

This Chapter provides a description of the existing landscape and features of the site and surrounding area of the current quarry operations and environmental management.

2.1 DESCRIPTION OF THE LOCALITY

Bombala Quarry is situated within the Monaro Region agricultural farmlands. Landuse in the locality is predominantly sheep and beef cattle grazing and timber milling and the area is known as one of the State's best trout fishing districts (Bombala Council, 2006).

2.1.1 Surrounding Landuses

The site is bounded by privately owned rural agricultural lands utilised for livestock grazing to the north, east and south and High Lake Road to the west. There are a number of small rural residential holdings to the southwest along Clay Pipe Springs Road. The Monaro Highway is north of the site and runs as close as 250 metres to the northern boundary of the property. The Coolangubra State Forest and South East Forest National Park are situated approximately 10 kilometres to the east of the site and contain large areas of native vegetation in the upland areas.

The nearest residence to the quarry is approximately 560 metres west of the quarry. Other residences are located approximately 630 and 950 metres to the southwest and over 1 kilometre to the southeast. The location of residences relative to the quarry is shown in *Figure 2.1*.

2.1.2 Climate

Climate data recorded at Bombala Bureau of Meteorology (BoM) station 070005 indicates that average annual rainfall for Bombala is 645mm and is slightly summer dominant. Annual average evaporation is well in excess of rainfall, being 1320mm and exceeds rainfall in all months except June and July. Wind speeds are generally low, averaging 7.4 kilometres per hour at 9am and 11.8 kilometres at 3pm and are typically strongest in spring. On an annual basis the predominant wind direction is northwest.

2.2 SITE DESCRIPTION

2.2.1 *Landform And Topography*

This area is characterised by broad valley floors with undulating to low relief and low bordering hills. Site elevations range from around 790 to 840m AHD. Drainage lines to the east and west of the existing quarry site converge to the north west of the site and form a tributary of Shoemakers Creek.

2.2.2 *Soils And Geology*

The soil profile at the site consists of a shallow loam which ranges from zero to 4 metres in depth (average 1.8 metres). It is likely to be used for bund walls and rehabilitation fill. A more detailed description of overburden at the Bombala Quarry is presented in *Section 7.1.1*.

The weathered zone beneath the soil profile comprises black olivine basalt with minor internal ironstaining, moderate iron staining on joint surfaces and minor iron rich clays derived from decomposed basalt. This layer is suitable for use as sub-base and roadbase. The basalt resource beneath this is likely to be used for aggregates and can be characterised as fresh black olivine basalt with very occasional green-white calcite veining, traces of iron clay falling from the surface and pale grey clay coatings near the water table. It overlies black olivine basalt with deeply altered or leached joint surfaces and red brown clay. This altered basalt is likely to be used for roadbase or discarded as waste. It occurs rarely, is very localised and is often related to the water table such that samples were frequently recovered as sludge.

The contact between the base of the altered basalt and the underlying basement rock constitutes the base of the quarryable basalt resource. This contact constitutes a dense black finely textured basalt with conchoidal fractures (chilled margin) plus dark grey basalt and basaltic clay (decomposed ash). The basement rock comprises predominantly Siluro-Devonian Coolumbooka Granodiorite (a biotite granodiorite) on the eastern side of the site and Tertiary fluvial sands, grits and lacustrine clays on the western side. The latter is evident over the site as generally either cream-pink-fawn clay with angular quartz fragments (totally decomposed Coolumbooka granodiorite), or dark chocolate brown claystone (Tertiary lacustrine mud). Basement geology specific to the quarry site is either red-orange-yellow-brown puggy clays (decomposed Coolumbooka granodiorite) or dark chocolate brown claystone (Tertiary lacustrine muds).

Table 2.1 provides a summary of layer thicknesses and watertable depths over the site in general and specific to the actual quarry site, as determined from drillhole investigations. It can be seen that the fresh basalt resource is generally thicker and closer to the surface at the quarry site than occurs over the rest of the site.

Table 2.1 ***Drillhole Log Summary***

Unit	Quarry Site		Whole Site	
	Intersection Thickness Range (m)	Average Intersection Thickness (m)	Intersection Thickness Range (m)	Average Intersection Thickness (m)
Overburden	0-4	1.80	0-14.8	3.90
Weathered Basalt Top	0-12.9	2.40	0-32.7	7.30
Fresh Basalt	9.3-33.9	21.70	0-37.1	10.90
Altered Basalt	0-3.2	0.40	0-8.5	0.40
Basement	17.8-36.1	27.10	3.7-42.8	22.70
Watertable	18-18.5	18.25	16.6-36.1	21.90

2.2.3 *Agricultural Suitability*

The relative suitability of the land for agriculture is classified as predominantly Class 4, with a section of Class 3 land on the eastern side of the property, in accordance with the Agricultural Land Classification Map (NSW Agriculture, 2001). However, it is important to note that the land suitability mapping has been developed for the primary purpose of planning at the strategic level and direct application to the site specific level, without ground-truthing, can be inaccurate.

Class 4 lands are considered suitable for grazing but not for cultivation. Agriculture is based on native pastures or improved pastures established using minimum tillage techniques. Production may be seasonally high, however overall production is low as a result of major environmental constraints. Class 3 lands are defined as grazing lands or lands well suited to pasture improvement. It may be cultivated or cropped in rotation with sown pasture. The overall production level is moderate due to edaphic or environmental constraints. Erosion hazard, soil structural breakdown or other factors, including climate, may limit the capacity of the land for cultivation and soil conservation or drainage works may be required.

2.2.4 *Hydrology And Hydrogeology*

Surface Water

The property is traversed by several overland flow paths, as depicted in *Figure 1.2*, with the general flow of overland drainage paths directed to the north. The onsite drainage paths direct runoff from the property itself, as well as surface water directed onto the property via a piped outlet from an artificial swale that runs along the southern side of Pipe Clay Springs Road. Water flowing along the central drainage line of the property, located to the west of the quarry pit, passes through two settling ponds on site, before draining north through another settling pond in the adjacent property. The minimal amounts of water from the existing quarry pit self drain to the northwest and also flow through these ponds. The property generally drains to the north and ultimately into Shoemakers Creek. More information on the hydrology of the property and its surrounds can be found in *Section 8*.

Groundwater

During the geotechnical site investigation undertaken in December 2006, 46 boreholes were drilled across the site and the adjacent property to the east. Nine of the boreholes intersected groundwater. These nine boreholes are listed in the table below, with respective water table depths, and shown in *Figure 3.1*.

Table 2.2 Borehole Locations Where Groundwater Was Encountered

Borehole	Surface Elevation	Water Table Elevation	Depth to Groundwater
BP1	822.139	804.1	18.0
BP4	826.059	807.6	18.5
BP5	826.941	806.4	20.5
BP7	832.056	806.1	26.0
BP8	827.054	804.9	22.2
BP11	825.443	804.2	21.2
BP17	837.946	820.3	17.6
BP31	822.729	806.1	16.6
BP36	840.533	804.4	36.1

1. all values in metres.

No monitoring wells were installed and therefore additional water table measurements have not been taken. The average depth to groundwater in the nine boreholes where the water table was intersected was 21.9m, suggesting that groundwater will be encountered during quarrying to lower benches than the existing bench of RL809. Groundwater resources in the area and across the site appear to be inconsistent, with only 20% of boreholes encountering the water table.

2.3 UTILITIES AND SERVICES

2.3.1 *Water*

The site is not connected to the Bombala town water supply. Water for use within the existing quarry operations is trucked to the site from Bombala using a contractor on an 'as required' basis. The site currently has capacity to store 44,000 litres of water in two plastic rainwater tanks. Typically, current operations require about 220kL of water per month and approximately 1,320kL per annum.

Potable site water is supplied through a bottled water cooler.

2.3.2 *Sewerage*

Currently, quarry staff utilities port-a-loo style chemical toilets. Sewage is collected from the site and transported to the Bombala Sewage Treatment Plant (STP).

2.3.3 *Electricity*

The site is not connected to the grid and site electrical needs are supplied by a diesel generator.

2.3.4 *Fuel Usage*

All site plant and equipment use diesel fuel. Diesel is stored onsite in a 10,000L above-ground storage tank (AST). The AST is located within a container, fitted with appropriate bunding and spill protection. The AST is refilled via tanker once per week on average.

2.4 EXISTING QUARRY OPERATIONS

2.4.1 *Extraction, Processing And Haulage*

Existing operations on site are considered typical for a small operating quarry. In compliance with current consent extraction quota, current production is 50,000 tpa of rock product.

The existing pit floor is currently fixed at an elevation of RL 809m and variable height faces are worked above this level i.e. face heights of 8.9m to 18.5m (average 14.2m). Height faces are variable as the surface topography and base of the basalt flow are variable and not necessarily parallel. The overall quarry plan includes future working of variable height faces below the- RL 809m level i.e. face heights of 3.4m to 21.1m (average 11.6m). The existing RL 809m elevation was selected as the middle bench, within the context of this overall quarry plan, with consideration to the variable face heights, and ensures that future quarry operations will be working the lowest possible maximum face heights on upper and lower benches.

Before the rock can be extracted, a series of charge shafts are drilled from surface level using a hydraulic track drill into the rock to a depth of 1 metre greater than the proposed bench height. These are then filled with explosives. Charges are laid in each shaft and triggered to provide the loose product for processing. At present, drilling and blasting activities occur once a year over a two week period, with two blasts undertaken providing approximately 25,000 tonnes each. The blasting is undertaken by an accredited blasting contractor, Orica.

The blasted rock is then transferred via a front end loader to a raw feed stockpile where it is loaded into the primary jaw crusher by an excavator Works associated with processing and stockpiling on-site are undertaken by the Rye Group, a local contractor based in nearby Berridale.

Following primary crushing, the product is transported by a 50 tonne haul truck out of the pit to a series of secondary crushers and screens to produce the various size fractions required for commercial use, namely 4mm dust to be used in concrete plants, 5mm grit, 7mm, 10mm, 14mm and 20mm aggregate and unspecified 20mm scalps which can be used as road base for the local market. Overburden is stockpiled on site and used for safety mounds around the pit and for noise attenuation earth bunds.

Plant currently used during drill and blast is:

- hydraulic track drill rig;
- a bulk explosives truck to load the holes; and
- a dozer or excavator to strip overburden. Dependant upon the distance overburden needs to be moved, a truck may be utilised for its transportation.

Plant currently used during crushing and screening is:

- mobile crushing plant (in pit);
- secondary crushers;
- screens and conveyors;
- two excavators (loading primary and secondary crushers);
- two front end loaders (one for running rock to the raw feed stockpile and one to run screened product to stockpiles);
- a generator set (in a container);
- a direct drive engine for the jaw crusher;
- a V16 engined 50 tonne Terex haul truck (to transport crushed rock from the pit to the secondary crushers);
- a front end loader to load haulage trucks for transport off-site.

The processed gravel is then hauled off site by truck via Clay Pipe Springs Road, High Lake Road and onto the Monaro Highway. On average there are currently 16 truck movements per day.

2.4.2 *Security And Access*

As outlined in *Section 1.1.1*, the site is accessed via Clay Pipe Springs Road. The site is fenced and there are two gates which can provide site access. One gate is impassable to trucks and is disused. The other is of sufficient width for truck passage and comprises double gates over a cattle grid. These gates are locked when not in use.

2.4.3 *Workforce And Hours Of Operation*

The plant currently operates 5 days per week from 7am to 5pm and loading occurs as needed from 6am to 7am. The site also loads out material on Saturdays from 7am to 12pm. The workforce comprises up to 5 site personnel, comprising the Boral Production Manager and 3-4 plant and equipment operators as subcontracted from the Rye Group.

2.4.4 *Environmental Management*

Surface Water

As described in section 2.3.1, water used in quarry operations is trucked onto the site by a contractor on an 'as required' basis. This water is primarily used to cool the crushers and for dust suppression via microsprays on the screens.

Clean water is diverted around disturbed areas by use of contour drains or modified channels. Dirty water from stockpile areas is retained either in the pit or in three on-site settling ponds below the quarry pit to prevent sediment discharges to tributary waters. The discharge from these ponds is not currently monitored, and as such the efficacy of the ponds and quality of water leaving the site is unknown. No surface water is generated in pit.

The diesel tank on site is fitted into a shipping container and is appropriately bunded to prevent pollution to the downstream tributary.

Soils

Topsoil is stripped immediately prior to extraction. Some of it is used for construction of earth bunds for noise attenuation and for safety mounds around the pit. The remainder is stockpiled on site away from drainage lines, to be used for later rehabilitation.

Noise Attenuation

Following discussions with nearby residents, the primary jaw crusher was relocated into the pit in February 2006. Earth bunds have been constructed around the quarry site to assist in attenuating noise experienced by sensitive receptors. Haulage trucks are restricted to speeds of 40km/hour on unsealed roads and no exhaust braking is permitted. Additionally, all heavy vehicle movements are restricted to access from the Monaro Highway to eliminate noise impacts on the lower sections of Pipe Clay Springs Road.

Waste Management

Wastes on site include a small volume of domestic waste, which is removed offsite by site personnel for disposal. By-products from quarrying activities, include fine and tailings, which are used for road base and small quantities of oil and grease containers, which are transported off site for disposal.

3 *DESCRIPTION OF THE PROPOSED QUARRY EXPANSION*

This Chapter provides a detailed description of the proposed expansion of the quarry and the ongoing operations of the site, a discussion of rehabilitation options and an assessment of the project alternatives.

3.1 *OVERVIEW*

Boral proposes a spatial and temporal extension of its existing operations at Bombala Quarry. The proposal entails development of the quarry to the east, south and west. Existing production rates will be maintained, however operations will be extended from approximately six months per annum, to year-round, facilitating doubling of annual production to 100,000 tpa.

The Bombala Quarry site has a total identified resource of approximately 4.5 million tonnes. At this stage, project approval is being sought for extraction of approximately 1.7 million tonnes of mixed road base and aggregate quality rock over an area that will be sufficient for 20 years of quarrying.

3.2 *DESCRIPTION OF RESOURCE*

A geotechnical investigation was undertaken by Boral in December, 2005. Forty six percussion holes intersecting the base of the basalt flow were drilled over the site and adjacent property to the east, on a 100 metre grid, closing to a 50 metre grid where necessary to delineate resource boundaries. Hole depths varied from 11 to 43.6 metres and averaged 25.6 metres. This survey enabled provision of good data on the shape, thickness and character of the basalt flow for quarry design modelling. *Figure 3.1* shows the site and borehole locations. The basalt flow was identified across a large proportion of the eastern part of the site, extending beyond the property boundary to the north and east. An additional large basalt resource was also identified in the south-western corner of the property.

The hard rock resource to be extracted from the proposed Bombala quarry site is Tertiary olivine basalt. The partially decomposed clayey basalt layer in the weathered zone varies in thickness from zero to 12.9m (averages 2.4m) and is suitable for sub-base or roadbase. The basalt below the weathering profile is fresh, clean and of uniform quality and provides high quality aggregates as it is hard, strong, non-porous, robust and durable with a mild flow texture. This resource varies in thickness from 9.3m to 33.9m (averages 21.7m) and is underlain by altered basalt, some of which may be suitable for roadbase. The basalt quality decreases near the flow margins, due to the effects of deeper weathering; this is beyond the limits of the proposed quarry. The thin black puggy clay commonly found at the base of the basalt flow is difficult to penetrate with percussion drilling and may represent a pre-flow ash layer. These basal clayey host sediments are of limited use and invariably mark the base of the potential quarrying resource, though in rare locations at the base of the basalt flow, the altered rock is still suitable for road base additive or bund walls.

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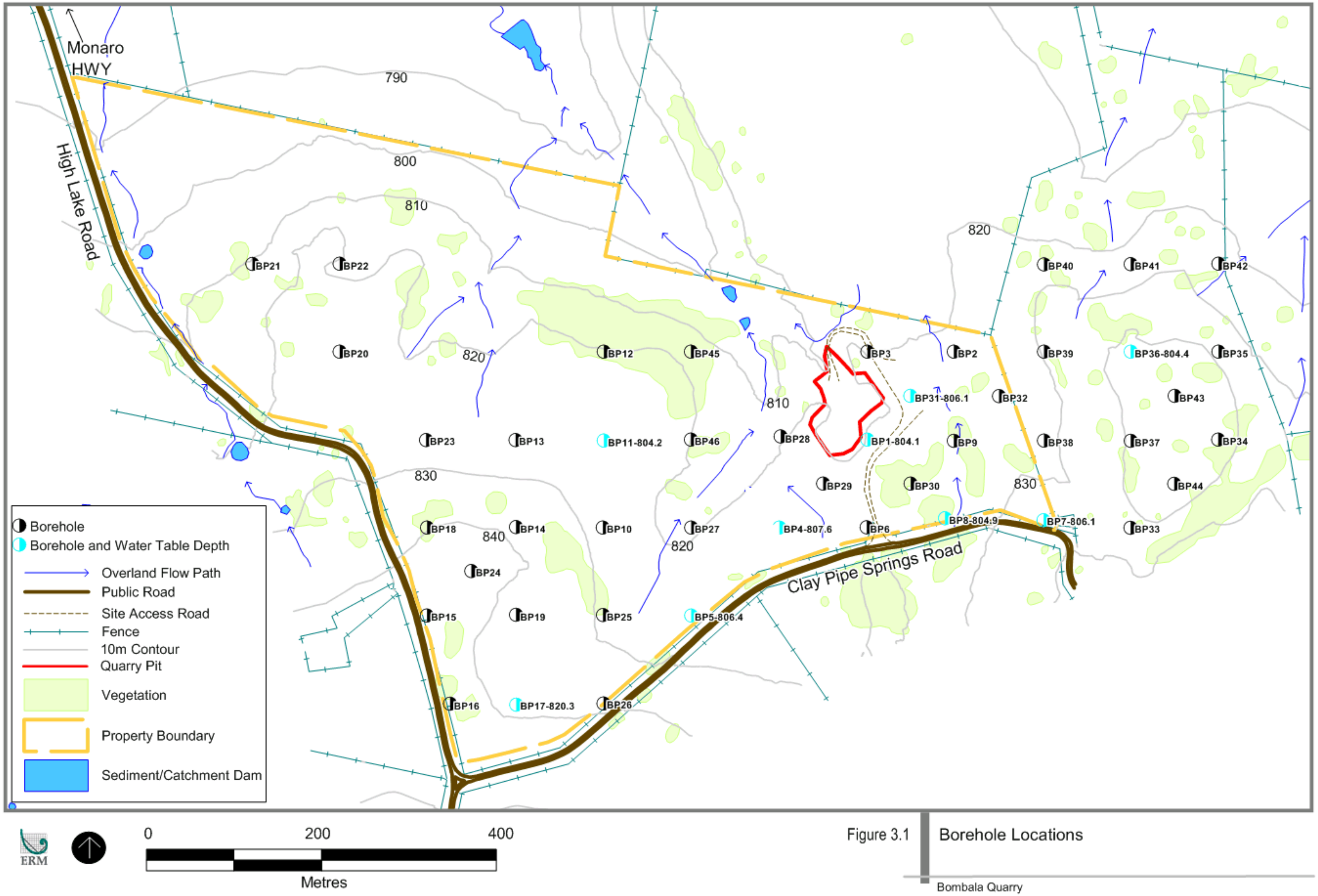

Figure 3.1 Borehole Locations

Bombala Quarry

3.3 PROPOSED LIFE OF OPERATION

Project approval is being sought for an area sufficient for up to 20 years of quarrying. At a rate of 100,000 tpa of rock products sold, the quarry in this location will last 16.6 years, however, expected lower sales in the early years would likely extend this to 20 years. The resource is open ended to the north and the proposed quarry design preserves access along the northern faces. Additional resource was identified in the western portion of the site. This would enable extension of the resource, either through the property boundary to the north or into the western portion of the site, if this were the preferred option at that time, and facilitate continued quarrying for a minimum of 25 years. Areas to the north and west do not form part of this application.

3.4 UTILITIES AND SERVICES

No changes to the existing utilities and services are proposed at this stage. However, Boral may investigate options for an alternative electricity supply for the proposed weighbridge.

3.5 PROPOSED QUARRY OPERATIONS

3.5.1 *Factors Influencing Extraction Plan*

During development of the quarry plan, a number of factors were considered. These included:

- setbacks to property boundaries and residences;
- buffer zones to drainage line;
- resource extent and quality;
- economic extraction limits and market requirements.

Following consideration of these factors, it was determined that extraction of the identified resource in the western part of the property would significantly impact the residences along High Lake Road, primarily via noise and potential vibration impacts during blasting. Consequently the proposed quarry plan excluded extraction in this area at this time.

The proposed limit of extraction on the eastern side was designed to account for the unusual nature of basalt flow in this area. The base of the basalt flow rises anomalously to the ground surface within the area that has been avoided by the quarry design. It then plunges deeply towards the property boundary to the east. This deep eastern development, however, is short lived and the flow quickly deteriorates in quality beyond the eastern property fence. As such the quarry design excludes this area. The proposed expansion plan ensures the economic viability of resource extraction, whilst minimising additional impacts.

3.5.2 *Extraction Plan And Staging*

Boral have proposed operations to comprise a ten stage process (*Table 2.1*) that will incorporate total release of approximately 228,700 tonnes of road base quality rock and 1,435,500 tonnes of aggregate quality rock. This development plan will involve removal of 87,700m^3 of overburden. *Figures 3.2, 3.3, 3.4, 3.5 and 3.6* show the existing quarry layout and proposed quarry layout at Stages 4, 6, 8 and 10 respectively.

To minimise noise experienced at neighbouring properties, the primary jaw crusher has been relocated in-pit at the RL 809m level. The remainder of the processing plant will be relocated in-pit at this level prior to stage 4, which will commence approximately 5.8 years into the project, positioned at the extreme southern end; the pit wall at this location will act as a noise barrier for properties south and west of the quarry. Due to space restrictions within the pit, it is will not be operationally feasible to relocate the processing plant any earlier than stage 4.

During the first three stages of operation, resource extraction will develop to the south and south west, reaching part of the southern and western limits of extraction. The existing stockpile areas, haul road and pit access will be used, though a new access ramp down to the RL 809m level will become active from stage 2, facilitating dual pit access.

In stage 4, the original haul road will be extracted and existing site access will be blocked by the southern quarry wall. Consequently, stockpile areas and a new site access and haul road will be constructed to the west of the pit and pit access will be limited to the new ramp. Extraction will proceed to the northern and eastern limits of extraction during stages 4 and 5, leaving a 20 metre buffer.

Once the resource has been exhausted at the RL 809m level (i.e. stage 6), a drop cut will be developed in the floor and excavation to the 798m level will commence at the southern end. The plant will be relocated to the far eastern end for this stage of operations; the bend in the quarry face here will serve as a noise barrier. In addition, a new ramp will be developed to the RL 798m level and a weighbridge will be installed to the west of the pit.

The proposed floor bench at RL 798m will effectively reduce the highest faces on the lower bench to 11m. At the southern end, basal sediments will be quickly intersected and close grid blast hole drilling will indicate the thickness of rock which can be blasted and recovered without contamination from the underlying basal sediments.

As extraction moves north from this position the basalt will become thicker, to a maximum height of 11m. However, as quarrying extends towards the east where the base of the basalt flow is nearer the surface, the faces will drop below 11m. At this location, the floor at RL 798m will need to extend into basal sediments so that a horizontal floor is produced for the final relocation of the processing plant. This will require extraction of approximately 57,400m^3 of basal sediments. These clayey sediments may have limited use in back blending with road base mixes to increase plasticity, building bunds and producing final rehabilitation landforms.

Stage 7 will involve extraction to the north, leaving a 20 metre wide access bench and will utilise the existing ramps to RL 809m and RL798m levels.

In stage 8, excavation to the 798m level will commence at the eastern end and the plant will be moved back to the extreme southern end of the quarry at the RL 798m level; positioning at a greater depth will reduce noise even further. During this stage of operations, extraction will proceed to the northern and eastern extraction limits, leaving 10 metre berms for rehabilitation access.

In stage 9, extraction paths will constitute a continuation of stage 8 operations. However, a new ramp to the RL 798m level will be progressively developed as the old one is removed.

To fully exploit the hard rock resource in this quarry, a drop cut is then proposed to extend from RL 798m to RL 789m in Stage 10. At this point pit access will be via ramps to the RL 798m level and RL 789m levels, and access to RL 809m will be restricted for use by rehabilitation equipment only. The ramp to the RL 789m level will be fairly steep (1 in 6), to fit into the confined space.

Table 3.1 Proposed Staged Development of Bombala Quarry Expansion

Stage	Overburden Removed (m^3)	Basal Sediment Removed (m^3)	Road Base Quality Rock Released (t)	Aggregate Quality Rock Released (t)	Duration (assuming 100 000tpa rock sold)[1] (years)	Cumulative Duration (years)
1	4,500	0	11,700	58,500	0.7	0.7
2	12,200	0	59,000	175,500	2.3	3
3	19,600	0	62,000	219,000	2.8	5.8
4	12,700	0	50,500	99,000	1.5	7.3
5	38,700	0	39,500	156,000	2	9.3
6	0	57,400	5,000	149,000	1.5	10.8
7	0	0	0	194,500	1.9	12.7
8	0	0	200	205,500	2.1	14.8
9	0	0	500	103,500	1	15.8
10	0	0	300	75,000	0.8	16.6
TOTAL	**87,700**	**57,400**	**228,700**	**1,435,500**	**16.6**	

1. Sales may not have reached 100,000tpa in early stages which could potentially extend estimated duration of Stages 1 and 2.

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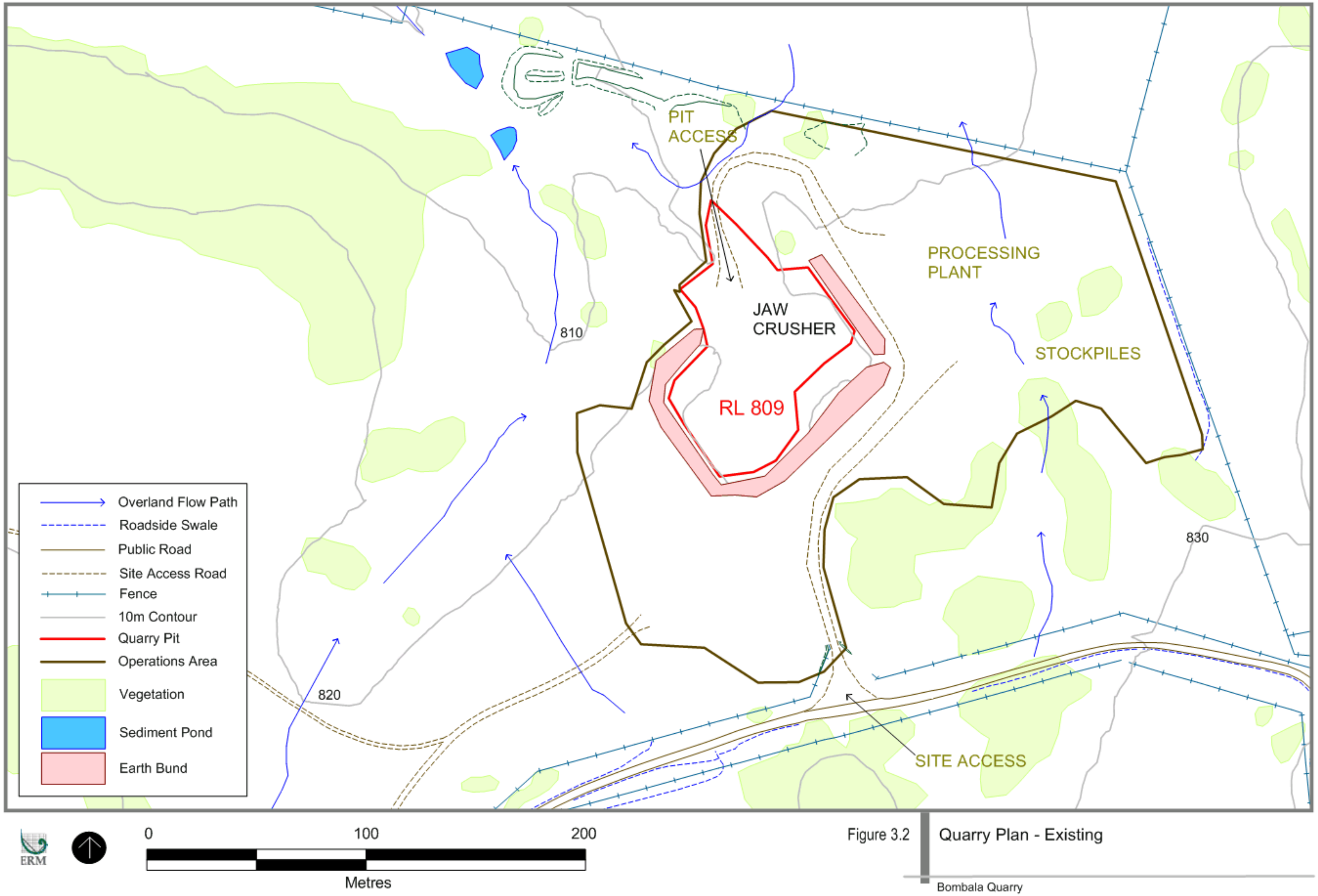

Figure 3.2 Quarry Plan - Existing

Bombala Quarry

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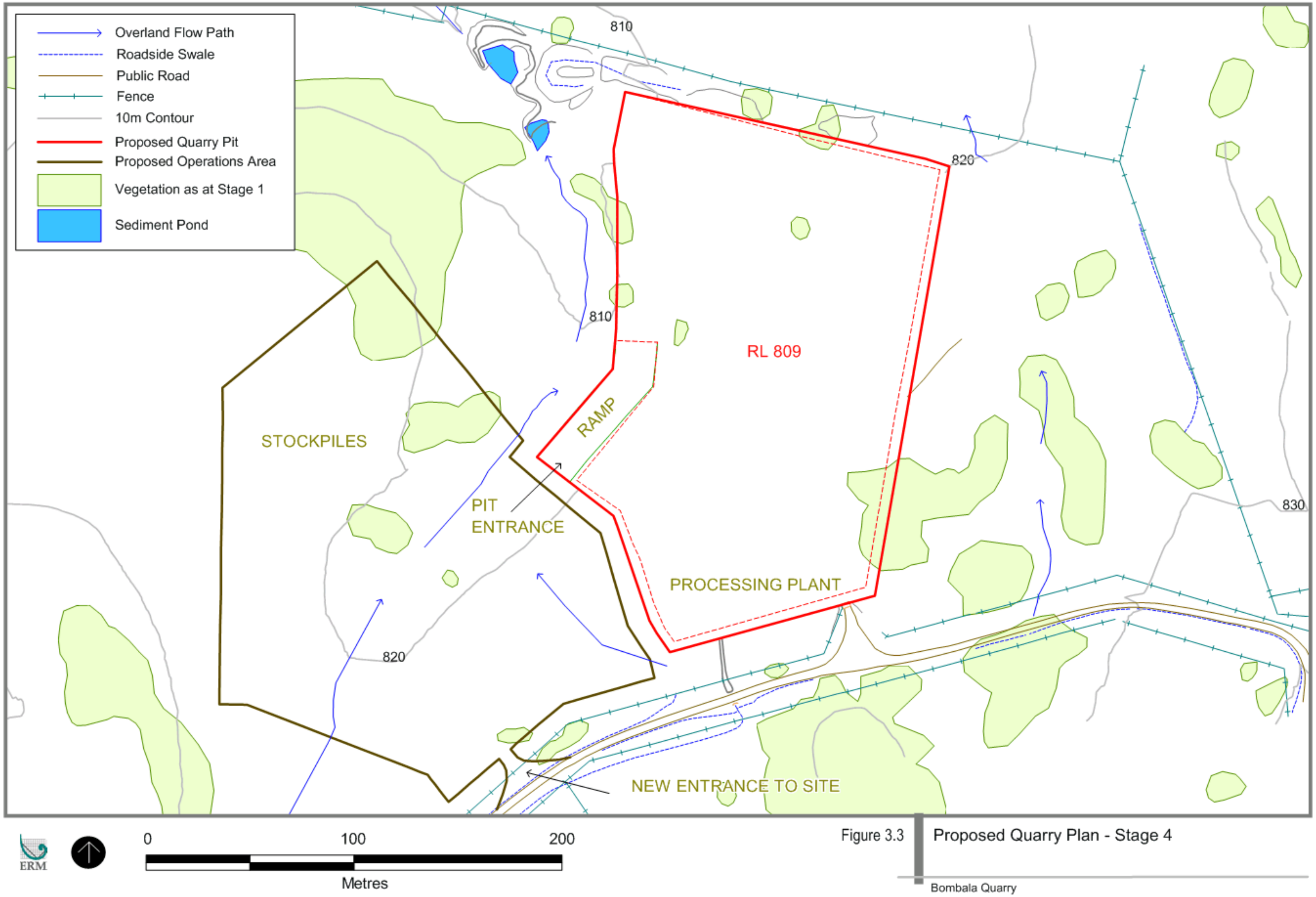

Figure 3.3 Proposed Quarry Plan - Stage 4

Bombala Quarry

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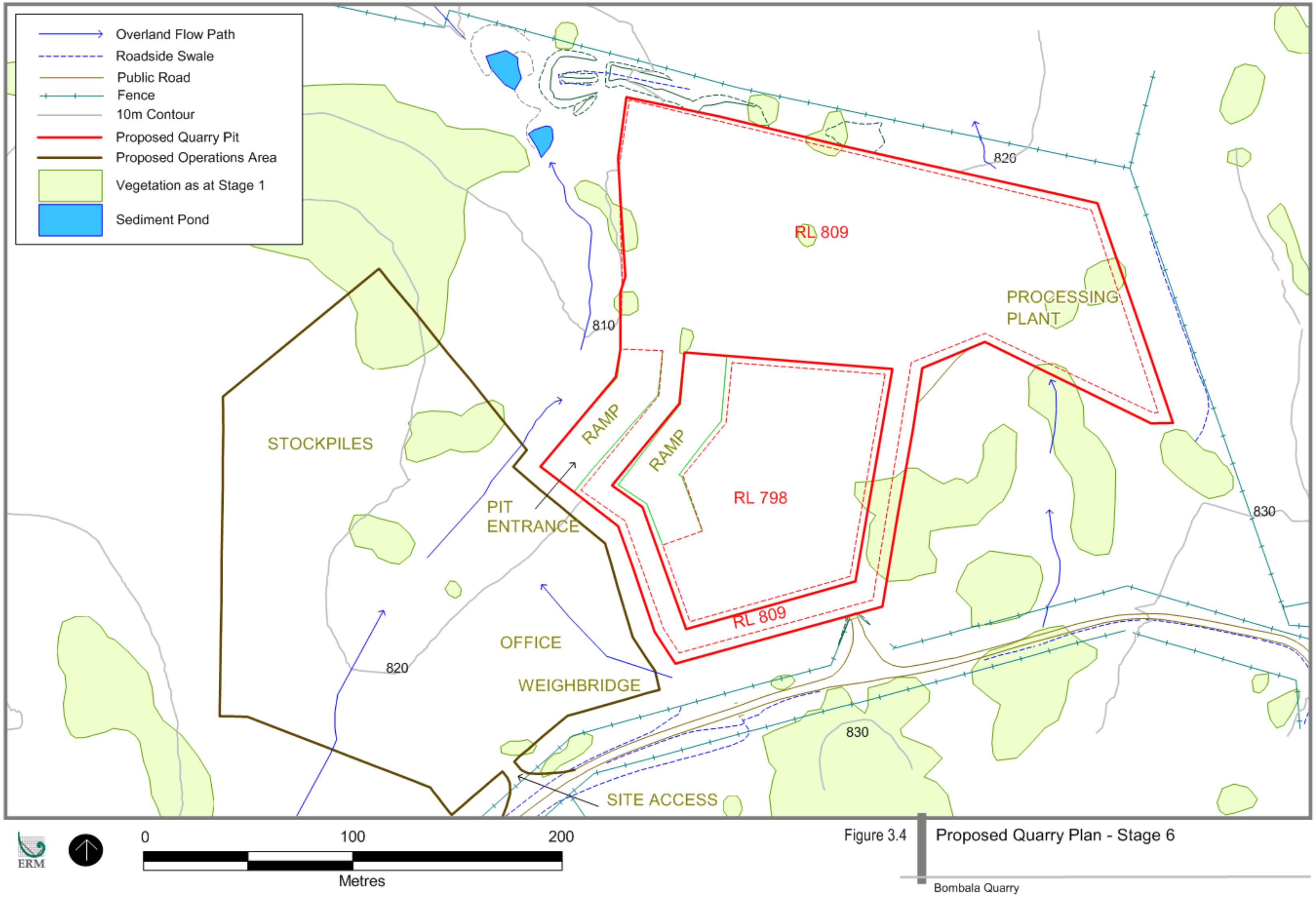

Figure 3.4 Proposed Quarry Plan - Stage 6

Bombala Quarry

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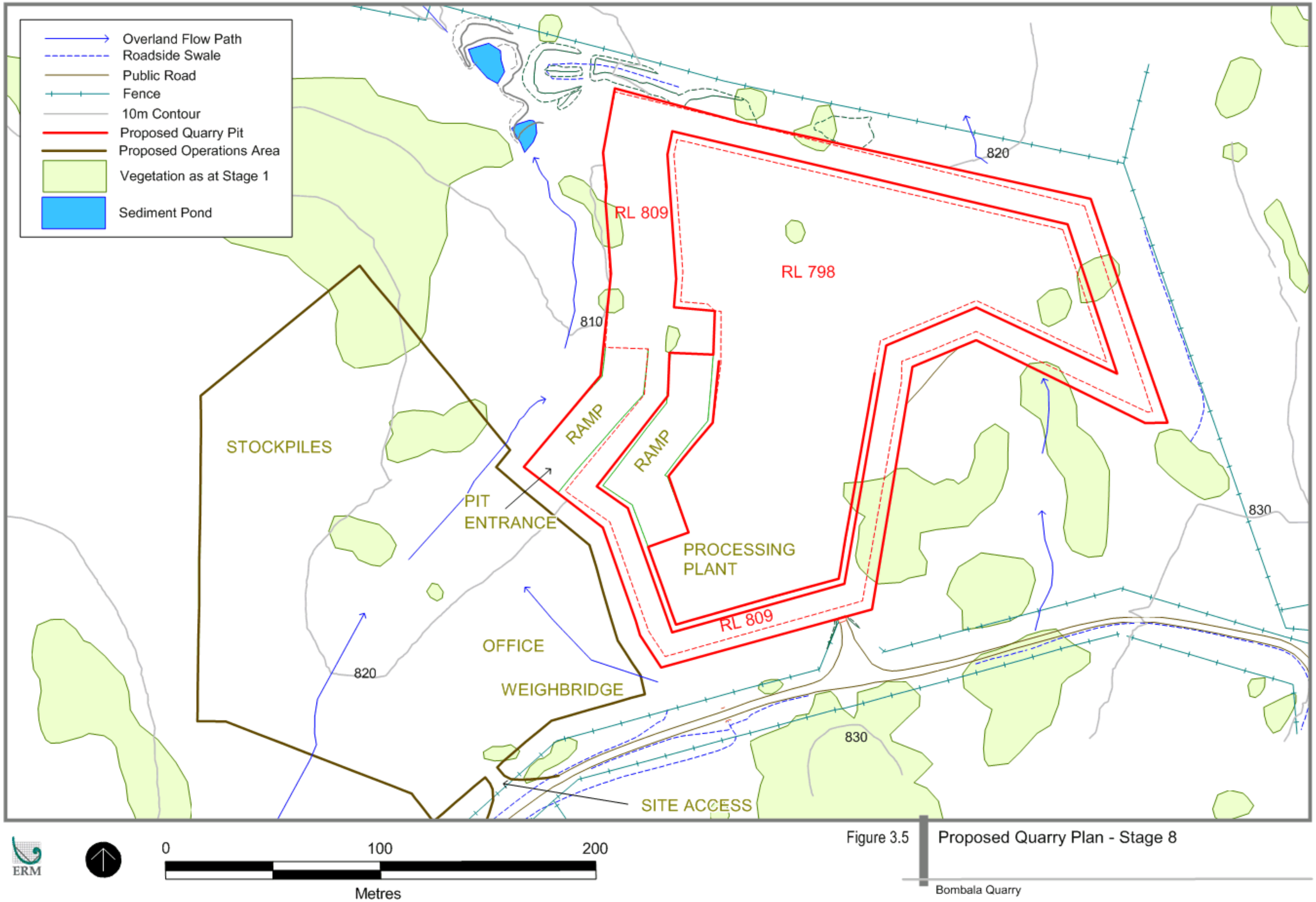

Figure 3.5 Proposed Quarry Plan - Stage 8

Bombala Quarry

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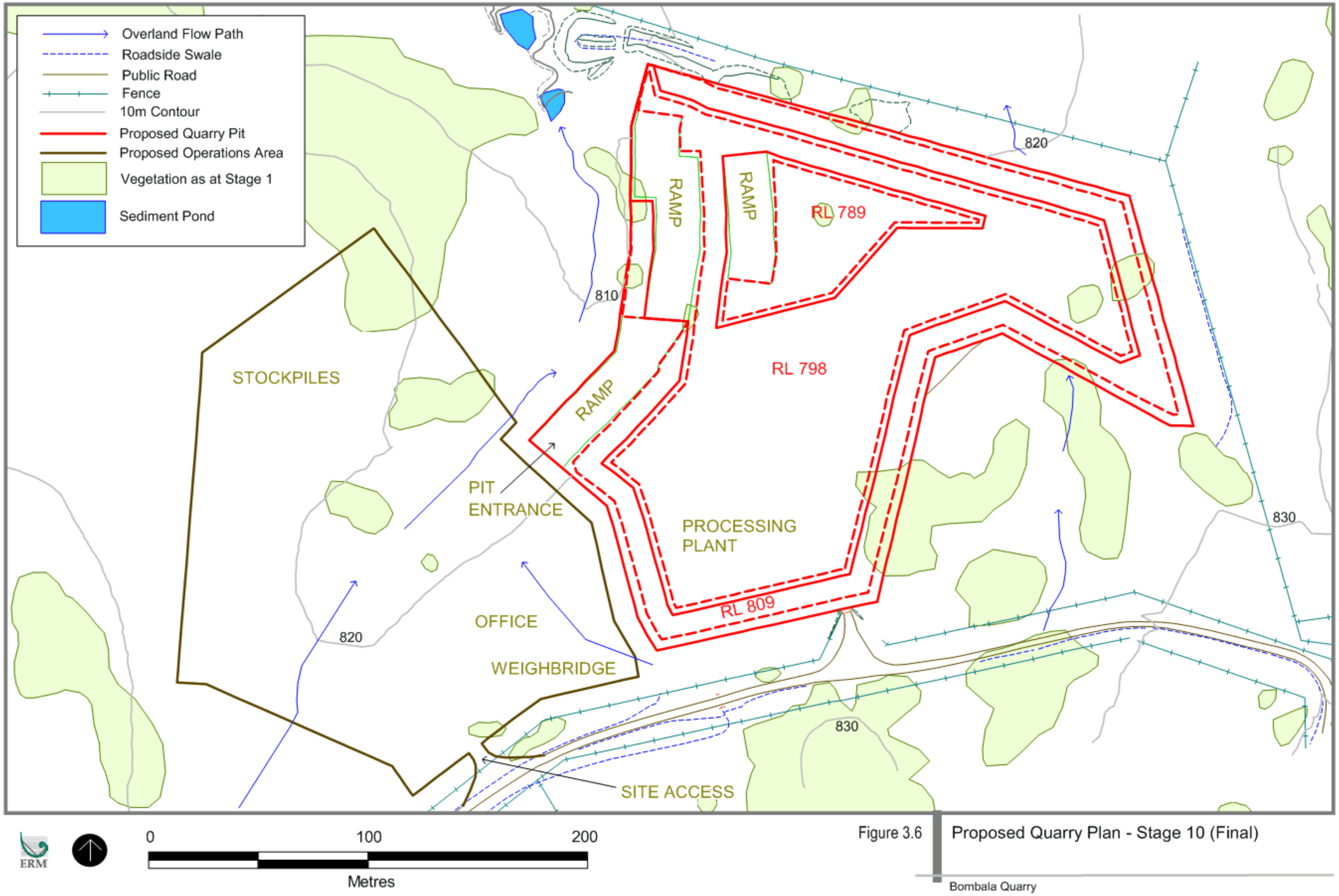


Figure 3.6 Proposed Quarry Plan - Stage 10 (Final)

Bombala Quarry

3.5.3 *Plant, Equipment And Site Infrastructure*

This proposal entails retention of existing plant and equipment, the details of which are outlined in *Section 2.4.1*. Additional site infrastructure required includes a weigh bridge and relocation of the site access to 500 metres west of its current location.

3.5.4 *Processing And Production Rate*

Processing procedures and the production rate will be the same as for existing operations and are outlined in *Section 2.4.1*. The doubling in production will be facilitated by extending the operational period of the quarry to 12 months rather than increasing production rates.

3.5.5 *Haulage*

Haulage will be unchanged from current operations described in *Section 2.4.1*. However, trucks will be operating year round as opposed to six months only.

3.5.6 *Blasting*

Blasting methodology will be unchanged from existing operations described in *Section 2.4.1*. Blasting will be undertaken twice yearly, at six month intervals, in order to extract the 100,000 tpa of resource for processing.

3.5.7 *Workforce And Hours Of Operation*

Workforce and hours of operation will be unchanged from existing operations described in *Section 2.4.3*.

3.6 *ENVIRONMENTAL MANAGEMENT*

Environmental management of the site for during future operations is described further in Section 18. As part of the proposal a surface water management system will be installed including additional surface drainage controls, e.g. swales and flow diversions, an additional sediment basin on the drainage channel downstream of the stockpile area and a sump to capture surface water flowing into the pit for reuse. Construction of earth bunds and relocation of plant will assist in noise management. Air quality impacts will be managed by relocation of plant, water spraying and a stop work policy to be employed on windy days.

3.7 REHABILITATION AND FINAL LAND USE

The proposed expansion of the Bombala Quarry would facilitate continued operations on the site for up to 20 years, at which point the final land form of the site will not be dissimilar to its present day condition. The quarry pit will be approximately 4.3 hectares in area, with stepped benches down to a final depth of RL789 metres. This constitutes an increase in the quarry pit footprint of approximately 3.6 hectares from its existing areal extent, and an increased floor depth of up to 20m. The quarry pit will remain as an amphitheatre, open to the north with walls on the eastern, western and southern faces. The walls will consist of a 10-11 metre drop to an upper bench at RL809 metres, another 10-11 metre drop to a lower bench at RL798 metres and a final 10-11 metre drop to the floor at RL789 metres. Quarry walls between benches will be at 75% gradient and no greater than 10-11m in height.

A comprehensive rehabilitation strategy will be developed in consultation with Bombala Council, as part of the site Environmental Management Plan (EMP), and address final land use of the site. In summary, once quarry operations are completed on the property, the site will be returned to agricultural use, most likely for livestock grazing.

3.7.1 *Rehabilitation Process*

The overall site plan involves opportunistic progressive rehabilitation throughout the life span of Bombala Quarry, whereby areas within the site no longer required for quarry operations including production, stockpiling or access, will be rehabilitated. This will involve landforming and revegetation to return these areas to a natural state. However, as the quarry site and operations are relatively small, the operations areas, including extraction, processing, stockpiling and access areas, are likely to be in use for the majority of the life of the quarry. In the interim, minor landscaping, tree plantings and site maintenance will ensure the site is maintained in a presentable tidy condition and help to reduce fugitive dust emissions and erosion of embankments and unsealed areas.

On completion of quarrying activities on the site, Boral will remove all plant, equipment and structures from the property and landscape. Disturbed areas will be levelled, landscaped and sown with appropriate native grasses and tubestock to make the site suitable for agricultural use (Class 4 Agricultural Land). Quarry operations will have ensured that benched areas will already be in a stable configuration, both in terms of the quarry face angles, the bench widths and the jointing patterns.

There are two main options for final site rehabilitation of the Bombala Quarry site as depicted in the conceptual diagrams (*Figure 3.7*), prepared for Boral by R.W. Corkery & Co. Pty Limited. These options include a rehabilitated quarry with water in the base of the void and a rehabilitated quarry with a dry free-draining floor. Implementation of the latter option would require the floor of the quarry be covered with a minimum of 600mm overburden and stabilised with native vegetation.

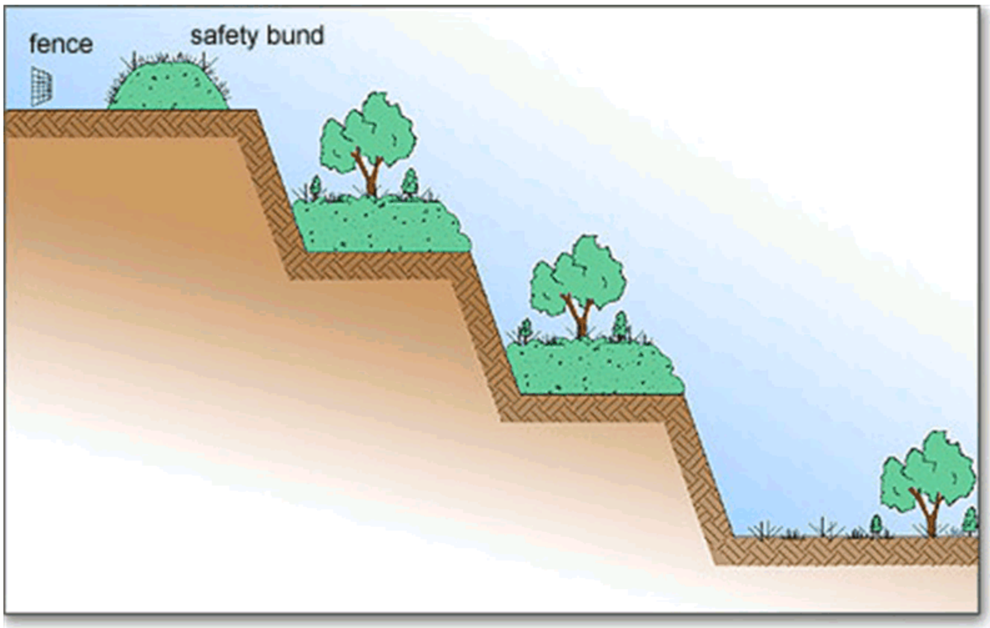
As the lowest bench and final quarry floor will be 8 metres and 17 metres respectively below the rim of the quarry surface at the open ended northern side of the quarry, it is considered that the dry free-draining quarry floor option is unfeasible. The more viable option is for the quarry to form a natural dam for stock watering or drought proofing the property. Alternatively, a channel could be excavated to the north at RL798m to allow the lower bench to free-drain to the catchment dam on the adjacent property, with a smaller dam footprint encompassing the section of the quarry with a floor level of RL789m. These options will be considered on consultation with the adjacent landowner and Bombala Council.

Following adoption of the preferred quarry site rehabilitation configuration, topsoils stockpiled onsite, including material used to form noise attenuation earthbunds, will be placed on all benches above the water line, at a depth of between 2-5 metres. The benches will then be revegetated with seeds and/or tubestock which are native to the site. Suitable species for revegetation, based on the findings of the flora and fauna survey conducted as part for this EIS, are listed in Appendix D.

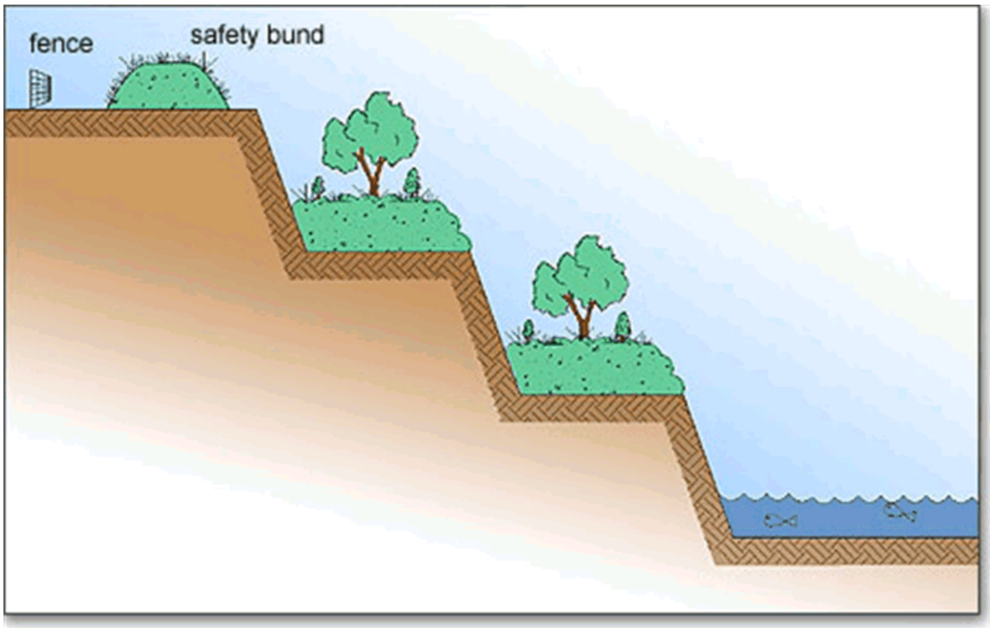
A safety bund and perimeter fence will be established around the rim of the void to prevent access by personnel and large animals.

The remainder of the property will remain relatively unchanged, though some additional sediment ponds and other surface water controls will be installed.

Rehabilitation without Pond



Rehabilitation with Pond



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Source: R.W. Corkery & Co. Pty Ltd

ERM

Figure 3.7 **Quarry Rehabilitation Options**

Bombala Quarry EIS

3.8 *Assessment Of Alternatives And Need For The Proposal*

3.8.1 *Need For The Proposal*

The three main components of concrete (apart from various admixtures) are aggregate, sand and cement. For some years Boral has been investigating the availability of aggregates for their concrete batching plants in the NSW southern region, and obtained the rights to Bombala quarry principally to supply aggregates to these plants. The high quality of the Bombala aggregate, along with the substantial reserves also allow the rock to be used for asphalt, road sealing and other purposes.

Boral's current development application is to extend the area available for quarrying to ensure the long-term sustainability of supply to their concrete batch plants, as well as provide availability of aggregate and roadbase products for local and regional roadworks and to Bombala Council and other local buyers. Bombala quarry is critical to Boral's local area operations and vital to Council works.

3.8.2 *Consideration Of Alternative Options*

Site Selection

The Bombala quarry site was identified as a potential site for purchase, ideally located between Boral's batching plants on the NSW south coast and in Jindabyne, by the Boral regional manager a few years prior to Boral acquiring the lease to the site. As the site was already an active quarry with and identified resource and existing license for extraction, the economic and environmental benefits of further developing the site were considered to outweigh that of developing a greenfield site for extractive industry.

Alternative Sources Of Materials

Boral considered sourcing construction materials from other non-Boral quarries, however, as this would require sourcing materials from direct competitors, this option was considered unacceptable.

Expansion Plan and Staging

The selected expansion plan was devised based on the site and resource constraints and the estimated tonnage of product required to supply Boral's southern region plants for the next two decades. During geotechnical investigations, the basalt resource was identified across large sections of the site and adjacent properties, as described in *Section 3.2*.

The proposed expansion plan of extending the existing pit to the south, west and east, within the property boundary, prior to excavating to the lowest depth of the identified resource, was devised to supply resource to Boral's plants at Pambula, Narooma, Bermagui, Bega and Jindabyne, as well as Bombala Council and other local users, for up to 20 years, whilst minimising environmental and social impacts. Additionally, current grazing activities on the remainder of the site would be able to continue throughout the quarry lifetime.

Other options for expansion of the quarry that were assessed during the planning stage included excavating a second pit on the western part of the site on completion of the expansion of the proposed pit, enabling the liberation of an additional 2.9 million tonnes of potential product over 30 years. Whilst assessment and approval of this option would further ensure the longterm sustainability of the operation, this option was discarded owing to the proximity of the operations area and associated impacts (e.g. noise, blasting, dust, visual) would have on the residents immediately west of this pit.

Extending the quarry into the identified resource into the adjacent properties to the north and east of the site were considered as potential future options for consideration once the resource has been exhausted from the proposed expansion plan.

Haulage and Access Routes

A number of additional haulage route and access options were considered during the quarry planning phase.

Trucks transporting product to Boral's coastal plants at Pambula and Bega currently pass through the town of Bombala, via the Monaro Highway, to reach Mount Darragh road and travel on to the coast. The use of Clay Pipe Springs Road for transporting product to Mount Darragh Road and on to the coast was considered as it would bypass the town of Bombala and reduce the travel distance to Boral's coastal plants by approximately 12km. This option was discarded as Clay Pipe Springs Road is considered unsuitable to heavy vehicle traffic, owing to the presence of tight bends and at least one area that would be subject to surface water flows across the road during heavy rains. Additionally, the use of this route would bring trucks in close proximity to residents who had previously not been impacted by the quarry operations.

The construction of a new access to the site directly off the Monaro Highway, through the adjacent property to the north of the site, was also considered. Constraints identified for this option included time delays associated with negotiating an easement or purchase of land for this access road and, because of the landform, any access road through this property would likely intersect existing surface drainage flow paths and sediment basins.

The continued use of the existing haulage routes and access was considered to provide minimal contribution to environmental and social impacts associated with the proposal.

Materials Handling And Processing

The existing processing plant on site is owned and operated by the Rye Group, a local contractor based in Berridale. Processing onsite is currently at a rate of approximately 400 tonnes per day crushed rock. The proposal will not result in a daily increase in production rate and therefore the requirements for additional plant or plant with a higher production capacity were not considered.

As the existing plant was identified as a significant noise source on the site, options were considered for either replacement or relocation of the plant to address residents concerns. The noise levels measured for the plant (see *Section 11*) were considered to be typical of this type of plant and equipment and therefore replacement of the existing plant is not likely to have provided a significant reduction in noise levels. Relocation of the processing plant was accepted as the optimum solution for noise reduction and has already been partially implemented, with the primary crusher already in the pit. Future relocation of the remaining plant into the pit will be possible in 5.8 years time providing a further reduction in offsite noise levels. These measures will also minimise potential dust impacts resulting from materials processing.

Materials handling options that were assessed included the location of the stockpile areas to optimise onsite movement and offsite transport of materials and associated dust impacts. Following completion of the expansion plan, the available areas for stockpiling were assessed, with the objectives being to provide ease of access for haulage from the pit to the stockpiles and for offsite transport vehicles. Based on these criteria, the selected area, as shown in *Figure 3.6*was considered the optimum location for stockpiling.

Water Management

Water management options assessed for the continued site operation included an assessment of water requirements used in processing and for dust control, and for management of surface waters and groundwater in and around the pit. These are addressed in *Section 8*.

3.8.3 Selection Of The Preferred Option

Following the assessment of alternative options for siting, expanding, operating and managing the proposed quarry, the determination of the preferred option was decided upon based on the following factors:

- The site is a currently an operating quarry located ideally between the batching plants at Pambula, Narooma, Bermagui, Bega and Jindabyne. Boral aims to supply the local market, providing economic and environmental benefits, particularly with regard to costs and impacts associated with establishing any alternative greenfield sites;

- The resource on the site was identified as an extensive reserve of high quality basalt, allowing the provision of a longterm sustainable supply of product to these batching plants, as well as Bombala Council and other local customers;

- The proposed quarry plan allows the progressive extraction of resources to keep up with the demand requirements over the 20 year approval period, while still allowing agricultural use on the remainder of the site;

- The proposed quarry plan provides the optimum use of the site, with regards to extraction of an identified valuable resource, whilst aiming to minimise the environmental and social impacts of the project, particularly with regards to impacts on nearby residents;

- The proposed quarry expansion plan and staging provide adequate opportunities for the implementation of control and mitigation measures, as described in the following chapters, to ensure that identified aspects and impacts related to the operation of the quarry are addressed; and

- The preferred site and expansion plan allow for the rehabilitation of the site for agricultural use with minimal loss of productive land.

4 LEGISLATIVE REQUIREMENTS

This chapter outlines the statutory considerations and the environmental determination process that applies to the proposed expansion of the Bombala quarry site and lists the relevant approvals and licenses required.

4.1 LOCAL PLANNING INSTRUMENTS

4.1.1 Bombala Local Environmental Plan 1990

Bombala Local Environmental Plan 1990 (LEP 1990) applies to all land within the Shire of Bombala. LEP 1990 has 11 aims with general objectives to achieve each aim; of particular relevance to the proposal are Aims c, g, h and j:

'(c) to protect prime crop and pasture land for agricultural use and to maintain and promote commercial agriculture,

(g) to ensure that development occurs in a manner which reflects and respects the opinions of the rural community,

(h) to ensure that development occurs in a manner which minimises risks due to environmental hazards, and minimises risks to important elements of the physical environment, and

(j) to promote the development of industry in the Shire, while ensuring that such development is located and carried out in a manner that minimises nuisance to residents'

The proposed expansion of the Bombala Quarry will not impact on prime agricultural land nor change the existing use of the site. The proposed development will increase the provision of aggregate product for industries within the region and incorporates appropriate mitigation measures to reduce potential impacts on the environment and neighbouring residences.

Under LEP 1990 the Bombala Quarry site is on land zoned 1(a) Rural. The objectives of the 1(a) Rural Zone are:

'(a) to enable the continuation of traditional forms of rural land use and occupation and the development of new or changed forms of agricultural enterprise,

(b) to enable other forms of development which are associated with rural activity, which require an isolated or rural location, or which support tourism, and

(c) to ensure that the type and intensity of development is appropriate in relation to the characteristics of the land, the rural environment, the need to protect agricultural activity from the effects of other development and the costs of providing public services and amenities.'

The proposed development seeks to expand Bombala Quarry, an existing operation appropriate in its rural location. The proposal will not significantly impact agricultural land within the local area and will utilise the existing services and utilities available to the site.

Clause 10 of LEP 1990 outlines the development principles to which the council must have regard when assessing a development within the 1(a) zone. The current proposal has been assessed each of these principles as follows:

'(1) (a) *whether the development is likely to restrict or otherwise inhibit agricultural use of land, by way of fragmenting prime crop and pasture land or removing it from production or otherwise,*

The site supports an existing quarry within a predominantly agricultural landscape. The proposed development will temporarily sterilise less than 8 hectares and retain a further 34 hectares of Class 4 grazing land on the site. The site does not represent prime agricultural land, and it is proposed that the land will be rehabilitated to support livestock grazing at the cessation of quarrying.

(b) *whether the development is likely to assist the maintenance and expansion of agricultural enterprise by farm consolidation, property rationalisation, maintenance of equity or otherwise,*

The proposed development will not impact on current agricultural enterprise within the region.

(c) *whether adequate water is available to service the development,*

Water for use within the existing quarry operations is currently trucked to the site from Bombala, with approximately 220kL of water required for use each month. This arrangement would continue for future operations, however water captured in the quarry pit will also be reused on site.

(d) *whether the development is likely to create unreasonable demands for the uneconomic provision of services, particularly the provision, extension, upgrading and maintenance of public roads,*

The proposed development will utilise the existing utilities and access arrangements available to the Bombala Quarry. The proposal will have minimal impact to the road network, with some additional wear and tear on haulage roads expected. Requirements for road maintenance works would be discussed with Bombala Council.

(e) the risks to the development and the risks to other land as a consequence of the development, from natural hazards, particularly soil erosion, land degradation and fire,

The proposed development will not increase the risk of natural hazards on the site or adjoining lands and will implement erosion and sediment control measures throughout the life of the quarry.

(f) whether the development poses an avoidable risk to land of environmental or conservation value,

The proposed development will not significantly impact on natural or European features of the environment, while no threatened species or protected sites have been recorded on or near to the Bombala Quarry.

(g) whether the development is likely to create a condition of ribbon development, related to traffic safety and the character of the countryside, and

The proposal will not alter the existing use of the site or the road safety of the local area.

(h) whether the development will substantially change the appearance and character of the countryside.

The proposed development will not alter the existing use of the site or the character of the surrounding area.

(2) In considering the matters referred to in subclause (1) the council shall take into account the significance of any probable effect, whether any potential adverse effect is capable of being minimised, and whether in the circumstances there are any benefits which compensate for any adverse effect.'

An assessment of the matters referred to in subclause (1) and proposed mitigation measures of potential impacts is included in the following sections of the EIS. Compensation to Council for any adverse effects identified would be partially met by the benefits of the project, such as input into the local economy and the ongoing supply of gravel and road-base to Council and local customers.

4.2 NEW SOUTH WALES

4.2.1 *Environmental Planning And Assessment Act 1979*

The proposed development requires consent under Part IV of the *Environmental Planning and Assessment Act 1979* (*EP&A Act*). The proposed expansion is classified as designated development under Schedule 3 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) as it involves the excavation of more than 30 000 cubic metres of material per annum and will disturb a surface area of more than two hectares. Consequently, under Section 78(8) of the *EP&A Act* an environmental impact statement (EIS) is required to accompany the development application.

The EP&A Regulation specifies matters to be addressed in an EIS and requires the Director-General of the DoP to be consulted regarding the specific form and content. The requirements of the Director-General are attached in *Annex A*.

Bombala Council is therefore the consent authority and the development application and EIS must be placed on public exhibition for 30 days. A written notice of the development application will be sent to relevant individuals and published in a local newspaper inviting written submissions to be lodged with Council.

The proposal is integrated development under Section 91 of the *EP&A Act* as it requires licences and approvals from the Department of Environment and Conservation (DEC), the Department of Natural Resources (DNR) and the NSW Roads and Traffic Authority (RTA). The relevant general terms of approval will therefore be obtained from these authorities prior to the determination of the application.

4.2.2 *State Environmental Planning Policy (Major Projects) 2005*

State Environmental Planning Policy (Major Projects) 2005 (SEPP MP) identifies projects to which the streamlined development assessment and approval process under Part 3A of the *EP&A Act* applies. Schedule 1 of SEPP MP identifies extractive industry major projects as:

'(1) Development for the purpose of extractive industry that:

(a) extracts more than 200,000 tonnes of extractive materials per year, or

(b) extracts from a total resource (the subject of the development application) of more than 5 million tonnes, or

(c) extracts from an environmentally sensitive area of State significance.

(2) Development for the purpose of extractive industry related works (including processing plants, water management systems, or facilities for storage, loading or transporting any construction material or waste material) that:

(a) is ancillary to or an extension of another Part 3A project, or

(b) has a capital investment value of more than $30 million.'

The expansion of the Bombala Quarry proposes a maximum extraction rate of 100 000 tonnes per annum (tpa) from a total potential resource of approximately 4.5 million tonnes (of which 2.5 million tonnes has been excluded from the proposed extraction plan due to environmental and social constraints), significantly less than the major project triggers outlined above. The proposed development is therefore not classified as a 'Major Project' and requires consent from Bombala Council under Part IV of the *EP&A Act*.

4.2.3 *Protection Of The Environment Operations Act 1997*

The *Protection of the Environment Operations Act 1997* (*POEO Act*) provides an integrated system of licensing for polluting industries. Schedule 1 of the *POEO Act* identifies types of development that require an environment protection licence. Included in Schedule 1 are:

'Extractive industries:

(1) that obtain extractive materials by methods including excavating, dredging, blasting, tunnelling or quarrying or that store, stockpile or process extractive materials, and

(2) that obtain, process or store for sale or re-use an intended quantity of more than 30 000 cubic metres per year of extractive material.'

As annual production of the Bombala Quarry will exceed 30 000 cubic metres per annum, the proposed development will require an Environment Protection Licence from the Environmental Protection Authority (EPA) branch of the DEC.

4.2.4 *Water Management Act 2000*

The *Water Management Act 2000* (*WM Act*) incorporates the provisions of various acts relating to the management of surface and ground water in NSW, and provides a single statute for the regulation of water use and works that affect surface and ground water, both marine and fresh.

Parts of the *WM Act* commenced on 1 January 2001. However provisions relating to the new water access licensing and water approvals systems were delayed until water sharing plans and public registers for licences and approvals where developed. Since 1 July 2004 the new licensing and approval system has been in effect in the areas of NSW covered by 36 operational water sharing plans.

There is an operational water sharing plan for the 'Wandella Creek Water Source' however the Bombala Quarry site is outside of the area covered by the water sharing plan. This means that the provisions in the *WM Act* in relation to obtaining approval for excavation works do not apply to the site and therefore previous legislation still applies, including the permit provisions of Part 3A of the *Rivers and Foreshores Improvement Act 1948*, and those in the *Water Act 1912*.

4.2.5 *Rivers And Foreshores Improvement Act 1948*

The *Rivers and Foreshores Improvement Act 1948* (*R&FI Act*) is administered by the DNR. This Act establishes a regime for the protection and improvement of certain rivers and foreshores and the prevention of erosion of lands by non-tidal and tidal waters.

Under Part 3A of the *R&FI Act* a permit from the DNR is required for any excavation works in or within 40 metres of a waterway. There is an overland flow path traversing the property which will be within 40 metres of the proposed quarry expansion and stockpile area. It is considered that a permit under Part 3A of the *R&FI* Act will be required. Consultation with DNR will be undertaken to determine the relevant requirements for a Part 3A permit.

4.2.6 *Threatened Species Conservation Act 1995*

Developments requiring approval from a Council or activities determined by a statutory authority of the NSW State Government, are required to be assessed in accordance with the *EP&A Act*, as amended by the *Threatened Species Conservation Act 1995* (*TSC Act*).

Section 3 lists the objects of the *TSC Act*, which are:

'(a) to conserve biological diversity and promote ecologically sustainable development, and

(b) to prevent the extinction and promote the recovery of threatened species, populations and ecological communities, and

(c) to protect the critical habitat of those threatened species, populations and ecological communities that are endangered, and

(d) to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities, and

(e) to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed, and

(f) to encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.'

The proposed expansion of the Bombala Quarry is generally consistent with the objects of the *TSC Act*. The proposed operation is relatively small in area (approximately 50 hectares) and sited on predominantly cleared agricultural land.

In accordance with section 5A of the *EP&A Act*, an Assessment of Significance is summarised in *Section 9*, the findings of which indicate that the proposed works will not have a significant impact on threatened species, populations or ecological communities, or their habitats, and therefore a species impact statement is not required.

4.2.7 *National Parks And Wildlife Act 1974*

The *National Parks and Wildlife Act 1974 (NPW Act)* promotes the conservation of nature and objects, places or features (including biological diversity) of cultural value within the landscape.

All Aboriginal objects within the state of New South Wales are protected under the *NPW Act*. Under Section 90, a person who, without first obtaining the consent of the Director-General of the DEC, knowingly destroys, defaces or damages, or knowingly causes or permits the destruction or defacement of or damage to, an Aboriginal object or Aboriginal place is guilty of an offence.

An Aboriginal heritage assessment was undertaken as a component of this EIS and is provided in *Section 12*. This assessment found no Aboriginal objects or places on the site, hence consent from DEC is not required. However, as a precautionary approach to complying with the provisions of this Act, if any Aboriginal heritage material is discovered, works will cease in the area, and DEC and the relevant Aboriginal groups will be informed. Works must not continue without the written consent of the NSW DEC.

4.2.8 Heritage Act 1977

The *Heritage Act 1977* protects heritage items, sites, and relics and is administered by the NSW Heritage Office. A relic is defined as any item relating to European settlement that is older than 50 years. It is an offence under the *Heritage Act 1977* to:

> *'disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will result in a relic being discovered, exposed, moved, damaged or destroyed, unless the disturbance is carried out in accordance with an excavation permit issued by the Heritage Council of New South Wales.'*

A European heritage assessment was conducted as a component of this EIS and is provided in *Section 12*. No heritage items, sites or relics likely to be affected by the proposal were identified in this assessment and so an excavation permit will not be required for this project.

4.2.9 State Environmental Planning Policy No. 11 – Traffic Generating Developments

State Environmental Planning Policy No. 11 – Traffic Generating Developments (SEPP 11) aims to ensure that the RTA is made aware of and given the opportunity to make representations in respect of developments such as extractive industry.

Under Clause 7 of SEPP 11 Council is required to forward a copy of the application to the RTA and cannot determine the application until it has received representation.

There will be no net increase in truck movements on a daily basis associated with the proposed expansion and therefore the proposal is not considered to be a traffic generating development.

4.2.10 State Environmental Planning Policy No. 33 – Hazardous And Offensive Development

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) relates to "potentially hazardous" or "potentially offensive" developments, such as quarries, and requires specified matters to be considered by consent authorities when assessing such applications.

The environmental assessment carried out as part of this EIS and the qualitative hazard and risk assessment (refer to *Section 16*) indicate that the proposed extension to the Bombala Quarry would not present a significant risk or offence to the environment or public health and is therefore neither potentially hazardous nor offensive.

4.2.11 *State Environmental Planning Policy No. 44 – Koala Habitat Protection*

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) applies to the Bombala local government area and aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas.

Prior to granting consent for the current development application, Council must satisfy itself whether or not the land is a potential koala habitat. The ecological assessment undertaken for the proposal concluded that no koala feed trees or potential koala habitat occur on the site.

4.2.12 *State Environmental Planning Policy No. 55 – Remediation Of Land*

The object of State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) is to provide for a State wide planning approach to the remediation of contaminated land.

Section 7 of SEPP 55 states that a consent authority must not consent to the carrying out of any development on land unless it has considered whether the land is contaminated.

Before determining an application for consent to carry out development that would involve a change of use on any of the land specified in subclause (4), the consent authority must consider a preliminary investigation report. Subclause (4) includes:

'(c) land on which development for a purpose referred to in Table 1 to the contaminated land planning guidelines is being, or is known to have been, carried out'

The proposed expansion of the Bombala Quarry does not propose a change of land use, however involves the change of use of a portion of the site from agriculture to extractive industries. The site is not within an investigation area as nominated by the EPA branch of DEC, however agricultural activities are listed in Table 1 of the Managing Land Contamination Planning Guidelines developed by Department of Urban Affairs and Planning (now DoP) and the NSW EPA (1998). As the proposed development seeks to expand the existing landuse, it is considered that a preliminary investigation into the contamination of the site is not required.

4.3 COMMONWEALTH

4.3.1 *Environment Protection And Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) requires approval of the Commonwealth Minister for the Environment for actions that may have a significant impact on matters of national environmental significance. The *EPBC Act* also requires Commonwealth approval for certain actions on Commonwealth land. Matters of national environmental significance under the Act include the following:

- World Heritage properties;
- natural heritage places;
- Ramsar wetlands of international importance;
- threatened species or ecological communities listed in the *EPBC Act*;
- migratory species listed in the *EPBC Act*;
- Commonwealth marine environment; and
- nuclear actions.

There are no World Heritage properties, National heritage places, Commonwealth marine areas or nuclear actions on or near the site. The Ramsar listed Blue Lake, occurs within the Kosciusko National Park approximately 100 kilometres to the north west of the site and is within the same catchment as the proposal. The glacial cirque lake, Blue Lake occurs in the headwaters of the Snowy River and is protected within the Kosciusko National Park for over 50 years. Previous impacts on Blue Lake prior and after its protection have been minimal, consequently the lake remains in a near natural state (Australian Wetlands Database, Department of the Environment and Heritage (DEH)). Blue Lake is not likely to be impacted directly or indirectly by the proposal.

There is the potential for the habitat of nationally listed threatened and migratory species to exist near to the site. An assessment under the *EPBC Act* is summarised in *Section 9.4*. The assessment of significance concluded that threatened species, communities and populations are not going to be placed at risk of extinction by the proposal. Furthermore, the proposal is not expected to have a significant effect upon the health and viability of any threatened or migratory species listed under the provisions of the *EPBC Act*. In conclusion, the proposed development will not have a significant impact on matters of national environmental significance therefore an approval from the Commonwealth Minister for Environment under the *EPBC Act* is not required.

4.3.2 *Aboriginal And Torres Strait Islander Heritage Protection Act 1984*

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* protects areas and/or objects which are of significance to Aboriginal people and which are under threat of destruction. The Act can, in certain circumstances override state and territory provisions, or it can be implemented in circumstances where state or territory provisions are lacking or are not enforced. A significant area or object is defined as one that is of particular importance to Aboriginal people according to Aboriginal tradition. The Act must be invoked by or on behalf of an Aboriginal or Torres Strait Islander or organisation.

4.4 SUMMARY OF APPROVALS, PERMITS AND REFERRALS

In summary, before Boral proceeds with the proposal it is anticipated that they will be required to:

- obtain approval under Part IV of the *EP&A Act* from Bombala Council;
- obtain an Environment Protection Licence from the DEC under Section 43 of the *POEO Act*; and
- obtain a permit under Part 3A of the *Rivers and Foreshores Improvement Act 1948* from the DNR.

5 ISSUES IDENTIFICATION AND STAKEHOLDER CONSULTATION

This Chapter provides details of consultation that was undertaken with government authorities, local landowners and other relevant groups during the EIS process. A summary of the key issues arising from this consultation process is also provided.

5.1 ISSUES IDENTIFICATION PROCESS

Consultation with the community, government authorities and other relevant stakeholders commenced in mid-2005 to contribute to the planning process by assisting in the identification of the main issues to be considered by Boral and ERM in developing the proposal quarry expansion plan and the EIS. Consultation has continued throughout the preparation of this EIS, aiming to keep stakeholders informed about the project and identify any issues of concern that may need to be addressed.

5.1.1 Identification Of Key Stakeholders

The following individual and groups have been identified as key stakeholders in the proposed expansion of the Bombala Quarry:

- nearby residents, particularly on High Lake Road and Clay Pipe Springs Road;
- relevant state government agencies, including DoP, DEC, RTA and DNR;
- Bombala Council;
- Boral employees; and
- Aboriginal groups.

Consultation was undertaken in a range of stakeholder engagement strategies tailored to selected stakeholder groups. Methods of communication included personal communication, either face-to-face or via telephone; distribution of newsletters; written correspondence to request input or requirements; and meetings. This section provides a brief discussion of the consultation objectives and methods for communication as they relate to each stakeholder group.

5.2 CONSULTATION WITH GOVERNMENT AUTHORITIES

Initial contact was made with Bombala Council in November 2005 to discuss the proposal, beginning the consultation and planning process of the project. Following on from this meeting, it was decided by Bombala Council, as the consent authority, that a Planning Focus Meeting was not required. As such, a project background paper was prepared and forwarded to the DoP for distribution to other relevant agencies, including:

- DEC;
- RTA;
- DNR; and
- Bombala Council.

Responses received from these agencies is detailed below.

5.2.1 *Bombala Shire Council*

A meeting with the Bombala Mayor and key Bombala Council staff, including the General Manager, was held in November, 2005. Feedback was generally positive, with Council in favour of development of industry in the region. Council indicated they would like to be kept informed with the progress of the Environmental Impact Assessment (EIA). Copies of the community newsletters will also be made available to Councillors and to Council.

5.2.2 *Department Of Planning*

Consultation with Government Departments has been used to refine the EIS process and identify the key issues of concerns for relevant departments. A summary of the requirements of these Departments is included in the following tables.

Table 5.1 Department of Planning Director-General's Requirements

Issues Raised	Section of the EIS
The EIS must provide:	
• A description of the Proposal	3
• Justification of the proposal	19
• An assessment of the proposal against relevant legislation	4
The EIS must assess the following key issues:	
• Noise;	11
• Blasting and vibration;	11
• Air quality;	10
• Water quality (including surface water and ground water);	8
• Traffic and transport;	13
• Flora and fauna (particularly threatened species, populations and Endangered Ecological Communities (EECs));	9
• Heritage (both Aboriginal and non-Aboriginal);	12
• Waste management;	15
• Visual;	14
• Utilities and services; and	2.3, 3.4
• Social and economic	6
The EIS must discuss the proposed rehabilitation and final land use of the site	3.7
The EIS must describe ongoing management and monitoring of the environmental performance of the proposal.	18

Table 5.2 ***DEC Director-General's Requirements***

Issues Raised	Section of the EIS
The EIS must provide:	
• An executive summary	ES
• The project objectives	1.4.2
• A description of the project	1.4.1, 3.5
• An assessment of the project with regard to Ecologically Sustainable Development (ESD)	19.2
• Details of the proposed rehabilitation of the site	3.7
• Consideration of alternatives and justification for the proposal	3.8
• Description of the General Location	2.1
• Identification and prioritisation of issues / scoping of impact assessment	5.6
The EIS must provide a description and assessment of the following key environmental issues:	
• Air quality, including identification of air emissions sources, description of existing air quality and meteorology, assessment of impacts in accordance with Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2001), and Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (EPA, 2001), and management measures	10
• Noise and Vibration , including identification of all noise sources, identification of sensitive receiver locations, determination of background noise levels in accordance with the *NSW Industrial Noise Policy* and existing road traffic noise levels in accordance with the *NSW Environmental Criteria for Road Traffic Noise*, determination of project-specific noise goals, assessment of impacts at sensitive receiver locations, assessment of blasting impacts in accordance with the *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990), and management and mitigation measures	11
• Water, including description of catchment and water resources, site existing water quality and water quality objectives, site drainage details, identification of potential pollutants, assessment of water quality impacts, and management measures for protection of water quality including proposed erosion and sediment controls	8
• Soils and Contamination, including details of the site history, description of soil resources, potential impacts to soils, and management of soils during operations	7
• Waste and Chemicals, including quantity and management of all waste, chemicals, and hazardous and dangerous materials, potential impacts from handling, storage and transport of wastes and measures to minimise impacts	15
• Cumulative impacts, particularly with regard to existing development and long term impacts to air, water and noise amenity	17
The EIS must include a list of all relevant approvals and licences	4.4
The EIS must include a compilation of mitigation measures	17.3
The EIS must include a justification for the Proposal	19

Table 5.3 ***RTA Requirements***

Issues Raised	Section of the EIS
The EIS must	
• Include an analysis of the impacts of additional vehicles on the road network	13.3
• Identify any improvements required to ameliorate road safety impacts	13.4
• Identify any improvements required to safely accommodate additional vehicles on identified traffic routes in terms of capacity, widths and turning paths, including design changes to the junctions of SH19 and High Lake Road and MR91 and Clay Pipe Springs Road.	13.4
• Include details types of vehicles in terms of weight and configuration.	13.1.3
• Include an analysis of the expected increase in wear and tear on affected road surfaces caused by additional vehicles over the proposed facilities life	13.3
• Assess the impact of construction traffic, if any, on the safety and efficiency of the road network.	n/a
• Consider the environmental impacts of any proposed roadworks.	n/a

Additionally, a meeting was held on 23 May 2006 between DEC, Boral and the members of the EIS Project Team to discuss the noise impact assessment, in particular, the methodology employed and the findings to date. The meeting allowed the EIS study team to further refine the assessment and address any other specific comments by DEC, including details on background data used in developing site-specific targets for noise emissions.

5.3 CONSULTATION WITH LOCAL RESIDENTS

Personnel communication has been undertaken with near neighbours to introduce the project and establish communication lines. Contact was initially made via telephone with face to face meetings between residents, the proponent and members of the Project Team carried out in November 2005. residents consulted included the three residents along High Lake Road, as well as one resident on Clay Pipe Springs Road and the property owners. Follow up discussions with selected residents occurred again on 16 February, 2006 and 21 March 2006 to discuss particular issues and "touch base". Additionally, site staff have had contact with residents on an ad hoc basis whilst the quarry has been operating.

Feedback to date has been mixed, with no residents opposed outright to the development, however some issues, such as noise and to a lesser extent dust and traffic, have been raised and residents are keen to see these issues addressed during through the planning and EIA process. Following these discussions, Boral saw an opportunity to address these concerns immediately by implementing a range of mitigation measures, including extension of existing earthbunds, construction of additional earthbunds and relocation of the primary crusher to within the pit to screen processing noise.

To ensure that the local residents and other identified relevant stakeholders were kept informed of the project status, an introductory newsletter was distributed in November 2005, with subsequent newsletters distributed in February and June, 2006. The newsletters included information on the recent activities onsite and details on the status of the EIS preparation, as well as contact details for the proponent and EIS Project Team to provide an avenue tor residents to voice concerns with the existing or proposed future quarry operations. Copies of the newsletters have also been provided to Bombala Council and are included in *Annex C*.

An additional opportunity for stakeholders to comment on the project will be provided prior to finalisation of this EIS, so that any issues and concerns can be addressed in person and incorporated into the final document as relevant.

5.4 ABORIGINAL GROUPS

In accordance with the interim DEC guideline for Aboriginal consultation, advertisements for the present assessment were placed in the Bombala Times newspaper on 25 January 2006. In accordance with the guidelines, a survey methodology was agreed with the respondents and surveys were completed in late November with representatives from Eden Local Aboriginal Land Council and the Ngarigu Native Title group.

5.5 OTHER COMMUNITY GROUPS

Other community groups consulted with during the EIA process include the Bombala & District Historical Society.

5.6 SUMMARY OF KEY ISSUES

Based on the consultation undertaken during the project planning and EIA process, the key issues were identified as follows:

- noise impacts from quarry operations (refer Section 11);
- air quality (dust) impacts from the processing plant, stockpile areas and haulage roads (refer Section 10);
- the impact of the proposed quarry expansion on surface waters and groundwater (refer Section 8);
- traffic management and impacts to the existing road and traffic network (refer Section 13);

- assessment of heritage impacts (refer Section 12);
- assessment of ecological impacts (refer Section 9);
- impacts to visual amenity (refer Section 14); and
- proposed rehabilitation of the site (refer Section 3.7); and
- ongoing environmental management of the quarry operations (refer Section 19).

6 SOCIO-ECONOMIC IMPACTS

This Chapter assesses the social and economic conditions of the study area, focussing on Bombala Shire, and the impacts the proposal will have on these conditions, both positive and negative.

6.1 SITE CONTEXT

The Bombala Quarry is within the Shire of Bombala, approximately 60 kilometres south west of Bega and 80 kilometres south of Cooma, near the New South Wales/ Victoria State border. The site is within the agricultural farmlands of the Monaro Region, approximately six kilometres north east of the rural centre of Bombala. The area is dominated by sheep and beef cattle grazing, vegetable growing and timber milling while the area is also known as one of the State's best trout fishing districts (Bombala Council, 2006). The site is within the large river valley of the Bombala Coolumbooka rivers, at the headwaters of the Snowy River system. Large areas of native vegetation are found in the upland areas of the Coolangubra State Forest and South East Forest National Park approximately 10 kilometres to the east of the site.

The site's basaltic resource will largely supply Boral's regional concrete batching plants at Pambula, Narooma, Bermagui, Bega and Jindabyne, and to a lesser extent provide deliveries of aggregates and fines to the local construction market.

6.1.1 Regional Profile

Information on the regional profile of Bombala Shire has been sourced from Australian Bureau of Statistics Census data (2001). Bombala Shire occupies almost 3 950 square kilometres stretching from Delegate in the south to Andoo in the north.

The Shire maintains a small population which in the 10 years to 2001 declined by more than 17 percent. Over 90 percent of the Bombala local government area comprises rural land used for agriculture.

In 2001 approximately one third of the Bombala Shire workforce were employed in the agriculture/forestry/fishing industry, and approximately 10 percent in the retail and service sectors. A small portion of the community held resource and engineering management roles in 2001, while Bombala Shire had an unemployment rate of 5.4 percent.

6.2 *IMPACTS OF THE PROPOSAL*

Socio-economic benefits of the proposal include continued direct and indirect employment of local staff contractors, the continued supply of a high quality hard rock resource to the region and continued economic multiplier effects to local and regional businesses and industries over a longer period.

The proposed expansion to the existing quarry would continue to provide a local source of hard rock aggregate and optimise associated economic advantages in terms of long term supply of premium quality rock to Boral's regional batching plants as well as local markets. Long term quarry development and operation would also continue to support indirect employment and local parts and service suppliers.

The quarry expansion would provide an amount of hard rock products for the construction or upgrading of roads and other infrastructure required for the future population growth expected in the region. Employees would continue to be sourced from the South East Region, placing no additional demand on local community services and amenities.

The proposal would increase the productive capacity of a portion of the site from an agricultural land use to the extraction of valuable resource. The proposed expansion would not threaten any existing agricultural use or the long-term potential of the site, and once rehabilitated, could continue to provide for activities such as cattle grazing.

Potential negative impacts associated with the expansion of the quarry may relate to the acoustic amenity and air quality affecting adjoining residents. Traffic in the local area will not be significantly affected during the operation of the quarry however changed conditions are expected due to the increase in trucks entering and leaving the site. The proposal will not disturb any adjoining rural lands to an extent which would compromise agricultural activity or production, and once the site is rehabilitated it could continue to provide for agricultural related activities or grazing.

7 SOILS AND LANDFORMS

This Chapter provides a description of the regional and site soil landscape and landform and any potential impacts resulting from the ongoing quarry operations.

7.1 EXISTING SOILS AND LANDFORMS

7.1.1 Soils

Geological site investigations undertaken at the Bombala Quarry site indicate that the soil is a shallow loam, with an average soil profile depth of approximately 1.8 metres (range 0-4 metres). The soil is described as a red-brown clayey topsoil directly related to the basaltic bedrock below. Soil landscape mapping has not been undertaken in the Bombala region, so the soil landscape units are not known.

Agricultural land classification mapping has been undertaken for the region and indicates that the relative suitability of the land for agriculture is classified as predominantly Class 4, with a section of Class 3 land on the eastern side of the property (NSW Agriculture, 2001). This indicates that soils of the region are capable of supporting grazing over the majority of the site and grazing with pasture improvement, including cultivation and cropping in rotation with sown pasture, on the eastern side of the property. However, susceptibility of the soil to erosion hazards and structural breakdown, limits its suitability for cultivation purposes. Consequently, soil conservation or drainage works may be required to realize the agricultural potential of the property.

7.1.2 Landforms

Landform at the site varies from undulating to low relief. Elevations ranging from around 840 metres AHD in the south western corner of the site to around 790 metres AHD in the north western corner of the site, at which point the land is sloping to the northwest. Overall, the site generally slopes to the north east. There is a broad relatively flat expanse across the central region of the site. Moderately incised overland flow paths to the east and west of the existing quarry site converge to the north west of the site, ultimately flowing to a tributary of Shoemakers Creek.

7.2 POTENTIAL IMPACTS OF THE PROPOSAL

7.2.1 *Soils*

There are a number of potential impacts that could arise from quarry operations, which in the absence of appropriate mitigation measures, could adversely affect soils.

There is a potential for soil erosion from quarry pit, stockpiles and unsealed access roads. If this takes the form of wind erosion, topsoil could potentially be transported offsite. However, a significant portion of the site is already denuded of vegetation and topsoil covering as a result of current quarry operations and as a result the extent of erosion is not expected to show any significant increase.

Heavy vehicle movements can cause soil compaction which would be most likely to manifest itself as a cumulative impact.

The ultimate use of the site is yet to be determined, however it is likely that the site would be returned to an agricultural use following rehabilitation. As the site soils have been identified as having limited capacity to support long-term cropping or grazing, the impact of the proposed continuation of quarrying activities would not significantly degrade this resource any further.

7.2.2 *Landforms*

The proposed quarry expansion will impact on the topography of the site via continued excavation for the quarry pit and continued assembly of out-of-pit emplacement areas for overburden and excess product. Construction of infrastructure, namely the new access road, weighbridge (including levelling) and water management structures, will result in minor impacts upon landform. However, given the existing extent of landform alteration associated with quarry operations, the relative impacts of this proposal are expected to be minor. In addition, landform alterations will be confined to the relatively small area of quarry operations and the remainder of the site will be unaffected.

Following site rehabilitation, the areas used for stockpiling of materials and access would be returned to a more natural landform, with soil stockpiles reallocated over the benches of the quarry pit to allow for revegetation.

7.3 *MITIGATION MEASURES*

7.3.1 *Soil Erosion*

Soil stockpile areas will be vegetated and application of an opportunistic progressive rehabilitation approach will ensure that disturbed areas are revegetated as soon as is practicable. Establishment of a vegetative cover will protect the soil from erosion.

Implementation of surface water management measures, as detailed in *Section 8*, will minimise the volume of water running over the site and thus act to abate potential water erosion.

7.3.2 *Soil Compaction*

Heavy vehicle movements on site will be restricted to those necessary for quarry operations and will be confined to the established access and stockpile area where practicable. These strategies will minimise the potential area, extent and severity of any soil compaction that occurs. No additional vehicles will be required other than those used for existing operations, thereby reducing the capacity for soil compaction in excess of that already occurring.

7.3.3 *Landform Alterations*

Throughout quarry operations, the visual integrity of the landform will be maintained where possible by means of minor landscaping, revegetation and site maintenance. Rehabilitation at the conclusion of operations will ensure that the landform is returned as close as possible to its original state.

8 WATER RESOURCES

This Chapter describes the existing drainage and water quality characteristics of the catchment of Shoemakers Creek, to which the quarry area ultimately drains. Relevant water quality objectives are defined and the potential impact of the the continued operation of the quarry site are assessed.

8.1 EXISTING ENVIRONMENT

8.1.1 Catchment Description

The Bombala quarry site occupies approximately 42 ha within the headwaters of an ephemeral tributary of Shoemakers Creek. The tributary meets Shoemakers Creek approximately 1.5 km to the north west of the quarry site, just beyond its crossing of the Monaro Highway. Shoemakers Creek flows to meet the Bombala River at a point approximately 10km upstream of the main township of Bombala. These waterways form part of the Snowy River Catchment. A catchment plan is shown in *Figure 8.1.*

Shoemakers Creek predominantly flow through agricultural land, with small farm dams located along the waterways downstream from the quarry. The catchment is characterised by broad valley floors and undulating topography.

8.1.2 Site Drainage

The site is located in the upper reaches of a tributary of Shoemakers Creek. Two overland flow paths pass along either side of the existing quarry and meet to form the tributary immediately downstream of the quarry.

The existing quarry pit is generally self draining to the north west where there are currently three settling ponds. All pit water drains through these ponds to the ephemeral tributary. The existing pit does not intersect any existing drainage paths.

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Figure 8.1 Catchment Plan

Bombala Quarry

8.1.3 *Groundwater*

During site investigations in December 2005, boreholes were drilled in 46 locations across the site and the adjacent property to the east refer *Table 2.2*. Nine boreholes intersected the water table, ranging between 16.6m and 36m with an average depth across the site of 21.9m, indicating that the water table across the site is well below the current ground level.

No monitoring wells were installed at the time, however a search of the NSW Natural Resource Atlas database (www.nratlas.nsw.gov.au) indicates that there are four groundwater bores located within 10km of the quarry site (refer Table 8.1)

The logs reported water bearing zones between 7.9m top 42m. Only one of these monitoring wells providing a standing water table level, recorded at 20m.

Table 8.1 ***Groundwater Bores Within 10km of Quarry Site***

Bore Reference	Distance / Direction	Location	Authorised Purposes	Final Drilled Depth	Standing Water Level	Yield (L/sec)	Water Bearing Zones
GW023759	4.0km NE	N5919837 E705721	Domestic Stock	9.4m	n/a	n/a	7.9m – 9.4m
GW032183	4.5km NE	N5919820 E706333	Stock	16.8m	n/a	n/a	7.6m – 7.6m 13.7m – 13.7m
GW038389	4.0km NE	N5918703 E706504	Stock	24.4m	n/a	n/a	16.7m – 16.7m
GW105598	5.5km S	N5909890 E702029	Domestic Stock	48.0m	20.0m	0.38	21m – 22m 34m – 36m 40m – 42m

In the absence of information on groundwater flow data for the site, it can be reasonably assumed that groundwater will generally follow the landform and flow in a northerly direction towards Shoemakers Creek.

8.1.4 *Rainfall and Evaporation*

Average rainfall and evaporation data in the vicinity of the Bombala quarry site was obtained from the BoM.

The rainfall gauging station with the longest record close to the site is Station 070005 – Bombala (Therry Street). This station is located approximately 5.5 km from the site. Mean monthly rainfall at this station as recorded from 1885 to 2004 is shown in *Table 8.2*.

The nearest station with evaporation data to the site is Station 070094 – Cooma North. This station is located approximately 70 km from the site and has data recorded from 1959 to 1970. Mean daily evaporation is shown in *Table 8.2*.

Table 8.2 Rainfall & Evaporation

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Ann
Mean monthly rainfall (mm)[1]	64.9	57.5	59.2	45.7	44	58.6	46	40.7	44.5	56.4	63.2	64.7	645.3
Mean monthly evaporation (mm) [2]	208.3	171.3	143.7	92.0	51.1	34.7	41.4	59.5	95.7	134.5	159.7	180.5	1320.7

1. Rainfall recorded at BoM station 070005 (Bombala Therry Street, 1885 - 2004)
2. Evaporation recorded at BoM Station 070094 (Cooma North, 1959 - 1970)

Evaporation exceeds rainfall for every month except for June and July.

8.1.5 Environmental Value Of Receiving Waters

Shoemakers Creek is the primary receiving water course for any discharges or runoff from the site. This waterway is affected by variable quality runoff from agricultural sub-catchments. Generally, interim environmental objectives are defined by the NSW DEC, however, this waterway forms part of the Snowy River Catchment and environmental values have been defined and agreed upon by the NSW, Victorian and Commonwealth Governments as an outcome of the Snowy Water Inquiry.

The environmental objectives for the Snowy River Catchment are to improve the habitat for a diverse range of plant and animal species by a combination of:

- improving the temperature regime of river water;
- achieving channel maintenance and flushing flows within rivers;
- restoring connectivity within rivers for migratory species and for dispersion;
- improving triggers for fish spawning; and
- improving the aesthetics of currently degraded riverine environments.

These objectives are complemented by an objective to maintain and improve environmental flows for the Snowy River.

Water quality objectives to achieve these environmental values are provided in terms of numerical guidelines in *Australian and New Zealand Guidelines for Fresh and Marine Waters Quality* (ANZECC & ARMCANZ, 2000) – referred to as the "ANZECC 2000 Guidelines".

8.1.6 Existing Catchment Conditions

The *State of the Environment Report: Australian Capital Region, 2000 (*SoE Report*)* includes a report on the State of Environment at Bombala. This report indicates that the majority of waterways throughout the Bombala Local Government Area (LGA) have some degree of stream degradation. The Bombala River has been assigned a high hydrological stress rating indicating that demand for water from this waterway equals or exceeds supply.

The SoE Report also discusses water quality in the Bombala LGA. There is very limited data available to draw any conclusions from, with only three monitoring locations reported on, including upstream and downstream of the Bombala STP (monitored by Bombala Council) and downstream from Bombala at Little Plains River, Wellesley (monitored by DNR).

This limited data suggests that the water quality in the catchment is generally good, however it does not specifically relate to water quality in the vicinity of the Bombala quarry site.

At the time of ERM's site inspection in February 2006, the drainage paths adjacent to the quarry were dry. There was some ponded water within the settling ponds downstream from the quarry with water that was stagnant and turbid.

8.1.7 Existing Pollution Control Measures

The existing quarry operations utilise three settling ponds below the quarry pit to prevent sediment discharges to the tributary. The discharge from these ponds is not currently monitored, and as such the efficacy of the ponds and quality of water leaving the site is unknown.

Swales have been formed down-gradient of the processing plant and stockpile area, along the eastern and northern edges of the property boundary, to direct surface water from these areas towards the settling ponds.

There is an existing diesel tank on site. This is fitted into a shipping container and is appropriately bunded to prevent pollution to the downstream tributary.

8.1.8 Existing Water Use and Supply

Water at the site is primarily used for dust suppression at the plant and to cool the crushers. All crushing operations cease if the sites water storage is running dry under current operations.

The site is not connected to the Bombala town water supply. Water for use within the existing quarry operations is trucked to the site from Bombala using a contractor on an as needed basis. The site currently has capacity to store 44,000L of water in two polyethylene rainwater tanks.

Typically, current operations require about 220kL of water per month. Operations currently run over 6 months of the year, and annual water use is about 1,320kL per annum.

Potable site water is supplied through a bottled water cooler.

8.1.9 Sewage Effluent

Currently, quarry staff utilise port-a-loo style chemical toilets. Sewage is collected from the site and transported to the Bombala STP.

8.2 Potential Water Resources Impacts

8.2.1 Water Quality and Environmental Flows

Appropriate site management will ensure there are minimal impacts on water quality and on the quantity of runoff.

Discharges from the pit and other disturbed areas have the potential to adversely affect water quality unless the water is adequately treated. The primary concern for water quality is in relation to increased sediment loads in Shoemakers Creek. It is intended to divert all water from disturbed areas to settling ponds to control all potentially dirty water prior to it leaving the site.

Given the location of the site within the upper reaches of the catchment, and the limited area to be disturbed for the quarry operations, it is unlikely that the quarry will cause significant changes to the environmental flows in the tributary or in Shoemakers Creek.

8.2.2 Diversions and Downstream Drainage

Clean water will be diverted around disturbed areas in contour drains or modified channels. This will have minor effects to local flows and may increase the risk of erosion in some locations. Appropriate design and management of contour drains will minimise potential for erosion as well as offsite transport of suspended sediments. Dirty water will be retained in settling ponds on site.

8.2.3 Groundwater Interception

Whilst the quarry expansion continues laterally at RL809m (i.e. stages 1 to 7) there is not expected to be any interception of groundwater, however as the quarry is extended to RL798m, approximately 20-23m below the existing ground level at 12.7 years into the operations, it is likely that the quarry floor will be marginally below the pre-project water table. It will therefore be necessary to control groundwater flows into the pit at this time. Groundwater seepage will be collected in a sump in the pit for settlement and reuse elsewhere on the site (i.e. stockpile watering), or released to the sediment ponds to the northwest of the pit. During stage 10 of the proposed expansion, the quarry floor will be further lowered to RL789m, with a likely increase in groundwater inflow into the pit. Following the cessation of quarry activities on the site and implementation of the rehabilitation process, it is likely that the final drop cut to RL789m will be filled, through groundwater seepage and rainfall, and retained as a fresh water storage.

8.2.4 Water Supply

The proposed quarry operations will increase the operating period for the quarry from 6 months to 12 months of the year. Daily water use at the quarry is not anticipated to increase as operations will continue in a similar manner to present. Annual water demand is therefore expected to approximately double, and will be about 2,640 kL per annum. This will mean that annually, additional water will be required to be carted to the site.

8.3 SITE WATER MANAGEMENT

8.3.1 *Water Quality Management*

Management of site water quality will minimise impacts of the operations on creeks and watercourses surrounding the site.

During construction and operation of the quarry, drainage facilities will convey water from areas of disturbed ground to settling ponds to prevent sediment laden or potentially contaminated runoff leaving the site. Details of site drainage from undisturbed and disturbed areas of the site are provided in *Sections 8.3.2* and *8.3.3* respectively.

Water quality will be monitored as outlined in *Section 8.4* to confirm the efficiency of the drainage system. Water quality devices will be inspected and cleaned regularly.

8.3.2 *Surface Drainage from Undisturbed Areas*

In general, runoff from undisturbed areas will be diverted around areas disturbed or affected by quarry activities. This will reduce the potential for clean runoff to be polluted by quarry activities. Diversion of clean water will be affected by diversion drains, contour drains and, where necessary, bunds, and pipe culverts.

All permanent diversion elements will be designed with capacity to convey critical flows from a 1 in 20 year Average Recurrence Interval (ARI) storm event but may be designed for a 1 in 100 year ARI event in critical locations where risk to property, operations or life is high. Temporary drains may be designed for smaller storm events depending on their design life – typically, elements that will be in place for less than 6 months would be designed for a 1 in 5 year ARI storm. Diversion elements that will be in place for more than 2 years should be considered "permanent".

Diversion drains and contour drains will be constructed as channels and/or banks depending on topography. Where practical, drains will be lined or vegetated and longitudinal gradients will be limited to 1% to minimise the risk of erosion. Where necessary, check dams and sediment basins will be constructed at intervals along diversion drains at locations with greater erosion potential. At points of concentrated or high velocity flows, spreaders, lining and dissipaters will be constructed.

A conceptual drainage plan is provided in *Figure 8.2*. There are two main points to note in regards to drainage from undisturbed areas:

1. The final stage quarry plan encroaches on the overland flow path which flows through the eastern part of the site. Surface water will be allowed to drain into the quarry pit where it will be treated as dirty water and directed to the settling pond. Erosion of the pit wall is not expected to occur due to the hard rock geology and the small quantities of water likely to enter the pit, associated with the minimal catchment area;

2. There is a roadside swale that directs surface water through a culvert under Pipe Clay Springs Road. Flows from this culvert will be diverted around the western perimeter of the pit, between the pit and the designated stockpile area.

8.3.3 Pit Water and Runoff from Disturbed Areas

As far as possible, all water runoff within the pit, including groundwater inflow, will be directed to a settling pond to be constructed in the bottom of the quarry pit. The use of the settling ponds downslope of the pit will also continue and all runoff from disturbed areas across the site should be directed through these ponds.

It is recommended that an additional settling pond be constructed at the downslope side of the proposed stockpile area prior to the commencement of its use (refer to *Figure 8.2)*.

All settling ponds will be required to be regularly desilted to ensure that they are operating effectively.

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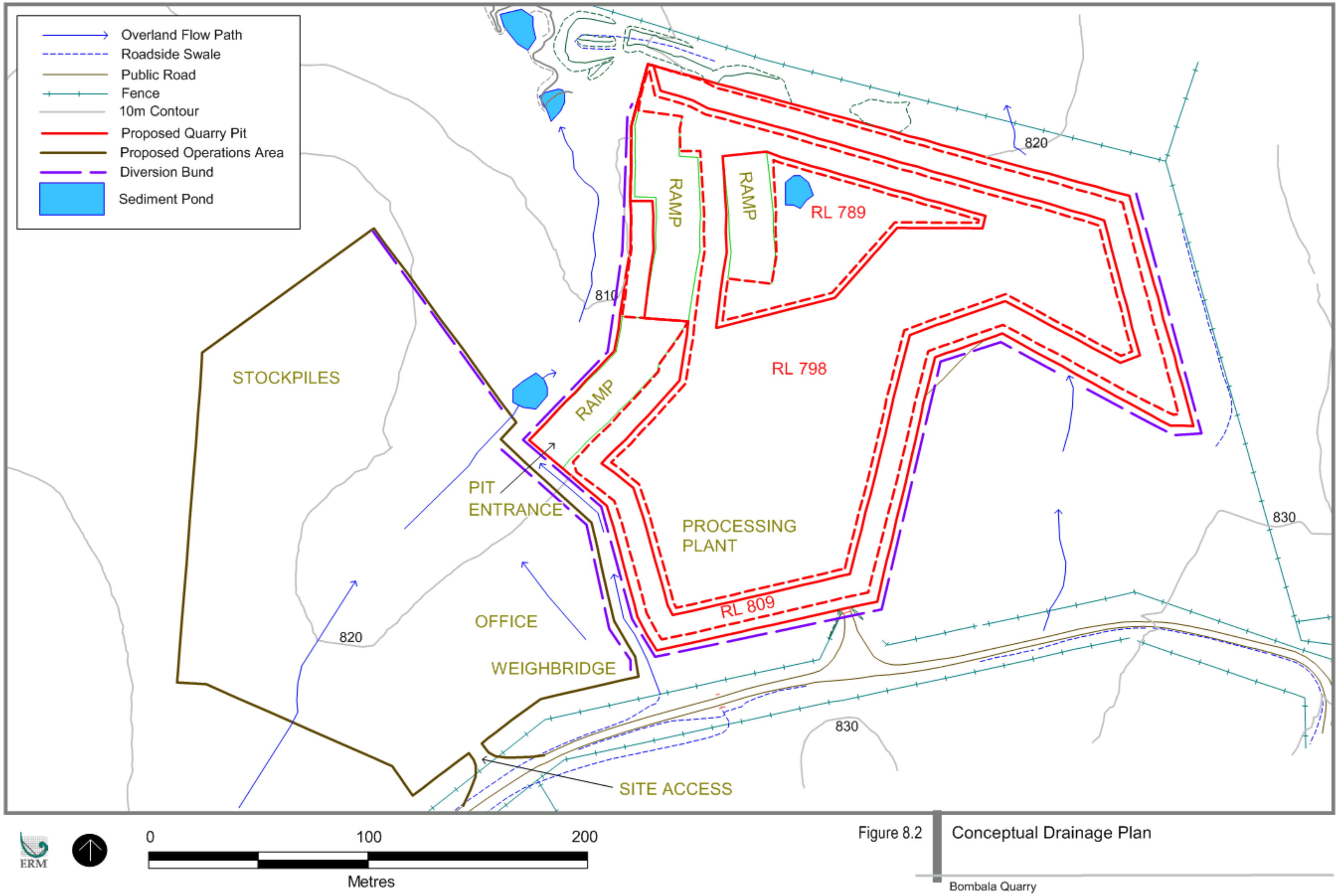

Figure 8.2 Conceptual Drainage Plan

Bombala Quarry

8.3.4 *Spills and Discharges*

It is important that all potentially contaminating materials used or stored on the site during quarrying activities should be prevented from entering the groundwater or surface water systems. This will be achieved through storage in designated bunded areas.

Provision of spill kits and training of site personnel in their use will ensure that in the event of any spills appropriate action can be taken rapidly to prevent and minimise impacts to surface waters or groundwater. Wherever possible, activities that have potential for spills will be located in areas that drain to the pit; otherwise appropriate safeguards and spill containment facilities will be installed.

8.3.5 *Water Supply*

As discussed in *Section 8.2.4*, annual water demand will increase from 1,320kL to 2,640kL due to the increased period of quarry operation. Water supply is proposed to primarily be through a local water cartage service as currently occurs.

Given the climate of the area, with evaporation exceeding rainfall for all except two months of the year (June and July), and the location of the site within the headwaters of the catchment, alternative water supply sources are considered to be limited.

An option to minimise water cartage on site is to collect all pit drainage in a settling pond within the pit and utilise this water for site uses such as dust suppression and crusher cooling. This settling pond should be constructed as a deep pond to minimise the surface area and hence limit evaporation as much as practical.

8.3.6 *Potable Water Supplies*

The Bombala quarry site is not connected to the main water supply for Bombala. Drinking water for quarry staff will continue to be supplied through the bottled water cooler.

8.3.7 *Sewage Effluent*

Currently, quarry staff utilities port-a-loo style chemical toilets. Given the small workforce proposed for future operations it is intended that this will continue.

8.4 SURFACE WATER MONITORING

An operational surface water monitoring program will be designed and implemented as part of the quarry environmental management procedures. Water quality monitoring is proposed to be undertaken as outlined below on an ongoing basis. This monitoring should be refined where necessary based on the results of previous monitoring and ongoing quarry operations.

8.4.1 *Objectives*

Surface water quality monitoring will comprise sample collection and testing by a National Association of Testing Authorities (NATA) registered laboratory and will provide a mechanism to:

- ensure the quarry is operating as anticipated with respect to water quality protection;
- assess the effectiveness of site water management strategies in protecting downstream water quality;
- identify any unforseen impacts from the quarry operations;
- implement measures to prevent any as yet unforseen impacts from the scheme; and
- verify that the quarry is achieving its environmental objectives.

8.4.2 *Sampling Locations and Frequency*

Water quality monitoring should be undertaken within the tributary of Shoemakers Creek, at a point immediately downstream of the final settling pond to confirm that site operations are not impacting receiving waters.

Monitoring should initially be undertaken on a monthly basis with additional monitoring following rainfall events and/or known discharges from the site. It is likely, given the dry conditions of the drainage channel on site, that samples will only be able to be collected following rain events. After an initial sampling period to understand the existing water quality, monitoring frequency may be reduced to quarterly or even half yearly, provided water quality meets the performance criteria.

Monitoring should be commenced immediately to gain an understanding of water quality in the tributary from the existing quarry operations.

8.4.3 *Monitoring Parameters*

A comprehensive suite of water quality parameters will be monitored initially to assist in gaining a comprehensive understanding of existing water quality conditions. Once the critical site water quality parameters have been determined, regular monitoring will focus on these and the frequency of comprehensive monitoring will be reduced. The key water quality parameters are expected to include pH, electrical conductivity (salinity), total suspended solids, total dissolved solids, oil and grease (hydrocarbons).

8.4.4 *Performance Criteria*

Results of the water quality monitoring will be compared to guideline values provided in *Australian and New Zealand Guidelines for Fresh and Marine Waters Quality* (ANZECC & ARMCANZ, 2000). Should any sample fail to meet these guidelines quarry management will be required to ascertain the reason(s) for failure and initiate remedial measures to correct any problems identified. Additional testing may be required to confirm the effectiveness of remedial actions.

8.5 *REHABILITATION DRAINAGE*

Contour drains will be installed on rehabilitated slopes to minimise the potential for scouring. Runoff will be directed to sediment traps and settling ponds before flowing to the tributary of Shoemakers Creeks. Where necessary, scour protection and dissipaters will be installed and rehabilitated slopes will be vegetated to reduce surface erosion. Rock batters will be benched to reduce erosion potential. Flows collected on each bench will be directed to contour drains or natural waterways.

9 *ECOLOGY*

This Chapter addresses the flora and fauna which may potentially be impacted by the proposed expansion of the quarry site. The ecological assessment comprises a review of the existing environment, results of the ecological study, potential impacts of the project, and proposed management measures to ameliorate potential impacts.

9.1 *METHODOLOGY*

9.1.1 *Literature Review*

Background literature reviews and database searches were undertaken to obtain information on flora and fauna species and vegetation communities likely to occur within the quarry site. This included searches for threatened species listed under the *TSC Act* and Commonwealth *EPBC Act* previously recorded in the locality within a 10 km radius of the site. Sources of information included the following:

- DEC Wildlife Atlas Database;
- DEH online search for Matters of National Environmental Significance (NES); and
- Australian Museum database.

9.1.2 *Field Survey*

Flora

Broad vegetation communities within the site were identified using random meander transects. All vascular plants within two metres of each transect were identified, as well as the height and percentage cover of the dominant species within each structural layer. Plant species names follow Harden (1992, 1993, 2000 and 2002). The disturbance history was noted to determine the severity and timing of fire, grazing, logging/clearing, dumping and weeds.

Targeted searches were undertaken in areas of potential habitat for threatened flora species *Calotis glandulosa*, *Rutidosis leiolepis*, *Dodonaea procumbens* and *Thesium australe*.

Fauna

An assessment of the diversity and general habitat value of the site was undertaken by appraising the extent of likely habitat, searching for secondary indications of threatened species and incidental observations.

The presence of flowering eucalypts and other plants were recorded as these may provide foraging resources for threatened species such as gliders and honeyeaters.

Habitat use by fauna was documented through analysis of tracks, scats, diggings, feathers and other traces. Surveys were conducted opportunistically and included:

- searches for raptor nests;
- investigation of any den sites for the tiger quoll;
- searches for chewed cones consistent with glossy black-cockatoo feeding sites;
- searches for characteristics scats, tracks and diggings; and
- checking trees for scratches / notches consistent with arboreal mammals.

A spotlighting survey was also undertaken within the vegetated portions of the site. The vegetation canopy, understorey and ground cover was illuminated with 50 watt hand-held spotlights to search for arboreal and terrestrial fauna and nocturnal birds. All spotlighting was undertaken within the first three hours after dusk. The spotlighting survey involved three people walking over the site on one night (approximately 6 person hours).

One stationary Anabat echolocation call detector was used to record bat calls during the spotlight survey. Recorded calls were then sent to Glenn Hoye of Fly By Night Bat Surveys for analysis and species identification.

9.2 RESULTS

9.2.1 Literature Review

Rare and Threatened Flora Species

The following threatened flora species have been reported to occur (*Figure 9.1*) or have habitat available within 10 kilometres of the site on the DEC and DEH online databases:

- *Calotis glandulosa;*
- *Rutidosis leiolepis;*
- *Westringia kydrensis;*
- *Dodonaea procumbens;* and
- *Thesium australe*.

These species have not been recorded within the site and have been further assessed in *Section 9.3.4*.

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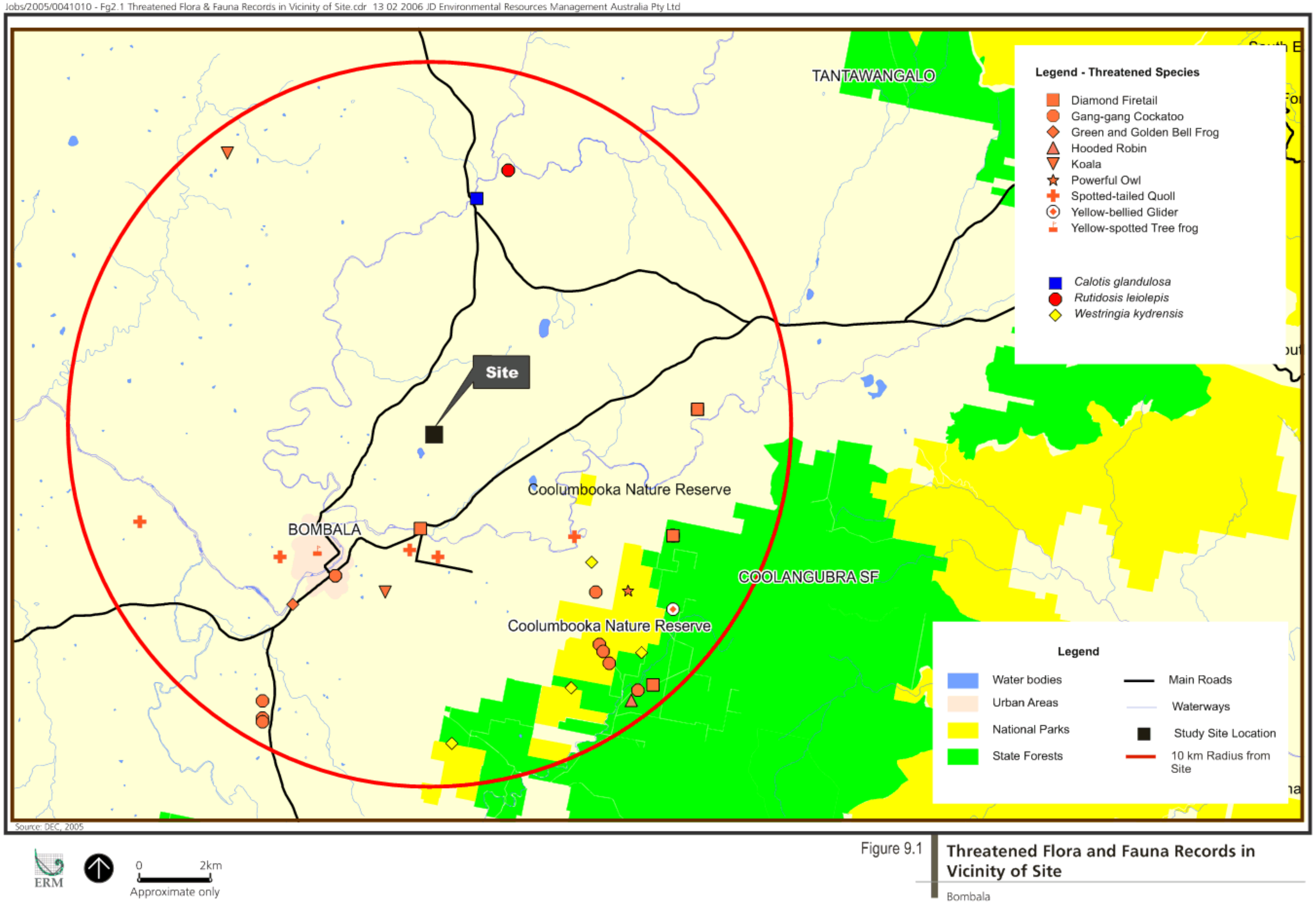

Figure 9.1 **Threatened Flora and Fauna Records in Vicinity of Site**

Bombala

Endangered Ecological Communities (EECs)

The following EECs have been reported to have habitat available within 10 kilometres of the site on the DEH online database:

- natural temperate grassland of the Southern Tablelands of New South Wales (NSW) and the Australian Capital Territory (ACT); and
- upland wetlands of the New England Tablelands and Monaro Plateau.

Lowland grassy woodland in the south east corner bioregion has also been listed as a preliminary determination under Part 3 Schedule 1 of the TSC Act 1995.

Threatened Fauna Species

The following threatened fauna species have been reported to occur (*Figure 9.1*) or have habitat available within 10 kilometres of the site on the DEC and DEH online databases:

<u>Birds</u>

- *Callocephalon fimbriatum* (gang-gang cockatoo);
- *Haliaeetus leucogaster* (white-bellied sea-eagle);
- *Hirundapus caudacutus* (white-throated needletail);
- *Lathamus discolor* (swift parrot);
- *Melanodryas cucullata cucullata* (hooded robin);
- *Monarcha melanopsis* (black-faced monarch);
- *Myiagra cyanoleuca* (satin flycatcher);
- *Ninox strenua* (powerful owl);
- *Rhipidura rufifrons* (rufous fantail);
- *Rostratula australis* (Australian painted snipe);
- *Stagonopleura guttata* (diamond firetail); and
- *Xanthomyza phrygia* (regent honeyeater).

Mammals

- *Dasyurus maculatus* (tiger quoll);
- *Miniopterus schreibersii* (eastern bentwing-bat);
- *Mormopterus norfolk*ensis (eastern freetail-bat);
- *Myotis adversus* (large-footed myotis);
- *Petaurus australis* (yellow-bellied glider);
- *Phascolarctos cinereus* (koala);
- *Potorous tridactylus tridactylus* (long-nosed potoroo);
- *Pseudomys fumeus* (smoky mouse); and
- *Pteropus poliocephalus* (grey-headed flying-fox).

Frogs

- *Heleioporus australiacus* (giant burrowing frog);
- *Litoria aurea* (green and golden bell frog); and
- *Litoria castanea* (yellow-spotted tree frog).

Reptiles

- *Delma impar* (striped legless lizard).

Marine mammals and shoreline birds were excluded from the threatened species assessment, as it is reasonable to assume they are not present or dependent on habitats within the site.

9.2.2 *Vegetation Communities*

Two vegetation communities were noted within the site, snow gum/ribbon gum grassy woodland and disturbed grassland as shown in *Figure 9.2* and *Photograph 9.1*.

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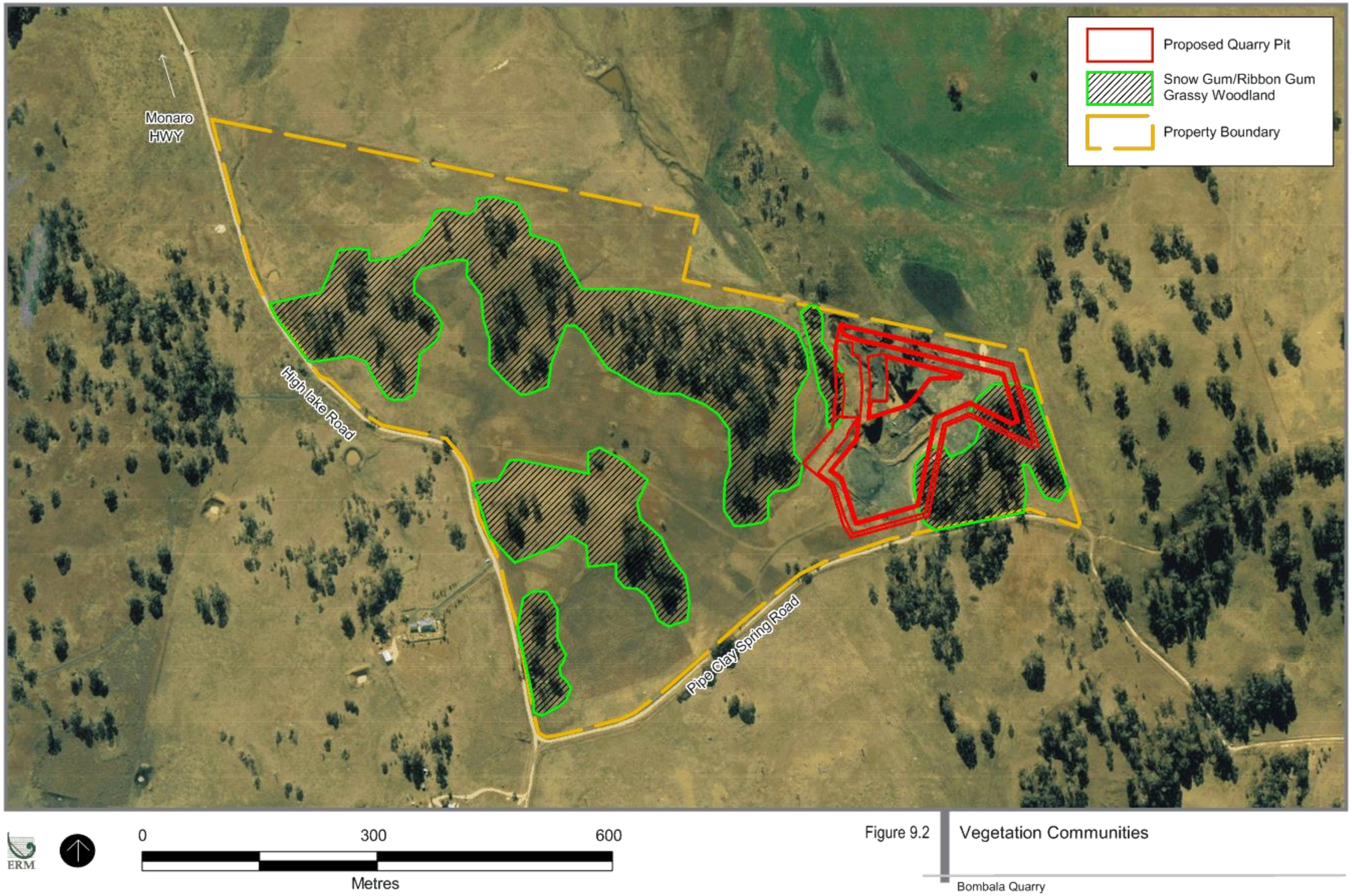

Figure 9.2 Vegetation Communities

Bombala Quarry

Snow Gum/Ribbon Gum Grassy Woodland

The snow gum/ribbon gum grassy woodland occupied the uncultivated areas of the site and was found in isolated patches along the upper slopes and ridges. The canopy cover was dominated by *Eucalyptus pauciflora* (snow gum) and *Eucalyptus viminalis* (ribbon gum). The midstorey was generally absent with scattered occurrences of *Acacia longifolia* (Sydney golden wattle). The groundcover was dominated by grasses including *Themeda australis* (kangaroo grass), *Hordeum leporinum* (barley grass), *Lolium rigidum* (Italian ryegrass) and *Austropstipa hodosa* (spear grass). Other groundcover species observed within this community included *Petrorhagia nanteuilii* (proliferous pink), *Plantago lanceolata* (common plantain) and *Solanum nigrum* (blackberry nightshade).

Photograph 9.1 On-site Vegetation Communities

Disturbed Grassland

Disturbed grassland dominated the lower slopes and drainage lines and was characterised by ploughed soils. A mixture of native and introduced grasses have become established within the previously cultivated areas. Recently ploughed areas were characterised by bare soils and various direct drill pasture mixes.

Species identified within the disturbed grassland included *Glycine tabacina* (love creeper), *Eleocharis gracilis* (slender spike rush), *Wahlenbergia communis* (tufted bluebell), *Helichrysum scorpioides, Hydrocotyle peduncularis, Mentha pulegium* (pennyroyal) and *Euchiton sphaericus* (cudweed).

Orchard species associated with the former residence portion of the property included pear, crabapple, plum and mulberry trees.

9.2.3 *Endangered Ecological Communities*

The lowland grassy woodland in the south east corner bioregion is listed as a proposed endangered ecological community. It is estimated that the lowland grassy woodland EEC has contracted to 20 percent of its pre-European range. Less than 15 000 hectares of the lowland grassy woodland EEC currently exist within the south east corner bioregion (DEC database, 2003).

The 14 hectares of snow gum/ribbon gum grassy woodland identified on site were found to be consistent with this EEC. As indicated within *Section 9.2.2*, this community occupied the uncultivated areas of the site and was found in isolated patches along the upper slopes and ridges (*Figure 9.2*). The canopy of this community appears to be relatively undisturbed, however edge effects, weed invasion and sheep grazing have resulted in a disturbed ground cover.

The proposed extension area will clear approximately 0.52 hectares of this community accounting for 3.6 percent of the total EEC occurring on site. The clearing of 0.52 hectares of this EEC equates to a 0.003 percent reduction in the overall extent of the community. Therefore, the proposal is unlikely to have an adverse effect on the extent of the ecological community and has been further assessed under Section 5A of the *EP&A Act* in *Section 9.3.4*.

No other endangered ecological communities listed under the TSC Act or EPBC Act were recorded on the site.

9.2.4 *Fauna Surveys*

Microchiropteran Bats

Results of the Anabat survey identified the presence of seven microchiropteran bat species. The threatened species *Mormopterus norfolkensis, Miniopterus schreibersii* and *Myotis adversus* were identified on site. The presence of these species on site has been further addressed in *Section 9.3*.

Other species identified on site were *Tadarida australis, Mormopterus* species 2, *Chalinolobus gouldii* and *Vespadelus darlingtoni*.

Spotlighting

Numerous *Oryctolagus cuniculus* (rabbit) and three *Trichosurus vulpecula* (brushtail possum) were observed on site during the spotlighting survey.

Opportunistic Diurnal Fauna

No threatened diurnal fauna were observed during the site inspection. Avifauna identified opportunistically included *Platycercus eximius* (eastern rosella), *Platycercus elegans* (crimson rosella), *Cacatua roseicapilla* (galah), *Dacelo novaeguineae* (kookaburra), *Egretta novaehollandiae* (white-faced heron), *Aquila audax* (wedge-tailed eagle), *Gymnorhina tibicen* (Australian magpie), *Manorina melanocephala* (noisy miner), *Cacatua galerita* (sulfur-crested cockatoo) and *Grallina cyanoleuca* (magpie lark).

A *Felis catus* (cat) was noted to the west of the existing quarry, within a pile of fallen timber. Numerous *Lepus capensis* (brown hare) were noted throughout.

Crinia signifera and *Limnodynastes peronii* were heard calling from the small dams along the northern boundary of the site during a brief period of rain in the early afternoon.

9.2.5 Habitat Assessment

The site contains one broad habitat type being grassy open woodland. This habitat type is well represented within the locality, including the surrounding Kosciusko and South East Forest National Parks.

The myrtaceous tree species would provide a seasonal foraging resource for nectivorous birds and mammals such as possums and honeyeaters. The variety of tree species would also provide suitable feeding/foraging resources for foliage dependant fauna species such as the common brushtail possum and insectivorous birds such as treecreepers.

The dense layer of grasses would provide seeds and stems for granivorous and herbivorous species including the threatened diamond finch.

The open woodland has a moderate layer of leaf litter (up to five centimetres deep underneath the trees) that may provide shelter for reptiles and small ground-dwelling mammals. The moderate cover of fallen logs and rocks provides a foraging substrate and shelter for small ground-dwelling mammals and reptiles.

The mature eucalypt trees scattered across the site provide shelter and breeding habitat in the form of hollows for many bird, arboreal mammal and microchiropteran bat species.

The series of dams located at the northern boundary of the site, along the drainage line that runs to the west of the existing extraction area provide habitat for aquatic birds and frogs as well as providing a drinking resource for a variety of species.

9.2.6 *Threatened Or Significant Fauna Species*

Schedules 1, 1a and 2 of the *TSC Act* list species, populations or ecological communities of native flora and fauna considered to be threatened in New South Wales. The status of species is assessed as either:

- Endangered (Schedule 1);
- Vulnerable (Schedule 2); or
- Critically Endangered; (Schedule 1a).

No threatened populations currently listed on the *TSC Act, 1995* were recorded, or considered likely to occur, within the site.

Three threatened microchiropteran bat species currently listed on the *TSC Act 1995* were recorded within the site. No other threatened species currently listed on the *TSC Act* and *EPBC Act* were identified on site.

A suite of threatened species have the potential to occur in the site, based on the DEC and DEH online database records and the presence of suitable habitat (see *Annex D, Table D.2*).

Marine mammals and shoreline birds were excluded from the threatened species assessment, as it is reasonable to assume they would not be dependent upon the habitat resources present within the site.

9.3 *THREATENED SPECIES ASSESSMENT*

9.3.1 *Habitat Loss*

There is a growing shortage of tree hollows in Australia, which are suitable for the nesting, roosting and denning requirements of native fauna. Availability of nest hollows may be one of the factors limiting distribution and density of some species. Substantial clearing of this habitat resource has the potential to push many of the local species below threshold levels at which populations can be sustained.

The proposed development will clear approximately 0.52 hectares of snow gum/ribbon gum grassy woodland and any associated hollow bearing trees within this area. The cleared area accounts for approximately 3.6 percent of the total snow gum ribbon gum grassy woodland that occurs on site. No trees will be removed within the proposed stockpile areas and no stocking piling is to be undertaken within the drip zone (extent of the tree canopy) of the retained trees.

9.3.2 *Habitat Fragmentation And Corridors*

Corridors are important for linking remnant areas of vegetation and for facilitating the many ecological processes required to sustain biodiversity. Corridors promote opportunities for fauna movement and the long-term viability of species as they reduce the effect of isolation of small remnant patches of vegetation.

The proposed extension area forms part of a fragmented corridor providing movement opportunities for mobile species such as birds, bats and large macropods. This vegetated corridor is relatively narrow forming a disjunct band from the southeast to beyond the western boundary of the site. Tree occurrences are generally restricted to roadside areas and scattered clumps where land has not already been cultivated. The site is bounded by High Lake Road and Pipe Clay Springs Road to the west and south respectively. A dirt track bisects the site from east to west whilst the existing quarry is situated on the northeastern corner of the site. This corridor will not be significantly fragmented or isolated by the proposed works

9.3.3 *Indirect Impacts*

Edge effects such as weed incursion and encroachment were evident within the proposed extension area. A weed management plan will be incorporated into the operational environmental management plan and rehabilitation activities for the site.

The absence of major streams and drainage lines within the site reduces the potential issue of erosion and sedimentation as a result of any development. The current water management plan for the site aims to ensure that there is adequate on-site water for use for dust suppression, processing operations, domestic water requirements and site rehabilitation. Sedimentation dams and catch drains provide increased management of on site impacts.

9.3.4 Assessment Of Significance

The following assessment is based on the Assessment of Significance in Section 5A of the *EP&A Act* as amended by the *Threatened Species Legislation Amendment Act 2004*. These factors allow a determination of whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats. It addresses the potential impact on threatened species and ecological communities which have been recorded in the extension area or are assessed as having a moderate or high likelihood of occurrence. Threatened flora and fauna species and ecological communities with moderate to high likelihood of occurring within the extension area are listed below.

- *Calotis glandulosa*;
- *Rutidosis leiolepsis*;
- *Delma impar* (striped legless lizard);
- *Stagonopleura guttata* (diamond firetail);
- *Pteropus poliocephalus* (grey-headed flying-fox);
- *Mormopterus norfolkensis* (eastern freetail-bat);
- *Miniopterus schreibersii oceanensis* (eastern bentwing-bat);
- *Myotis adversus* (large-footed myotis); and
- Lowland grassy woodland in the south east corner bioregion EEC.

a) In the case of threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Calotis glandulosa colonises bare patches of earth via dispersal of sticky burrs. This species prefers roadside areas particularly within the Monaro and Kosciusko regions. This species was not recorded within the site, despite surveys being undertaken during the known flowering period. The site provides some suitable habitat along the fence lines, vehicle tracks and recently ploughed areas. The proposal will not significantly reduce the area of potential habitat available on site and it will not impact the lifecycle or seed dispersal of any local population.

Rutidosis leiolepsis grows on basalt, granite and sedimentary substrates in natural temperate grassland on the Monaro and propagates from seeds. The site provides potential habitat in the form of grassy woodland and disturbed grassland, although no population of this species has been recorded on site.

The proposed removal of approximately 3.6 hectares of disturbed grassland (including the existing quarry) and 0.52 hectares (3.6 percent) of grassy woodland will not significantly reduce the area of potential habitat available on site. The proposal will not result in any isolation or fragmentation of the habitats available and will therefore not impact the lifecycle or seed dispersal of any local population.

Delma impar (striped legless lizard) is found mainly in natural temperate grassland but has also been captured in grasslands that have a high exotic component. Habitat is typically dominated by perennial, tussock-forming grasses such as kangaroo grass, spear-grasses, poa tussocks and occasionally wallaby grasses. The site provides potential habitat in the form of grassy woodland and disturbed grassland, although no population of this species has been recorded on site. The proposed clearing of approximately 4.12 hectares will not significantly reduce the area of potential habitat available on site. The proposal will not result in any isolation or fragmentation of the habitats available and will not impact the lifecycle of any local population.

Stagonopleura guttata (diamond firetail) prefers grassy box gum woodland or snow gum woodland. The diet of the diamond firetail primarily consists of seeds, insects and green leaves sourced from the ground stratum. Nests are constructed in a globular form usually below hawk or raven nests. Preferred roost sites are located in a dense shrub understorey. The site does not contain preferred roosting or nest sites due to the open nature of the understorey however could be utilised for foraging purposes. The proposed extension will not significantly reduce the availability of the grassy habitats. As the site does not contain any preferred nesting habitat and no population has been recorded within two kilometres of the site, the proposal is not likely to impact the lifecycle of this species such that a local extinction would occur.

Pteropus poliocephalus (grey-headed flying-fox) occur in a variety of habitats from subtropical and temperate rainforests to woodlands, heaths and swamps. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies with a dense canopy. They feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. The site provides seasonal foraging habitat only in the form of flowering eucalypts. Given the absence of roosting habitat, the high mobility of the species and the abundance of foraging habitat in the locality, the proposal is unlikely to significantly impact this species such that a local extinction would occur.

Mormopterus norfolkensis prefers tree hollows, crevices, under bark, caves and buildings for roosting, eucalypt wet and dry forest, woodland and rainforest for foraging. Roosting habitat is supported within the wooded areas of the site. Given that large areas of similar vegetation is reserved in the locality (Kosciusko National Park and South East Forest National Parks), the removal of 0.52 hectares of roosting habitat (3.6 percent of the total area of grassy woodland on site) is not likely to affect the lifecycle such that the local population of this species is placed at risk of extinction.

Miniopterus schreibersii oceanensis prefers mainly caves for breeding (also man-made structures such as culverts) and a range of eucalypt forest and woodland for foraging. Given the absence of preferred breeding habitat on site, this species is only likely to utilise habitat on site for foraging purposes. The removal of approximately 0.52 hectares of wooded habitat on site (approximately 3.6 percent of the total area of grassy woodland on site) is thus not considered likely to affect the lifecycle of this species such that it is placed at risk of extinction.

Myotis adversus roosts in caves, tunnels, tree hollows and dense vegetation associated with permanent, slow flowing water bodies. No permanent waterbodies exist on site. Roosting habitat is restricted to hollows with the site mainly suitable for foraging purposes. The proposed clearing of 0.52 hectares of grassy woodland representing 3.6 percent of total wooded vegetation on site is not likely to affect the lifecycle of the species such that it is placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations have been identified as occurring in the site.

(c) In the case of a critically endangered or endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The preliminary listed lowland grassy woodland in the south east corner bioregion EEC occurs within the site. It is estimated that the lowland grassy woodland EEC has contracted to 20 percent of its pre-European range. Less than 15 000 hectares of the lowland grassy woodland EEC currently exist within the south east corner bioregion (DEC database, 2003). The proposed extension area will clear approximately 0.52 hectares of this community accounting for 3.6 percent of the total EEC occurring on site. The clearing of 0.52 hectares of this EEC equates to a 0.003 percent reduction in the overall extent of the community. Therefore, the proposal is unlikely to have an adverse effect on the extent of the ecological community and will not place its' local occurrence at risk of extinction. As a precautionary measure, it is recommended that no stockpiling is to be undertaken within the drip zone (extent of the tree canopy) of the retained trees and any landscaping use species consistent with this EEC. All plants should be sourced from local seed stock.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The proposed quarry extension will result in the clearing of approximately 3.6 percent (0.52 hectares) of lowland grassy woodland with the retention of the remaining 96.4 percent (13.84 hectares). The proposed quarry extension will not adversely modify species composition such that its local occurrence is placed at risk of extinction.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

Approximately 0.52 hectares of grassy woodland habitat and 3.6 hectares of disturbed grassland (including the existing quarry) will be removed as a result of the proposal. This vegetation provides potential habitat for a range of threatened species. The removal of this habitat is not considered significant on a local scale given that large amounts of the surrounding vegetation providing similar habitat will be retained. The extent of habitat to be removed is not likely to significantly impact the occurrence of *Calotis glandulosa, Rutidosis leiolepsis, Delma impar, Stagonopleura guttata, Pteropus poliocephalus, Mormopterus norfolkensis, Miniopterus schreibersii oceanensis* or *Myotis adversus* nor is the proposal likely to adversely affect habitat of the lowland grassy woodland within the south east bioregion EEC given that 96.4 percent of the community that occurs on the site will be retained.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The site forms part of a highly fragmented corridor providing movement opportunities for mobile species such as birds, bats and large macropods. This corridor will not be significantly fragmented or isolated by the proposed works.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

The vegetation to be removed provides a very small proportion of hunting and foraging habitat available within the locality. Given the retention of the interconnecting vegetation on all sides of the site with the exception of land to the north, the importance of habitat to be removed is greatly reduced. The proposed extension is thus not likely to affect the movement or habitat of threatened species, populations or ecological communities.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly of indirectly).

There is no critical habitat listed in the locality.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Currently there are no recovery plans for the threatened species considered to have a moderate to high likelihood of occurring within the site. No relevant threat abatement plans were identified for the site.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

At present there are 26 key threatening processes listed on Schedule 3 of the *TSC Act 1995*, as detailed in *Table 9.1* below.

Table 9.1 Key Threatening Processes Listed in Schedule 3 of the TSC Act

Threatening Process	Applicable to Project
Alteration of habitat following subsidence due to longwall mining	No
Alteration of natural flow regimes.	No
Bushrock removal resulting in the removal and/or disturbance of habitat for native species that may find shelter in or under rocks, use rocks for basking, or which grow in rocky areas.	No
Clearing of native vegetation.	**Yes**
Competition and grazing by the feral European rabbit (Oryctolagus cuniculus).	**Yes**
Competition and habitat degradation by feral goats.	No
Competition from feral honeybees Apis mellifera.	No
Death or injury to marine species following capture in shark control programs on ocean beaches.	No
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments.	No
Feral pigs - predation, habitat degradation, competition and disease transmission.	No
Herbivory and environmental degradation caused by feral deer.	No
High frequency fire resulting in the disruption of life cycle processes in plants and animal and loss of vegetation structure and composition.	No
Human caused climate change.	**Yes**
Importation of red fire ants into NSW.	No
Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations).	No
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis.	No
Infection of native plants by Phytophthora cinnamomi.	No
Introduction of the large earth bumblebee (Bombus terrestris)	No
Invasion of native plant communities by bitou bush and boneseed	No
Invasion of native plant communities by exotic perennial grasses.	**Yes**
Loss and/or degradation of sites used for hill-topping by butterflies.	No
Predation by mosquito fish (Gambusia holbrooki).	No
Predation by feral cat (Felis cattus).	No
Predation by fox (Vulpes vulpes).	No
Predation by ship rat (Rattus rattus) on Lord Howe Island.	No
Removal of dead wood and dead trees.	**Yes**

Threatening processes relevant to the proposal are discussed below.

Clearing of native vegetation

The proposed extension involves the removal of approximately 0.52 hectares of grassy woodland and 3.6 hectares of disturbed grassland (including the existing quarry). Although the removal of this vegetation is a key threatening process, large areas of similar vegetation reserved in the locality including Kosciusko and South East Forest National Parks, will remain.

Competition and grazing by the feral European rabbit

The site currently supports a population of rabbits. The proposed extension to the existing quarry will not increase predation of native grasses by the European rabbit given the open habitat already existing at the site. The proposal is unlikely to result in an increase in numbers of the European rabbit.

Anthropogenic climate change

The proposed removal of approximately 0.52 hectares of grassy woodland within the site will result in a lower amount of carbon dioxide uptake by the larger open forest area. However the removal of vegetation is likely to be offset by regenerating areas in adjoining land and will not adversely impact greenhouse gas absorption such that climate change is significantly accelerated.

Invasion of native plant communities by exotic perennial grasses.

Exotic perennial grasses are present in disturbed areas of the site, particularly where vegetation has been cleared for cultivation purposes. Provided appropriate weed control techniques are employed at the quarry, the impact to native vegetation communities will be minimal such that species composition will not be significantly altered.

Removal of dead wood and dead trees.

The site contains a small number of fallen logs and hollows providing habitat for a variety of species. The proposed extension will result in the removal of approximately 0.52 hectares of grassy woodland representing 3.6 percent of the total grassy woodland habitat on the site. It is recommended that any hollow trees and logs be relocated to those areas of woodland to be retained within the site.

9.4 COMMONWEALTH THREATENED AND MIGRATORY SPECIES

The Commonwealth *EPBC Act* requires approval for actions that may have a significant impact on matters of national environmental significance or Commonwealth land. There are no World Heritage properties, Commonwealth marine areas or nuclear actions on or near the site. There are Commonwealth listed wetlands, ecological communities, threatened species and migratory species recorded or likely to occur on the site (see *Table D.2, Annex D*).

The proposed development site is located within the eastern portion of the Snowy River catchment. Blue Lake is a glacial lake located in Kosciusko

National Park approximately 45 kilometres from the site and is also located in the headwaters if the Snowy River catchment. Blue lake is a Ramsar site recognised as being of international importance due to the presence of rare flora and fauna. The proposal will not directly or indirectly impact on this Ramsar site.

The Commonwealth listed threatened species with a moderate to high likelihood of occurring within the site are *Delma impar* (striped legless lizard) and *Pteropus poliocephalus* (grey-headed flying fox). Provided the environs continue to function as a wildlife corridor and seasonal foraging resources are retained, the proposal is not expected to cause detrimental impacts upon the health of the remaining vegetation within the site. The assessment of significance in *Section 9.3.4* considered whether the proposal would:

1. decrease the size of a population;
2. reduce the area of occupancy of the species;
3. fragment an existing population;
4. adversely affect critical habitat;
5. disrupt the breeding cycle of a population;
6. affect the availability or quality of habitat to the extent that the species is likely to decline;
7. result in harmful invasive species becoming established within the site; or
8. interfere with the recovery of the species.

The assessment of significance concludes that threatened species, communities and populations are not going to be placed at risk of extinction by the proposal. Therefore, it is unnecessary to reassess these threatened species listed in the *EPBC Act*.

Six Commonwealth listed migratory species have been identified as occurring or having the potential to occur within 10 kilometres of the site (see *Table D.2, Annex D*). One is a marine bird whilst the remaining five species are terrestrial. Unsuitable vegetation type and lack of nesting habitat reduced the likelihood of migratory wetland species occurrence on site.

Terrestrial migratory species may occasionally use the site for foraging habitat. However, as the distribution of vegetation communities supported is not confined to the site and given that these species are wide-ranging with generalist habitat requirements, it is unlikely that the proposal will have a significant impact on these migratory species.

Therefore the proposal will not;

1. substantially modify, destroy or isolate an area of important habitat of the migratory species;
2. result in harmful invasive species becoming established within the site; or
3. disrupt the life cycle of an ecologically significant proportion of a population of the species.

The proposal is not expected to have a significant effect upon the health and viability of any threatened or migratory species listed under the provisions of the *EPBC Act*. Given the proposal would not impact on matters of national environmental significance, the *EPBC Act* does not apply and approval from the Commonwealth Minister for the Environment is not required

9.5 CONCLUSION

One preliminary listed endangered ecological community and three threatened microchiropteran bat species were recorded on site.

The proposed extension area will clear approximately 0.52 hectares of lowland grassy woodland, accounting for 3.6 percent of the total EEC occurring on site. The clearing of 0.52 hectares of this EEC equates to a 0.003 percent reduction in the overall extent of the community. Therefore, the proposal is unlikely to have an adverse effect on the extent of the ecological community and will not place its' local occurrence at risk of extinction. As a precautionary measure, no stockpiling is to be undertaken within the drip zone (extent of the tree canopy) of the retained trees and any landscaping undertaken within the site use species consistent with this EEC. All plants should be sourced from local seed stock.

The site provides potential hunting and roosting habitat for *Mormopterus norfolkensis* and *Myotis adversus* in the form of tree hollows. Given the absence of any caves or similar structures, *Miniopterus schreibersii oceanensis* would use the site for hunting purposes only. The proposed clearing of 0.52 hectares of grassy woodland representing 3.6 percent of total wooded vegetation on site is not likely to affect the lifecycle of these species such that the local populations would be placed at risk of extinction.

Additional management procedures include:

- a weed management plan should be produced for the operational and rehabilitation phases of the quarry; and
- hollow trees and logs should be relocated to those areas of woodland to be retained within the site as a habitat resource for native fauna.

10 AIR QUALITY

This chapter provides an assessment of particulate impacts at sensitive receptors in the vicinity of the quarry, based on existing and expected future air emissions. The air quality assessment has been carried out using AUSPLUME v 6.0. in accordance with the NSW DEC approved methods for dispersion modelling (NSW DEC, 2005). The full assessment and methodology are included in Annex E.

10.1 POTENTIAL AIR QUALITY ISSUES

Particulate matter emissions will arise from the operation of the quarry as a result of land clearing, blasting, processing, transporting and stockpiling activities. Emission sources from the Bombala Quarry will be fugitive in nature (i.e. not able to be collected by passing through a chimney, stack or vent) and influenced by weather patterns, especially the level of moisture contained in the product and as well as wind speed and direction. Typically, particulate matter is characterised by its size. Particulate size ranges assessed in this report include particulate matter less than 10 microns in diameter (PM_{10}), and less than 2.5 microns in diameter ($PM_{2.5}$) as well as Total Suspended Particulates (TSP).

Exposure to crystalline silica can pose a potential health risk. However, analysis of the hard rock resource at the Bombala Quarry found no free silica, therefore silica has not been considered further in this report.

10.2 APPROACH TO ASSESSMENT

AUSPLUME is the current NSW DEC approved regulatory model for most applications in NSW and was used in this assessment.

Emissions from particulate generating activities have been quantified using published emission factors. Emission factors were preferentially derived from equations or alternatively, default emission factors, given in the US Environment Protection Agency (US EPA), 2006 *AP-42 Compilation of Emission Factors*. If these were not available, equations or default emission factors were sourced from the National Pollutant Inventory (NPI), 2006 *Emission Estimation Technique Manuals*, or as a last resort, the NSW Mineral Council, 2000 *Technical Paper, Particulate Matter and Mining Interim Report*.

A conservative approach to modelling was taken, whereby the plume depletion function was not used in modelling. Plume depletion occurs when some particles settle towards the ground under the influence of gravity, turbulence, the nature of the ground surface or rain. Thus, estimations of particle concentrations at sensitive receptors in this report are likely to be overestimations of actual concentrations.

10.3 DISPERSION METEOROLOGY

10.3.1 *Meteorology*

Meteorology plays a major role in determining the location and degree of offsite air quality impacts. Air dispersion modelling using AUSPLUME requires information about the dispersion characteristics of the area, including wind direction and speed, temperature, atmospheric stability and mixing height.

PDS Multimedia and Consultancy Service (PDS) were engaged to develop an AUSPLUME meteorological file for 2004 suitable for the Bombala project area. Meteorological data including wind speed and direction, ambient temperature, dew point and surface pressure were obtained from BoM station number 070328, which is located approximately 10 kilometres south of Bombala at the property 'Lillianfel'. This is distinct from the BoM weather station in Therry St, Bombala, which has been used elsewhere in this report, as the wind data at station number 070328 was considered more complete than that at the Therry St, Bombala station.

Parameters such as the variation of wind direction, cloud cover and solar radiation can be used to determine atmospheric stability class and mixing heights. It must be noted that night time stability was calculated from Sydney data as night time cloud cover is not measured at all BoM stations.

10.3.2 *Local Climatic Conditions*

The following climatic data is based on observations at the BoM weather station number 070328.

Temperature

On average January is the warmest month with a mean monthly maximum temperature of 24.6°C. The coolest month is July with a mean monthly minimum temperature of 0°C.

Humidity

On average, December has the lowest relative humidity, with a daily average of 64 per cent. June is the month with the highest relative humidity, with a daily average of 76 per cent.

Rainfall

The mean annual rainfall is 494.6mm, falling on an average of 110 annual raindays. November is the wettest month with a monthly average of 63.5mm and August is the driest month with a monthly average of 22.3mm.

10.3.3 Windrose Summary

Windroses for the Bombala area are included in the Air Quality Impact Assessment (*Annex E*) and indicate that winds are predominantly from the:

- northwest on an annual basis, with contributions from the north, east and south west.
- southeast, north and east during summer;
- northwest during autumn, with contributions from the north and west;
- northwest during winter, with contributions from the west and the north; and
- west, northwest and southwest in spring.

10.3.4 Stability Class

Table 10.1 shows the frequency of occurrence of the different stability classes expected in the area.

Table 10.1 Frequency of Stability Class Occurrences

Stability Class*	Percentage
A	1
B	4
C	12
D	53
E	14
F	15

*Class A refers to unstable conditions where dispersion occurs rapidly. Class F refers to stable conditions such as those during the night where dispersion is slow. Classes B, C, D and E relate to intermediate dispersion conditions.

The frequencies of E and F stability classes (29%) indicate that conditions in the Bombala area would be such that emissions from the quarry would disperse slowly for a significant period of the time. E and F classes predominantly occur during the early hours of the morning when the sky is clear and an inversion is present.

10.4 AMBIENT AIR QUALITY

10.4.1 *Overview*

The Bombala area has generally clean air, due to low vehicle concentrations and a lack of heavy industry. Pollutant loadings are low and usually dispersed, although inversions can occur on some winter nights, thus trapping pollutants close to ground level.

A review of the NPI did not identify any major industry in the area, though a petroleum depot which emitted low levels of pollutants such as Volatile Organic Compounds was reported. It is likely that the quarry will form the dominant source of air emissions in the area.

10.4.2 *Background Levels*

There is no known ambient air monitoring carried out in the Bombala region. In the absence of site specific data, an average of PM_{10} monthly values obtained at four NSW DEC and three Victorian Environment Protection Authority rural air quality monitoring locations, has been used to estimate background concentrations.

Background TSP levels were determined on the assumption that 39% of TSP is in the PM_{10} range (NSW Minerals Council, 2000). $PM_{2.5}$ background levels were calculated on the basis that 4.68% of TSP is in the $PM_{2.5}$ range.

In addition, assessment against 24hr PM_{10} and $PM_{2.5}$ concentrations is required. As this data is not readily available, the approach adopted provides for 24hr averages at the residences should be less than the National Environment Protection Measure 24hr average guideline of 50μg/m^3 (PM_{10}) and 25μg/m^3 ($PM_{2.5}$) in ambient air.

Deposited Dust monitoring has not been undertaken at the Bombala quarry site. Therefore, a background average dust deposition value was taken from monitoring results of a comparable hard rock quarry in Tweed NSW. However, these results were influenced by two quarry sites; values at Bombala would likely be lower.

Consequently, the background levels employed in this assessment are:

- Annual average TSP of 46 μg/m^2;
- Annual average PM_{10} of 18.6 μg/m^2;
- Annual average $PM_{2.5}$ of 2.2 μg/m^2; and
- Annual average dust deposition of 2 g/m^2/month.

10.5 AIR QUALITY LEGISLATION AND ASSESSMENT GUIDELINES

The proposal will be assessed against impact assessment criteria published by the DEC in *'Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales, 2005'(Table 10.2)*. These criteria incorporate the National Environment Protection Measure (NEPM) goals. The criteria refer to cumulative emissions, therefore existing background levels must be combined with predicted quarry impacts to allow for assessment of impacts against these criteria.

Table 10.2 Particulate Matter Impact Assessment Criteria

Pollutant	Averaging Period	Concentration	Agency
Total Suspended Particulates (TSP)	Annual	90 µg/m³	NSW DEC
Particles less than 10 micron (PM_{10})	24 hour	50µg/m³	NSW DEC
	Annual	30µg/m³	NSW DEC
Particles less than 2.5 micron ($PM_{2.5}$)	Annual	8 µg/m³	NEPM
	24 hour	25 µg/m³	NEPM
Deposited Dust	Monthly	4 g/m² /month	NSW DEC
	Monthly	An increase of no more than 2 g/m²/month	NSW DEC

Source: Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2005) and NEPM (Ambient Air Quality) http://www.ephc.gov.au/nepms/air/air_nepm.html.

10.6 EMISSIONS ESTIMATIONS

10.6.1 *Overview*

Particulate emissions will arise from the following activities at the quarry;

- Stripping of overburden;
- Drilling and blasting of rock;
- Loading product to haul and road trucks;
- Crushing and screening;
- Dumping of material to stockpiles by front end loaders and conveyors;
- Wheel generated dust from road trucks, haul trucks and mobile equipment; and
- Wind generated dust from exposed areas and stockpiles.

Published emission factors have been used to estimate particulate emissions from the existing quarry operations and for stages 3 and 8 of the proposed quarry expansion (*Table 10.3*). The modelling of the existing operations was undertaken to provide an indication of current air quality emissions, while stages 3 and 8 were selected as representative stages throughout the lifetime of the quarry. Details about the quarry configuration at stages 3 and 8 can be found in *Section 3.5.2* of the EIS.

In making these estimates, a control factor of 50% has been applied to roads and unsealed surfaces, based on the assumption that a low level of watering (less than 1 $L/m^2/hr$) will occur. In addition, it has been estimated that crushing and screening equipment have dust control (for instance water suppression) with 50% efficiency.

Emissions from stages 3 and 8 have been estimated based on an annual output of 100,000 tonnes and a quarry operating schedule of 6 days per week and 10 hours per day. This is a conservative assumption as the quarry generally only operates five days a week throughout the year, with limited load out activity on Saturdays.

10.6.2 *Particle Size Distribution*

A study on the particle size distribution of dust from open cut coal mines in the Hunter Valley was undertaken by the NSW State Pollution Control Commission (now DEC) in 1986. This study indicated that 39.1% of TSP was in the PM_{10} size range and 4.68% was in the $PM_{2.5}$ size range. This particle size distribution has been used to estimate $PM_{2.5}$ emissions from calculated emissions of TSP.

Characterisation of particulate emissions was based on the particle size distribution presented in *Table 10.3*. It has been assumed that particulate matter in excess of 30 microns will deposit at a short range from the source. On the basis that the receptors are at a distance of a several hundred metres, coarser fractions have not been included.

Table 10.3 ***Mean Particle Size Distribution – Hunter Valley***

Range (micron)	Mass Fraction	Mean Particle Size in range (micron)
0-2.5	0.0468	1.2
2.5 - 10	0.3442	7
10-30	0.609	20

Source: NSW Minerals Council, 2000

Estimated emissions have been provided in *Table 5.3* for varying stages of quarry operations. The predominant particulate matter generating activities are haulage offsite, wind erosion from quarry pit and stripping of overburden. It has been assumed that the quarry will predominantly handle aggregates that have an estimated particle density of 2.6 g/ml.

Table 10.4 Estimated Dust Emissions

Stage	TSP Emission Rate (kg/year)	PM_{10} Emission Rate (kg/year)	$PM_{2.5}$ Emission Rate (kg/year)
Existing Quarry	37,769	12,010	1,768
Stage 3	81,259	27,764	3,820
Stage 8	91,161	33,038	4,281

10.7 PREDICTION OF IMPACTS

10.7.1 Modelling Parameters

Roughness Height

The roughness height (which affects surface-generated turbulence) selected for modelling purposes is that of rolling rural. AUSPLUME Version 6.0 allows the user to simulate this by the choice of 0.4 metres.

Terrain Effects

AUSPLUME only accounts for terrain effects from elevated stack emission points and as such these could not be assessed in this report. However, it is not considered that the terrain surrounding the quarry would significantly influence the dispersion of pollutants from the quarry.

Receptor Locations

The study area was set up to comprise a Cartesian grid with gridded receptors at regularly spaced intervals of 100m, covering an area of 3.0 kilometres by 3.0 kilometres. Discrete receptors were established at the three nearby potential residences. These are shown in *Figure 10.1*.

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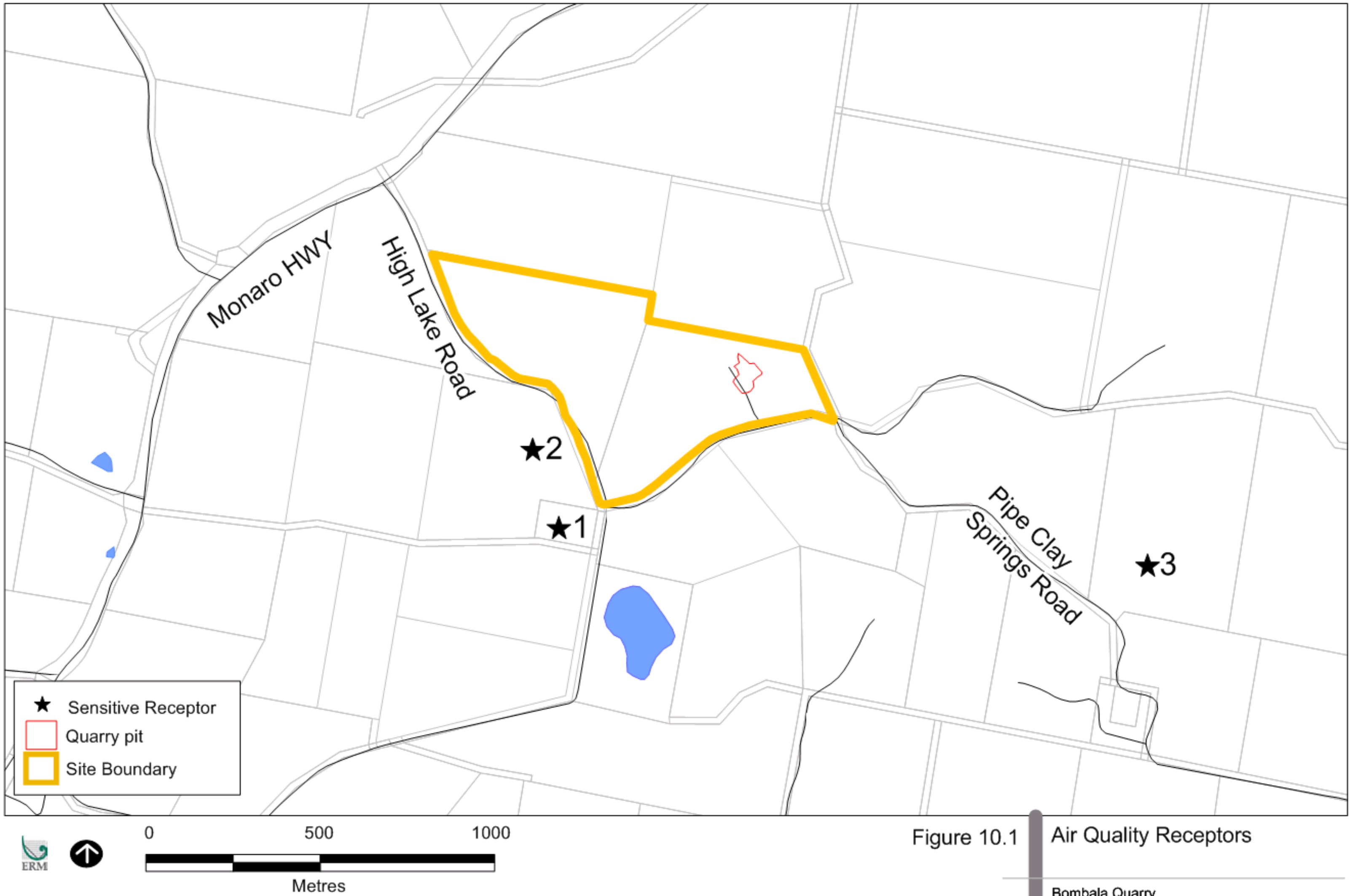

Figure 10.1 Air Quality Receptors

Bombala Quarry

Building Wakes

Buildings will affect the flow of air around the facility and subsequent ground level concentrations by causing negative pressures on the leeward side of the buildings and pulling emissions down to ground closer to the source. Building wake effects are computed only for point sources (i.e. a stack) and as potential quarry emissions are from area sources, building wake effects have not been included in the model.

10.7.2 Modelling Scenarios

The modelling options employed in this assessment included:

- TSP – annual average
- PM_{10} – 24 hr average and annual average and
- $PM_{2.5}$ – 24 hr average and annual average.

10.8 RESULTS

10.8.1 Modelling Results

Dispersion modelling results have been summarised in terms of predicted pollutant ground level concentrations (glc's) at the nominated sensitive receptors (*Table 10.5* and *Table.10.6)*.

Table 10.5 Predicted glc's: Annual Avg- Existing Stage 3 and Stage 8 Quarry Operations

Receptor	Quarry Contribution				Total Predicted			
	TSP (ug/m³)	**PM_{10} (g/m³)**	**$PM_{2.5}$ (µg/m³)**	**Deposited Dust (g/m2/month)**	**TSP (µg/m³)**	**PM_{10} (µg/m³)**	**$PM_{2.5}$ (µg/m³)**	**Deposited Dust (g/m2/month)**
Existing Quarry								
1	1.4	0.45	0.051	0.35	47	19	2.3	2.4
2	2.0	0.60	0.094	0.51	48	19	2.3	2.5
3	0.90	0.31	0.042	0.31	47	19	2.2	2.3
Stage 3 Operations								
1	3.7	1.6	0.17	0.84	50	20	2.4	2.8
2	5.0	2.2	0.23	1.2	51	21	2.4	3.2
3	2.4	1.0	0.11	0.80	48	20	2.3	2.8
Stage 8 Operations								
1	4.5	1.8	0.22	0.90	51	20	2.4	2.9
2	6.6	2.6	0.31	1.6	53	21	2.5	3.6
3	2.5	1.0	0.12	0.68	49	20	2.3	2.7
Criteria	90µg/m³	30µg/m³	8 µg/m³	2 g/m²/month	90µg/m³	30µg/m³	8 µg/m³	4g/m²/month

Table 10.6 Predicted glc's: 24 hr Avg - Existing, Stage 3 and Stage 8 Quarry Operations

Receptor	Quarry Contribution Existing		Quarry Contribution Stage 3		Quarry Contribution Stage 8	
	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
1	8.2	1.3	24.4	2.7	31.2	2.5
2	6.7	1.1	22.5	2.4	27.1	2.8
3	2.8	0.41	9.3	1.2	9.7	1.0
Criteria	50 µg/m³	25 µg/m³	50 µg/m³	25 µg/m³	50 µg/m³	25 µg/m³

10.9 DISCUSSION AND CONCLUSIONS

10.9.1 Predicted Impacts

Total Suspended Particulates (TSP)

The predicted ground level concentrations of TSP comply with the NSW assessment criterion (annual average) at nominated sensitive receptors for existing activities and stages 3 and 8 of the quarry expansion.

Particulate Matter Less Than 10 Micron (Pm_{10})

The predicted ground level concentrations of PM_{10} (24 hour average) comply with the NEPM assessment criterion at sensitive receptors in the project area for all modelled phases of quarry operation.

The predicted ground level concentrations of PM_{10} (annual average) comply with the NSW assessment criterion at nominated sensitive receptors for existing activities and stages 3 and 8 of the quarry expansion.

Particulate Matter Less Than 2.5 Micron ($Pm_{2.5}$)

The predicted ground level concentrations of $PM_{2.5}$ (24 hour average) comply with the NEPM assessment criterion at sensitive receptors in the project area for all modelled phases of quarry operation.

The predicted ground level concentrations of $PM_{2.5}$ (annual average) comply with the NSW assessment criterion at sensitive receptors in the project area for the existing activities and stage 3 and stage 8 of the proposed expansion.

10.9.2 Deposited Dust

The predicted deposition levels (monthly average) comply with the NSW assessment criterion as a maximum increase in deposited dust at sensitive receptors for existing quarry operations, stage 3 and stage 8.

Deposition predictions have been overstated as plume depletion was not considered in modelling. It is likely, when plume depletion is considered, predicted deposition impacts will be less than those reported.

10.9.3 Cumulative Impacts

Cumulative impacts predicted reflect the total impact for the development and incorporate particulate emissions from the proposed quarry expansion plus existing background levels.

Cumulative ground level concentrations of TSP (annually averaged), PM_{10} (24 hour and annual averages) and dust deposition levels (monthly averaged), comply with the NSW assessment criterion at sensitive receptors for existing quarry operations and for proposed stages 3 and 8.

10.9.4 Dust Mitigation Measures

This section discusses the mitigation and control options for particulate matter to ensure levels do not affect the health and amenity of the surrounding area.

Unpaved Surfaces and Vehicle Movements

Particulate emissions from unpaved surfaces should be controlled using:

- Wet suppression;
- Revegetation of exposed surfaces where possible;
- Limiting load size to minimise spillage;
- Compliance with the site speed limit of 15 km/hr; and
- Covering loads to prevent dust being released during road transport.

Stockpiles

Fine material stored in stockpiles can be subject to wind erosion at mid to high wind speeds i.e. generally wind speeds above 5 metres per second. Dust emissions can also occur when product is dropped onto the stockpile from conveyors or dump trucks. Options for dust control of stockpiles include:

- Wet suppression using sprinklers;

- Covering stockpiles;
- Limiting the height and the slope of the stockpile to reduce wind entrainment. A flat shallow stockpile will be subject to less wind turbulence than a tall conical shape;
- Limiting drop heights from conveyors and dump trucks; and
- The use of wind breaks such as fences, vegetation and fixtures such as shadecloth.

Material Handling

Dust emissions can occur as a result of material handling by front end loaders and other machinery. These mainly occur when the load is dropped into a truck or hopper, but can be caused by spillages during handling. Options for minimising emissions from material handling include:

- Minimising drop heights; and
- Regular clean up of any spillages.

11 NOISE AND VIBRATION

This chapter provides an assessment of potential noise and vibration impacts at nearest affected residences. Noise modelling and assessment has been carried out using the Environmental Noise Model (ENM) in accordance with the Environmental Protection Authority (EPA) (part of DEC) Industrial Noise Policy (INP) (EPA 2000). The full assessment and methodology are included in Annex F.

11.1 EXISTING NOISE ENVIRONMENT

11.1.1 Residential Receivers

Four residences were identified as sensitive receiver locations that could potentially be affected by noise associated with proposed quarry operations. *Table 11.1* and *Figure 11.1* indicate the location of these residences.

Table 11.1 Receiver Locations Used for Modelling Purposes

Receiver Location	Resident	GPS Coordinates		Location relative to Bombala Quarry	
		Easting	Northing	Direction from Quarry	Distance from Quarry Pit (m)
1 ('Oxley')	McInnes	701961	5916740	WSW	560
2 ('High Lake')	Helmers	702012	5916459	SW	670
3 ('Gadara')	Herron	701946	5916144	SSW	950
4 ('Inglewood')	Rolph	703502	5916342	SE	1180

11.1.2 Background And Ambient Noise

The area to be potentially effected by noise from Bombala Quarry is categorised as a 'rural area', in accordance with the EPA classification system and features:

"an acoustical environment that is dominated by natural sounds, having little or no road traffic".

Bombala Quarry currently operates from 7.00am to 5.00pm, Monday to Friday with limited loadout activity on Saturdays and no site activity on Sundays. The results of unattended long term noise monitoring and attended short term noise monitoring undertaken in the vicinity of the quarry, have been used to evaluate background and ambient noise at the identified receiver locations.

Unattended Noise Monitoring

A summary of raw noise logger data obtained in a background and ambient noise survey conducted by Heggies Australia in November 2005 (Heggies, 2006) is presented in *Table 11.2.* This survey involved unattended continuous monitoring at the southwestern boundary of the property, approximately 150 metres east of the Helmers residence (receiver location 2), from 30th November 2005 to 9th December 2005. The specific location of the noise logger during monitoring is depicted in *Figure 11.1.* This data provides an indication of background noise in the absence of quarry operations, during evening and night-time. Day results were likely to be influenced by existing quarry operations and have been amended accordingly. In accordance with EPA's INP, day is taken to be between 7am and 6pm, evening between 6pm and 10pm, and night between 10pm and 7am.

Table 11.2 Summary of Background and Ambient Noise Levels

Location	Rating Background Level (dB(A))			Ambient Noise Level (dB(A)L_{eq},period)		
	Day	Evening	Night	Day	Evening	Night
SW Property Boundary	32[1]	32	30	52	43	40

1. The value of 32dB(A) was adopted from the evening period, as the RBL of 33dB(A) attained from the logger during the day period may have been influenced by site noise.

NB. Noise data obtained during rainfall periods and/or times when wind speeds exceeded 5m/s were discarded.

Source: Heggies Australia (2006)

Attended Noise Monitoring

Attended noise monitoring was undertaken by ERM at the receiver locations depicted in *Figure 11.1* on 28th April, 2006, between 10.00am and 4.30pm. At this time the quarry was operational and the contribution of the quarry site to recorded noise levels was determined for each measurement. It should be noted that in the period between the unattended noise monitoring and attended noise monitoring, i.e. December 2005 to April, 2006, the following operational and landscaping changes to the site had taken place:

- Relocation of the primary crusher into the pit;
- Enlargement of the earth bund adjacent to the processing plant to 8m in height; and
- Placement of an earth bund in the south-western corner of the property.

The attended noise monitoring results are summarised in *Table 11.3.*

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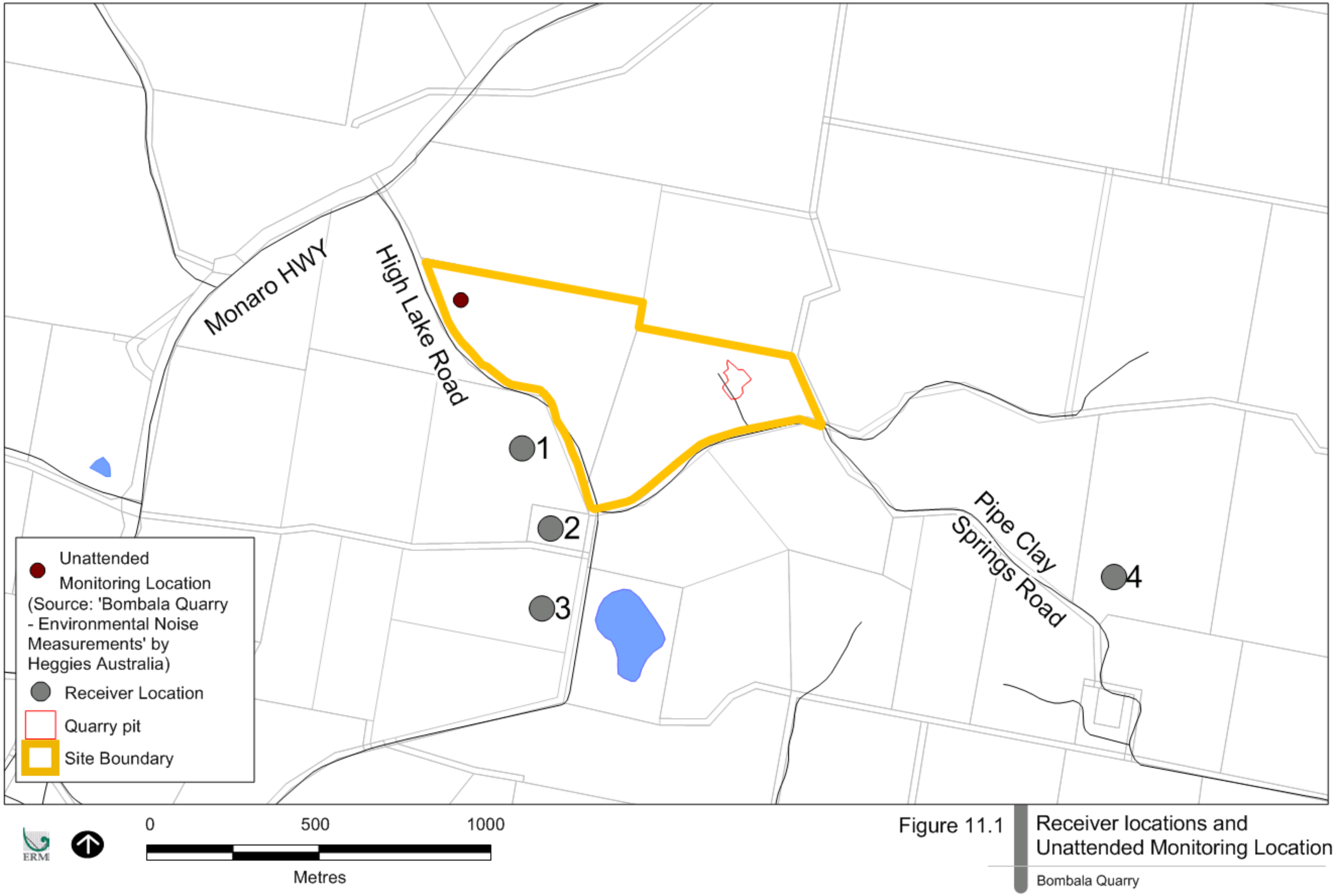

Figure 11.1 Receiver locations and Unattended Monitoring Location

Bombala Quarry

Table 11.3 Summary of Existing Site Noise as Determined from Attended Measurements

Receiver Location	Resident	Time	Duration (min)	Wind Condition (hand held anemoter)	Total Measured Noise Levels (dB(A))			Site Contribution (dB(A))
					L_{eq}	L_{90}	L_{10}	
1	McInnes	12:10	15	Calm	33.3	30	33.8	<30
		14:47	15	~>3m/s,E	52.9	41.8	51.6	48
2	Helmers	11:50	15	Calm	39.1	36.4	40.8	33
		14:25	15	~2m/s,E	43.1	37.8	45.6	38
3	Herron	10:38	15	Calm	38.9	34	41.2	35
		13:58	15	~1.5m/s,E	40.1	37.6	41.6	33
4	Rolph	11:19	15	Calm	39.4	36	40.8	33
		15:15	15	~1m/s,E	40.8	34.8	40.2	<30

NB. Measurements have been filtered for high frequency cricket noise.

11.1.3 *Prevailing Weather Conditions*

Noise propagation over long distances can be significantly affected by the weather conditions. In particular, received noise levels can be enhanced by source to receiver winds and the presence of a temperature inversion.

Temperature inversions typically occur at night and so are not considered for the purposes of this study, given that the quarry will only operate during the day. Likewise, only daytime winds are relevant to this study. Daytime wind roses created between 1st January, 2000 and 13th March, 2006 indicate that winds below 3m/s do not occur in a particular direction for more than 30% of the time. Consequently, in accordance with the INP (EPA 2000), noise levels under wind do not need to be assessed as part of this study, although noise will be enhanced during adverse winds.

11.2 *GENERAL OPERATIONAL NOISE CRITERIA*

11.2.1 *Introduction*

Noise assessment criteria for sensitive receivers near industry, as specified in the INP (EPA 2000), are based on the following objectives:

- protection of the community from excessive intrusive noise; and
- preservation of amenity for specific land uses.

To ensure these objectives are met, two separate criteria are prescribed by the EPA, namely the amenity criteria (which applies to the entire assessment period, i.e. day, evening and night) and the intrusiveness criteria (which applies to a 15 minute time frame in any period). Assessment criteria are dependent on the existing amenity of potentially affected areas.

11.2.2 Project Specific Criteria

The EPA's amenity criterion takes a holistic approach and requires industrial noise to be within an acceptable level for the particular locality and land use. It aims to ensure that total industrial noise (existing and future) received at a given receptor does not exceed the recommended goals. Base amenity criteria for the receivers potentially affected by the proposal are given in *Table 11.4*. However, no other industries are near enough to Bombala Quarry for existing industrial noise to be a concern.

Table 11.4 EPA Base Amenity Criteria

Location	Indicative Area	Time	Recommended L_{eq} period Noise Level (dB(A))	
			Acceptable	Maximum
Residential	Rural	Day	50	55
		Evening	45	50
		Night	40	45

The intrusiveness criterion requires that $L_{Aeq,15min}$ noise levels from a newly introduced source during the day, evening and night (as measured over a 15 minute period) do not exceed the existing Rating Background Levels (RBL) by more than 5dB. A RBL value of 30 dB(A) is adapted in instances where RBL is less than 30 dB(A).

The intrusiveness criteria derived for the proposed quarry extension are shown in *Table 11.5* and are derived from RBL obtained from the long term unattended survey detailed in *Section 11.1.2*.

Table 11.5 Intrusiveness Criteria for Receiver Locations

Location	$L_{eq,15min}$ Intrusiveness Noise Goals, (dB(A))		
	Day	Evening	Night
Residential Receivers (1-4)	37	37	35
NB. Only the Day criterion is applicable to this study.			

As these criteria are more stringent than ambient criteria, they have been adopted as the project specific noise criteria for all identified receiver locations.

Under the provisions of the INP, specifically chapter 10, achievable noise limits for existing operations can be negotiated with the regulatory authority where measured noise levels exceed the defined project specific criteria. This is pursuant to the assessment of all reasonable and feasible mitigation measures. In the case of the Bombala Quarry site, mitigation measures been assessed and, in some cases, already implemented, including the relocation of the primary crusher into the pit and the erection of noise attenuation earth bunds on the site. The quarry plan also incorporates a noise reduction component with the relocation of the remainder of the processing plant into the pit at stage 4 of the proposed operations (i.e. 5.8 years from now) and subsequent relocation within the pit to further reduce noise levels. The current proposal includes maintaining existing plant and continuing their operation. Hence, additional mitigation measures such as upgrading of plant and equipment to achieve lower sound power levels, were considered to be cost prohibitive and therefore not reasonable.

11.3 NOISE MODELLING

11.3.1 Modelling Scenarios

Proposed quarry operations will comprise a ten stage process. To assess the impact of the proposed quarry extension, modelling using the ENM has been undertaken for Stages 1 and 8 of the proposed quarry operations. These two scenarios have been selected for modelling as they represent the worst case scenario, i.e. the existing situation (Stage 1) where the primary crusher is located in the pit at RL809m, with the remaining plant on the surface at RL821m with an 8 metre bund adjacent to the plant providing noise screening, and an improved scenario, with all plant located in the pit. At Stage 8, approximately 14.8 years into the quarry operation, all plant is to be located in pit at RL798m, with the haul truck and excavator in pit at RL809m.

11.3.2 Plant Noise Levels

Measurements of noise emissions from plant were conducted during Bombala Quarry operating hours on 13th February 2006 and 28th April 2006. The measurements were used to derive the various plant representative Sound Power Levels which have been used in the study for modelling purposes. Representative $L_{eq,15minute}$ Sound Power Levels for the plant ranged between 101 and 120dB(A), with the jaw crusher recording the highest Sound Power Level and therefore was considered to be the main contributor to plant noise emissions.

11.4 PREDICTED NOISE LEVELS

11.4.1 *Calculation Procedures*

The EPA accepted ENM noise prediction software was used for modelling in this study. ENM takes into account distance, ground effect, atmospheric absorption and topographic detail and gives consistently reliable predictions of environmental noise.

The model incorporated three-dimensional digitised ground contours for the quarry, as derived from quarry plans, and the surrounding land base topography, superimposed on each other. Plant and equipment was modelled at various locations and heights, representative of realistic operating conditions in Stage 1 and Stage 8 and chosen to represent worst case scenarios.

The noise model predicts L_{eq} noise levels, based on equipment Sound Power Levels determined from measurements conducted during existing operations. The results are considered conservative as modelling assumes that all plant and equipment operate simultaneously, which is a scenario that would be unlikely to occur in reality.

The results of noise modelling have been validated by running a model with actual noise measurements under actual weather conditions.

11.4.2 *Validation*

Attended measurements, as provided in *Table 11.3,* were used for validation. An important pre-requisite for validation is that the site noise must dominate the noise environment so that actual measurements can be meaningfully compared against modelled site noise. Measurements from *Table 11.3* which satisfied this condition (i.e. at the McInnes and Helmers residences) were consequently used for validation.

Wind speed and direction at 10m above the ground were obtained from the NSW Bureau of Meteorology (station number 070005) for the monitoring period, to validate prevailing wind conditions determined by on site wind anemometer observations at the time of sampling.

Validation results as summarised in *Table 11.6,* indicate that the ENM model predicts noise levels within an accuracy of ±2dB(A). This level of accuracy is deemed acceptable for this site.

Table 11.6 *Validation Summary*

Receiver Location		Time	Duration (min)	Wind Condition	Total Measured Noise Levels (dB(A))			Measured Site Contribution (dB(A))	Modelled Noise Level (dB(A))
					L_{eq}	L_{90}	L_{10}		
1	McInnes	14:47	15	~>3m/s,E	53	42	52	48	48
2	Helmers	14:25	15	~2m/s,E	43	38	46	38	40

11.4.3 *Noise Modelling Results*

The results of noise modelling conducted for Stage 1 and Stage 8 of the Bombala Quarry expansion are presented in *Table 11.7*. As discussed in *Section 11.1.3,* wind is not pertinent to the noise assessment and so modelling was only carried out under calm conditions.

Table 11.7 *Noise Modelling Summary*

Receiver Location		L_{eq},dB(A)		Project Specific Criterion
		Stage 1	Stage 8	(L_{eq},dB(A))
1	McInnes	**39**	36	37
2	Helmers	36	32	37
3	Herron	30	30	37
4	Rolph	28	24	37

NB. Criterion exceedances are shown in bold font.

For Stage 1, the project specific criterion is met at the Helmers, Herron and Rolph residences (receiver locations 2, 3 and 4). There is a marginal infraction of 2dB(A) at the McInnes residence (receiver location 1). This is considered to be insignificant, given that a change in noise levels of 2dB(A) is generally not perceptible by the human ear. Furthermore, an engineering tolerance of ±2dB(A) is generally acceptable for the purposes of noise modelling.

Given that the modelling includes the implementation of identified reasonable and feasible noise mitigation measures, the values presented in *Table 11.7* are considered to be achievable noise limits at the receiver locations, as per Chapter 10 of the INP.

The above results are for calm weather conditions. Although not assessable according to the INP, under adverse winds it is expected that quarry noise would increase in the order of 6dB to 45dB(A) at McInnes. Similar measured quarry noise levels are demonstrated in attended monitoring in *Table 11.6*. As the quarry operates during daytime hours only, and given the improvement to historic noise emissions through implementation of noise mitigation, it is not unreasonable to consider a daytime noise limit of 45 dB(A) for adverse weather conditions.

For Stage 8, the project specific criterion is met at all receiver locations as would be expected due to additional shielding afforded by relocation of the plant into pit at RL798m.

Table 11.7 shows that there is a decrease in noise levels from Stage 1 to Stage 8. This portrays the expected trend throughout the life of the quarry. As extension proceeds, the pit becomes deeper and the plant is moved in-pit at progressively greater depths. There is no corresponding increase in the intensity of extraction and so noise levels will be progressively reduced.

As the quarry does not operate during the night period (10pm to 7am) when the residents are adjudged to be sleeping, potential sleep disturbance issues are not addressed in this report.

11.4.4 Construction Activities

There will be no significant construction activities that are likely to add to received noise levels at residences.

11.5 ROAD TRAFFIC NOISE

Site access for trucks is via a fixed route along Monaro Highway, High Lake Road and Pipe Clay Springs Road, with haulage of extracted material offsite by the same route. There are typically 16 truck movements each day, occurring between 7.00am and 5.00pm, Monday to Friday, in accordance with quarry operating hours.

Only the McInnes residence (receiver location 1) and Helmers residence (receiver location 2) are adjacent to the haul route. Noise assessment relating to road traffic has been undertaken for each of these residences, at a location one metre from the worst-affected façade facing the road.

In accordance with ERM's database of noise measurements, a truck pass-by typically creates a Sound Exposure Level of 75dB(A) at a measurement distance of 20 metres. The haul trucks will pass approximately 40 metres from the façade of both residence. Noise calculations were performed under a hypothetical worst case scenario, whereby 16 truck movements occur within a 1 hour period. The resultant noise level at these residences was calculated to be $L_{eq,1hr}$48dB(A). This complies with the NSW DEC Environmental Criteria for Road Traffic Noise (ECRTN) which recommend a daytime criterion of $L_{eq,1hr}$60dB(A) for collector roads. Only daytime criterion is used for this assessment as haulage does not occur at night (the ECRTN defines daytime as 7am to 10pm). Traffic noise criteria for collector roads is used as Pipe Clay Springs Road and High Lake Road have been identified as a principal haulage route on the basis of ERM's observations of Bombala Quarry operations. Hence, road traffic noise associated with Bombala Quarry is not expected to create an adverse noise impact.

It should be noted that noise management policies are currently in place with regard to truck noise. A speed limit of 40 km/h is enforced on High Lake Road and Pipe Clay Springs Road and use of air brakes by trucks is not permitted as they pass either of the above-mentioned residences. Heavy vehicles servicing Bombala Quarry are directed not to use the lower section of Pipe Clay Springs Road to minimise noise and dust impacts to the Rolph residence.

11.6 BLASTING NOISE AND VIBRATION

Under existing quarry operations, blasting takes place twice over a fortnight every twelve months, occurring on the surface of the highest shelf of the quarry. The proposal will increase the blasting frequency to twice over a fortnight every six months, i.e. 4 explosions per year. Drilling is expected to occur for two weeks prior to each blasting. The distances from the pit boundary to the residences, as given in *Table 11.1*, are deemed to be the minimum blast separation distance. These distances are similar to previous blast situations.

The blast design, and hence corresponding air blast overpressure and ground vibration, is within the operator's control. The site's existing blast management strategy will be used to ensure appropriate charge masses are used for blasting. Such charge masses (or maximum instantaneous charge (MIC)) are presented in *Table 11.8*.

Table 11.8 Blasting Assessment

Blast to Receiver Distance (m)	MIC_{8ms} to satisfy ANZECC (1990) 95 % Overpressure Limit of 115 dB(Lin) (kg)	MIC_{8ms} to satisfy ANZECC(1990) Maximum Allowable Overpressure Limit of 120 dB(Lin) (kg)	MIC_{8ms} to satisfy ANZECC (1990) 95% Ground Vibration Limit of 5 mm/s (ppv), (kg)	MIC_{8ms} to satisfy ANZECC (1990) Maximum Allowable Ground Vibration Limit of 10 mm/s (ppv) (kg)
500	6	26	83	215
1000	48	207	331	862
1500	163	699	745	1938

Source: These results are derived from 95% formulae contained in the *Drill and Blast Study, Mount Pleasant* monitoring data as prepared by Blastronics Pty Limited for CNA in September 1994. This is a study of mines in the area.

NB. In general, blast overpressure considerations limit MIC

Noise and vibration from blasting carried out at the southern end of the quarry pit was monitored on two different occasions by Orica Explosives. The blasting conducted at this time was considered typical of blasting that will be carried out throughout the life of the quarry. The intensity of the blasts is not expected to increase as the blasts carried out previously achieved the desired effect.

The dB(L_{peak}) unit of sound measurement considers the low frequency sounds which are not audible to the human ear but can be 'felt'. The ANZECC (1990) *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* specify that air-blast overpressure should not exceed 115 dB(L_{peak}) for more than 5% of the total number of blasts over a period of 12 months and the maximum level should not exceed 120 dB(L_{peak}) at any time.

The guidelines specify that the peak particle velocity (ppv) from ground vibration should not exceed 5 mm/s for more than 5% of the total number of blasts over a period of twelve months and the maximum level should not exceed 10 mm/s at any time. They also recommend that a level of 2 mm/s be considered as the long-term regulatory goal for the control of ground vibration.

These criteria are for the purposes of minimising human annoyance and discomfort and were not developed to control possible structural damage. However, if ground vibration ppv comply with these criteria, they would also be below levels that may cause structural damage to buildings.

The blast monitors were installed at the two residences nearest the quarry pit, i.e. McInnes residence (receiver location 1) and Helmers residence (receiver location 2). In accordance with the ANZECC (1990) guidelines, trigger levels on the blast monitors were set to 115 dB(Lin) for air blast overpressure and 5mm/s for ground vibration. Blasting did not trigger off either monitor on these occasions. Consequently, blasting is not expected to have an adverse impact on the residences surrounding the quarry.

In accordance with ANZECC guidelines, blasting will generally be limited to the hours of 9.00 am to 5.00 pm Monday to Saturday and not take place on Sundays or public holidays. There is however, recognition that under some circumstances, for instance adverse prevailing winds, blasting cannot be restricted to these hours and achieve compliance with blast level limits.

The guidelines also recommend that at sites where blasting effects can be perceived at noise sensitive locations, blasting should be avoided where practical, when a temperature inversion is known to exist.

It is recommended that blasting generally be limited to once per day, except for minor blasts. In addition to the above criteria, general best practice procedures can be used to effectively minimise noise impacts.

11.7 MITIGATION MEASURES

Several noise mitigation measures are currently in place in Bombala Quarry and will continue to be employed throughout the proposed expansion operation. These measures are summarised as follows:

- The operating hours of the quarry are restricted from 7am to 5pm. This time restriction prevents noise emissions during the evening and night periods, at which time background noise levels are lower. It also avoids potential sleep disturbance to the residents.
- Blasting occurs only four times per year and adequate notification is provided to the residents. As such, air blast overpressure and ground vibration effects are not permanent features of the quarry. Furthermore, blasting undertaken complies with the stipulated criteria as detailed in *Section 11.6*.
- Residents will be advised of proposed blasting times in advance of blasting events.
- Noise and vibration from blasting is monitored through the use of blast monitors, to ensure acceptable limits are maintained.
- Road traffic noise created by the haul trucks accessing the site is ameliorated by imposing a speed limit of 40km/h and prohibiting use of compression braking along High Lake Road and Pipe Clay Springs Road, as well as requiring heavy vehicles to use the preferred access from the Monaro Highway along High Lake Road.
- An 8m earth bund adjacent to the plant out-of-pit, provides shielding to residences to the west from noise from the out-of-pit plant.
- Noise experienced at sensitive receivers is expected to be progressively reduced as the quarry expansion proceeds, through implementation of the following measures:
- Plant is to be progressively moved in-pit where the pit walls will act to shield receiver locations from noise generated.
- Plant will be relocated to greater pit depths throughout the life of the quarry to further reduce noise at receiver locations.
- The earth bund adjacent to the pit will be progressively increased in height whilst the plant is at ground level and consequently increase shielding to the residences to the west of the quarry.
- No additional noise producing activities, plant or equipment will be introduced at the site.
- In these ways, noise levels emanating from the quarry are expected to be controlled.

11.8 CONCLUSION

This study considered the potential noise and vibration impacts of the extension of Bombala Quarry.

Noise modelling under calm conditions found that in Stage 1 of the proposed quarry expansion, stipulated noise goals were met at all receiver locations except the McInnes residence (receiver location 1). A marginal insignificant exceedence of 2dB occurred at the McInnes residence. In Stage 8, noise levels complied with stipulated criteria at all receiver locations and were lower than for Stage 1, as the pit was deeper and all the plant was located in-pit at this deeper level.

Conservative calculations of road traffic noise associated with Bombala Quarry found that levels complied with stipulated criteria at potentially affected residences.

Noise and vibration from blasting complied with criteria for minimising human annoyance and discomfort. Blasting only occurs 4 times per year and is currently being monitored to ensure acceptable limits are maintained. This will continue in the future.

It is considered that, through the implementation of noise mitigation measures outlined in *Section 11.7*, noise levels at the receiver locations are expected to be controlled so as not to have an adverse effect at identified receiver locations, and will be reduced progressively throughout the life of the proposed Bombala quarry operations.

12 HERITAGE

This chapter provides an Aboriginal and historical context for the study area, describes the process followed in identifying past Aboriginal activities and likely areas of cultural significance and provides information on the site survey and various database searches involved with the assessment. Further details of the heritage assessment are presented in Annex G.

12.1 INTRODUCTION

An assessment of potential impacts of the proposal on Aboriginal and historical heritage was undertaken at the property. This chapter provides a summary of the methodology employed, including consultation, and the study findings. The full assessment is presented in *Annex G*. Objectives for the assessment can be summarised as follows:

- to consult with the local Aboriginal community and historical society as to the specific social value and regional heritage research context of the land;
- to identify, record and assess the significance of any heritage objects or places on the land;
- to assess the impact of the proposed development on Aboriginal and historical heritage values; and
- to prepare management recommendations for Aboriginal and historical values based on consultation with the local Aboriginal community and local historical society respectively.

In the preparation of the heritage assessment, it was necessary to consider the effects of the proposal on the cultural heritage component of the environment, under several pieces of commonwealth and state legislation, principally:

- *EP&A Act*;
- Part 6 of the *National Parks and Wildlife Act 1974*, in particular Section 90 and Section 84;
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*; and
- *Heritage Act 1977*.

12.2 METHODOLOGY

12.2.1 Desktop Investigation

Aboriginal Heritage

A review of relevant archaeological reports lodged in the DEC Archaeological Reports Catalogue at Hurstville was undertaken. In addition, a search of the Aboriginal Heritage Information Management System (AHIMS) Aboriginal Sites Database at DEC was undertaken within an area roughly four kilometres square, centred on the study area.

Historical Heritage

Historic place searches were made of:

- local historic Parish maps (incorporating online research into names appearing in the locality of the study area);
- Register of the National Estate;
- National Heritage List;
- State Heritage Register;
- State Heritage Inventory;
- RTA Heritage Register; and
- Bombala LEP Heritage Items Schedule 1990.

12.2.2 Consultation

Aboriginal Heritage

Aboriginal consultation was carried out in accordance with the DEC (2004) Interim Community Consultation Requirements guidelines and is a legal requirement for any assessment of Aboriginal heritage.

A local press advertisement was placed in the Bombala Times newspaper on 25 January 2006, inviting Aboriginal individuals or groups to write to ERM and register interest in being involved in consultation for the project. The proponent waited the required time for a response, and at the conclusion of this time no responses to this advertisement had been received.

Requests for lists of relevant Aboriginal groups or individuals for the Bombala area were also sent to the Register of Aboriginal Owners, Bombala Shire Council and the DEC, and a search of the National Native Title Tribunal was carried out on 16 January 2006. One active claimant application was found for the Bombala LGA, namely "Ngarigu". As the study area is freehold land, Native Title is extinguished on the land, however, this strategy enabled identification of a Traditional Owner group.

No relevant Aboriginal individuals were identified, however two local Aboriginal community groups were identified, namely Eden Local Aboriginal Land Council and the Ngarigu Native Title group. These two groups (along with four government authorities) were contacted by fax, letter or telephone and invited to be involved in the consultation for the heritage assessment. The two Aboriginal groups were also invited to provide one community representative to participate in the survey of the study area, and to comment on Aboriginal heritage issues. Consequently, investigation of potential non-archaeological Aboriginal heritage values was based on consultation with the Eden Local Aboriginal Land Council and the Ngarigu Native Title group.

Historic Heritage

Consultation was undertaken with the Bombala & District Historical Society to establish whether the property had any known heritage values.

12.2.3 Field Survey

A field surface survey was undertaken at the study area to identify and record any Aboriginal or historical archaeological sites. An archaeologist and two representatives from both the Eden Local Aboriginal Land Council and the Ngarigu Native Title group were present. Ground was visible over approximately 30% of the study area and extensive grass cover, generally up to 10cm in height, precluded visibility over the rest of the site. Consequently, the survey focused on the patches of visible ground, including ploughed ground, the drainage line, the trees, and any surface stone that may contain art or engraving.

12.3 ABORIGINAL ARCHAEOLOGICAL CONTEXT

12.3.1 *Regional Context*

The results of previous archaeological investigations undertaken in the south Monaro area of New South Wales are presented in *Annex G*. In summary, sites recorded in the region comprise stone artefact scatters (including hearths), isolated artefacts, rock quarries, burial sites, ceremonial grounds, stone arrangements and scarred trees. These sites have primarily been recorded in association with waterways.

Dating of sites along the south coast indicates that Aboriginal occupation of the region dates back as far as 21,000 years BP (before present), and continued through to the time of European contact.

12.3.2 *Predictive Assessment Of Site Location*

An analysis of existing literature, landforms, geological characteristics and the established pattern of local Aboriginal site occurrence indicates that stone artefact scatters, and to a lesser extent isolated artefacts, are the sites most likely to occur within the study area. These would most likely be found on level or gently sloping well drained land, in close proximity to water. Stone artefact scatters are unlikely to be dense as the water sources in the study area are not a major reliable source (they were dry at the time of the survey).

Scarred trees may occur, as some mature trees are present in the study area. Carved trees are extremely rare in the region and hence are unlikely to occur.

The presence of a drainage line and underlying basalt means that grinding grooves, engravings/art sites or other stone based sites may occur, although a lack of substantial stone outcrops would limit the potential of these sites to occur. The lack of stone overhangs and caves means that shelter sites (with art or deposit), whilst fairly common in the area, will not occur in the study area. Quarry sites may occur, due to the presence of a suitable stone source, although basalt is generally not the preferred stone source for Aboriginal stone artefacts.

Stone arrangements, bora grounds and earth circles are unlikely to be found in the study area because of its disturbed nature. Burials may be located along the drainage line, however the low-lying and hence flood-prone nature of the drainage line renders this possibility fairly unlikely. Furthermore, there is no indication that burials are more likely to occur in this area than in any of the surrounding localities.

It is conceivable that the nearby major, more reliable water courses, such as the Bombala and Coolumbooka Rivers, would have constituted the focus of activity and camping in the area and may have large archaeological sites. In contrast, the study area has only an ephemeral drainage line and would have been subject to relatively low-intensity activities dispersed over a wide area.

The disturbed nature of the site and past ploughing practices suggest that a field survey should be able to detect any large Aboriginal sites present in the study area. However, this high level of disturbance also implies that any such sites will not have remained intact, and any small sites originally present are likely to have been destroyed. Previous assessments and consultation with the Eden Local Aboriginal Land Council and Ngarigu Native Title Group have not identified any "non-archaeological" heritage values that could relate to the study area.

12.4 HISTORICAL CONTEXT

European settlement of Bombala is believed to have commenced in the 1840s, predominantly focussed on the northern side of the Bombala River. Historical landuse at the site has entailed agricultural activity including grazing and ploughing, along with quarrying in the southeastern corner of the site. There are a number of heritage-listed items in Bombala on the Australian Heritage Places (AHP) listings. However, most of these sites are located in the township of Bombala, approximately 6 kilometres northeast of the quarry site, and no items are listed within the study area.

12.5 RESULTS

Desktop assessment, stakeholder consultation and field survey found no Aboriginal or historical heritage sites or values associated with the property. No surface stone was located within the study area (only individual stones that had been brought to the surface by ploughing and exhibited impact marks). Some mature native trees occurred in the study area but none of these were scarred or carved.

Although surface evidence does not necessarily reflect subsurface archaeological content, the extensive bare eroded exposures in the study area provided a "window" into the archaeological content of the topsoil. In addition, it appears that the majority of the study area has been previously disturbed, and this disturbance combined with the reasonable visibility, indicates that artefacts from any large, intact Aboriginal heritage sites would have been located during the survey. The absence of artefacts from these locations is an indication of the archaeological paucity of the study area.

12.6 IMPACT ASSESSMENT

The proposed extension of the Bombala Quarry will involve the disturbance and removal of the soil profile and therefore potentially impact upon any unidentified subsurface artefacts within the extension area. However, as described in *Section 12.5*, the level of disturbance and visibility indicates that artefacts from any large, intact subsurface Aboriginal heritage sites would have been located during the survey, as would large historical heritage sites. Consequently there is expected to be no undetected subsurface Aboriginal or historical heritage material, and hence no impact of the proposal on heritage.

12.7 MITIGATION MEASURES

As no Aboriginal sites have been identified on the property, and the study area has minimal potential for subsurface heritage material, no further Aboriginal heritage work is recommended. A precautionary approach be adopted and the following mitigation measures be implemented:

- site personnel undertaking the proposed construction works be instructed that under the *National Parks and Wildlife Act 1974,* it is an offence to knowingly deface, destroy or damage, or permit the defacement, destruction or damage of, an Aboriginal place or relic without first having the written consent of the Director-General; and

- if any Aboriginal heritage material is discovered, works must cease in the area, and DEC and the relevant Aboriginal groups must be informed. Works must not continue without the written consent of the NSW DEC.

13 TRAFFIC AND ACCESS

This chapter describes the existing traffic conditions around the quarry site, the transport routes currently used, the changes to these resulting from the proposed quarry expansion and an assessment of the potential impact to existing traffic conditions in the local and wider area.

13.1 EXISTING TRAFFIC AND ROAD NETWORK CONDITIONS

13.1.1 Surrounding Road Network

The quarry site is located at the junction of High Lake Road and Pipe Clay Springs Road, which runs along the western and southern boundaries of the site respectively. Both Pipe Clay Springs Road and High Lake Road are single lane unpaved rural roads exposed to minimal traffic consisting primarily of rural residential traffic and quarry site personnel and haulage vehicles associated with the existing site operations. Both roads are council roads and are speed limited to 60km/hr. High Lake Road meets the Monaro Highway at a t-junction intersection approximately 1km to the north of the site. Clay Pipe Springs Road continues to the south-east, meeting Mount Darragh Road approximately 2.5km from the site.

There are three residences along High Lake Road. The closest residence, "*Oxley*" is approximately 50 metres from the western boundary of the property (800m from the quarry), with the remaining residences, "*High Lake*" and "*Gadara*" increasingly further away. The nearest of the five residences on Clay Pipe Springs Road, "*Inglewood*", is approximately 1km from the quarry.

The town of Bombala is located at the crossroads of the Monaro Highway and Coolumbooka Road (a continuation of Mount Darragh Road), approximately 5km to the south-west of the site. As population of the surrounding area is relatively small, with a small number of properties located along these roads, traffic volumes are considered to be low within the vicinity of the quarry site.

The Monaro Highway is a state road and is the major transport route running between Bombala and Nimmitabel (via Bibbenluke), approximately 45km to the north. The highway is a two-lane paved road, with sealed shoulders, lane markings and speed and hazard signage. The Monaro Highway continues south from Bombala and crosses the Victorian border into the Victorian high country. To the north the Monaro Highway passes on through Nimmitabel to Cooma and then towards Canberra or Jindabyne.

Mount Darragh Road is a regional road and is the main thoroughfare between Pambula, approximately 80km to the east on the NSW south coast, and Bombala, via Coolumbooka Road. Mount Darragh Road is a sealed two-lane road with sealed shoulders, has lane markings and speed and hazard signage.

13.1.2 *Traffic Volumes For Surrounding Road Network*

Traffic on the Monaro Highway generally comprises local traffic between the towns and rural areas along it's route and trucks transporting goods and materials between NSW and Victoria.

The RTA undertakes regional traffic surveys of classified roads, town and city roads and unclassified roads on a three year repeating cycle. This involves recording the total traffic numbers over a 12 months period at specified traffic counting stations ("station")on these roads to provide Annual Average Daily Traffic (AADT) values. Bombala falls within the southern region and results of traffic counts on the Monaro Highway (State Highway 19) and Mount Darragh Road (Main Road 91) are listed in the "*Traffic Volume Data for the Southern Region 2003*" (RTA, 2003). Traffic volume data for representative stations is summarised below and presented in *Table 13.1*. Traffic counting stations are indicated on *Figure 13.1*.

Results for the station on the Monaro Highway, 0.5km north of Mitchell Street, Bombala (station 08.177, approximately 4.5km south of High Lake Road) indicated an AADT of 954 vehicles in 2003 travelling in either direction. For the same period at the station just south of Ando Road (station 08.072) approximately 18km north of the site, the AADT was 985.

Therefore the annual daily traffic volume on the Monaro Highway passing the High Lake Road intersection is estimated to be between 954 and 985 for the year 2003. It is considered that, based on traffic volumes for previous study years, there will be no significant change in the AADT for years following 2003.

Results for the station on Monaro Highway, just north of Maybe Street (Main road 91) in the centre of Bombala (station 08.179) indicated an AADT of 2556 vehicles for the year 2003. This is the main intersection within the town of Bombala. The station on Mount Darragh Road (station 08.199), approximately 1km from Cathcart and 11 km from Pipe Clay Springs Road recorded an AADT of 336 for the year 2003. This is considered to be representative of traffic volumes along this road to and from Bombala.

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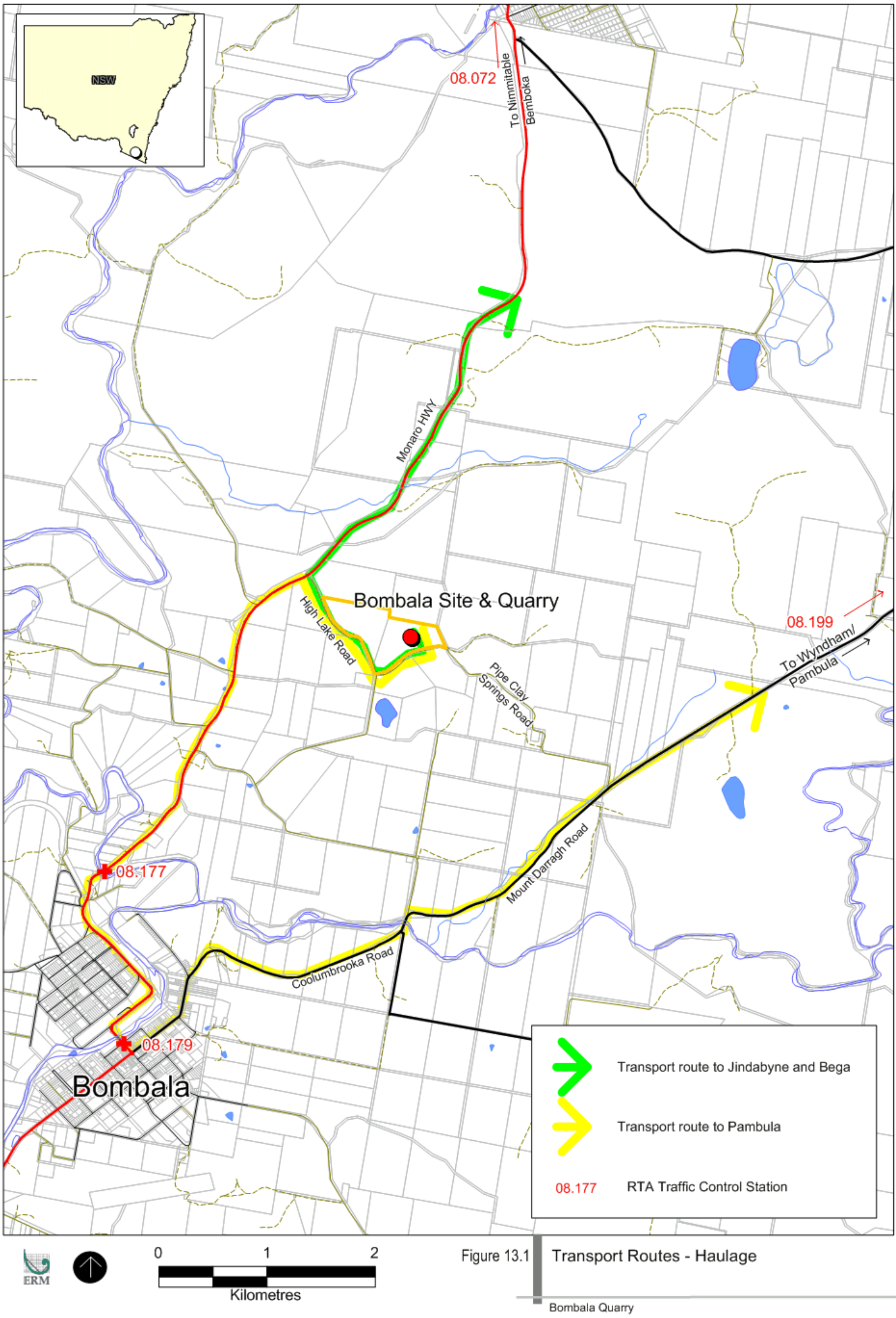

Figure 13.1 Transport Routes - Haulage

Bombala Quarry

13.1.3 *Existing Quarry Traffic Routes and Volumes*

Traffic accessing the quarry site includes haulage trucks, transporting product to Boral's concrete plants in Pambula, Narooma, Bermagui, Jindabyne and Bega, and site workers personal vehicles. Truck movements are generally in the morning and mid-afternoon, depending on travel times between the site and destination.

Haulage Routes

The haulage route used for transporting product from the site under existing operations is via Clay Pipe Springs Road and High Lake Road to the Monaro Highway. At the highway, trucks will follow one of the following routes, depending on where they are transporting the product:

- turn right, and travel north via Nimmitabel, and then on to the Boral plant at Jindabyne via the Snowy Mountains Highway and Cooma;
- turn right, and travel north on to the Boral plants at Bega, Bermagui and Narooma via the Snowy Mountains Highway and Bemboka; or
- turn south, travelling through the town of Bombala and then along Coolumbooka Road and Mount Darragh Road to the Boral plant at Pambula.

The existing haulage routes and surrounding road network are shown in *Figure 13.1*.

Existing Traffic Volumes

There are an average of eight visits of heavy vehicles to the site per day (16 truck movements) during operation to remove the product from the site on Mondays to Fridays. This includes:

- six visits (two visits each by 3 trucks) by a truck and dog semi trailer (48 tonne gross, 16 tonne tare); and
- two visits by rigid tri-axle truck (42.5 tonne gross, 14.5 tonne tare).

There are also limited truck movements on Saturday mornings, which, for the purpose of approximating weekly truck movements for the quarry site, will be estimated at 8 truck movements per Saturday.

Approximately 40 percent of the product extracted from the Bombala quarry site is directed to Boral's Pambula batching plant, which is the largest of Borals operating plants on the NSW south coast, with 30 percent of the product directed to Jindabyne and the remaining 30 percent directed to the smaller south coast plants at Bega, Narooma and Bermagui.

At this ratio, there are 6.4 truck movements through Bombala and onto Pambula via Mount Darragh Road per weekday and 3.2 per Saturday (35.2 per week) and 9.6 truck movements per weekday and 4.8 per Saturday (52.8 per week) along the Monaro Highway to the Snowy Mountains Highway junction, where truck movements are split evenly to Jindabyne and Bega.

Based on the traffic volume data for these respective roads and haulage truck movements to and from the quarry site (refer *Table 13.1* below), estimates of Boral's contribution to the weekday traffic volumes on roads along the haulage route are considered to be minimal, with Boral trucks accounting for less than half a percent of the total traffic volume travelling through Bombala town centre (based on 2003 traffic counts).

Table 13.1 Traffic Volumes for Haulage Routes and Boral Contribution

Station	Location	2003 AADT[1]	Boral Truck Movements (trucks/day)	Boral Contribution[3] (%)
Haulage route to Pambula				
08.177	Monaro Hwy (SH 19), 0.5km north of Mitchell St, Bombala	954	6.4	0.7%
08.179	Monaro Hwy (SH 19), 0.1km north of Maybe St (MR 91)	2556	6.4	0.3%
08.199	Mount Darragh Road (MR 91), 1km west of Cathcart	336	6.4	1.9%
Haulage route to Jindabyne and Bega				
08.072	Monaro Hwy (SH 19), 0.1km south of Ando Road, Ando	985	9.6	1.0%

1 Source: "Traffic Volume Data for the Southern Region 2003" (RTA, 2003)
2 Based on existing quarry operations.
3 In the absence of more recent traffic data, these values are a function of 2003 AADTs and existing quarry related truck movements.
Abbreviations: AADT – Annual Average Daily Traffic; SH – State Highway; MR – Main Road

There are generally between three and five site workers on site during normal operations. These consist of the Boral Production Manager and the processing contractors, Rye Group. Vehicle movements associated with site personnel include an average of three cars accessing the site during the day.

Under the current quarry consent and Rye Group's license, the quarry will operate for six months of the year. Reduced numbers of truck movements may occur outside of the six month operating period to transport stockpiled product from the site on an ad hoc basis.

Existing Traffic Impacts and Controls

Using the existing haulage route, trucks travelling to and from the site along High Lake Road will pass within 150m of the Oxley property and, while turning at the High Lake Road and Clay Pipe Springs Road intersection, will come within 150m of the High Lake property.

Discussions with the owners of the *High Lake* property have commented that truck noise and dust stirred up from the unsealed intersection and roads can sometimes be an issue, particularly when dry and windy with regards to dust emissions. Similar noise and dust impacts would be expected at the *Oxley* property. More detailed assessment of traffic impacts with regards to noise and air quality impacts is included in *Section 10* (air quality) and *Section 11* (noise).

High Lake Road and Clay Pipe Springs Road are unpaved minor roads and can expect to be subject to some wear and tear over time resulting from their continued use as part of the site transport route.

Specific controls for Boral trucks travelling to and from the site include:

- Imposed speed limit of 40km/hr on the unsealed High Lake Road and Clay Pipe Springs Road;
- No engine retarder or exhaust braking allowed on High Lake Road or Clay Pipe Springs Road;
- Speed limit of 10km/hr within the quarry site; and
- Warning signs posted 100m meters to the north and south of the intersection of High Lake Road and the Monaro Highway.

Loading and unloading of equipment and materials will be undertaken at the site and there is adequate off-street parking within the site to ensure no trucks or vehicles are parked on road verges.

All Boral drivers carry appropriate current drivers licenses and are aware, of and adhere to, normal road safety rules.

13.2 PROPOSED CHANGES TO QUARRY RELATED TRAFFIC MOVEMENTS

The current operational phase of work allows extraction and processing of 50,000 tpa and occurs for six months of the year. Under the proposed expansion the quarry will operate for 12 months of the year, with approval to extract 100,000 tpa. As a result, there will be no net increase in truck movements per day, however truck movements will occur throughout the year.

Trucks will use the existing haulage routes as described above. Speed limits and controls on exhaust braking would continue to be implemented.

All haulage vehicles will continue to exit the site onto Pipe Clay Springs Road to High Lake road and then to the Monaro Highway. Due to the expansion footprint, the site access point will be relocated within 3 years to approximately 400m to the west. No other route will be used for the movement of material off site.

13.3 ASSESSMENT OF IMPACTS

The contribution of the existing haulage movements to and from the site is considered minimal. Boral trucks represent:

- 1.0% of weekday traffic on the Monaro Highway between High Lake Road and the Snowy Mountains Highway junction;
- 0.7% of weekday traffic on the Monaro Highway between High Lake Road and Bombala;
- 1.9% of weekday traffic on Mount Darragh Road between Cathcart and Bombala; and
- Less than half a percent of weekday traffic through Bombala town centre.

As there will be no net daily increase in traffic, the impact of the changes to site related traffic resulting from the proposed expanded quarry operations to existing traffic conditions in and around the quarry site is considered to be negligible.

The increase in production on an annual basis means that the quarry will be operating for the full 12 months of the year, compared to six months under existing operations. There will be no additional vehicle movements on a daily basis, however vehicle movements will approximately double annually, resulting in some additional wear and tear on haulage roads.

As the quarry activities contribution to traffic in the area is considered to be minimal, the net increase in these impacts is not considered to be significant.

13.4 MITIGATION MEASURES AND SAFEGUARDS

The following mitigation measures are already in practice and will continue to be implemented to minimise impacts on traffic and access requirements in the surrounding area during operation:

- speed will be limited to 40km/hr on High Lake Road and Clay Pipe Springs Road;
- vehicle movements will be restricted to the minimum necessary to complete the work;
- materials will be delivered and removed from site during standard working hours;
- vehicles will be loaded and unloaded on site;

- vehicle/plant movements will be restricted to dedicated lay-down areas previously cleared of vegetation;
- materials and equipment will be stored securely on site where appropriate to minimise vehicle movements; and
- the "trucks entering" signs on the Monaro Highway will be retained.

As the impact to the existing road network is not expected to be significant as a result of the proposed expansion it is not considered necessary to provide any road improvements to existing roads at this time. If changes occur during the lifetime of the proposed works that significantly affect or impact traffic in the vicinity of the quarry, additional traffic control measures will be Considered following consultation with Bombala Council and/or the RTA.

14 *VISUAL AMENITY*

This visual assessment determined the potential impacts associated with operation of the proposed upgrading/expansion of the Bombala Quarry within the local and regional landscape setting.

14.1 *INTRODUCTION*

The assessment has been based upon an analysis of the following factors:

- impact to visual amenity – an assessment of the existing and proposed quarry operations and their impacts to visual amenity of identified viewer locations;
- visual absorption capacity – a factor of site visibility and the degree of contrast between the proposal and the local and regional visual landscape;
- visual sensitivity – a measure of the level of concern attached by a user group to a change in the landscape character. Visual sensitivity is based on the number of people affected, land use and distance of the viewer from the proposal; and
- the nature and extent of rehabilitation and landscape mitigation measures.

14.2 *STUDY METHODOLOGY*

The tasks involved in undertaking the assessment are summarised below:

- a review of the local landscape setting;
- identification and description of significant viewer locations;
- an assessment of the visibility of the proposal from each significant viewer location;
- determination of the absorption capacity of the proposal, based on visibility from each significant viewer location in the context of the local and regional setting;
- assessment of the visual sensitivity from each significant viewer location; and
- determination of the likely visual impacts of the proposal, based upon an analysis of the visual absorption capacity and visual sensitivity of each significant viewer location.

14.3 EXISTING ENVIRONMENT

14.3.1 *Regional And Local Context*

Bombala is a small rural service village located in the far south east corner of New South Wales approximately 81 km south of Cooma. It currently has a population of around 1500. The main road from Cooma to the coast does not pass through Bombala and therefore the town has remained relatively undeveloped. The majority of the area has been cleared and mainly consists of agricultural activity including sheep and beef cattle, vegetable growing, trout fishing, and timber milling (Bombala Council, 2006).

Bombala Shire is close to major inter-regional transport routes from Gippsland to Canberra and from the Snowy Mountains to the sea.

The overall visual character of the region relates to the scenic qualities of the variable landscapes including landscapes from granite boulder outcrops, heath lands, upland swamps, tall old forests, stunted subalpine woodlands and moist fern-filled gullies. The region contains many densely vegetated state forests and national parks including South East Forest National Park.

14.3.2 *Visual Description Of Site*

The visual catchment of the site is defined by High Lake Road to the west and Pipe Clay Springs Road to the south. The area is generally an undulating rural landscape characterised by agricultural grazing land and rural residential development.

The majority of the property is rural grassland with large clusters of vegetation/trees visible toward the middle of the property and smaller vegetation clusters located in patches throughout the remainder of the property. The existing quarry is located on the eastern portion of the property, with the immediate surrounding area used for stockpiling and truck loading and turning. The quarry is open to the north and has an approximate footprint of 0.6ha, while the area of operations currently in use, including stockpile and access areas, is estimated to be about 4.0ha.

Visual elements of the existing quarry operations include the following items, landforms and activities:

- the quarry pit itself;
- product and tailings stockpiles, generally up to 4 m above in height;
- earth-bunds and stockpiles of overburden, including mounds placed around the site for specific purposes, such as earth piled around the edge of the pit, a 6m earth-bund adjacent to the processing plant and a 3m earth-bund near the High Lake Road and Clay Springs Pipe Road intersection;

- two small sites sheds located approximately 40m to the south and 30m to the northeast of the existing pit. The sheds are small demountables used as a site office and lunch shed respectively;

- unsealed and disturbed areas of the site including access roads and truck parking and turning areas in the western half of the property;

- dust associated with processing and crushing, loading and unloading of materials, stockpiles and unsealed surfaces and movement of trucks on unsealed roads; and

- on site plant and equipment, including crushers, screens, excavators, loaders and haulage trucks. At present, the primary jaw crusher is located in the pit, with the secondary crushers and screens adjacent to the pit at ground level. Haulage trucks transporting product off site travel along High Lake Road and Clay Pipe Springs Road.

Surrounding properties/land use appears to be visually similar to the subject property with residential dwellings seen on large tracks of mainly undeveloped grass covered land with pockets of dense vegetation.

14.3.3 Potential Viewer Locations

Following inspections of the site and surrounds in November 2005 and February 2006 a number of locations were identified as potentially sensitive viewer locations. These include both residential properties and areas that are exposed or elevated above the quarry site. The main sensitive locations can be seen in *Figure 14.1* and are identified are as follows:

- Viewer Location 1. Martin- McInnes residence (*Oxley*), approximately 700m west of the quarry along High Lake Road;

- Viewer Location 2. Helmer's residence located (*High Lake*), approximately 800m southwest of the quarry on High Lake Road;

- Viewer Location 3. Cobana Bed and Breakfast, 2km to the north on the Monaro Highway;

- Viewer Location 4. along Pipe Clay Springs Road and High Lake Road; and

- Viewer Location 5. along the Monaro Highway to the north, from between 0.5km and 1.5km northwest of the High Lake Road intersection.

Views from these locations towards the site generally include the disturbed area of the site comprising the quarry and stockpile areas, grass covered undeveloped land, drainage of Shoemakers Creek running from the northern part of the site to the Monaro Highway, and pockets of vegetation mainly to the west and south of the quarry.

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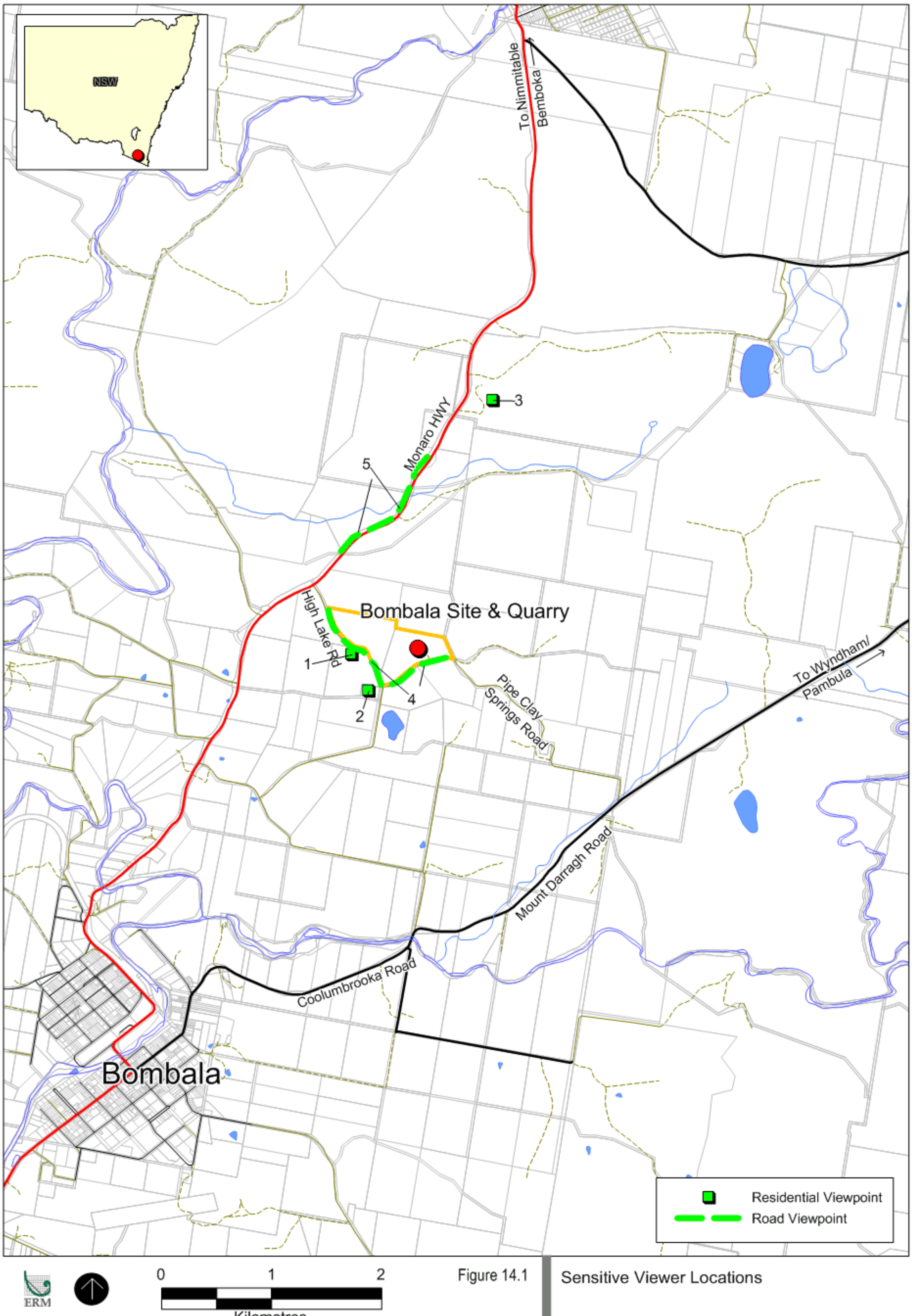

Figure 14.1 Sensitive Viewer Locations

Bombala Quarry

14.4 OVERVIEW OF PROPOSED DEVELOPMENT AND SITE VISIBILITY

The proposed expansion of the quarry will occur in stages and extend further east almost to the eastern property boundary, further south almost to the southern property boundary and slightly west of the current operations footprint. The quarry expansion is described in detail in *Section 3* and a brief summation of the major expected visual changes to the quarry expansion by stages follows. The purposed expansion will take place in stages over a period of between 16-20 years dependent on sales of the final product. Major expected visual changes and the approximate corresponding timeframes are described in the following sections.

Quarry Footprint

The quarry footprint will increase gradually over time as the resource is extracted. *Figures 3.2 to 3.6* show site plans of the existing quarry footprint and the expected quarry footprint at Stages 4, 6, 8 and 10. As the quarry will be below the surface level of the surrounding terrain, the changing area of the quarry will be visible only from viewer locations elevated above the quarry and from the north, looking into the open side of the quarry.

Stockpile And Access Areas

The present location of the stockpile areas will remain unchanged until approximately year 5. At this time the quarry will extend to the south, restricting vehicle access between the access to the quarry and the area currently used for stockpiling and quarry pit access. The new stockpile area will be laid down to the west of the quarry pit with pit access via a newly constructed ramp adjacent to this area. This area would remain in use as a stockpile and access area for the duration of quarrying activities on the site. Earthbunds used for noise attenuation would be relocated as the quarry expands and would provide visual screening from the site operations.

Location Of Plant And Equipment

Following staged expansion of the quarry to a point where there is adequate free space on the quarry floor, the secondary crushers and screens would be moved to the southern corner of the quarry pit at RL809m. This is expected to be prior to Stage 4 of the expansion plan after approximately 5.8 years. The entire processing plant would then be relocated to the eastern corner of the pit prior to Stage 6 (10.8 years), still at RL809. Prior to Stage 8 (12.7 years) the processing plant would be relocated a final time back to the southern corner of the pit at RL798. Mobile plant and equipment would still operate above ground.

Vegetation Clearing

The expansion of the quarry pit and relocation of stockpile areas will not result in significant removal of vegetation. A small portion of the existing vegetation (approximately 0.52 ha) would be removed from the southern part of the site as the quarry expands in this direction during Stage 3. However, these trees are not considered to act as a significant visual screen for any of the identified sensitive viewer locations.

14.5 SITE VISIBILITY

An assessment of the site visibility of the quarry from each of the viewpoints is provided below.

Viewer Location 1

This viewpoint is a residential property approximately 700m to the west and 20m above the operating area of the quarry. The existing view to the site from the Martin-McInnes residence is obscured partly by trees on the Martin-McInnes property as well as on the western part of the site. The view towards the site includes the grassed and vegetated areas on the western half of the property, with the disturbed areas of the quarry beyond. Haulage trucks travelling to and from the site would pass close to this residence along High Lake Road.

Changes in the view of the quarry from this site include the relocation of the stockpile area to the near side of the pit and the expanded pit itself. The processing plant will be located in the pit and therefore not visible from this location. The changes to the visual amenity from this viewpoint resulting from the proposed expansion are expected to be minimal.

The following photographs (*Photographs 10.1 to 10.3*) show the existing view of the quarry from selected viewpoints as described above.

Photograph taken from within site boundary, adjacent to McInness driveway

Photograph 14.1 Site From Viewer Location 1 – McInnes Residence*

Viewer Location 2

Viewpoint 2 is a residential property approximately 800m to the south-west and 30m above the quarry operations, however the landform extending towards the site from the residence is generally level, before dropping away to the north-east resulting in the view of the site being is largely obscured. Additionally, a 3m earth-bund has been placed within the near corner of the quarry property to minimise noise at this residence, further blocking the view of the quarry pit and activities. Haulage trucks travelling to and from the site are visible as they turn at the High Lake Road and Clay Pipe Springs Road intersection.

The view of the proposed expanded quarry site would remain partially hidden from this location by landform and vegetation. However the relocation of the stockpile area and the larger quarry pit footprint is expected to become increasingly visible from this viewpoint.

Viewer Location 3

This location is approximately 2km to the north of the site. From this distance the area of disturbance on the site is small relative to the surrounding area and there are a number of copses of trees and minor ridges within or near to the line of sight to the quarry from this location.

The distance from this viewpoint to the site, as well as the existing terrain and vegetation screening would indicate that any changes to the quarry site as a result of the proposed expansion would go relatively unnoticed from this viewer location.

Viewer Location 4

This viewer location takes in the sections of High Lake Road and Clay Pipe Springs Road that adjoin the western and southern boundaries of the site respectively and is specific to vehicles or people travelling along these roads. From these sections of road, particularly near the site access point on Clay Pipe Springs Road, where the quarry, stockpile area and disturbed/unsealed areas of the site are quite visible. The quarry is less visible along High Lake Road, with vegetation and landform partially or fully blocking the view.

The expected visual changes will include clear views of the new stockpile area and pit access. The majority of vegetation on the southern corner and western parts of the site will remain, providing partial screening of the operations to the approach of this viewer location from each direction. As this viewer location is primarily used for small volumes of local traffic, this is considered to be a minimal increase to the existing visual amenity of the site.

Photograph 14.2 Site From Viewer Location 4 – Pipe Clay Springs Road

Viewer Location 5

This location includes in a 1km stretch of the Monaro Highway, approximately 1km to 2km from the site and is specific to vehicles or people travelling along the highway. Views of the site range from below the elevation of the site to roughly level with the site and include the quarry pit and some stockpile areas and disturbed areas of the site. The quarry is relatively small in comparison to the surrounding landform and is surrounded and partially hidden by vegetation.

Changes in the view from this location will include the relocation of the stockpiles and, to an extent, the expansion of the quarry pit. There will be minimal vegetation removed from the northern portion of the site and the expanded quarry will remain partially screened. The visual impact of the proposed quarry expansion on this viewer location are considered to be low.

Photograph 14.3 Site From Viewer Location 5 – Monaro Highway

14.6 IMPACT ASSESSMENT

14.6.1 *Overview Of Impacts*

The proposed expansion of the quarry is not considered to significantly alter the existing viewscape. The proposal forms an expansion to an existing operation, with elements of the quarry becoming increasingly visible to a small number of receptors, in particular, Viewer Location 2. Retention of much of the original vegetation and landscape features wherever possible has been included in the quarry design to minimise potential impacts upon the visual amenity of the locality.

14.6.2 *Visual Absorption Capacity*

The visual absorption capacity of the development can be expressed as the level of visual contrast (i.e. form, shape, pattern, line, texture and colour) of the proposed development to the visual setting within which it is placed.

A high visual absorption capacity will occur if there is minimal contrast and a high level of integration between the proposal and the existing landscape setting. Conversely, a low visual absorption capacity will occur when the proposal has a high visual contrast to the surrounding landscape and there is little or no visual screening, resulting in a more extensive visual impact.

The proposed expansion of the quarry is considered to have a high visual absorption capacity. The proposal forms an expansion of existing operations and therefore does not add a new landscape element into a predominantly rural setting. Surrounding undulating landform and vegetation on and off the site provide partial screening and hence, enhancing the visual absorption capacity of the site.

14.6.3 *Visual Sensitivity*

Visual sensitivity is a measure of the level of concern attached by surrounding land users to a change in the existing landscape. It is based largely upon visibility and distance from critical viewing areas, but is also influenced by land use, the current degree of exposure to the style of development proposed and the length of viewing time.

Generally the sensitivity of a user group will increase the closer they are to a critical change in landscape character. Similarly the greater the viewing time or period of exposure the more critical the user group will be to the change. The existing land use is also important in determining the visual sensitivity of each key viewer location. Residential or recreational land uses generally have higher sensitivity to a change in landscape character than for example an industrial land use, as they place a greater emphasis on scenic qualities and visual amenity.

The most sensitive receivers are considered to be the rural residential properties in close proximity to the site. Viewer Location 2 in particular, will have increasing visibility of the operations. Vegetation and landscaping have been incorporated into the design to shield the operations wherever practicable.

Local traffic on Clay Springs Road will experience passing views of the quarry operations,. The existing quarry has been part of the local viewscape for around 50 years and local road users are not expected to be visually sensitive to the continues operations. Traffic on the Monaro Highway will receive only passing glimpses of the quarry and are not expected to be sensitive to continued operations.

14.7 *MITIGATION MEASURES*

Minimal visual impacts are expected to occur during the operation of the proposed upgrade. The following mitigation measures will be implemented to further minimise the extent of impacts upon visual amenity for the proposed works:

- plant and equipment will be progressively located in the pit;
- stockpiling will be carried out within the areas specified, i.e. no stockpiling outside of designated areas;
- the contractor will maintain the site in an orderly manner and will minimise the spread of materials stockpiles, waste and vehicle parking;
- clearing of vegetation will be kept to a minimum, with trees in the proposed stockpile area to be retained;
- appropriate landscaping (such as seeding of stockpiles) will be initiated to screen the facility from sensitive viewer locations as much as is practicable; and
- progressive rehabilitation will be carried out opportunistically, with site rehabilitation to be undertaken on cessation of quarrying activities.

14.8 CONCLUSION

Due to the quarry operations existing contribution to the visual catchment of the site and surrounding area, the proposed expansion will not be foreign in this landscape. The proposed expansion is proposed to occur in stages incrementally over the next 16-20 years, therefore the visual impacts are expected to occur gradually with no large significant impact occurring at one given time.

As such it is expected that continual maintenance of the vegetative cover and strategic stockpiling and revegetation in the viewshed of particularly sensitive receptor areas will minimise visual impacts.

Due to the above it is considered that overall operations will have low visual impact on the surrounding area.

15 WASTE

This chapter examines the wastes and resources generated during the expansion of the existing quarry. Opportunities for waste recycling and reuse are examined and methods of waste disposal are outlined.

15.1 INTRODUCTION

Under the *Waste Avoidance and Resource Recovery Act 2001*, Resource NSW a state government agency was charged with developing a statewide strategy for waste avoidance and resource recovery. The aims of this strategy are:

- to minimise the consumption of natural resources;
- to encourage resource recovery, including reuse, recycling and energy recovery;
- to provide for the continual reduction in waste generation; and
- to minimise the final disposal of waste.

As part of the strategy the State Government recognises the need to reduce waste as a means of promoting ecological sustainability. The proposed expansion of the quarry will incorporate waste reduction strategies in accordance with the NSW Waste Management hierarchy: avoid, re-use, recycle/reprocess, dispose.

15.2 IDENTIFIED WASTE STREAMS

The existing site operations and proposed expansion are described in *Section 2* and *Section 3* respectively. There will be minimal changes to the day to day operations on-site, particularly with regard to waste management, with the major change being the extending the operations throughout the year. The proposed development will involve the handling and production of waste from a limited number of sources, including:

- vegetative matter from minor clearing;
- overburden from the extraction works;
- tailings from the processing plant;
- used oils, filters and machinery parts;
- sewage waste/wastewater from portaloos; and
- general office and administrative waste.

15.3 MANAGEMENT PROCEDURES

15.3.1 Non Liquid Waste

Excavated Material

Based on the historical uses of the site for quarrying and agricultural purposes, the overburden on-site is considered to be inert waste, in accordance with *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non Liquid Wastes* (EPA, 1999), as it can be considered as 'virgin excavated natural material that is not mixed with any other waste and that has been excavated from an uncontaminated area. Overburden and topsoil removed during quarrying will be used in rehabilitation of previous strips, as earth bunds/barriers for noise reduction and/or stockpiled for later use within the final landform of the quarry pit in later phases of operation. Prior to reuse of materials for rehabilitation purposes, it is recommended that stockpile samples are collected and analysed to confirm its suitability for reuse on-site.

Processing Waste

There will be no waste generated during processing as all fractions and by-products will be stockpiled for later use. Tailings and fines generated in the process will be used for roadbase.

Domestic Waste

'Domestic' waste comprises everyday waste such as paper, aluminium cans, plastics, packaging and other material generated by on-site staff. Where practical, collection bins will be provided for recyclables (including paper, cardboard, glass bottles and aluminium cans). General domestic waste such as food and paper waste generated on-site will be collected and transported off-site for appropriate disposal by quarry staff.

Green Waste

Green waste comprises vegetation clearance material and vegetation clippings. Vegetation stripped during clearing may be re-used to rehabilitate different areas of the property including as a vegetative cover on stockpiles.

15.3.2 Liquid Waste

Effluent

Portable toilets are used on site. Effluent collected in the site portable toilets will be collected and disposed of by a sub-contractor who will remove the effluent under their own liquid trade waste agreement.

Lubricants

Small quantities of waste such as greases and other lubricants may be generated during operation of the quarry. To prevent these waste types from posing a potential risk to the environment, any waste of this type generated will be collected and stored in designated drums for off site disposal or re-use wherever possible. These wastes are classified as Group B liquid wastes under the EPA guidelines (EPA, 1999).

Any waste oils accumulated during on-site maintenance of heavy machinery will be disposed of by the contractor under their license agreement. Waste oil contractors and maintenance and refuelling contractors will be required to have spill response protocols in place. Spill response equipment will be stored at the site in the event of unforeseen spills due to hose breaks and similar exceptional events.

15.4 Mitigation Measures And Safeguards

Mitigation measures to be implemented to minimise wastes generated during quarry operations are outlined below:

- Wherever possible wastes will be separated into recyclable and non-recyclable materials and stored in appropriate containers;
- Containers will be collected by a licensed waste contractor, as appropriate, or removed by quarry staff on a regular basis and transported off-site for disposal to a licensed landfill or recycling facility;
- all waste disposal will be in accordance with the *PoEO Act 1997* and the guidelines recommended in the EPA (1999) Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes; and
- waste management will be incorporated into the EMP which will outline measures to avoid waste generation and promote reuse, recycling and reprocessing of waste where possible during construction; emergency and contingency plans; and training for on-site staff on the contents of the EMP.

16 HAZARD ASSESSMENT

This chapter provides an assessment of the quarry site operation against SEPP 33 and describes the potential hazards associated with the quarry site and ongoing operations and discusses safety measures for addressing these hazards.

16.1 ASSESSMENT OF OPERATIONS AGAINST SEPP 33

State Environmental Planning Policy (SEPP) No 33: Hazardous and Offensive Development links the permissibility of an industrial development proposal to its safety and environmental performance. An assessment of potential hazards and risks associated with the proposed extension/expansion of the quarry has been undertaken n accordance with SEPP 33.

SEPP 33 relates to "potentially hazardous" or "potentially offensive" developments, including extractive industries such as quarries, and requires specified matters to be considered by consent authorities when assessing such applications. SEPP 33 defines 'hazardous materials' as substances falling within the classification of the Australian Code for the Transport of Dangerous Goods by Road or Rail (Federal Office of Road Safety).

Raw materials to be extracted and stockpiled on the site are not classified as hazardous substances under the Code. Diesel fuel and lubricating oil are stored at the site with secondary containment and spill kits. Both diesel and lubricating oil are combustible liquids (classes C1 and C2 respectively) and are not classified as hazardous substances under the Code. Given there will be no hazardous materials as defined by the Code stored on site, the proposed development is not classified as potentially hazardous and is not affected by SEPP 33.

The environmental assessment carried out as part of this EIS and this qualitative assessment of hazards and risks associated with the proposal indicate that the proposed extension to the Bombala Quarry would not present a significant risk or offence to the environment or public health and is therefore neither potentially hazardous nor offensive.

16.2 IDENTIFICATION AND ASSESSMENT OF HAZARDS

Following an inspection of the environmental features of the site and an assessment of the quarry operations (see *Chapter 2* for more details), the following general site and operational hazards have been identified:

- trip hazards resulting from uneven surfaces;
- fall hazards associated with the quarry pit, including pedestrian and vehicle safety;
- operation of plant and equipment on-site;
- transport, storage and handling of dangerous goods/fuels and lubricants;
- exposure to elements (sun, cold);
- dangerous or irritating animals (insects, snakes, etc);
- road safety;
- blasting;
- landslip;
- bushfire; and
- flooding.

These issues and others are discussed in more detail below, along with recommended safety or mitigation measures.

Management Of Risks Associated With General Site Hazards

The following measures are recommended for managing general site and operational hazards:

- induction into site health and safety plan and environmental management plan for all quarry personnel and site visitors;
- use of high visibility vests, hardhats, appropriate footwear and clothing;

- maintenance of earthbunds around quarry pit to keep people and vehicles from the edge of the quarry wall;
- triggers for stopping work, i.e. dangerous temperature or climatic conditions (e.g. snow);
- limit access to areas not used for quarry operations, as appropriate; and
- reverse warnings on plant and equipment and adherence to site speed limits and warnings.

Transport, Storage And Handling Of Dangerous Goods/Fuels And Lubricants

A 10,000L diesel AST is present on site for the refuelling of vehicles/machinery. The tank is enclosed in a 20 foot storage containment to include internal bunding in the case of a spill. Fuel is delivered via a Mobil or Caltex tanker once per week. Any spills that occur on site would be contained in the bunded area and the fuel cleaned up and removed.

Road Safety

Road safety hazards include the use of heavy vehicles for transporting product from the site; driving in adverse conditions (at night or in heavy rain); driving on windy roads, driving on slippery or icy roads; and animals on the road.

The following mitigation measures are already in force and will continue to be implemented to minimise impacts on traffic and access requirements in the surrounding area during operation:

- speed will be limited to 40km/hr on High Lake Road and Clay Pipe Springs Road;
- materials will be delivered and removed from site during standard working hours; and
- the "trucks entering" signs on the Monaro Highway will be retained.

Blasting

Hazards associated with blasting activities include the storage and use of explosives and the triggered blast itself, including flying debris, landslip and shockwave impacts. Blasting events will be undertaken by a licensed explosives contractor, Orica, on a six monthly basis, with two scheduled blasts over a two week period. Events are carefully coordinated with the Quarry Production Manger and safe work instruction and Job Safety Risk Analysis (JSRA) are prepared for each event. No explosives are stored on the site and explosives used on site for blasting of rock faces are only handled by Orica.

Landslip

The land slip potential of the site is limited to failure of excavated soil profiles within the quarry, along elevated portions of the access road and within the batters of the acoustic bunds. The potential hazards of land slip to the quarry site will be ameliorated by drainage control measures to divert surface runoff away from excavated areas, and the use of appropriately designed batters during extraction and bund construction. The excavated walls of the proposed quarry have been designed with maximum final gradients of 75% (vertical to horizontal) to reduce the susceptibility of failure and land slip. Revegetation of benches will be undertaken as practical to further stabilise the quarry site.

Bushfire

The site and surrounding areas are largely cleared agricultural land with isolated stands of shrubs and trees. Of the 42ha site, approximately 14ha is woodland and the remainder of the site consisting of disturbed areas related to quarrying activities (4ha) and grassland or tilled soil. Consultation with Bombala Council reported that the site is not required to have a formal bushfire management plan. However, the following bushfire response measures should be incorporated into a site environmental plan:

- identify potential fire hazards and maintain coordinated response procedures with Council and the Rural Fire Service;
- provide training on bushfire hazards and fire control for all employees;

- establish response procedures for the control of accidental fires;
- provide well-maintained fire fighting equipment on-site, including fire extinguishers in all vehicles; and
- maintenance of plant and equipment and installation of spark arresters.

Flooding

The quarry is not located within a flood-prone area, however, localised flooding may occur within the quarry pit following substantial rainfall events if adequate controls are not installed to prevent surface flow into the pit. At present, the pit is free-draining to the north. Controls to direct the majority of site surface runoff from flowing into the pit have been described in *Chapter 8*. Additionally, a sump will be installed in the pit to collect surface water and groundwater for reuse on site.

16.3 ENVIRONMENTAL MANAGEMENT PLAN

It is recommended that site-specific EMP will be prepared for the ongoing operation of the quarry. Training of staff and site visitors will be conducted to raise awareness of potential hazards and risk during the operation the quarry. The site-specific safety and environment management plans shall describe who would be responsible for the identified hazards and should also include and discuss:

- ongoing identification and assessment of the hazards associated with the works, and documentation of hazard control measures;
- emergency response procedures;
- compliance with health, safety and environmental regulations;
- procedures for potentially hazardous on-site activities, e.g. refuelling and maintenance of plant and equipment;
- maintenance of earthbunds and erosion and sediment controls;
- assessing and monitoring contractor capabilities against health, safety and environmental requirements;

- recording health, safety and environmental information and reporting to managers, supervisors and people working on site;
- maintaining first aid stocks, fire fighting equipment and spill kits;
- keeping health, safety and environmental records; and
- identifying training needs, implementing training and keeping records.

16.4 CONCLUSION

Provided that the recommended safety and environmental management plans are implemented, the impacts from the identified hazards and risks to people and the off-site environment, during construction and operation phases of the proposed development are unlikely to be significant.

17 CUMULATIVE IMPACTS

This chapter provides a brief assessment of the cumulative impacts associated with the quarry site with regards to other local industry and the combination of identified potential impacts as described in earlier chapters of this EIS.

Potential impacts of the proposed expansion of the quarry site have been discussed in the previous sections. The key cumulative impacts to the biophysical and social environment include the combined affect on general amenity as a result of air quality, noise and to visual impacts. These issues are discussed in *Chapters 10, 11* and *14* respectively. Provided that the mitigation measures recommended for managing these issues are implemented, it is considered that the overall amenity of the site and surrounds will be maintained.

There is little cumulative impact of the quarry site with regards to other industrial facilities or operations in the area. The site is located in an isolated area 5km from the town of Bombala. The nearby Monaro Highway is used by trucks transporting materials between Victoria and NSW and quarry traffic would add to this, however, as discussed in *Chapter 13*, the quarry sites contribution to local traffic is considered to be minimal. Furthermore, Boral has imposed speed limits on it's trucks and placed warning signage at main road access points to consider to ensure the safety of the surrounding roads and users.

The quarry site is a relatively small operation and the requirements for additional infrastructure or maintenance of existing infrastructure (e.g. services and transport) are considered to be minimal.

18 ENVIRONMENTAL MANAGEMENT AND IMPACT MITIGATION

This chapter provides a description of the framework under which the EMP for the proposal will be developed. A summary of management procedures to be included in the EMP is presented in Table 17.1.

18.1 ENVIRONMENTAL MANAGEMENT PLAN

A site specific EMP will be developed for the proposal which will provide a framework for the management of environmental impacts arising from the extension of activities at the Bombala Quarry. The EMP will incorporate any conditions of approval or licensing requirements applicable to the site, for example requirements contained within the Environmental Protection Licence.

The purpose of the EMP is to act as an environmental operations manual for the contractors and staff. Its implementation will ensure that all mitigation measures are effectively executed and sustainable practices are adopted throughout the duration of the project. The preceding chapters in this EIS have described potential impacts of the proposed extension to Bombala Quarry and incorporated a number of precautionary “good practice” measures, along with the measures proposed to mitigate these impacts. The EMP will address all these items and include:

- details of how environmental safeguards are to be implemented;
- the timing of the implementation of the mitigation measures; and
- clear definitions of the allocation of environmental responsibilities of the contractors and staff.

The monitoring and reporting carried out as part of the EMP allows the contractor and operators to demonstrate compliance with licensing and approval requirements. The EMP will be a dynamic document, which will be updated and modified as necessary so that it is applicable and practical for the duration of the project.

18.2 OUTLINE OF THE EMP

An EMP will be prepared for quarry operations. The form that this document will take is outlined herein.

Introduction

This section will describe the purpose and background to the project in relation to the environmental commitments made in the EIS and the requirements of subsequent assessments and approvals. The environmental management structure will also be described, incorporating such details as the roles, responsibilities and induction and training schedules for each employee and or contractor associated with quarry operations.

Site Characteristics

This section will contain a description of the site and its environmental characteristics. A detailed site layout will be provided, including a site plan.

Project Activities

The activities to be undertaken at the site will be detailed and the potential environmental impacts identified.

Environmental Management

This section will state the mitigation measures associated with the proposal. It will also describe the:

- environmental management outcomes, actions, responsibilities and timing;
- incident management;
- risk management;
- monitoring requirements and programs; and
- continual improvements.

18.3 SUMMARY OF MITIGATION MEASURES

A summary of the potential impacts of the proposal upon environmental aspects together with mitigation measures and monitoring requirements to meet the environmental objectives is provided in Table 17.1. The quarry Production Manager will have overall responsibility for implementing the mitigation measures detailed in the EMP. In addition, site personnel will have a role in the implementation of the identified mitigation measures and Boral's regional manager will have a role in review of performance against the EMP.

Table 18.1 Summary of potential issues/ impacts and related mitigation measures associated with the proposed Bombala Quarry expansion

Aspect	Issue/ Impact	Mitigation Measure
1. Socio-Economic	Local economy	Boral will employ local contractors and use local parts and services where possible; and the high quality hard rock resource extracted will be made available to local markets, where possible.
	Agricultural use/ potential of site	The expansion area will be limited to that required to extract the resource so as not to compromise existing agricultural activity or production of the remainder of the site or adjoining rural lands; and On completion of quarrying the site will be rehabilitated to a level suitable for classification as Class 4 agricultural lands as soon as practicable.
2. Air Quality	Dust emissions from unpaved surfaces and vehicle movements	Wet suppression of unpaved surfaces will be considered as necessary; Exposed surfaces will be revegetation where possible; Load sizes will be minimised to prevent fugitive dust during transport; Haulage truck will be limit speeds to 10 kph within the quarry site and a 40 kph on unsealed access roads; and Loads will be covered to prevent dust being released during road transport.
	Dust emissions from stockpiles	Wet suppression of stockpiles will be considered as necessary; Stockpiles will be covered as necessary; Stockpile heights and slopes will be limited to reduce wind entrainment; and Overburden and topsoil stockpiles will be progressively revegetation as necessary.
	Materials handling	When moving materials around the site, drop heights (i.e. from loaders to stockpiles) will be minimised.
	Dust monitoring	Dust monitors will continue to be used to monitor dust emissions resulting from site operations.
3. Noise and Vibration	Site plant and vehicle noise	Quarry operating hours will be restricted to between the hours of 7am to 5pm, Monday to Friday; The introduction of additional noise producing plant or equipment to the site should be avoided where possible; The earth bunds adjacent to the plant will be maintained, as necessary, to provide noise screening to the residences to the west of the property; and Plant will be progressively relocated into and within the pit according to the quarry expansion staging plan.
	Truck noise during haulage operations	Haul trucks will comply with a 40kph speed limit on High Lake Road and Clay Pipe Springs Road; Haul trucks will be access the site only between the hours of 7am to 5pm, Monday to Friday; and Haul trucks will not use compression braking on High Lake Road and Clay Pipe Springs Road.
	Blasting noise and vibration	Blasting will be limited to four blasting events per year; Blasting will be conducted between the hours of 9am to 5pm, Monday to Friday, where possible;

Aspect	Issue/ Impact	Mitigation Measure
		Residents will be notified of upcoming blasting events at least one week prior to blasting; Blasting events to be carefully coordinated with the Quarry Production Manger and safe work instruction and JSRA's to be prepared for each event; and Blasting noise and vibration will continue to be monitored to ensure compliance with relevant guidelines.
4. Soils and Landforms	Soil erosion	Overburden and topsoil stockpiles will be vegetated as appropriate; Opportunistic progressive rehabilitation will be employed to ensure that disturbed areas are revegetated as soon as is practicable; and Surface water management measures, as outlined in Part 5 of this table, will be implemented to minimise soil erosion.
	Soil compaction	Onsite heavy vehicle movements will be restricted to those necessary for quarry operations and confined to the established access routes and pit and stockpile areas, where practicable.
	Landform alterations	Landform alterations, i.e. blasting and quarrying will be confined to the proposed area of quarry operations; Landscaping, revegetation and site maintenance will be undertaken to minimise landform alterations; and Rehabilitation will be undertaken as soon as practicable to return the site, as near as possible, to a natural state.
5. Water Management	Catchment water quality	Water from disturbed areas will be diverted to onsite settling ponds; Clean water will be diverted around disturbed areas to minimise the quantity of "dirty" water; Contour drains and modified channels will be designed to cope with critical flows from a 1 in 20 year ARI; Regular inspection and cleaning of erosion and sediment controls will be undertaken; Any fuels, lubricants and chemicals stored on site will be stored in designated bunded areas; Spill kits, and training in their use, will be provided to site personnel, to enable rapid action in the advent of fuel, oil or lubricant spills; Activities that have potential for spills will be located in areas that drain to the pit; Contour drains and, where necessary, scour protection and dissipaters, will be installed on rehabilitated slopes to minimise the potential for scouring; and Rehabilitated slopes will be vegetated and rock batters benched to reduce erosion potential.
	Site water use	Where possible, collected surface water will be reused onsite to supplement or replace water cartage service.
	Groundwater interception	Groundwater flows intercepted in the pit will be diverted to a sump for settlement and reuse elsewhere on the site or release to the downstream sediment ponds.
	Water quality monitoring	Water quality monitoring of settlement ponds will be undertaken to ascertain the efficiency of site water management controls.

Aspect	Issue/ Impact	Mitigation Measure
6. Ecology	Flora	No stockpiling is to be undertaken within the drip zone (extent of the tree canopy) of retained trees; Revegetation undertaken during landscaping and rehabilitation will use species consistent with the endangered ecological community, with all plants sourced from local seed stock; A weed management plan will be produced for the operational and rehabilitation phases of the quarry; Vegetation clearing will be restricted to the area of quarry operations only; and Vegetation that does not need to be cleared will be maintained.
	Fauna	Any hollow trees and logs will be relocated to those areas of woodland to be retained within the site.
7. Heritage	Presence of subsurface Aboriginal artefacts or items	If any Aboriginal heritage material is discovered, works will cease in the area, and DEC and the relevant Aboriginal groups will be informed with works not to resume without the written consent of DEC.
8. Traffic and Transport	Dust emissions resulting from materials handling and transport	Materials and equipment will be stored on site in such a way as to minimise vehicle movements; and Trucks will be comply with a speed limit of 40kph on High Lake Road and Clay Pipe Springs Road and 10kph within the quarry site.
	Haulage truck noise	Haul trucks will adhere to site operation hours of 7am to 5pm, Monday to Friday; and Haul trucks will not use compression braking on High Lake Road and Clay Pipe Springs Road.
	Public safety	All drivers must carry appropriate current drivers licenses and be aware, of and adhere to, normal road safety rules; and Appropriate warning signs, e.g. the "trucks entering" signs on the Monaro Highway, will be maintained.
	Impacts to soils and vegetation	Vehicle/plant movements will be restricted to dedicated lay-down areas previously cleared of vegetation.
	Public road deterioration	Trucks will comply with a 40kph speed limit on High Lake Road and Clay Pipe Springs Road.
9. Visual Impact	Ongoing quarry and stockpiling operations	Quarrying will follow the approved staged expansion plan to minimise adverse changes to visual environment; Plant and equipment will be relocated in the pit as soon as feasible; Stockpiling will be carried out only within the designated stockpiling areas; The site will be maintained in an orderly manner; Appropriate landscaping (such as strategic stockpiling and revegetation of stockpiles) will be initiated to screen the facility from sensitive viewer locations as necessary; and Progressive rehabilitation will be carried out opportunistically and full site rehabilitation undertaken as soon as practicable, on cessation of quarrying activities.
	Reduced vegetation cover	Vegetation clearing will be kept to a minimum and trees in the proposed stockpile area will be retained; and Progressive revegetation will be carried out opportunistically as a component of site rehabilitation.

Aspect	Issue/ Impact	Mitigation Measure
10. Waste	Waste generation and pollution	Where possible, wastes will be separated into recyclable and non-recyclable materials and stored in appropriate containers for removal offsite by quarry staff and disposal to a licensed landfill or recycling facility; All waste disposal will be in accordance with the *PoEO Act 1997* and the *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (DEC 1999); Prior to reuse, stockpiled materials will be classified as suitable for this purpose, in accordance with *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non Liquid Wastes* (DEC 1999); and Where possible, contractors/suppliers will be made responsible for removal and disposal of packaging materials.
11. Hazards	Health and safety	All quarry personnel and site visitors will be inducted into the site health and safety plan and EMP; High visibility vests, hardhats and appropriate footwear and clothing will be worn at all times onsite during quarry operations; The earthbunds around the quarry pit will be maintained to ensure people and vehicles are kept from the edge of the quarry wall; All plant and equipment will be fitted with reverse warnings and will comply with site speed limits; and Weather conditions will be observed for conditions which could trigger stopping work, i.e. extreme heat or cold.
	Landslip	Drainage control measures will divert surface runoff away from excavated areas; Excavated walls will be finished at maximum final gradients of 75% (vertical to horizontal) to reduce the susceptibility to failure and land slip; and Benches will be revegetated as soon as possible.
	Bushfire hazard	Site personnel will be trained in bushfire awareness and response procedures; Well-maintained fire fighting equipment will be maintained on-site, including fire extinguishers in all vehicles; All plant and equipment will be maintained and installed with spark arresters; and Coordinated response procedures will be communicated with Bombala Council and the Rural Fire Service.
	Flooding	Potential flooding impacts will be mitigated with the implementation of controls described in Part 5 of this table.
	Transport and storage of dangerous goods	The fuel storage vessel in the container and associated bunding will be maintained; Spill kits, and training in their use, will be provided on site; and No explosives will be stored onsite and explosives will be only handled by the licensed explosive contractor.
	Road safety	Road safety will be maintained with the implementation of measures described in Part 9 of this table.

19 PROJECT JUSTIFICATION AND CONCLUSION

This chapter provides a summary of the main biophysical, social and economic issues relating to the proposed quarry expansion and discusses the proposal in consideration of the principles of ESD.

19.1 INTRODUCTION

19.1.1 Biophysical Considerations

Soils and Land Capability

The site is typified by a shallow loam overlying the basalt resource that is being quarried. These soils are classified as predominantly Class 4 agricultural suitability land, with a section of Class 3 land on the eastern side of the property, indicating that they are capable of supporting grazing over the majority of the site. Although this is limited by the susceptibility of the soil to erosion hazards and structural breakdown. The proposed expansion of quarry operations will account for approximately 8ha of the 42 ha site, with the majority of this area, i.e. stockpile and ground level operations areas, able to be returned to Class 4 land at least on completion of quarrying onsite. The quarry pit itself will be rehabilitated to include vegetated benches and a water storage, so that ultimately, only a small proportion of the site will be unable to be used for agricultural purposes.

Water Resources and Quality

The quarry site is located within the headwaters of an ephemeral tributary of Shoemakers Creek which flows to the Bombala River in the Snowy River Catchment. A number of overland flow paths traverse the site, with surface flows from the site flowing to a number of small settlement ponds on the northern edge of the property, or offsite to downstream farm dams.

The proposed quarry expansion will incorporate diversion of catchment runoff from undisturbed areas around areas disturbed or affected by quarry activities via diversion drainage and contour drains, designed to cope with at least a 1 in 20 year ARI storm event. Additionally, check dams and sediment basins will be constructed at intervals along diversion drains where erosion is expected. Water runoff within, and into, the pit, including groundwater inflow, will be directed to a settling pond in the bottom of the quarry pit for reuse onsite or transfer to the nearby settlement ponds. It is considered that, with the implementation of these control measures, as well as a monitoring program of the sediment ponds, the impact to offsite water quality will be minimal.

Water for use on the site is currently trucked in and used for suppression of dust on the processing plant. This will continue, however, surface runoff collected onsite and in the pit will be used to supplement and, if possible, replace the need to bring water to site.

Flora and Fauna

The quarry site is located within an agricultural rural setting, with the onsite vegetation consisting of two distinct vegetation communities, the snow gum/ribbon gum grassy woodland, part of a listed EEC, and disturbed grassland. The remainder of the site is disturbed area currently in use for quarrying or associated activities.

The proposed expansion area will ultimately result in the clearing of approximately 0.52 ha the grassy woodland which accounts for 3.6 percent of the total EEC on site and 0.003 percent of the overall extent of the community in the region. Therefore, the proposal is unlikely to have an adverse effect on the extent of the ecological community. Threatened species recorded on site was limited to three microchiropteran bat species which may use the site for hunting or roosting. The minimal amount of clearing that will be undertaken over the life of the quarry is not likely to significantly affect these species.

19.1.2 Social Considerations

Air Quality

Air quality impacts resulting from quarrying activities predominantly refers to fugitive dust emissions from materials processing, stockpiling and onsite and offsite transport. Modelling of offsite particulate matter migration towards sensitive receivers was undertaken for quarry operations at stages 3 and 8 of the proposed expansion, incorporating meteorology and terrain data. Results indicated that all NSW and NEPM assessment criterion for annual average and 24 hour average ground level concentrations were met. Therefore it is considered that air quality impacts to the general site and surrounds as a result of the continued operations of the quarry will not be significant and will be further minimised by the incorporation of suggested mitigation measures such as wet suppression, revegetation or covering of unsealed areas or stockpiles and implementation of appropriate controls for materials handling and transportation.

Noise & Vibration

An assessment of the proposed expansion of the Bombala quarry site was undertaken and considered the potential noise and vibration impacts of the extension of Bombala Quarry on the four nearest identified receiver locations. The results indicated that currently, under calm conditions, stipulated noise goals were met at all receiver locations apart from a marginal exceedence (2dB) at the McInnes residence. Noise levels were met at all receiver locations in the later stages of the development as processing plant was relocated into the pit. Noise levels associated with road traffic noise was found to comply with stipulated criteria at potentially affected residences. Noise and vibration from blasting has been monitored and was found to comply with criteria for minimising human annoyance and discomfort. Blasting will increase from two events every 12 months to two events every six months.

It is considered that the general amenity of the site and surrounds will be maintained during the ongoing quarry operations, with the implementation of noise mitigation measures such as progressive relocation of plant and equipment and strategic stockpiling of materials to act as noise attenuation screens, means that noise levels at the identified receiver locations are expected to be controlled so as not to have an adverse effect.

Heritage

A survey of Aboriginal and historical heritage has on the proposed expansion area of the Bombala Quarry indicated that there is not expected to be any undetected subsurface Aboriginal or historical heritage material on the site, and hence no impact of the proposal on heritage.

Traffic and Transport

The proposed expansion will not result in any changes to the ongoing quarry activities, including traffic impacts, on a daily basis. At present, there are an average of 16 truck movements per weekday and up to 8 truck movements per Saturday associated with the quarry on roads of the identified haul routes, with these movements spilt between the south coast and southern highlands haulage routes. The contribution of the existing haulage movements to and from the site being considered minimal, with Boral trucks representing a small proportion (generally less than 1%) of traffic on roads along identified haul routes. This will remain the case, with no changes to daily truck movements. Annual truck movements associated with haulage to and from the site is expected to approximately double, however it is considered that this will not significantly impact the existing road network.

Visual

The quarry has been an operating quarry for over 50 years and has therefore been a part of the visual catchment of the surrounding area for some time. The proposed expansion is proposed to occur in stages incrementally over the next 16-20 years, with the area of operations roughly doubling in that time. Combined with the existing vegetation cover on the site and the undulating terrain, the proposed expansion and continued operation of the site will have low visual impact on the surrounding area. Maintenance of the vegetative cover and screening with strategic placement of stockpiles in the viewshed of particularly sensitive receptor areas will further minimise visual impacts.

19.1.3 Economic Considerations

Agriculture and forestry are traditionally the major areas of business in the Bombala area, with extractive industries not yet established as a major contributor to the regional economy. The expansion of the Bombala quarry would boost earnings for this industry for the region, and provide impetus to identify and develop other sites for similar use.

According to forecasting of the Australian Construction Industry Forum (www.industry.gov.au), the peak consultative organisation of the building and construction sectors, the construction industry is set to continue it's current growth, in conjunction with Australia's general economic growth, resulting in a continued demand for construction materials such as those produced at the Bombala site.

The extraction of the identified resource will support construction in the southern region, with the provision of a readily available supply of high quality aggregate to Boral's NSW operations on the south coast and in the southern highlands, as well as for other local and regional customers.

Furthermore, the ongoing operations of the Bombala quarry site will provide continued local and regional benefits with regards to employment of the locally based Rye Group contractors.

19.2 *ECOLOGICALLY SUSTAINABLE DEVELOPMENT*

19.2.1 *Introduction*

ESD in its broadest sense, can be defined as:

"*using, conserving and enhancing the community's resources so that the ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased*" (Commonwealth of Australia, 1992).

Or, as a general interpretation, the intent of ESD is that current and future generations should leave a natural environment that functions as well or better than the one inherited.

The four principles of ESD are outlined in s6(2) of the *Protection of the Environment Administration Act 1991* and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. These principles are:

- the precautionary principle;
- intergenerational equity;
- the conservation of biological diversity and ecological integrity; and
- improved valuation and pricing of environmental resources.

These four principles are considered in the following sections.

19.2.2 *Precautionary Principle*

Interpretation

According to the *Protection of the Environment Administration Act 1991*, the precautionary principle means that if there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

This principle was developed in response to one of the great difficulties of interpreting scientific data. Scientific method produces results based on confidence limits. These are controlled by the scope of data acquisition, interpretation methods and general understanding within a particular scientific discipline of a particular phenomenon. This has been used as a way of validating a lack of response to a potential threat of serious or irreversible environmental degradation.

In the application of this principle:

- careful application should always be undertaken to avoid serious or irreversible environmental damage; and
- an assessment of consequences of various options should be undertaken in formulating a proposal.

ESD requires that uncertainty and the associated risk level be considered in decision making.

Justification

The environmental consequences of the proposed expansion of the Bombala Quarry operations have been assessed as accurately as possible using appropriate specialists in relevant disciplines. The assessment process involved computer modelling, scientific analysis and interpretation of the potential environmental impacts associated with the proposed development. This process has enabled the impacts of the proposal to be predicted with a reasonable degree of certainty. All predictions, however, contain a degree of uncertainty, which reflects the variable nature of the environment. Where there has been any uncertainty in the prediction of impacts throughout the EIA process, a conservative approach was adopted to ensure the worst case scenario was predicted in the assessment of impacts.

Whilst the proposed expansion will result in a change to the landform in the footprint of the quarry, this is not considered to be a significant alteration to the wider landscape of the area and therefore does not constitute serious damage to the general amenity of the area. Implementation of appropriate rehabilitation strategies, as discussed in *Chapter 3*, will ensure that the property can continue to be utilised for agricultural purposes to the best of it's ability on cessation of quarrying activities on the site and irreversible environmental degradation is prevented.

During operations, implementation of mitigation measures outlined in *Chapter 18* and incorporated into a site specific EMP, will ensure that potentially adverse impacts to air and water quality resulting from the operations will be minimised. Additionally, environmental monitoring will be undertaken as a precautionary measure to reduce any uncertainty regarding the potential for environmental damage.

19.2.3 Social Equity Including Intergenerational Equity

Interpretation

Social equity involves value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fair distribution of costs and benefits to improve the well being and welfare of the community, population or society. Social equity does not imply equality but there should be equal access to opportunities for improved welfare, with a bias towards advantaging the least well off sectors of society.

Social equity includes intergenerational equity, which requires that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

Justification

The proposal is consistent with the principles of social equity and intergenerational equity. The extraction and processing of the identified basalt resource on-site will supply Boral and other local customers, including Bombala Council, with high-quality gravel for use in concrete batching, as well as fines and tailings for road base and other construction works, for up to 20 years. These products will allow continued growth in the building and construction industry for the southern region of NSW, providing a valuable contribution to new housing, industry, commercial and services (e.g. road maintenance) for the region for at least the next two decades.

19.2.4 Conservation Of Biological Diversity And Maintenance Of Ecological Integrity

Interpretation

Biological diversity refers to the diversity of genes, species, populations, communities and ecosystems, and the linkages between them. Biological resources provide food, medicines, fibres and industrial products. They are also responsible for vital ecological services such as maintaining soil fertility and the supply of clean and fresh water. Maintaining biological diversity safeguards life support functions and can be considered a minimal requirement for intergenerational equity.

Justification

A flora and fauna survey has been undertaken for the proposed development site and is detailed in *Chapter 9*. Results indicated that one preliminary listed endangered ecological community and three threatened microchiropteran bat species were recorded on site. The proposed extension area will clear approximately 0.52 hectares of lowland grassy woodland, accounting for 3.6 percent of the total EEC occurring on site. This equates to a 0.003 percent reduction in the overall extent of the community. Therefore, the proposal is unlikely to have an adverse effect on the extent of the ecological community and will not place its' local occurrence at risk of extinction. Moreover, the proposed clearing of grassy woodland onsite is not likely to affect the lifecycle of the recorded bat species such that the local populations would be placed at risk of extinction.

In addition, the expansion area will be limited to that required to extract the resource so as not to compromise areas within the remainder of the site or adjoining rural lands and the implementation of surface water management measures, as detailed in *Section 8*, will minimise the volume of water running over and from the site, providing protection to ultimate receiving waters and aquatic habitats.

It is considered that the proposed scheme will not adversely impact any threatened or endangered species or communities.

19.2.5 Improved Valuation And Pricing Of Environmental Resources

Interpretation

Conventionally, the environment has been considered a free resource, with examples of environmental exploitation to extract or harvest resources on a national, and indeed global, level too numerous to count. As such, the true cost to the environment is rarely factored into extraction, harvesting or production costs or the ultimate use and fate of that resource.

This principle involves placing a monetary or social value on the environment that ultimately increases its value in assessing the impacts of a proposed development so as to decrease further exploitation and encourage sustainable practices of extracting, harvesting or processing resources.

Pollution and future exploitation can be controlled under the polluter pays principal, whereby developers or operators who degrade or damage the natural environment are responsible and accountable for returning it to its previous condition, or providing adequate environmental compensation for any adverse impacts.

Justification

In considering options for the extraction of the identified resource from the Bombala quarry site, sustainability of the resource and consideration of the surrounding environment were paramount to the final expansion plan. The proposed operations will be undertaken over 16 to 20 years, based on a sustainable extraction and processing rate which aims to meet consumer demand and minimise impacts to the environment over the duration of quarrying activities. The use of the site for quarrying is in accordance with local government objectives and, once quarrying activities onsite have ended, the majority of the property can be returned to agricultural use with the implementation of appropriate rehabilitation strategies, as discussed in *Chapter 3*. Further, implementation of recommended mitigation measures, as outlined in *Chapter 18*, will prevent significant pollution to the environment

19.3 CONCLUSION

The EIS presents findings of an environmental impact assessment for the proposed expansion of quarrying operations at the Boral site in Bombala, NSW. The major benefits of the proposal relate to:

- the continued extraction of an identified resource for up to 20 years (until the resource is expended) to realise the economic potential of the site and maximise resource recovery and yield;
- the provision of high-quality gravel to Boral's NSW southern region operations and to other local customers, e.g. Bombala Council, for building and roadworks;
- the long-term maintenance of the site for the dual purposes of quarrying and agricultural (pasture) activities;
- the implementation of effective and feasible environmental management measures to ensure ongoing operations are conducted in an environmentally responsible manner; and
- rehabilitation of the site on cessation of quarrying activities for continued agricultural use.

There were no significant environmental impacts identified during the preparation of the EIS that cannot be mitigated by appropriate safeguards and management strategies, and the proposal is consistent with the principles of ecologically sustainable development.

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