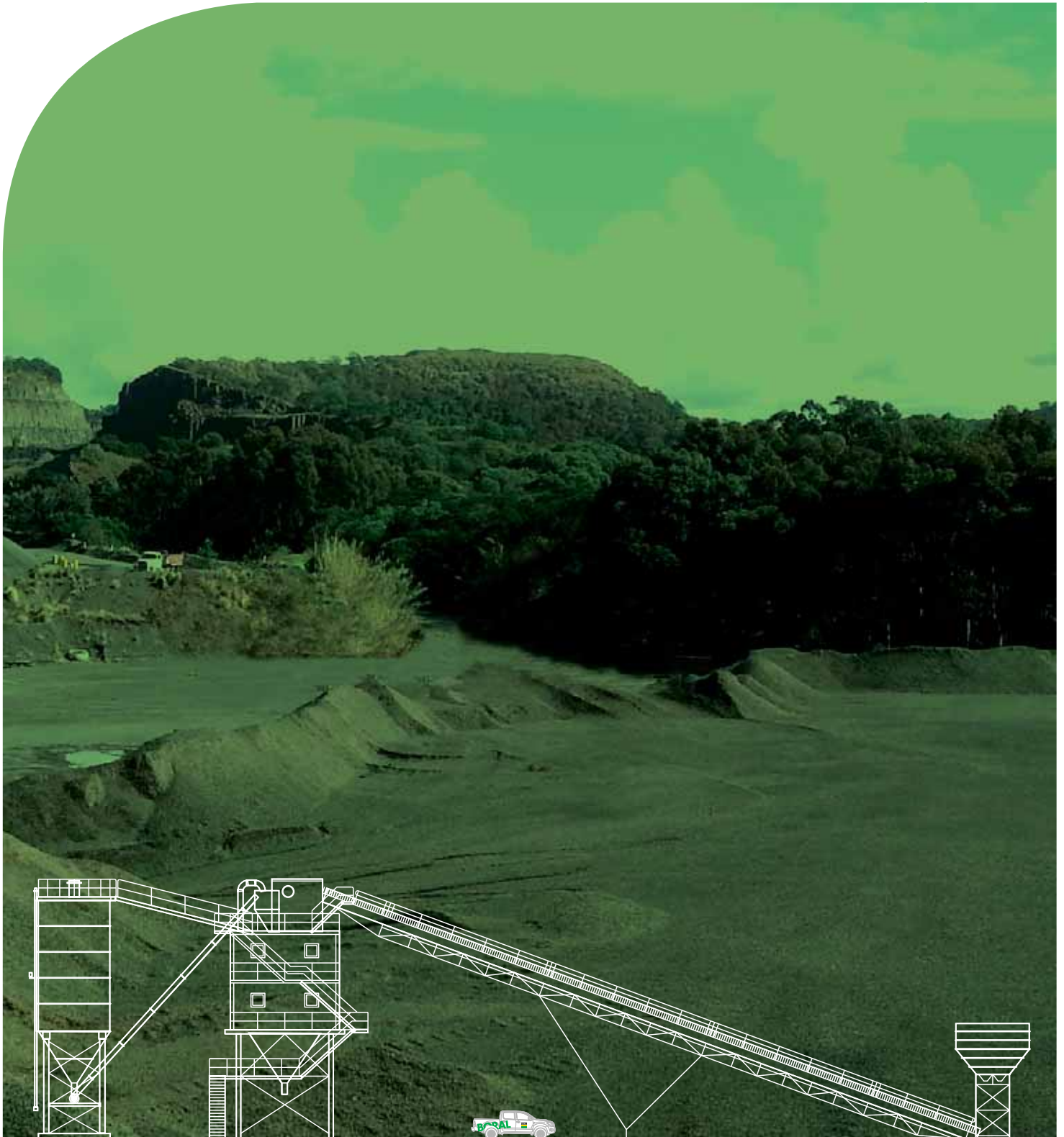


PROPOSED BLENDING PLANT DUNMORE HARDROCK QUARRY

DA 470-11-2003 - MODIFICATION 7

ENVIRONMENTAL ASSESSMENT

Prepared for Boral Resources (NSW) Pty Limited - December 2014



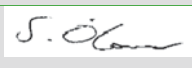
BLENDING PLANT- DUNMORE HARD ROCK QUARRY

ENVIRONMENTAL ASSESSMENT FOR MODIFICATION 7

Prepared for Boral Resources (NSW) Pty Limited
December 2014

REPORT STATUS - FINAL

Job number - PR15 Dunmore Mod

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Date	12 December 2014	Date	13 December 2014

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DOCUMENT CONTROL

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- RW Corkery (2003), *Environmental Impact Statement Dunmore Quarry Production Increase*; and
- EMM (2012), *Environmental Assessment Dunmore Hard Rock Quarry*, DA470-11-2003 Modification 6

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1 INTRODUCTION

1.1 Overview

Dunmore Hard Rock Quarry is located at 38 Tabbita Road, Dunmore in Shellharbour local government area (**Figure 1**) and is owned and operated by Boral Resources (NSW) Pty Ltd. This environmental assessment (EA) has been prepared to accompany a modification application to the existing development consent for the quarry (DA 470-11-2003).

It is proposed to modify the existing development consent to:

- Construct and operate a mobile blending plant with a maximum production of 150,000tonnes per annum, which is included within the existing extraction limit of 2.5 million tonnes per annum (Mtpa) of finished quarry product. The blending plant is proposed to be located within the Dunmore Hard Rock Quarry consented footprint area, to the east of the quarry as shown in **Figure 2**. Operation hours of the plant will be 7am-3pm Monday-Saturday, which is within the site's existing approved operational hours as set out in the site's Environmental Protection Licence (EPL); and
- Cease the continuous real-time monitoring of the noise generated by the development at the Stocker residence (referred to Schedule 4, condition 12 in development consent (DA 470-11-2003).

The proposed modification is sought under Section 75W of the *Environmental Planning and Assessment Act, 1979* (EP&A Act). The Minister for Planning is the consent authority for the proposed modification.

1.2 Background

Quarrying first commenced at Dunmore Quarry in 1921. Since that time, Boral and its predecessor companies have progressively expanded the area of extraction operations.

In September 2004, the Minister Assisting the Minister of Infrastructure and Planning issued Development Consent DA 470-11-2003 under Part 4 of the EP&A Act, which allowed production at Dunmore Hard Rock Quarry to increase from 1.2 Mtpa to 2.5 Mtpa. The development was classified as State Significant Development, under section 76A(7) of the EP&A Act, because it is an extractive industry where the proposed rate of production exceeds the threshold limits specified in the Ministerial declaration of 3 August 1999. An Environmental Impact Statement (EIS) was prepared and exhibited prior to the granting of this consent (RW Corkery 2003).

Subsequently, five modifications (Modifications 1 - 5) under Section 96 and one modification (Modification 6) under Section 75W of the EP&A Act have been approved, which are outlined in **Table 1**.

Table 1 Dunmore Quarry Modifications

Date of Modification Approval	Mod Number	Details
December 2005	Mod 1: Mod 172-11-2005	Allowed for the construction of a new amenities block on the site.
June 2006	Mod 2: Mod 59-4-2006	Amended the vegetation offset requirements and the approved transport route, extended the deadline for dam upgrade works and removed the Croome Farm Catchment water management works.

Date of Modification Approval	Mod Number	Details
May 2008	Mod 3	Allowed for the construction of a new workshop, office and amenities buildings.
November 2008	Mod 4	Extended the approved extraction area on land owned by RailCorp and changed the stormwater management design criteria for the site.
November 2008	Mod 5	Allowed for a truck parking facility, including amenities for company trucks that service the quarry.
February 2014	Mod 6	Allowed for an increase in road transport of material to 1.5 Mtpa and an extension to the approved extraction area to allow lateral access to the lower flow in the original Dunmore Quarry.

The Dunmore Quarry currently holds an Environment Protection Licence No. 77 (EPL 77) which would also need to be varied under the modification.

1.3 The Applicant

Boral Resources (NSW) Pty Ltd (Boral) is a subsidiary of the publicly listed Company, Boral Limited and is the Applicant for the Project. Boral is an international building and construction materials group, headquartered in Sydney, Australia. Boral's competitive position is underpinned by leading market positions in Cement and Construction Materials in Australia; Plasterboard in Australia and Asia; and Cladding and Roof Tiles in the USA.

The Boral Construction Material and Cement division employs over 5,000 employees in its quarry, concrete, asphalt, concrete placing and cement operations. The business is a major supplier of products to the dwelling, commercial construction, and roads and engineering markets.

Boral has over 110 operating quarries, sand pits and gravel operations, producing products such as concrete aggregates, crushed rock, asphalt and sealing aggregates, road base materials, sand and gravels for the Australian construction materials industry.

1.4 Environmental Assessment Requirements

1.4.1 Department of Planning and Environment

Under Section 75W of the EP&A Act, the request for Minister's approval for a modification is to be lodged with the Director-General. The Director-General may notify the proponent of environmental assessment requirements (EARs) with respect to the proposed modification that the proponent must comply with before the modification will be considered by the Minister or the Minister's delegate.

The Department of Planning and Environment (DP&E) were issued a briefing letter on 3 July 2014 and confirmed on 7 August 2014 (**Appendix A**), that the proposal would be assessed as a modification under Section 75W. DP&E also confirmed their agreement with the assessment approach (to undertake a noise, air quality and visual assessment) and noted that while the other elements (e.g. transport and water) may not require a detailed assessment, these matters should be considered at a sufficient level in an EA supporting the modification (at least to justify why these matters do not require assessment).

1.4.2 Shellharbour City Council & EPA

A briefing letter was also provided to the Shellharbour City Council (Council) and the Environment Protection Authority (EPA).

Council confirmed on 24 November 2014 (**Appendix A**) that the key issues of concern appear to have been identified, namely potential impacts associated with noise, air quality and visual amenity. Council noted that it was not proposed that a traffic assessment be undertaken. Council requested a detailed explanation addressing the number, types and transport routes of trucks associated with the proposed blending plant operation as well as consideration of any cumulative impacts.

The EPA confirmed by phone in October 2014 that they had no issues with the proposal and were satisfied with the environmental assessment methodology outlined in the briefing letter.

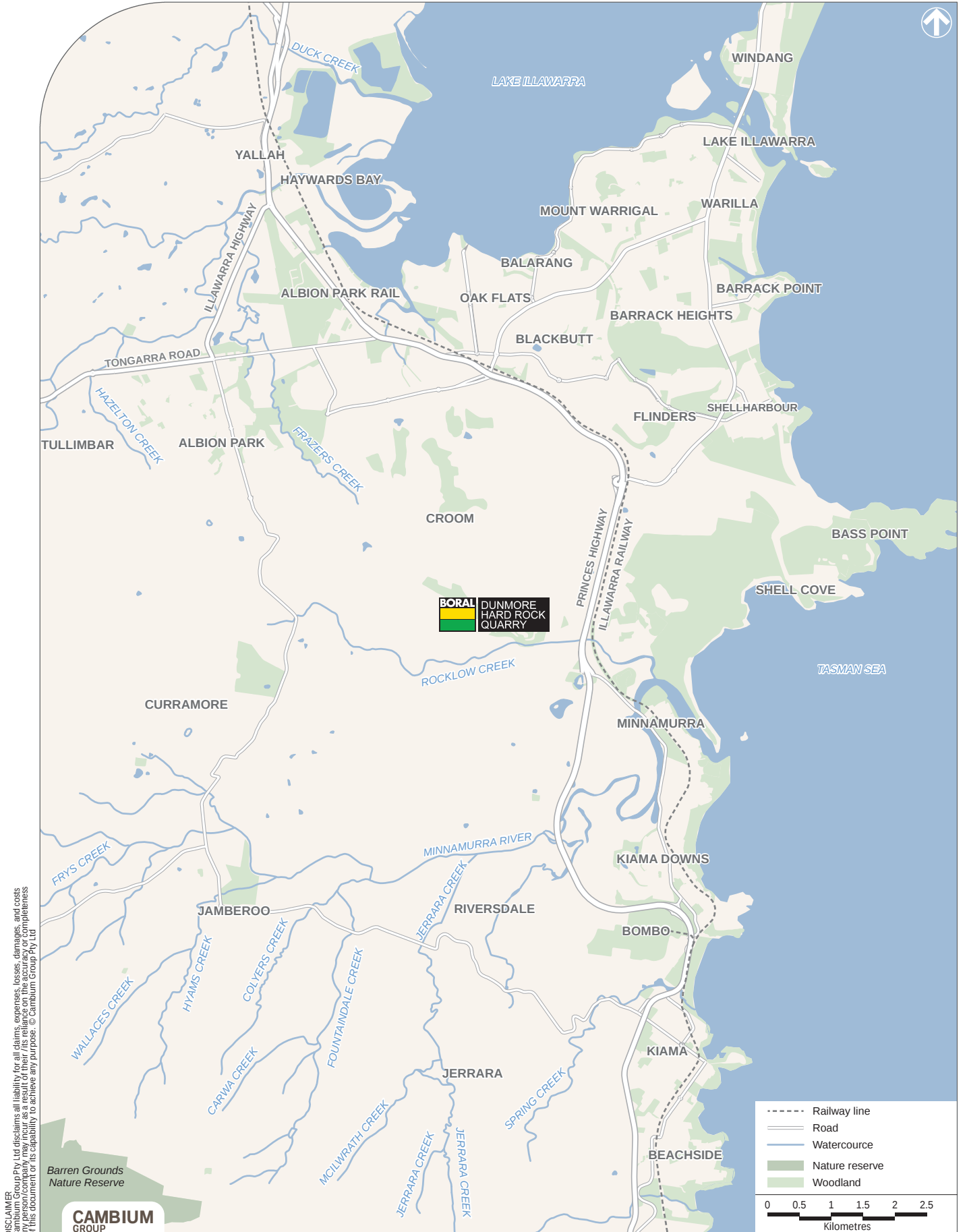
Comments received from DP&E and Council have been addressed in the preparation of this EA.

1.4.3 Community Consultative Committee

Boral facilitate a Community Consultative Committee (CCC) who meet bi-annually to discuss matters that relate to Dunmore Quarry. During the last CCC meeting on 20 August 2014, the blending plant was briefly discussed and an information sheet providing an overview of the proposed modification will be forwarded to the group in early 2015. To date, no specific issues have been raised by either the CCC or other community stakeholders. Progress on the proposed modification will be further discussed at the next CCC meeting on 25 February 2015.

FIGURE 1
Regional location

DUNMORE HARD ROCK QUARRY - PROPOSED BLENDING PLANT



2 EXISTING OPERATIONS

2.1 Site Description

Dunmore Hard Rock Quarry is located at 38 Tabbita Road approximately 12 km north-west of Kiama and 110 km south of Sydney (**Figure 1**). The quarry is located adjacent to the Princes Highway and other Boral operations including, Dunmore Soil and Sand Quarry and Dunmore Concrete Batching Plant (**Figure 2**). Access to Dunmore Quarry is achieved directly off the Princes Highway via Tabbita Road, a road used solely for access to Boral's businesses.

The Hard Rock Quarry property is approximately 246.4ha in size, with an approved disturbance area of 96.85ha.

The Hard Rock Quarry includes a processing plant, which is located south of the original Dunmore Quarry. The site's rail siding runs parallel to Tabbita Road, beginning east of the processing plant and passing under the Princes Highway before connecting to the Illawarra Railway Line. Products to be despatched by rail are generally stockpiled south of the rail siding.

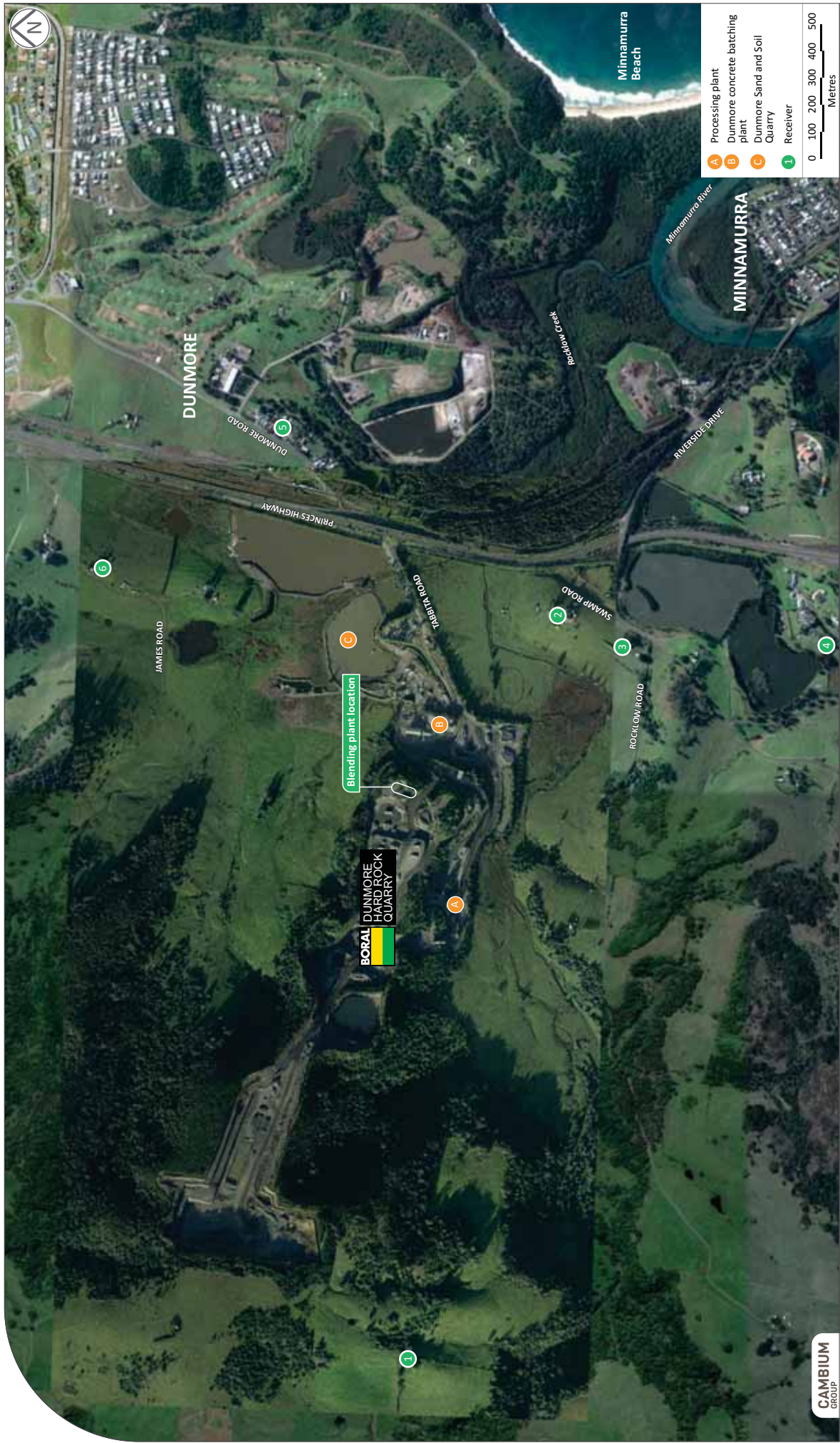
2.2 Existing Environment

Dunmore Quarry is located in hilly terrain west of the Princes Highway. The topography of the quarry is sloped downwards from the north-west to the south-east of the site with elevations between 164 m Australian height datum (AHD) in the RailCorp extraction area and 10 m AHD around the processing plant and rail siding.

The proposed location of the blending plant has been carefully selected, immediately west of the eastern rim of the original Dunmore Quarry, a 16 m high rock face, that forms the eastern edge of the historical extraction area, now used for stockpiling finished quarry products (**Plates 1 to 3**). The outer (east facing) slopes of the eastern rim of the original Dunmore Quarry are densely vegetated with a mixture of mature trees and shrubs, which protrude above the top of the eastern rim (**Plates 1 and 4**).

FIGURE 2
Local settings and receiver locations

DUNIMORE HARD ROCK QUARRY - PROPOSED BLENDING PLANT



2.3 Surrounding Environment

Boral's Concrete Batching Plant and Dunmore Sand and Soils operations are located to the east of the hard rock quarry, immediately north of Tabbita Rd, between the site and the Princes Highway. Surrounding land uses are primarily rural (grazing and agriculture) and rural residential. The closest residential receivers for the quarry and proposed blending plant are presented in **Figure 2** and outlined in **Table 2**.

Table 2 Residential Receivers

Receiver Number	Receiver Name	Location in Development Consent	Distance from Blending Plant (m)
1	McParland Residence	Location A	2089
2	Creagan Residence	Location J	855
3	Stocker Residence	Location K	975
4	Dunmore Lakes Estate	Location O	1615
5	Dunmore Road Residences	Not specified	1405
6	Renton Residence	Not specified	1374

Surrounding residential suburbs within 10 km of the site are Shell Cove, Minnamurra and Kiama Downs.

Boral currently holds a negotiated agreement with the Creagan residence (R2) located approximately 350 m south-east of the site.

2.4 Extraction Operations

Hard rock has been extracted from the quarry for approximately 90 years. The quarry has an extensive resource and, due to its ability to rail product into the Sydney metropolitan market, is a key asset for Boral. Total resources within the approved extraction area are estimated at 31.6 million tonnes of latite and 2.5 million m³ of breccia agglomerate. Due to its superior strength and structure, latite is used mainly as rail ballast, in sea walls, and other aggregate applications, whereas breccia agglomerate is used in fill or in a blend for road base.

Boral has approval under DA 470-11-2003 for the production of 2.5 Mtpa of quarry products which equates to between 5,000 and 12,000 tonnes of rock extracted per day.

2.5 Product Transportation

Dunmore Quarry is part of Boral's integrated quarry and distribution network that supplies quarry products to the greater Sydney region, which includes Metropolitan Sydney and the outer lying regional areas of the Hunter, Lower Blue Mountains, Illawarra, Southern Highlands and Southern Tablelands. Dunmore Quarry currently supplies products to the local Illawarra and Southern Highland markets by road and eastern metropolitan Sydney by rail for direct use on site or road distribution.

The Dunmore Quarry currently has approval to transport up to 2.5 Mtpa of quarry products by road and rail, with road transport limited to 1.5 Mtpa.

Product transported by road is trucked along Tabbita Road and then onto the Princes Highway primarily by six axle truck and dog trailer combination vehicles, each carrying approximately 33 t of material per load. Approximately 87.5% of truck deliveries are

currently to the north with the remainder (12.5%) to the south, although this figure varies depending on the location of each project.

2.6 Hours of Operation and Employment

The approved hours for extraction and processing activities at the Dunmore Quarry are 6 am to 10 pm Monday to Saturday. Drilling activities during the evening period (i.e. between 6 pm and 10 pm) are confined to the second or third bench levels and blasting is undertaken between 9 am and 5 pm Monday to Saturday, as approved by the EPA. Product transfer to stockpiles is allowed between 6 am to midnight Monday to Saturday. Maintenance can be undertaken 24 hours Monday to Sunday.

Approved hours for distribution of material by road are 24 hours Monday to Saturday with distribution on Sundays approved between 8 am and 6 pm for 15 Sundays per year. Distribution by rail can be undertaken 24 hours Monday to Sunday.

Around 30 people are currently employed at the quarry as well as 10 road truck drivers for deliveries.

3 PROPOSED MODIFICATION

3.1 Overview

Boral has identified the requirement to produce bound and unbound road base, to NSW Roads and Maritime (RMS) specification, to supply road construction materials to road projects in southern NSW. It is therefore proposed to modify Development Consent (DA 470-11-2003) to allow for the construction and operation of a blending plant with a production limit of 150,000 tonnes per annum.

Boral is also seeking to remove Condition 12 from the Development Consent (DA 470-11-2003), which requires continuous real-time noise monitoring at receiver R3 (location K in the development consent) at the request of the resident at this location.

3.2 Proposed Blending Plant

The proposed blending plant at Dunmore Quarry will be located in the existing stockpile area to the north-east of the main processing plant and therefore no vegetation clearing is required (**Figure 3** and **Figure 4** and **Plates 1 - 3**). The proposed location of the blending plant has been carefully selected immediately west of a 16 m high rock face, that forms the eastern edge of the original Dunmore Quarry extraction area, now used for stockpiling finished quarry products. This area is within the approved area of disturbance and, therefore, would not increase the area of disturbance within the property. The elevation of this area is around 32 m AHD and the maximum height of the blending plant (silos and pugmill) would be 15 m (47 m AHD). The blending plant will be orientated in a north-south direction (**Figure 4**) with the tallest structures (silos and pugmill) located immediately west of the highest section of rock face, to obscure the plant from the closest residential receivers and the Princes Highway to the east. The blending plant will be painted Boral green (**Figure 4** and **Plate 5**) to reduce the visual impact of any parts that may be visible from surrounding areas.

The blending plant is comprised of four main components (**Figure 4**):

- Product bins;
- Conveyors;
- Silos; and
- Pugmill;

The blending plant will produce up to 150,000 tonnes per annum of blended product. At peak production the blending plant could produce approximately 400 tonnes per hour or 200-1,800 tonnes per day with average production estimated at approximately 1,200 tonnes per day. Material blended within the plant will comprise of aggregate (crushed rock) from Dunmore Hard Rock Quarry and cement from Boral's cement operations at Berrima. Bag house dust from the site dust collectors will be stored in one of the silos and used as a filler in certain blended products. Stabiliser (a Boral Cement stabiliser used as a binder in road stabilisation products) will be delivered to the plant in 25-28 tonne tankers at a rate of no more than one to two cement truck deliveries per week and will be stored within the other two silos. There will be no additional material delivered to the site to be blended within the plant other than stabiliser.

Aggregate is loaded into the product bins using a front end loader. Aggregate travels up the conveyors into the pugmill where it is blended with stabiliser and/or bag house dust and water (usually at an optimum water content of 7.5%) depending on the required product. The blended product is then either discharged directly from the pugmill into trucks for delivery to customers or is stockpiled in the existing stockpile area adjacent to the blending plant. All product produced by the blending plant will be transported by truck.

There will be no changes to the current production and transportation volumes described in **Section 2** or the hours of operation. Truck deliveries of blended products will be the same as current practice, via Tabbita Road and the Princes Highway.

While the blending plant is considered mobile, it is anticipated that it will remain in its proposed location within the stockpile area until quarrying activities commence in the area.

Construction works required to install the plant include:

- Installation of gabion baskets and tilt up panels surrounding the plant for stabilisation;
- Concrete slab for footings; and
- Connection to power and water (using the existing services infrastructure on the site).

3.3 Justification for the Modification

3.3.1 Proposed Blending Plant

Dunmore Quarry is both a major supplier of quality concrete and asphalt aggregates to both the Sydney and local markets. Without a blending plant, the quarry has not been able to produce specified road base products to meet the demand on local and major road upgrade projects such as the Princes Highway - Gerringong upgrade project (nearing completion).

Boral has identified a strong demand for specified road base products in the coming years including the following approximate volumes:

- 240 kilo tonnes per annum (ktpa) required by councils in 2015 (Shellharbour, Wollongong, Shoalhaven, Kiama, Wingecarribee and Wollondilly);
- 120 ktpa required by local civil contractors in 2015;
- 220 ktpa required for the Princes Highway upgrade project between Foxground and Berry (to commence construction in 2015);
- > 200 ktpa will be required for the Albion Park Bypass (to commence construction in 2017);

Dunmore Hard Rock Quarry is ideally located to supply this local demand with direct access to the Princes Highway and under 25 km haulage distance to planned major road upgrade projects.

Producing specified road base products at Dunmore Quarry has an added benefit of utilising by-products of the quarries aggregate manufacturing process including micron dust and scalps.

3.3.2 Removal of BarnOwl Noise Monitor

Continuous real-time monitoring of noise generated by the quarry is currently conducted at Receiver R3 (Stocker Residence referred to as location K in the development consent) in accordance with Condition 12 of the Development Consent (DA 470-11-2003) (discussed in detail in **Section 4.2**).

Boral is proposing to remove Condition 12 from the development consent and remove the real-time noise monitor from receiver R3 on the following basis:

- The resident at R3 (Margrit Stocker) has requested the removal of the monitoring system from her property (refer to letter from Mrs Stocker in **Appendix A**);
- A long history of attended noise compliance and ongoing BarnOwl monitoring (2005-2007) demonstrating compliance with project specific noise limits. It should be noted that BarnOwl reporting requirements were removed from the site's EPL in 2008 due to regular compliance. In addition, the site installed cladding on the primary, secondary, and tertiary crusher buildings between 2006 and 2009, significantly reducing noise

levels at nearby residences and helping to achieve continual compliance with the noise criteria;

- No community complaints in at least six (6) years; and
- Good relationship between Boral and the surrounding residents through community consultation and the site's Community Consultative Committee (CCC).

3.4 Alternatives to the Modification

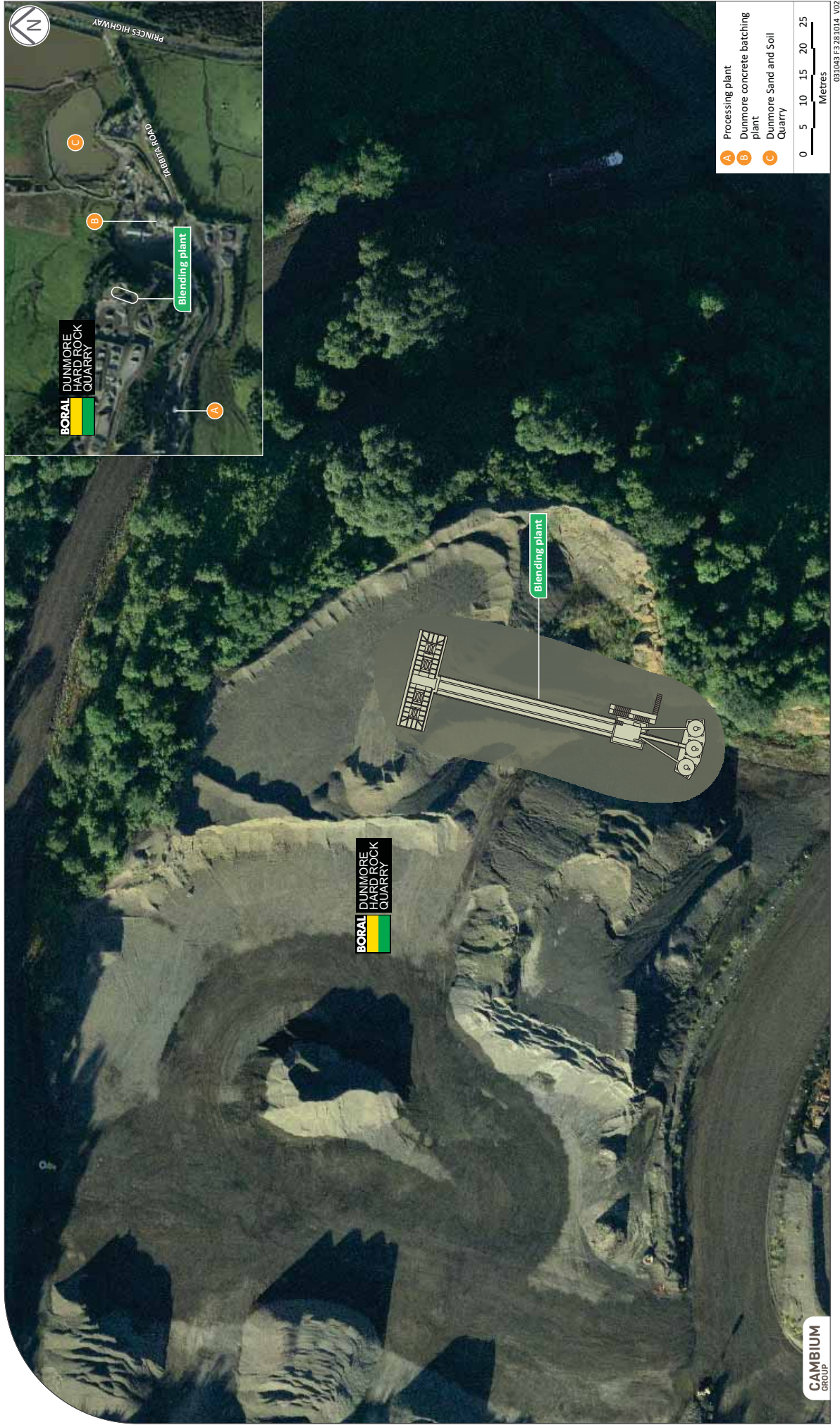
Dunmore Hard Rock Quarry is Boral's only operating hard rock quarry on the NSW south coast. The quarry is also ideally located to supply councils, civil contractors and major RMS road upgrade projects with direct access to the Princes Highway. The quarry also supplies the majority of raw materials required for the specified road base products, therefore locating the proposed blending plant on the quarry site reduces production costs and improves sustainability through a reduction in:

- Fuel consumption and associated greenhouse gas emissions;
- Heavy vehicle road traffic; and
- Transport costs.

The do nothing option would not realise these benefits and therefore is not considered a reasonable alternative.

FIGURE 3
Blending plant location

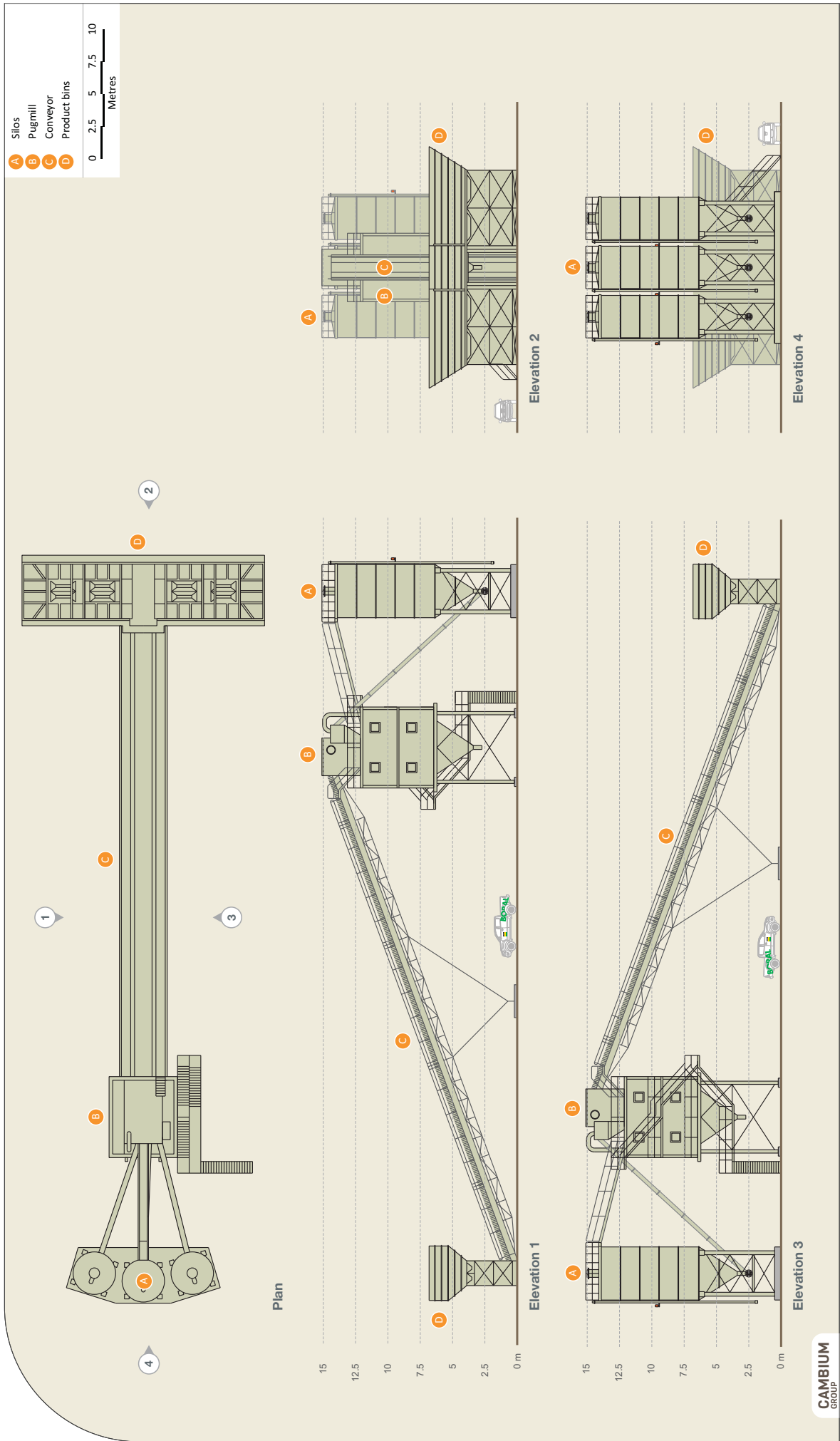
DUNMORE HARD ROCK QUARRY - PROPOSED BLENDING PLANT



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FIGURE 4
Blending plant – Plan and elevations

DUNMORE HARD ROCK QUARRY - PROPOSED BLENDING PLANT



4 ENVIRONMENTAL ASSESSMENT

4.1 Identification of Potential Environmental Impact

A preliminary environmental risk analysis was undertaken on commencement of the environmental assessment process to identify the key potential environmental issues or impacts associated with the proposed modification.

Table 3 identifies the key potential environmental issues or impacts associated with the proposed modification. For those environmental issues that achieved a high or medium risk rating, further assessment has been undertaken in the form of technical investigations (refer to **Sections 4.2, 4.3 and 4.4** and **Appendix B and C**). For those environmental issues that achieved a low risk rating in the environmental risk analysis, further technical investigations are not considered necessary. The proposed modification will not result in any additional impacts on these low risk environmental issues than has already been assessed in the EIS that accompanied the original development application in 2003 and subsequent approved modifications, as these non-key issues could largely be addressed using existing environmental safeguards and management measures.

Table 3 Preliminary Environmental Risk Analysis

Environmental Aspect	Overview of Key Outcomes	Risk Rating
Noise	Potential for noise impacts associated with the construction and operation of a blending plant in a rural noise setting, in moderate proximity (greater than 800 metres) to existing residences. A noise impact assessment has been undertaken by Wilkinson Murray (Section 4.2, Appendix B) to quantify the potential noise impacts associated with the proposed modification.	Medium
Air Quality	Potential for operational air quality impacts associated with the operation of a blending plant in a rural setting, in moderate proximity to existing residences. An air quality assessment has been undertaken by Wilkinson Murray (Section 4.3, Appendix C) to quantify the potential air quality impacts associated with the proposed modification.	Medium
Visual Amenity	A visual catchment analysis identified that the proposed blending plant, located within the existing finished product stockpile area, may be visible from residential receivers to the east and the Princes Highway. A visual impact assessment (Section 4.4) has been undertaken to determine whether the proposed modification would result in negative impacts on the local visual amenity.	Medium
Traffic and Transport	All raw materials used in the blending process to create specified road base products (with the exception of stabilment), is produced at Dunmore Quarry. Stabilment, a binder used in road stabilisation products will be delivered to site by 25-28t tonne cement tankers and will be contained within 2 of the 100 tonne silos within the blending plant. It is anticipated that there would be no more than 1-2 stabilment deliveries per week from Boral's Cement operations at Berrima. Blended road base product will be delivered to customers by truck	Low

Environmental Aspect	Overview of Key Outcomes	Risk Rating
	via the Princes Highway. Neither the delivery of stabilment to the site nor the transport of finished road base products to customers, will exceed the transport limit of 1.5 Mtpa under the current consent. Therefore, traffic impacts associated with the proposed modification are not required to be considered further within this EA.	
Surface water	As the Dunmore Hard Rock Quarry site is located in an elevated position along spurs and ridges, water entering the site can only be as a result of rainfall. Therefore all runoff within the extraction and infrastructure areas is contained within the site. Potentially sediment-laden runoff flows into a dedicated stormwater dam located to the southeast of the processing area. This dam, known as the Lower Dam, has a capacity of between 15 and 20 ML. All runoff outside of the extraction and processing areas is clean and flows directly into the tributaries of Rocklow Creek. A Water Management Plan was prepared for the quarry by Evans & Peck. This plan involved upgrades to the water management system described in the original EIS and involved a major upgrade of the water management system with upgrades to the Lower Dam to take it 'off -line' from construction of two new dams (one in Croome Farm and one in the Original Dunmore Quarry), alterations to drainage and discharge, and construction of a system of pumped transfers between dams. Discharge from the quarry is from the Lower Dam to Rockflow Creek and occurs after water has resided in the Lower Dam for sufficient time to allow settlement to occur. Discharge is via a bio-filtration swale to meet the discharge criteria under the EPL of TSS <50 mg/L and pH 6.5 to 8.5. The proposed blending plant is within the existing catchment area and would not affect the capacity of the current water management system. The proposed modification does not require an increase in water use and will not affect the existing quarry's site water balance. As the proposed location of the blending plant in the existing stockpile area is located in an elevated position, away from watercourses, the proposed modification will not be susceptible to flooding and will not increase flooding risk on the site or surrounds. The proposed modification is not expected to result in additional surface water impacts and, therefore, this environmental aspect is not considered further within this EA.	Low
Groundwater	Boreholes drilled during the various evaluation phases for the existing quarry design and development have not encountered any significant groundwater inflows at the proposed extraction depths with only minor inflows occurring within the Croome Farm extraction area (Corkery 2008). The proposed blending plant area is outside of the Croome Farm and only involves minor excavations in the existing stockpile area to establish foundations. The proposed modification is, therefore, not expected to intercept	Low

Environmental Aspect	Overview of Key Outcomes	Risk Rating
	groundwater or impact on groundwater quality.	
Flora and Fauna	The proposed blending plant is to be located in the existing stockpile area, which was previously the original Dunmore Quarry hard rock extraction area (Figure 3 and Plates 1 - 3). Constructing the blending plant will not require the clearing of native vegetation or fauna habitat or require the disturbance of ground that has not previously been disturbed. There will be no impacts on threatened flora or fauna species and/or communities. Therefore, potential impacts on flora and fauna are not considered further within this EA.	Low
Aboriginal Heritage	Aboriginal Heritage: Aboriginal artefact surveys of the site have previously been conducted by Brayshaw and Associates (1986), Navin Officer (1992) and Robert Paton Archaeological Studies (2003). These surveys identified only two items within the site: an artefact scatter and a scarred tree in the Croome Farm area. Consent to destroy the artefact scatter was granted by National Parks and Wildlife Service in 1996 and the scarred tree from the Department of Environment and Conservation in 2005 (EMM 2012). The proposed blending plant is to be located in the existing stockpile area, which was previously a hard rock extraction area (Figure 3 and Plates 1 - 3). The current ground level at this location is over 10 m below the natural historical ground level. Unidentified artefacts are therefore highly unlikely to occur at the proposed blending plant site. Constructing the blending plant will not require the clearing of native vegetation or disturbance of ground that has not previously been disturbed.	Low
Non-Aboriginal Heritage	There are no recorded non-Aboriginal heritage items within the Dunmore Quarry property boundary. There are five heritage listed items within a 2 km radius of the quarry. These are locally registered items listed on the National Trust, Shellharbour LEP 2000 and Illawarra Regional Environmental Plan No 1. The Dunmore Railway Station and Residence, which is located approximately 1 km north-east of the quarry is also listed under the <i>NSW Heritage Act 1977</i>. The closest of these to the quarry is the Former Minnamurra School (also known as the Peterborough Estate) Residence and Grounds, which is located 500m south-east on the Stocker property (EMM 2012). The operations of the Dunmore Quarry has previously been assessed as not having any adverse impacts upon nearby items of non-Aboriginal heritage (EMM 2012). The proposed modification would not have adverse impacts on non-Aboriginal heritage items and therefore this matter has not been considered further within this EA.	Low
Waste	Construction waste e.g. pieces of timber, plastic, steel and concrete will be separated, stored and removed by licenced waste contractors. The operational blending plant will not create any waste products as all raw materials are either stockpiled on site in	Low

Environmental Aspect	Overview of Key Outcomes	Risk Rating
	the form of aggregate or stored in the three silos. Existing waste management processes for the quarry would continue under the proposed modification. As the proposed modification would not generate operational waste, this matter has not been considered further within this EA.	

4.2 Noise

4.2.1 Introduction

This section is informed by the technical assessment, *Dunmore Hard Rock Quarry, Modification 7, Proposed Blending Plant, Noise Impact Assessment, December 2014, Wilkinson Murray Pty Ltd*, which is provided in full in **Appendix B**. The report identifies and assesses the potential noise impacts associated with the construction and operation of the blending plant in accordance with the *NSW Industrial Noise Policy, EPA, 2000* (INP).

Boral are also proposing to remove Condition 12 relating to noise monitoring from the Development Consent (DA 470-11-2003). This is discussed separately from the noise assessment in **Section 4.2.4**.

Construction works would take place during recommended standard hours and the proposed blending plant would only be operating during the day. Therefore, noise levels associated with the Project have only been predicted for the daytime period. It is deemed reasonable to consider construction of the blending plant as a phase of general operations since construction activities would co-exist with operational activities and it is unlikely both types of activities would be discernable from one another at the surrounding receivers (i.e. mobile plant associated with construction works are expected to emit noise relatively similar in levels and noise characteristics as that generated by operational plant). As such, construction works are assessed against the project specific noise levels in the development consent (**Table 4**).

Noise levels associated with the proposed blending plant were predicted at the identified residential receivers. The resultant predictions were then added to the predicted levels from the existing operations of the Dunmore Quarry. Noise predictions from the proposed blending plant were then assessed against the relevant noise limits set in the development consent.

The operation of the proposed blending plant is expected to generate no more than one to two cement truck deliveries per week, which is within the site's existing approved product transportation limit. As such, for the purpose of the noise assessment, it can be considered that typical operations of the proposed blending plant will not generate additional vehicle movements.

The potentially noisiest phase of construction relates to in-situ concrete works e.g. for slab footings, where two agitator trucks and one medium size excavator would typically be operating on site simultaneously.

4.2.2 Existing Environment

The closest residential receivers for the quarry are the McParland Residence (R1), the Creagen Residence (R2), the Stocker Residence (R3), and the Dunmore Lakes Estate (R4), which are located 800 m to 2 km from the proposed blending plant location (**Figure 2**). Noise limits under the consent and the site's EPL apply to these receivers. Records have

shown a steady decline in noise related complaints since the issue of the development consent in 2004 with no noise complaints since 2008.

The Development Consent (DA 470-11-2003) sets noise limits for the Project, which are outlined in **Table 4**.

Table 4 Noise Impact Assessment Criteria for the Development

Receiver	Noise Limits dB(A)					
	$L_{Aeq,15min}$			$L_{A1,1min}$		
	Day	Evening	Night	Day	Evening	Night
Location A McParland (R1) Residence	35	35	35	35	45	45
Location J (R2) Creagan Residence	Negotiated Agreement in Place					
Location K (R3) Stocker Residence	49	44	38	47	48	55
Location O (R4) Dunmore Lakes	49	44	38	47	48	55

Previous noise predictions from the existing operations were obtained from the noise assessment report prepared as part of the last approved modification (*Noise Impact Assessment - Dunmore Hard Rock Quarry Modification 6* (EMM October 2012)). The daytime predictions including the last approved modification (Modification 6) are outlined in **Table 5** and the noise levels associated with the existing Dunmore Quarry operations (including approved Modification 6) comply with the relevant daytime noise limits.

Table 5 Operational Noise Levels - Existing Operations (Including Approved Modification 6)

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level (dBA)		Project-Specific $L_{Aeq,15min}$ Noise Limit (dBA)	Compliance with Noise Limit (Yes/No)
	Neutral Met	Prevailing Met		
R1	29	26	35	Yes
R2	41	49	n/a	n/a
R3	41	45	49	Yes
R4	32	39	49	Yes

Noise compliance measurements of Dunmore Quarry have been conducted on a yearly basis by SLR Consulting Pty Limited. The most recent 2013 and 2014 daytime measurement results available for R1, R3 and R4 are summarised in **Table 6**. The results show a relatively good consistency between the predicted daytime levels and the measured levels.

Table 6 Noise Compliance Measurement Results

Receiver	Measured $L_{Aeq, 15min}$ Noise Level (dBA)	
	2013	2014
R1	<30	<30
R3	42	<35
R4	40	<30

4.2.3 Potential Impact

Noise levels from the Project Only

The prediction of noise associated with the proposed modification was undertaken using the Environmental Noise Model (ENM) prediction software. The predicted daytime operational $L_{Aeq, 15min}$ noise levels associated with the construction of the proposed blending plant under neutral and prevailing meteorological conditions are presented in **Table 7**. Daytime noise levels associated with the operation of the blending plant are presented in **Table 8**.

Table 7 Predicted Operational Noise Levels - Construction of Blending Plant

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level (dBA)		Project-Specific $L_{Aeq, 15min}$ Noise Limit (dBA)	Compliance with Noise Limit (Yes/No)
	Neutral Met	Prevailing Met		
R1	11	7	35	Yes
R2	39	41	n/a	n/a
R3	37	38	49	Yes
R4	25	25	49	Yes

Table 8 Predicted Operational Noise Levels - Operation of Blending Plant

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level (dBA)		Project-Specific $L_{Aeq, 15min}$ Noise Limit (dBA)	Compliance with Noise Limit (Yes/No)
	Neutral Met	Prevailing Met		
R1	5	1	35	Yes
R2	33	35	n/a	n/a
R3	31	32	49	Yes
R4	19	19	49	Yes

Noise levels from the Combined Operations

Noise predictions associated with the Project were added to the predicted noise levels from the existing quarry operations including Modification 6. The resultant daytime noise levels from the construction and operation of the blending plant are presented in **Table 9** and **Table 10**, respectively.

Table 9 Predicted Operational Levels - Combined Operations (Construction of Blending Plant)

Receiver	Predicted L_{Aeq} , 15min Noise Level (dBA)		Project-Specific L_{Aeq} , 15min Noise Limit (dBA)	Compliance with Noise Limit (Yes/No)
	Neutral Met	Prevailing Met		
R1	29	26	35	Yes
R2	43	50	n/a	n/a
R3	42	46	49	Yes
R4	33	39	49	Yes

Table 10 Predicted Operational Noise Levels - Combined Operations (Operation of Blending Plant)

Receiver	Predicted L_{Aeq} , 15min Noise Level (dBA)		Project-Specific L_{Aeq} , 15min Noise Limit (dBA)	Compliance with Noise Limit (Yes/No)
	Neutral Met	Prevailing Met		
R1	29	26	35	Yes
R2	42	49	n/a	n/a
R3	41	45	49	Yes
R4	32	39	49	Yes

Table 9 and **Table 10** show that daytime noise levels associated with the combined operations of the existing Dunmore Quarry (including approved Modification 6) and the proposed blending plant comply with the relevant noise limits set in the Development Consent (DA 470-11-2003).

The combined noise levels appear to be dominated by the existing quarry operations. A review of the predicted noise levels show that the Project only increases overall noise levels by 1dB at one receiver (R2) during the operation of the blending plant and by up to 2dB during the construction phase. As such, it is expected that the Project would not impact on the acoustic amenity of nearby residences.

4.2.4 Removal of Noise Monitoring Condition

Continuous real-time monitoring of noise generated by the quarry is currently conducted at the Stocker Residence (R3 or Location K in the Project Approval) in accordance with Condition 12 of the Development Consent (DA 470-11-2003).

Condition 12 is reproduced below.

Within 3 months of the date of this consent, the Applicant shall:

- a. *conduct continuous real-time monitoring of the noise generated by the development at the location K; and*
- b. *use this information in the day to day management of the development to ensure compliance with the noise impact assessment criteria.*

Boral is proposing to remove Condition 12 from the development consent on the following basis:

- The resident at R3 (Margrit Stocker) has requested the removal of the monitoring system from her property (refer to letter from Margrit Stocker in **Appendix A**);
- A long history of attended noise compliance monitoring and ongoing BarnOwl monitoring. The BarnOwl monitoring system was installed at R3 in 2005. Data was collected and processed and monthly reports were prepared for the duration of approximately two years between September 2005 and July 2007. An application to remove BarnOwl reporting requirements from the site's EPL was made in 2008 due to regular compliance and the amendment was accepted by the regulators. Since then, the BarnOwl unit was only used as a real-time alarm system. In addition, it should be noted that the site installed cladding on the primary, secondary, and tertiary crusher buildings between 2006 and 2009, significantly reducing noise levels at nearby residences and helping to achieve continual compliance with the noise limits. Since the last modification addressing changes in operations (Modification 6) was approved, attended noise compliance monitoring has been conducted on an annual basis and the results have consistently demonstrated compliance with the noise limits;
- No community complaints in at least six (6) years; and
- Good relationship between Boral and the surrounding residents through community consultation and the establishment of the site's Community Consultative Committee (CCC).

4.2.5 Mitigation and Management Measures

Current noise management measures implemented on site will continue to be implemented during the operation of the blending plant.

4.3 Air Quality

4.3.1 Introduction

This section identifies the potential for adverse air quality impacts occurring at surrounding assessment locations as a result of the Project during operation. It is informed by the technical assessment, *Dunmore Hard Rock Quarry, Modification 7, Proposed Blending Plant, Air Quality Impact Assessment, December 2014, Wilkinson Murray Pty Ltd*, which is provided in full in **Appendix C**.

The project specific air quality criteria has been established to protect the general health and amenity of the community in relation to air quality, with reference to the NSW Environment Protection Authority document "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (DEC 2005).

Particulate matter refers to particles of varying size and composition. The air quality goals relevant to this assessment refer to three classes of particulate matter based on the size of the particles including TSP, PM₁₀ and PM_{2.5}. These particles include potential atmospheric pollutants which may occur as a result of the Project and the applicable air quality criteria. As such, consideration of background pollutant levels is required when using goals to assess the potential impacts.

Atmospheric pollutants likely to be generated by the potential activities include the following fugitive emissions:

- Deposited dust;
- Total Suspended Particulate (TSP): is nominally taken to be less than 30 micrometers (μm) in diameter and refers to all suspended particles in the air;
- PM_{10} : is a subset of TSP and have a diameter of 10 μm or less;
- $\text{PM}_{2.5}$: is a subset of TSP and have a diameter of 2.5 μm or less; and
- Those generated through the combustion of fuel in vehicle engines (NO_x , SO_2 , VOCs, CO, PM_{10}).

Air quality criteria for the Project as identified within the relevant policy is presented in **Table 11**.

Table 11 Air Quality Criteria

Particulate Matter	Averaging Time	Criterion	Source
Total Suspended Particulate (TSP)	Annual	90 $\mu\text{g}/\text{m}^3$	DEC 2005 Approved Methods
PM_{10}	24-hour maximum	50 $\mu\text{g}/\text{m}^3$	DEC 2005 Approved Methods
	Annual mean	30 $\mu\text{g}/\text{m}^3$	DEC 2005 Approved Methods
$\text{PM}_{2.5}$	24-hour maximum	25 $\mu\text{g}/\text{m}^3$	NEPC 2003 (advisory only)
	Annual mean	8 $\mu\text{g}/\text{m}^3$	NEPC 2003 (advisory only)
Dust Deposition	Annual	Maximum Incremental (Project only) increase of 2g/m ² /month Maximum Total (Project and other sources) of 4 g/m ² /month	DEC 2005 Approved Methods

4.3.2 Existing Environment

The land use of the area immediately surrounding the Project site is rural residential, with the Princes Highway located to the east of the site (refer to Sections 2.2 and 2.3 for further details).

The residential receivers considered in this assessment are shown in **Figure 2**.

Local Climate and Meteorological Conditions

Long-term climatic data from the Bureau of Meteorology weather station at Albion Park (Wollongong Airport) (Ste No. 068241) were analysed to characterise the local climate in the proximity of the Project. The Albion Park weather station is located approximately 8km north-west of the Project. A summary of data from the Albion Park weather station, collected over an approximate 11-year period indicates that:

- January is the hottest month with a mean maximum temperature of 26.8°C, July and August are the coldest months with mean minimum temperatures of 6.3 °C;
- Humidity levels exhibit variability over the day and seasonal fluctuations. Mean 9.00 am humidity levels range from 57 per cent in September to 76 per cent in March. Mean 3.00 pm humidity levels vary from 49 per cent in August to 67 per cent in February;
- Rainfall peaks during the summer months and declines during winter. The data shows February is the wettest month with an average rainfall of 151.0 mm over 9.0 days and August is the driest month with an average rainfall of 28.7 mm over 4.4 days;

- As expected, wind speeds during the warmer months have a greater spread between the 9.00 am and 3.00 pm conditions compared to the colder months. The mean 9.00 am wind speeds range from 8.1 km/h in March to 15.3 km/h in September. The mean 3.00 pm wind speeds vary from 17.1 km/h in May to 22.6 km/h in September; and
- The wind patterns (analysed at Dunmore Quarry for 2013) show a generally similar pattern on an annual basis, with winds tending to occur from the south western quadrant. During summer, winds from the north and east appear most dominant.

Local Air Quality

The main sources of air pollution in the vicinity of the Project Site may include industrial activities, emissions from local anthropogenic sources such as motor vehicle exhaust and traffic-related dust from Princes Highway and the local road network. There are also a number of other potential non-Project dust emission sources in the area including activities at the adjacent Boral operations, the existing Ready mix and Cleary Brothers hard rock quarries at Albion Park and sea salt.

Site specific air quality monitoring has been undertaken at the Project Site at four dust deposition gauges and one High Volume Air Sampler (HVAS). The monitoring data has been reviewed to assist in the characterisation of background air quality levels at the Project Site.

PM₁₀ and dust deposition levels have been consistently measured around the Project Site since 2005. The recorded PM₁₀ and dust deposition levels have been used to establish the potential zone of impact for the existing quarry and these results are used qualitatively to assess the proposed modification. The PM₁₀ and dust deposition levels measured around the quarry are summarised in **Table 12** and **Table 13** respectively.

Table 12 PM₁₀ Monitoring Results

Year	Measured PM ₁₀ Levels	
	24 hour maximum (µg/m ³)	Annual Average (µg/m ³)
2005-2006	30.8	12.7
2006-2007	68.9	18.9
2007-2008	36.1	12.6
2008-2009	49.4	12.95
2009-2010	33.6	8.2
2010-2011	46.4	16.4
2011-2012	35.7	11.3
2012-2013	30.3	11.0
2013-2014	42.3	13.9

The results of HVAS (installed at the quarry in 2005) monitoring indicate that suspended particulates have generally remained below the air quality goals despite the monitor being located half way between the closest receiver and the boundary of the quarry. Three exceedances of the 50 µg/m³ 24 hour impact assessment criteria were recorded in 2006 - 2007 with the maximum recorded being at a time when the wind speeds and directions did not indicate that the quarry operations were the contributing factor to the elevated readings. In 2013 to 2014 the annual average was 13.9 µg/m³, which is well under the long term impact assessment criteria of 30 µg/m³, and the highest reading was 42.3 µg/m³, which is below the 24 hour impact assessment criteria of 50 µg/m³.

Table 13 Dust Deposition Monitoring (g/m²/month) (Annual Average)

Annual Averages	D1	D2	D3	D4
2005-2006	3.3	3.7	4.1	3.9
2006-2007	3.5	3.1	2.8	4.3
2007-2008	3.3	2.4	3.9	3.8
2008-2009	3.7	3.0	3.1	2.7
2009-2010	3.8	3.5	5.0	2.6
2010-2011	3.4	3.3	3.4	2.5
2011-2012	3.7	3.3	5.0	2.8
2012-2013	3.7	2.6	5.8	3.3
2013-2014	5.2	3.6	4.6	3.2

The deposited dust goal of 4 g/m²/month is for all insoluble solids. Deposited dust samples are non-discriminate (i.e. material from all sources is collected and not just that of the quarry) and also can include organic material such as leaf litter and insects. The ash content of a sample, which is more indicative of the material processed onsite, is therefore used in the quarry's monitoring records to help determine the quarry's contribution to deposited dust in the surrounding area. Therefore, if an exceedance is detected in insoluble solids but the ash content remains below the assessment criteria it is deemed that the quarry contribution is compliant.

Past deposited dust samples have generally remained below the guidelines of 4 g/m²/month with only minor exceedances mostly due to external influences. For example, monitoring records for 2009 to 2010 show that exceedances of the 4 g/m²/month were during months where dominant winds were not from the direction of the quarry, or were during summer months where increased insect deposition is characteristic. There are single exceedances of the annual average deposition goal for gauges D1 and D4. However, the overall trend of these gauges is that they comply with annual the average deposition goal of 4 g/m²/month. There have been a number of exceedances of the deposited dust goal at D3. However, this gauge is located very close to the quarry compared to the closest residence - Receiver 2. The gauge is located approximately 300 m from the active part of the quarry compared to Receiver 2, which is 600 m away. Therefore the deposited dust levels at Receiver 2 are likely to be well below the recommended deposited dust goal of 4 g/m²/month (annual average).

4.3.3 Potential Impact

The 2008 Statement of Environmental Effects (SEE), which accompanied the Modification 4 application states that the estimated annual dust emissions from the quarry would be 469,885 kg of dust per annum for a production rate of 2.5 Mtpa.

The proposed blending plant has the potential to increase dust from the Project Site due to the following operations:

- Dumping of crushed rock in the product bins. This process has already been accounted for in the inventory from the previous assessments as it would be similar to loading a truck;
- Conveying the crushed rock to the blending plant;
- Loading of the cement to the silos and the conveying to the blending plant;
- Blending of the product; and
- Loading of the blended product into trucks for dispatch to customers.

Dust generated from the blending plant is summarised in Error! Not a valid bookmark self-reference.4.

Table 14 Estimated Dust Generation from the Blending Plant

Process	Emission estimate kg/tonnes	Quantity of Dust kg
Dumping of crushed rock in the product bins.	This process has been accounted for in the existing inventory from the previous assessment as it would be similar to loading a truck. No emissions.	-
Conveying of the crushed rock to the blending plant	Conveyor is fully enclosed. No emissions.	-
Loading of the cement to the silos and the conveying to the blending plant	The cement would be transferred pneumatically. No emissions.	-
Blending of the product	Blending occurs in an enclosed space. No emissions.	-
Loading of the blended product	0.0022 kg/t USEPA(1995) NPI (2012)	330
Total Dust (kg)	-	330

In conclusion, the proposed modification would not increase the amount or rate of production and so would not increase dust generation from sources such as crushing and screening of rock within the processing plant and wind erosion from stockpiles. The levels of dust generated from the loading and unloading of material would remain constant. The frequency of blasts will not increase.

It is estimated that there will be a 330kg increase in annual dust emissions due to the blending plant, which represents a less than 0.1 percent increase in dust emissions. Hence, as the dust emissions from the existing operations of the quarry are generally compliant with ambient criteria it is highly unlikely that the proposed blending plant will cause exceedances of the ambient air quality criteria.

4.3.4 Mitigation and Management Measures

The following dust management measures are already in place at the quarry and will continue to be implemented during the operation of the blending plant:

- Regular wet down of unsealed surfaces using a water truck;
- Wet down as required on blasted rock haul roads and stockpiles;
- Collection or dampening down on drill rig cuttings to reduce the quantity of dust released to the atmosphere during a blast;
- Where possible, confining traffic to identified haul road routes;
- Removal and rehabilitation of unnecessary roads;
- Exposed areas kept to a minimum;
- Requiring all trucks exiting the site to use the operating wheel wash;
- Cleaning of areas which could become sources of dust; and
- Review of meteorological conditions prior to blasting to minimise dust emissions.

Provided the management measures described above are implemented, it is considered that exceedance of the air quality goals would not result from the proposed modification. Therefore, the proposed modification would not have a significant impact on air quality.

4.4 Visual

As the original footprint at the Dunmore Hard Rock Quarry has not been substantially altered since the visual impact assessment was undertaken for the Dunmore Quarry Proposed Croome Farm Extension EIS (Sinclair Knight Merz, 1994), the existing visual character of the site and surrounds has largely remained unchanged. Therefore, the following subsections provide a brief overview of the existing visual amenity and visibility of the Project Site, with the impact assessment focused upon the area of the proposed blending plant.

4.4.1 Existing Environment

The proposed location of the blending plant has been carefully selected, immediately west of the eastern rim of the original Dunmore Quarry and adjacent a 16 m high rock face that forms the eastern edge of the historical extraction area, now used for stockpiling finished quarry products (**Plates 1 to 3**). The outer (east facing) slopes of the eastern rim of the original Dunmore Quarry are densely vegetated with a mixture of mature trees and shrubs, which protrude above the top of the eastern rim (**Plates 1 and 4**).

The existing visual character of the landscape surrounding the Project Site is a combination of rural, rural residential, extractive industry and residential areas, including Dunmore Village (receiver R5), Dunmore Lakes (receiver R4) and Minnamurra. Dunmore Village (1.4 km away) and Dunmore Lakes (1.6 km away) have low elevation and distant views of the densely vegetated eastern rim of the original Dunmore Quarry, from the north-east and south-east respectively. A visual catchment analysis confirmed that the eastern rim of the original Dunmore Quarry is also visible from low lying rural residential receivers R2 (0.85 km away), R3 (0.97 km away) and R6 (1.4 km away). The Project Site is not visible from the Minnamurra residential area or rural residential receiver R1 due to topography.

4.4.2 Potential Impact

The proposed blending plant is to be orientated north - south with the silos and pugmill at the southern end and the product bins at the northern end (**Figure 3**). The silos and pugmill are the tallest structures at 15m and the product bins the lowest at 7m (**Figure 4**).

As the proposed location of the blending plant is immediately west of the eastern rim of the original Dunmore Quarry (**Figure 3**) (a 16 m high rock face), it will be completely screened from the view of all identified residential receivers to the east as well as commuters on the Princes Highway.

The proposed modification would therefore not have an impact on the visual amenity of the surrounding area.

4.4.3 Mitigation and Management Measures

Although it is highly unlikely that even the highest parts of the blending plant will be visible from sensitive receivers, as a precautionary approach, the blending plant will be painted Boral green (**Figure 4** and **Plate 5**).

5 CONCLUSION

Dunmore Hard Rock Quarry is a major supplier of quality concrete and asphalt aggregates to both the Sydney and local markets. Without a blending plant the quarry has not been able to produce specified road base products to meet the demand on local and major road upgrade projects.

Boral is therefore seeking to modify the Development Consent (DA 470-11-2003) under Section 75W of the EP&A Act, to produce up to 150,000 tonnes of specified road base products per calendar year. There will be no changes to the current production and transportation volumes or the hours of operation. Truck deliveries of blended products will be the same as current practice, via Tabbita Road and the Princes Highway.

Dunmore Hard Rock Quarry is ideally located to supply local demand with direct access to the Princes Highway and under 25km haulage distance to planned major road upgrade projects. Producing specified road base products at Dunmore Quarry has an added benefit of utilising by-products of the quarries aggregate manufacturing process including micron dust and scalps.

Technical investigations were undertaken to assess medium risk environmental issues associated with the proposed modification. For those environmental issues identified as low risk, further specialist technical investigations were not required as the proposed modification will not result in any additional impacts on these low risk environmental issues than what has already been assessed in the EIS that accompanied the original development application in 2003 and subsequent approved modifications.

Assessment of potential environmental impacts associated with the proposed blending plant have concluded that:

- The proposed blending plant will be located in the existing stockpile area to the north-east of the main processing plant and no native vegetation clearing is required. Therefore the proposed modification is unlikely to result in any negative impacts on flora and fauna;
- The Project Site is already included within the approved area of disturbance and the proposed blending plant would not increase the area of disturbance within the property. Therefore the proposed modification will not impact on Aboriginal and non-Aboriginal heritage items, exacerbate stormwater runoff or influence current surface water management;
- Neither the delivery of stabilment to the site nor the transport of finished road base products to customers, will exceed the road transport limit of 1.5 Mtpa under the current consent;
- The proposed location of the blending plant has been carefully selected immediately west of a 16m high rock face, that forms the eastern rim of the original Dunmore Quarry and in so doing screens the blending plant (15 m high at its highest point) from residential receivers and the Princes Highway;
- Existing quarry operations are consistently meeting project specific noise levels at identified sensitive receivers. As the proposed modification will not generate noise that exceeds existing quarry operations, it is highly unlikely that the proposed modification will result in additional noise impacts at sensitive residential receivers; and
- There will be an estimated 330 kg increase in annual dust emissions due to the blending plant, which represents a less than 0.1 percent increase in estimated dust emissions from the approved quarry operations. As the dust emissions from the existing quarry operations are generally compliant with ambient criteria, it is highly unlikely that the proposed blending plant will cause exceedances of the ambient air quality criteria.

Boral is also seeking to remove Condition 12 from Development Consent (DA 470-11-2003), which requires continuous real-time noise monitoring at receiver R3 (location K in the

development consent). Boral are proposing to remove Condition 12 from the Development Consent (DA 470-11-2003) on the following basis:

- The resident at R3 (Margrit Stocker) has requested the removal of the monitoring system from her property;
- A long history of attended noise compliance monitoring and ongoing BarnOwl monitoring demonstrating compliance with the Project's noise limits. It should be noted that BarnOwl reporting requirements were removed from the site's EPL in 2008 due to regular compliance;
- No community complaints in at least six (6) years; and
- Good relationship between Boral and the surrounding residents through community consultation and the establishment of the site's Community Consultative Committee (CCC).

As outlined in this Environmental Assessment, the proposed modification is unlikely to result in any significant impacts on either the biophysical or social environment with the implementation of:

- Environmental management and mitigation measures as outlined in:
 - Dunmore Quarry Environmental Management Plans;
 - This EA report;
- Requirements of the EPL; and
- Conditions of the development consent (DA 470-11-2003).

6 REFERENCES

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PLATES



Plate 1: View of the Project Site showing the southern section of the eastern rim of the original Dunmore Quarry.

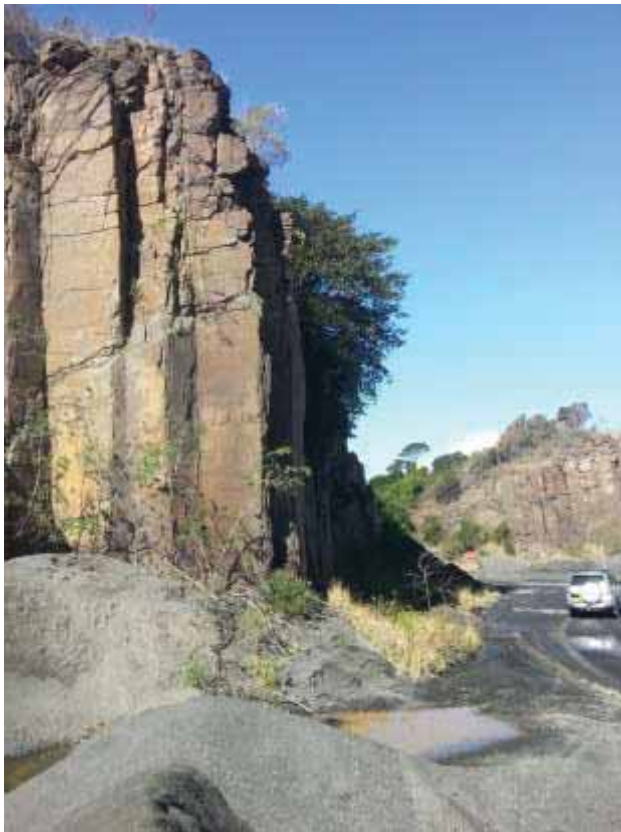


Plate 2: The proposed blending plant site immediately adjacent to the 16 m high rock face.



Plate 3: View of the Project Site showing the northern section of the eastern rim of the original Dunmore Quarry.



Plate 4: View westwards from the northern side of Tabbita Road showing the densely vegetated outer (east facing) slopes of the eastern rim of the original Dunmore Quarry (green rectangle).



Plate 5: Example of the green colour of the blending plant.



APPENDICES





APPENDIX A

CONSULTATION



Correspondence from the Department of Planning and Environment:

From: Kane Winwood [<mailto:Kane.Winwood@planning.nsw.gov.au>]
Sent: Thursday, 7 August 2014 11:59 AM
To: Jackson, Kate
Cc: Mike Young
Subject: RE: Dunmore Quarry - Proposed modification for blending plant

Hi Kate,

I refer to your letter of 3 July 2014. I can confirm the proposal would be assessed as a modification under s75W and the proposed assessment approach is reasonable.

Please note that while the other elements (transport, water, etc) may not require a detailed assessment, these matters should be considered at a sufficient level in an EA supporting the modification (at least to justify why these matters do not require assessment).

Please contact me if you have any further questions.

Regards,
Kane

Kane Winwood
Team Leader, Mining Projects

NSW Planning & Environment
GPO Box 39 | Sydney NSW 2001
T 02 9228 6298 E kane.winwood@planning.nsw.gov.au



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Please consider the environment before printing this email.

Correspondence from Shellharbour City Council:

From: Cathy Bern [<mailto:Cathy.Bern@shellharbour.nsw.gov.au>]
Sent: Monday, 24 November 2014 11:26 AM
To: Jackson, Kate
Cc: Records; Andrew Williams; Luke Preston; Grant Meredith
Subject: Council Comments - Dunmore Quarry Blending Plant Proposed Modification Application (s75W) - Response to ECM Document # 10612515

SCC RECORDS – please **bind** to # 10612515 and name document "Council response to Boral's request for Council feedback concerning a proposed modification under s75A for the Dunmore Quarry which permitted increased production"

Dear Ms Jackson,

Firstly I am sorry about the delayed response. We have had technical problems of late which are now resolved. Following consultation with various officers in Council, the reports you propose appear to address the issues of concern, namely potential impacts associated with noise, air quality and visual amenity.

With regard to traffic impacts, I note that you do not intend to provide a separate assessment report. However, a detailed explanation is required addressing the number and types of trucks (cement) to the plant and routes is required to enable an assessment to be made of any impacts (eg noise, traffic) and whether the cumulative impacts are an issue.

Regards,

Cathy Bern
Team Leader – Planning
City Development
SHELLHARBOUR CITY COUNCIL

SHELLHARBOUR CITY CENTRE | LOCKED BAG 155 | NSW 2529
P: 4221 6134 | F: 4221 6016 | E: Cathy.Bern@shellharbour.nsw.gov.au
Web: www.shellharbour.nsw.gov.au



Margrit Stoker
Rocklow Road
Dunmore NSW 2529

15/12/14

Mr Todd Kalajzich
Dunmore Quarry Manager
38 Tabitta Road
DUNMORE NSW 2529

Dear Todd,

Further to our conversation on 15/12/14, I would like to request the removal of the BarnOwl continuous noise logger from my property on Rocklow Road, Dunmore (lot 1 DP 745632). I understand that Boral's Dunmore Quarry is currently required to continuously monitor noise levels at my property under their development consent and Environment Protection Licence (EPL).

As an active member of the Dunmore Quarry Community Consultative Committee, I am satisfied that noise from the quarry is consistently compliant with the relevant criteria at my property, and that Boral actively engages with the surrounding community to ensure we are fully informed of their operations and compliance requirements.

I therefore request the removal of both Condition 12 in the quarry's consent and section M 8.2 of the EPL which requires continuous monitoring at my property, and the subsequent removal of the BarnOwl logger from my property.

Yours sincerely



Margrit Stoker





APPENDIX B

NOISE IMPACT ASSESSMENT



DUNMORE HARD ROCK QUARRY MODIFICATION 7 PROPOSED BLENDING PLANT NOISE IMPACT ASSESSMENT

**REPORT NO. 14401
VERSION B**

NOVEMBER 2014

PREPARED FOR

ELEMENT ENVIRONMENT
25 KINGFISHER WAY
WARRIEWOOD NSW 2102

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	25 November 2014	Roman Haverkamp	John Wassermann
B	Final	11 December 2014	Roman Haverkamp	John Wassermann

Note

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Quality Assurance

We are committed to and have implemented AS/NZS ISO 9001:2008 "Quality Management Systems – Requirements". This management system has been externally certified and Licence No. QEC 13457 has been issued.



AAAC

This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.



Celebrating 50 Years in 2012

Wilkinson Murray is an independent firm established in 1962, originally as Carr & Wilkinson. In 1976 Barry Murray joined founding partner Roger Wilkinson and the firm adopted the name which remains today. From a successful operation in Australia, Wilkinson Murray expanded its reach into Asia by opening a Hong Kong office early in 2006. 2010 saw the introduction of our Queensland office and 2011 the introduction of our Orange office to service a growing client base in these regions. From these offices, Wilkinson Murray services the entire Asia-Pacific region.



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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

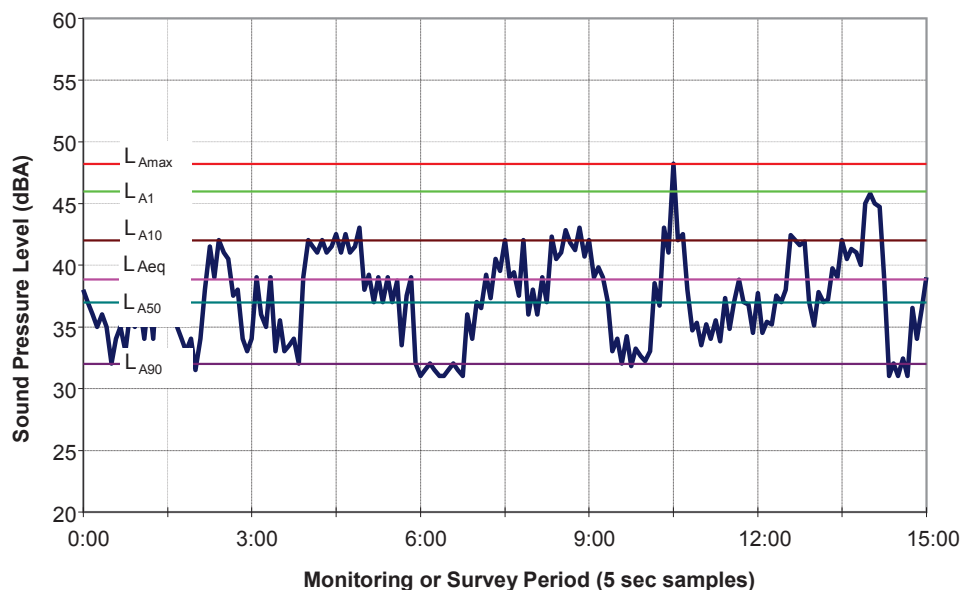
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



EXECUTIVE SUMMARY

A noise and vibration impact assessment has been conducted by Wilkinson Murray Pty Limited (WM) to identify and assess potential impacts associated with the construction and operation of the blending plant (the Project) proposed to be established in the northeast corner of the Dunmore Hard Rock Quarry site located at 38 Tabbita Road in the Shellharbour local government area.

The receiver locations for the Site are specified in the Development Consent (DA 470-11-2003) along with their relevant noise limits.

Noise levels associated with the Project were predicted at the identified receivers. The resultant predictions were then added to the predicted levels from the existing operations of the Dunmore Hard Rock Quarry (including Modification 6). Noise predictions from the existing operations were found to correlate relatively well with the results of recent compliance monitoring undertaken for the site. The combined levels were then assessed against the relevant noise limits.

Operational noise levels at nearby receivers have been predicted using the Environmental Noise Model (ENM) prediction software, taking into account noise source characteristics, prevailing meteorological conditions for the site and noise attenuation due to geometric spreading, shielding, ground absorption and air absorption.

Noise predictions indicate that noise levels at nearby residential receivers associated with the construction and operation of the blending plant together with noise generated by the approved operations of the site, comply with all criteria set in the Development Consent. As such, the Project is not expected to impact on the acoustic amenity of nearby residences.

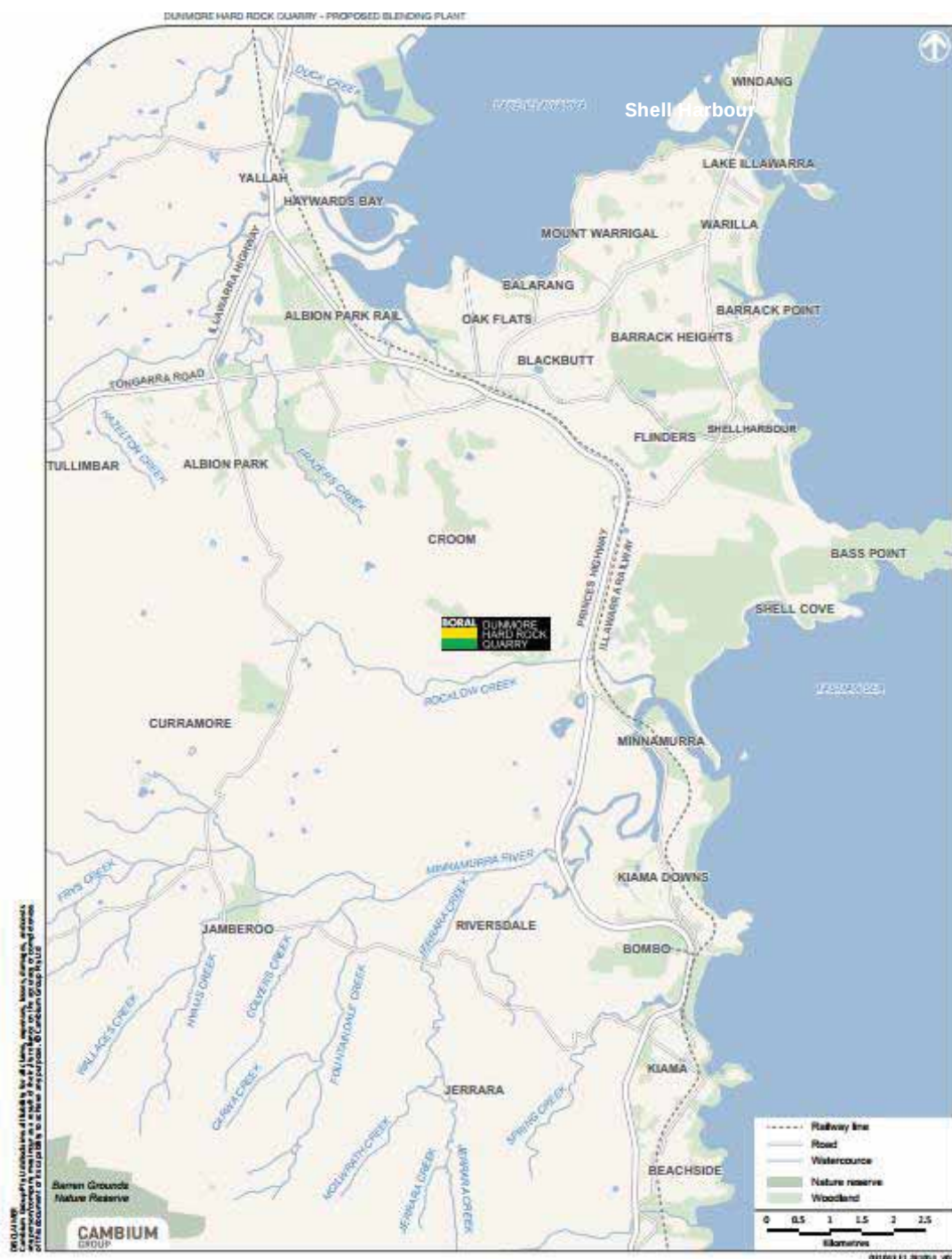
Boral are also proposing to remove Condition 12 relating to noise monitoring from the Development Consent (DA 470-11-2003) based on the following:

- Residents at R3 (Stocker residence) have expressed their intention to remove the monitoring system from their property.
- A long history of attended noise compliance monitoring and ongoing BarnOwl monitoring demonstrating compliance with the Project's noise limits. It should be noted that BarnOwl reporting requirements were removed from the site's EPL in 2008 due to regular compliance.
- No community complaints in at least six (6) years.
- Good relationship between Boral and the surrounding residents through community consultation and the establishment of a Community Consultative Committee (CCC).

1 INTRODUCTION

Boral Resources (NSW) Pty Limited (Boral) are proposing to construct and operate a blending plant (the Project) on the Dunmore Hard Rock Quarry site located at 38 Tabbita Road in the Shellharbour local government area. The location of the Dunmore Hard Rock Quarry and the Project is presented in Figure 1-1.

Figure 1-1 Site Location



Wilkinson Murray Pty Limited (WM) has been commissioned by Element Environment Pty Limited (Element) on behalf of Boral to conduct a Noise Impact Assessment (NIA) to identify the likelihood of noise and/or vibration impacts being caused by the Project.

This NIA has been prepared to accompany the Environmental Assessment (EA) prepared by Element for the Project.

The assessment investigates potential noise impacts associated with the Project on nearby residential receivers.

Boral are also proposing to remove Condition 12 relating to noise monitoring from the Development Consent (DA 470-11-2003). This is discussed separately from the noise assessment in Section 6.

Due to the large separation distance between the Project and nearby sensitive receivers, the potential for vibration impacts from the blending plant is negligible. Accordingly, vibration impacts are not considered further in this study.

2 PROJECT DESCRIPTION

It is proposed to construct a blending plant with a maximum production of 150,000tpa. Operation hours of the plant would be 7.00am to 3.00pm Monday to Saturday, which is within the site's existing approved operational hours.

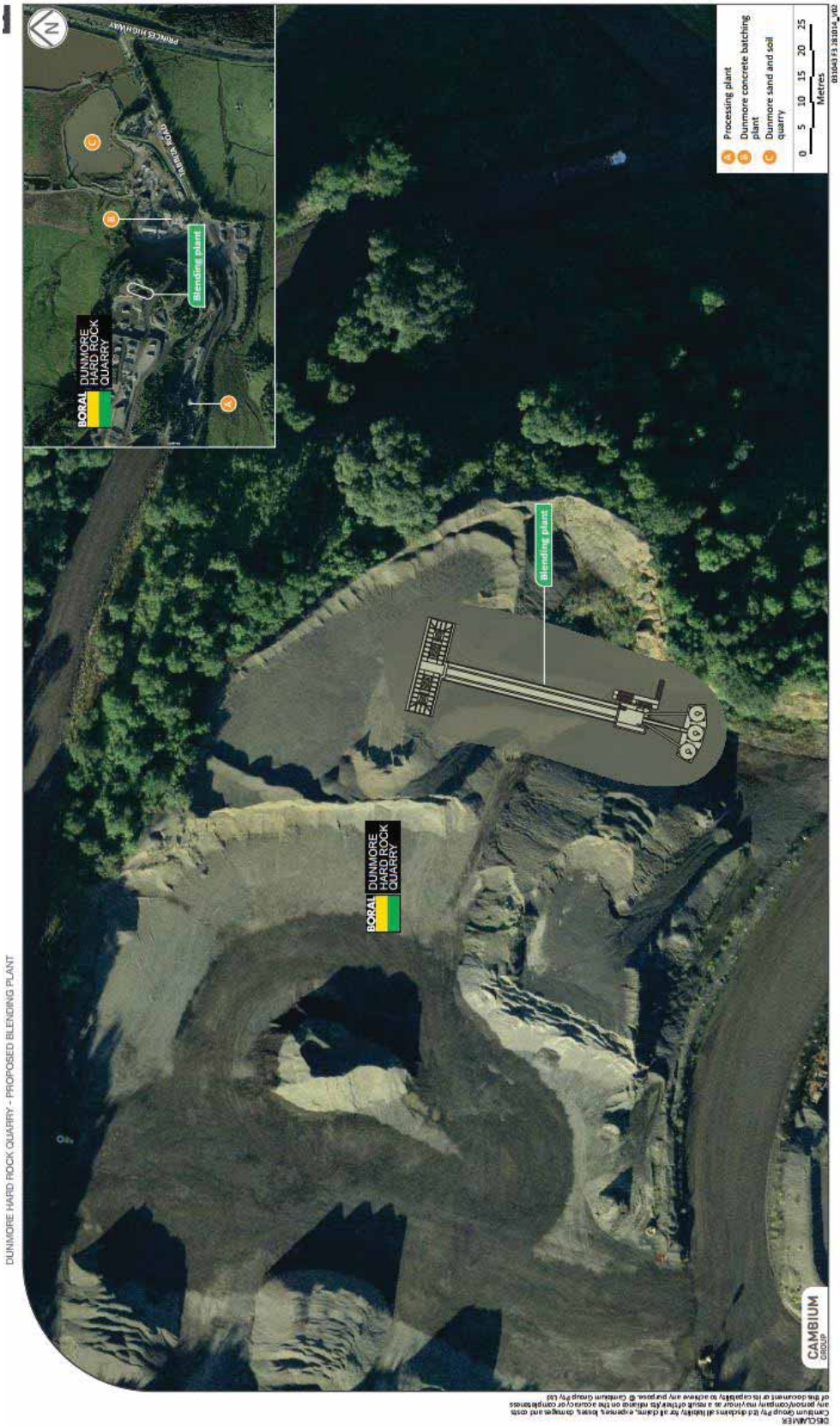
There will be no change to the quarry's existing consented production volumes (2.5Mtpa). The operation of the proposed blending plant is expected to generate no more than one (1) to two (2) cement truck deliveries per week, which is within the site's existing approved product transportation limit.

Figure 2-1 shows the exact location of the proposed blending plant. While the plant is considered mobile, it is anticipated that it will remain in its proposed location within the stockpile area until quarrying activities commence in this area.

Construction of the blending plant would take place during recommended standard hours and would co-exist with operational activities. Construction works would include:

- Installation of gabion baskets and tilt up panels surrounding the plant for stabilisation;
- Concrete slab for footings; and
- Connection to power and water (using the existing services infrastructure on the site).

Figure 2-1 Location of Mobile Blending Plant



3 EXISTING ENVIRONMENT

3.1 Surrounding Land Use and Nearby Receivers

The land use of the area immediately surrounding the Dunmore Hard Rock Quarry site is rural.

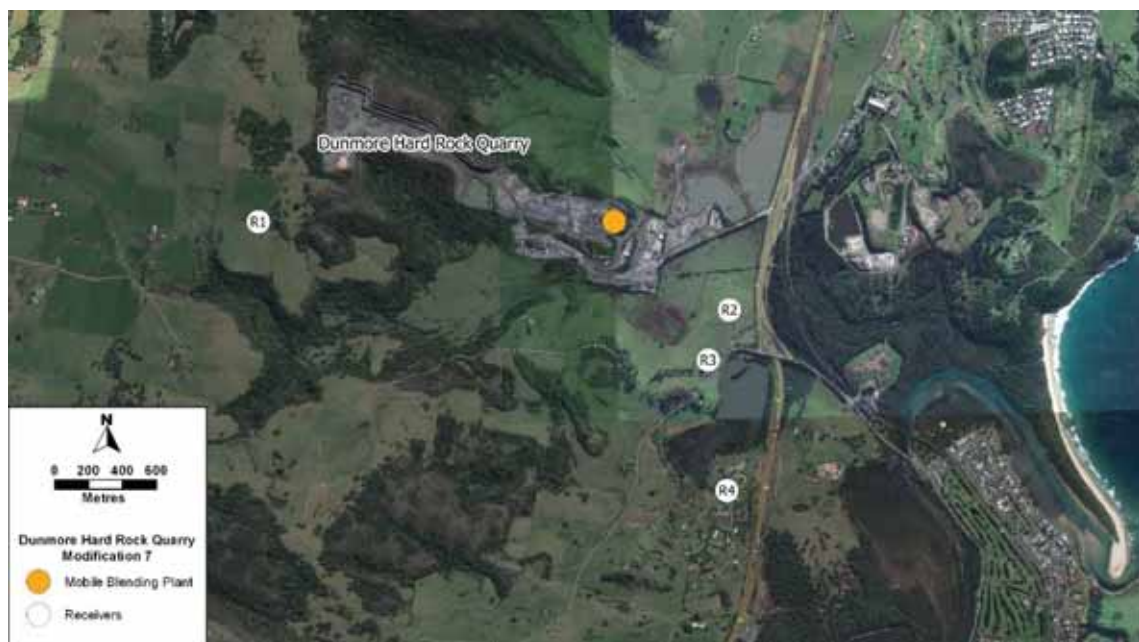
The residential receivers addressed in this assessment include:

- R1 McParland Residence (Location A in Project Approval)
- R2 Creagan Residence (Location J in Project Approval)
- R3 Stocker Residence (Location K in Project Approval)
- R4 Dunmore Lakes Estate (Location O in Project Approval)

Preliminary modelling has determined that these four (4) receivers represent the receivers potentially most impacted by the Project. Therefore, if compliance can be established at these four (4) dwellings, compliance would also be implied at other surrounding receivers.

The four (4) identified receivers are presented in Figure 3-1.

Figure 3-1 Identified Receivers



3.2 Existing Development Consent Noise Limits

The Development Consent (DA 470-11-2003) sets noise limits for the Project. These are reproduced in Table 3-1.

Table 3-1 Noise Impact Assessment Criteria for the Development

Receiver Locations	Noise Limits dB(A)					
	L _{Aeq,15min}			L _{A1,1min}		
	Day	Evening	Night	Shoulder	Night	Shoulder
Location A McParland Residence	35	35	35	35	45	45
Location K Stocker Residence	49	44	38	47	48	55
Location O Dunmore Lakes	49	44	38	47	48	55
Location J Creagan Residence	Negotiated Agreement in Place					

Notes:

1. Receiver locations nominated in Appendix A Figure A2 of the report prepared by Richard Heggie Associates Report No. 605/03 titled Part 1: Noise Assessment – Dunmore Quarry Production Increase.
2. The above table may be varied if the Applicant enters into a negotiated agreement with any of the affected residents, or if existing agreements become void.
3. Noise from the development is to be measured 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 30 from the boundary, to determine compliance with the L_{Aeq,15min} noise limits in the above table. Where it can be demonstrated that direct measurement of noise from the development 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 levels where applicable.
4. Noise from the development is to be measured at 1m from the dwelling façade to determine compliance with the L_{A1,1min} noise limits in the above table.
5. The noise emission limits identified in Table 1 apply under meteorological conditions of:
 - Wind speed up to 3m/s at 10m above ground level; or
 - Temperature inversion conditions of up to 3°C/100m and wind speed up to 2m/s at 10m above the ground

3.3 Existing Dunmore Hard Rock Quarry Operations (incl. Approved Modification 6)

Noise predictions from the existing operations were obtained from the noise assessment report prepared as part of the last approved modification (*Noise Impact Assessment – Dunmore Hard Rock Quarry – Modification 6*, EMGA Mitchell McLennan Pty Limited, October 2012). The daytime predictions including the last approved modification (Modification 6) have been reproduced in Table 3-2.

Table 3-2 Daytime Operational $L_{Aeq,15min}$ Noise Levels – Existing Operations (incl. Approved Modification 6)

Receiver	Predicted $L_{Aeq,15min}$ Noise Level (dBA)		Project-Specific $L_{Aeq,15min}$ Noise Limit (dBA)	Compliance with Noise Limit? (Yes/No)
	Neutral Met	Prevailing Met		
R1	29	26	35	Yes
R2	41	49	n/a	n/a
R3	41	45	49	Yes
R4	32	39	49	Yes

A review of Table 3-2 shows that noise levels associated with the existing Dunmore Hard Rock Quarry operations (including approved Modification 6) comply with the relevant noise limits.

Noise compliance measurements of Dunmore Hard Rock Quarry have been conducted on a yearly basis by SLR Consulting Pty Limited since Modification 6 was approved. The 2013 and 2014 daytime measurement results available for R1, R3 and R4 only are summarised in Table 3-3.

Table 3-3 Noise Compliance Measurement Results (Daytime)

Receiver	Measured $L_{Aeq,15min}$ Noise Level (dBA)	
	2013	2014
R1	<30	<30
R3	42	<35
R4	40	<30

A review of Table 3-3 shows relatively good consistency between the predicted levels and the measured levels.

4 ASSESSMENT METHODOLOGY

4.1 Assessment Methodology

Construction works would take place during recommended standard hours and the proposed blending plant would only be operating during the day. Therefore, noise levels associated with the Project have only been predicted for the daytime period.

Noise levels associated with the proposed plant were predicted at the identified receivers. The resultant predictions were then added to the predicted levels from the existing operations of the Dunmore Hard Rock Quarry. As mentioned in Section 3.3, noise predictions from the existing operations, obtained from the noise assessment report prepared as part of the last approved modification, correlate well with the results of recent compliance monitoring undertaken for the site. The combined levels were then assessed against the relevant noise limits set in the Development Consent.

The operation of the proposed blending plant is expected to generate no more than one (1) to two (2) cement truck deliveries per week, which is within the site's existing approved product transportation limit. As such, for the purpose of this noise assessment, it can be considered that typical operations of the proposed blending plant is not expected to generate additional vehicle movements.

4.2 Assessment of Construction Works

In the context of this assessment, it is deemed reasonable to consider construction of the blending plant as a phase of general operations since construction activities would co-exist with operational activities and it is unlikely both types of activities would be discernable from one another at the surrounding receivers (i.e. mobile plant associated with construction works are expected to emit noise relatively similar in levels and noise characteristics as that generated by operational plant).

As such, construction works are assessed against the Development Consent noise limits.

4.3 Assessed Meteorological Parameters

An analysis of the prevailing meteorological conditions present on site was previously conducted for the quarry.

For consistency reasons, the same meteorological conditions (which were also used for the Modification 6 noise assessment) were considered for this assessment. These are summarised as follows:

- Neutral weather condition: no wind or temperature inversion; and
- Adverse weather condition: 3m/s wind from the west south west direction (247° degrees).

4.4 Noise Sources

The only significant source of operational noise from the proposed Project (i.e. not associated with the current operations) is from the blending plant itself. The indicative sound power level (SWL) of the plant, taken from previous noise assessments conducted for Boral, is 105dBA. It should be noted that this SWL corresponds to a fully enclosed blending plant, such as the one proposed to be erected on the Dunmore Hard Rock Quarry site.

The potentially noisiest phase of construction relates to in-situ concrete works e.g. for slab footings, where two (2) agitator trucks and one (1) medium size excavator would typically be operating on site simultaneously.

The continuous sound power level (SWL) of these mobile plant items, taken from previous measurements by WM, are presented in Table 4-1.

Table 4-1 Continuous Sound Power Levels

Plant Item	Continuous SWL (dBA)
Agitator truck	106
Medium size excavator	108

It should be noted that the values in Table 4-1 represent the SWL of plant items operating on a continuous basis. In reality, plant is not operated in this fashion, and the subsequent noise levels are lower than those in Table 4-1. Therefore, noise predictions associated with construction works may be conservative.

4.5 Modelling Software

Construction and operation noise emissions associated with the Project were modelled using the Environmental Noise Model (ENM) prediction software. Factors that were addressed in the noise modelling are:

- Equipment noise level emissions and locations;
- Prevailing meteorological conditions for the site;
- Shielding from structures;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

5 STUDY FINDINGS

5.1 Predicted Noise Levels from Project Only

The predicted daytime operational $L_{Aeq,15min}$ noise levels associated with the construction of the proposed blending plant under neutral and prevailing meteorological conditions are presented in Table 5-1. Noise levels associated with the operation of the blending plant are presented in Table 5-2.

Table 5-1 Predicted Operational $L_{Aeq,15min}$ Noise Levels (Daytime) – Construction of Blending Plant

Receiver	Predicted $L_{Aeq,15min}$ Noise Level (dBA)		Project-Specific $L_{Aeq,15min}$ Noise Limit (dBA)	Compliance with Noise Limit? (Yes/No)
	Neutral Met	Prevailing Met		
R1	11	7	35	Yes
R2	39	41	n/a	n/a
R3	37	38	49	Yes
R4	25	25	49	Yes

A review of Table 5-1 shows that noise levels associated with the construction of the blending plant are well below the relevant noise limits.

Table 5-2 Predicted Operational $L_{Aeq,15min}$ Noise Levels (Daytime) – Operation of Blending Plant

Receiver	Predicted $L_{Aeq,15min}$ Noise Level (dBA)		Project-Specific $L_{Aeq,15min}$ Noise Limit (dBA)	Compliance with Noise Limit? (Yes/No)
	Neutral Met	Prevailing Met		
R1	5	1	35	Yes
R2	33	35	n/a	n/a
R3	31	32	49	Yes
R4	19	19	49	Yes

A review of Table 5-2 shows that noise levels associated with the operation of the blending plant are well below the relevant noise limits.

5.2 Predicted Noise Levels from Combined Operations (Existing Dunmore Hard Rock Quarry Operations + Project)

Noise predictions associated with the Project were added to the predicted levels from the existing operations including Modification 6 (see Table 3-2). The resultant noise levels for the construction and operation of the blending plant are presented in Table 5-3 and Table 5-4, respectively.

Table 5-3 Predicted Operational $L_{Aeq,15min}$ Noise Levels (Daytime) – Combined Operations (Construction of Blending Plant)

Receiver	Predicted $L_{Aeq,15min}$ Noise Level (dBA)		Project-Specific $L_{Aeq,15min}$ Noise Limit (dBA)	Compliance with Noise Limit? (Yes/No)
	Neutral Met	Prevailing Met		
R1	29	26	35	Yes
R2	43	50	n/a	n/a
R3	42	46	49	Yes
R4	33	39	49	Yes

Table 5-4 Predicted Operational $L_{Aeq,15min}$ Noise Levels (Daytime) – Combined Operations (Operation of Blending Plant)

Receiver	Predicted $L_{Aeq,15min}$ Noise Level (dBA)		Project-Specific $L_{Aeq,15min}$ Noise Limit (dBA)	Compliance with Noise Limit? (Yes/No)
	Neutral Met	Prevailing Met		
R1	29	26	35	Yes
R2	42	49	n/a	n/a
R3	41	45	49	Yes
R4	32	39	49	Yes

A review of Table 5-3 and Table 5-4 shows that noise levels associated with the combined operations of the existing Dunmore Hard Rock Quarry (including approved Modification 6) and the Project comply with the relevant noise limits.

It is found that the combined noise levels are dominated by the existing hard rock quarry operations. A review of the predicted noise levels show that the Project only increases overall noise levels by 1dB at one (1) receiver (R2) during the operation of the blending plant and by up to 2dB during the construction phase.

6 REMOVAL OF NOISE MONITORING CONDITION

Continuous real-time monitoring of noise generated by the quarry is currently conducted at the Stocker Residence (R3 or Location K in Project Approval) in accordance with Condition 12 of the Development Consent (DA 470-11-2003).

Condition 12 is reproduced below.

12. ⁵*Within 3 months of the date of this consent, the Applicant shall:*

- (a) conduct continuous real-time monitoring of the noise generated by the development at the location K; and*
- (b) use this information in the day to day management of the development to ensure compliance with the noise impact assessment criteria.*

Boral are proposing to remove Condition 12 from the Development Consent on the following basis:

- The resident at R3 (Margrit Stocker) has expressed her intention to remove the monitoring system from her property.
- A long history of attended noise compliance monitoring and ongoing BarnOwl monitoring. The BarnOwl monitoring system was installed at R3 in 2005. Data was collected and processed and monthly reports were prepared for the duration of approximately two (2) years between September 2005 and July 2007. An application to remove BarnOwl reporting requirements from the site's EPL was made in 2008 due to regular compliance and the amendment was accepted by the regulators. Since then, the BarnOwl unit was only used as a real-time alarm system. In addition, it should be noted that the site installed cladding on the primary, secondary, and tertiary crusher buildings between 2006 and 2009, significantly reducing noise levels at nearby residences and helping to achieve continual compliance with the noise criteria. Since the last modification addressing changes in operations (Modification 6) was approved, attended noise compliance monitoring was conducted on an annual basis and the results have consistently demonstrated compliance (Refer to Table 6-1).
- No community complaints in at least six (6) years.
- Good relationship between Boral and the surrounding residents through community consultation and the site's Community Consultative Committee (CCC).

As mentioned in Section 3.3, noise compliance measurements of Dunmore Hard Rock Quarry have been conducted on a yearly basis by SLR Consulting Pty Limited since Modification 6 was approved. Table 6-1 summarises the 2013 and 2014 measurement results for R3.

Table 6-1 Noise Compliance Measurement Results – R3

Year of Monitoring	Measured Level (dBA)		
	Morning Shoulder	Day	Evening
2013	45	42	43
2014	43	<35	<31

A review of the compliance measurement results presented in Table 6-1 shows that noise levels generated by the Dunmore Hard Rock Quarry have been complying with the relevant noise limits since the last modification.

7 CONCLUSION

A noise impact assessment has been conducted by Wilkinson Murray Pty Limited to identify and assess potential impacts associated with the construction and operation of the blending plant proposed to be established at the Dunmore Hard Rock Quarry site.

Operational noise levels at nearby receivers have been predicted using the Environmental Noise Model (ENM) prediction software. Results indicate that noise levels at nearby residential receivers comply with the relevant noise limits set in the Development Consent (DA 470-11-2003).

It is found that the combined noise levels are dominated by the existing hard rock quarry operations. A review of the predicted levels show that the Project only increases overall levels by 1dB at one (1) receiver (R2) during the operation of the blending plant and by up to 2dB during the construction phase. As such, it is expected that the Project would not impact on the acoustic amenity of the community.

Current noise management measures will continue to be implemented during the proposed modification.

Boral are also proposing to remove Condition 12 from the Development Consent (DA 470-11-2003), which requires continuous real-time noise monitoring at location K (receiver R3). The proposal to remove the real-time noise monitor is based on the following:

- Resident at R3 has expressed her intention to remove the monitoring system from her property.
- A long history of attended noise compliance monitoring and ongoing BarnOwl monitoring demonstrating compliance with the Project's noise limits. It should be noted that BarnOwl reporting requirements were removed from the site EPL in 2008 due to regular compliance.
- No community complaints in at least six (6) years.
- Good relationship between Boral and the surrounding residents through community consultation and the establishment of the site's Community Consultative Committee (CCC).

8 REFERENCES

SEE (2012)

“Noise Impact Assessment – Dunmore Hard Rock Quarry – Modification 6”, EMGA Mitchell
McLennan Pty Limited, October 2012

NSW EPA (2005)

“NSW Industrial Noise Policy”, NSW Environment Protection Authority, 2000





APPENDIX C

AIR QUALITY ASSESSMENT



DUNMORE HARD ROCK QUARRY MODIFICATION 7 PROPOSED BLENDING PLANT AIR QUALITY ASSESSMENT

**REPORT NO. 14401
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GLOSSARY OF AIR QUALITY TERMS

Air Pollution – The presence of contaminants or pollutant substances in the air that interfere with human health or welfare, or produce other harmful environmental effects.

Air Quality Standards – The level of pollutants prescribed by regulations that are not to be exceeded during a given time in a defined area.

Air Toxics – Any air pollutant for which a national ambient air quality standard (NAAQS) does not exist (i.e. excluding ozone, carbon monoxide, PM-10, sulphur dioxide, nitrogen oxide) that may reasonably be anticipated to cause cancer; respiratory, cardiovascular, or developmental effects; reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans.

Airborne Particulates – Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts, and reactions to gases in the atmosphere.

Area Source – Any source of air pollution that is released over a relatively small area, but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities, or biogenic sources, such as a forest that releases hydrocarbons, may be referred to as nonpoint source.

Concentration – The relative amount of a substance mixed with another substance. Examples are 5 ppm of carbon monoxide in air and 1 mg/l of iron in water.

Emission – Release of pollutants into the air from a source. We say sources emit pollutants.

Emission Factor – The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials.

Emission Inventory – A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Flow Rate – The rate, expressed in gallons -or litres-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement.

Fugitive Emissions – Emissions not caught by a capture system.

Hydrocarbons (HC) – Chemical compounds that consist entirely of carbon and hydrogen.

Hydrogen Sulphide (H₂S) – Gas emitted during organic decomposition. Also, a by-product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness.

Inhalable Particles – All dust capable of entering the human respiratory tract.

Nitric Oxide (NO) – A gas formed by combustion under high temperature and high pressure in an internal combustion engine. NO is converted by sunlight and photochemical processes in ambient air to nitrogen oxide. NO is a precursor of ground-level ozone pollution, or smog.

Nitrogen Dioxide (NO₂) – The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.

Nitrogen Oxides (NO_x) – A criteria air pollutant. Nitrogen oxides are produced from burning fuels, including gasoline and coal. Nitrogen oxides are smog formers, which react with volatile organic compounds to form smog. Nitrogen oxides are also major components of acid rain.

Mobile Sources – Moving objects that release pollution; mobile sources include cars, trucks, buses, planes, trains, motorcycles and gasoline-powered lawn mowers.

Particulates; Particulate Matter (PM-10) – A criteria air pollutant. Particulate matter includes dust, soot and other tiny bits of solid materials that are released into and move around in the air. Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, incineration of garbage, mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining operations, agricultural burning (field and slash burning), and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems.

Parts Per Billion (ppb) / Parts Per Million (ppm) – Units commonly used to express contamination ratios, as in establishing the maximum permissible amount of a contaminant in water, land, or air.

PM10/PM2.5 – PM10 is measure of particles in the atmosphere with a diameter of less than 10 or equal to a nominal 10 micrometres. PM2.5 is a measure of smaller particles in the air.

Point Source – A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack.

Scrubber – An air pollution device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Source – Any place or object from which pollutants are released.

Stack – A chimney, smokestack, or vertical pipe that discharges used air.

Stationary Source – A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses etc.

Total suspended particulates – TSP is the measure of all particles that are suspended in air.

Temperature Inversion – One of the weather conditions that are often associated with serious smog episodes in some portions of the country. In a temperature inversion, air does not rise because it is trapped near the ground by a layer of warmer air above it. Pollutants, especially smog and smog-forming chemicals, including volatile organic compounds, are trapped close to the ground. As people continue driving and sources other than motor vehicles continue to release smog-forming pollutants into the air, the smog level keeps getting worse.

EXECUTIVE SUMMARY

A qualitative air quality assessment has been conducted by Wilkinson Murray Pty Limited (WM) to identify and assess potential impacts associated with the construction and operation of the blending plant (the Project) proposed to be established in the existing stockpile area of the Dunmore Hard Rock Quarry site located at 38 Tabbita Road in the Shellharbour local government area.

The proposed modification would not increase the amount or rate of production and so would not increase dust generation from sources such as crushing and screening of rock within the processing plant and wind erosion from stockpiles. The levels of dust generated from the loading and unloading of material would remain constant. The frequency of blasts will not increase.

It is estimated that there will be a 330kg increase in annual dust emissions due to the blending plant, which represents a less than 0.1 percent increase in dust emissions. Hence, as the dust emissions from the existing operations of the quarry are generally compliant, it is considered that the proposed modification would result in a negligible increase to current dust emissions.

The following dust management measures are already in place at the quarry and will continue to be implemented during the proposed modification:

- regular wet down of unsealed surfaces using a water cart;
- wet down as required on blasted rock haul roads and stockpiles;
- collection or dampening down on drill rig cuttings to reduce the quantity of dust released to the atmosphere during a blast;
- where possible, confining traffic to identified haul road routes;
- removal and rehabilitation of unnecessary roads;
- exposed areas kept to a minimum;
- requiring all trucks exiting the site to use the wheel wash;
- cleaning of areas which could become sources of dust; and
- review of meteorological conditions prior to blasting to minimise dust emissions.

Provided that the site continues to implement these management measures, it is considered that exceedance of the air quality goals would not result from the proposed modification. Therefore, the proposed modification would not have a significant impact on air quality.

1 INTRODUCTION

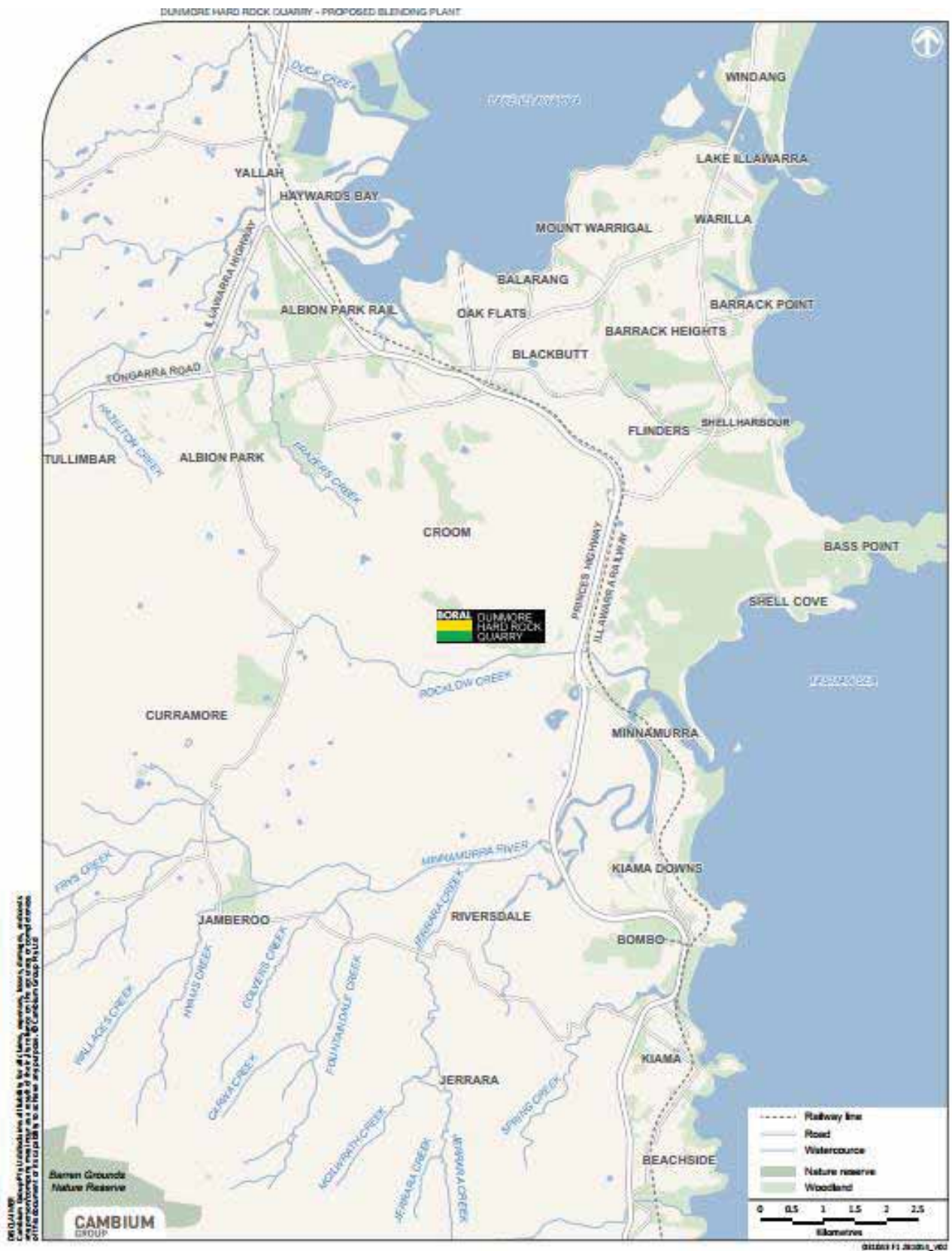
Dunmore Hard Rock Quarry is located at 38 Tabbita Road in Shellharbour local government area (LGA) and is owned and operated by Boral Resources (NSW) Pty Ltd. This air quality assessment has been prepared to accompany a modification application to the existing development consent for the quarry (referred to as Modification 7).

The location of the Project site is presented in Figure 1-1.

Wilkinson Murray Pty Limited (WM) has been commissioned by Element Environment Pty Ltd (Element) on behalf of Boral Resources (NSW) Pty Ltd to conduct a qualitative Air Quality Assessment (AQA) to identify the potential air quality impacts from the Project (Modification 7).

The assessment investigates potential air quality impacts associated with the Project on nearby residential receivers and has been conducted in general accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW DEC, 2005).

Figure 1-1 Site Location



2 PROJECT DESCRIPTION

It is proposed to modify development consent 470-11-2003 (Modification 7) to construct a blending plant with a maximum production of 150,000 tpa. Operation hours of the plant will be 7am-3pm Monday – Saturday, which is within the site's existing approved operational hours.

There will be no change to the quarry's existing consented production volumes (2.5 Mtpa) and all product produced by the blending plant will be transported by truck, within the site's consented 1.5Mtpa road transport limits. While the plant is considered mobile, it is anticipated that it will remain in its proposed location within the stockpile area until quarrying activities commence in this area.

Material blended within the plant will comprise quarry product from Dunmore Quarry and cement from Boral's cement operations at Berrima. The operation of the proposed blending plant is expected to generate no more than one (1) to two (2) cement truck (30 tonne tankers) deliveries per week. There will be no additional material delivered to the site to be blended within the plant other than cement.

Construction works required to install the plant include:

- installation of gabion baskets and tilt up panels surrounding the plant for stabilisation;
- concrete slab for footings; and
- connection to power and water (using the existing services infrastructure on the site).

Figure 2-1 and shows the exact location of the proposed blending plant.

Figure 2-1 Location of Blending Plant

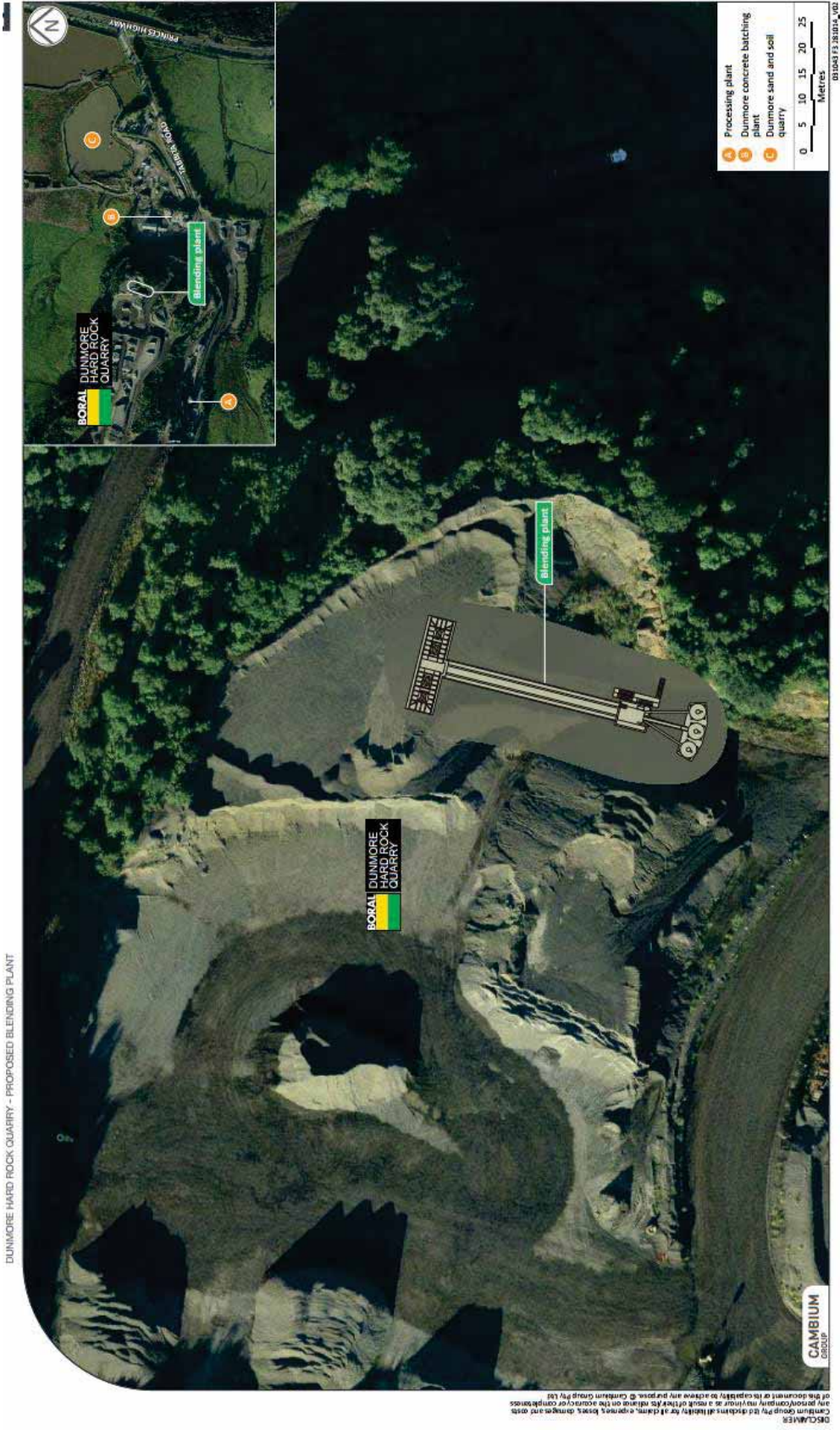
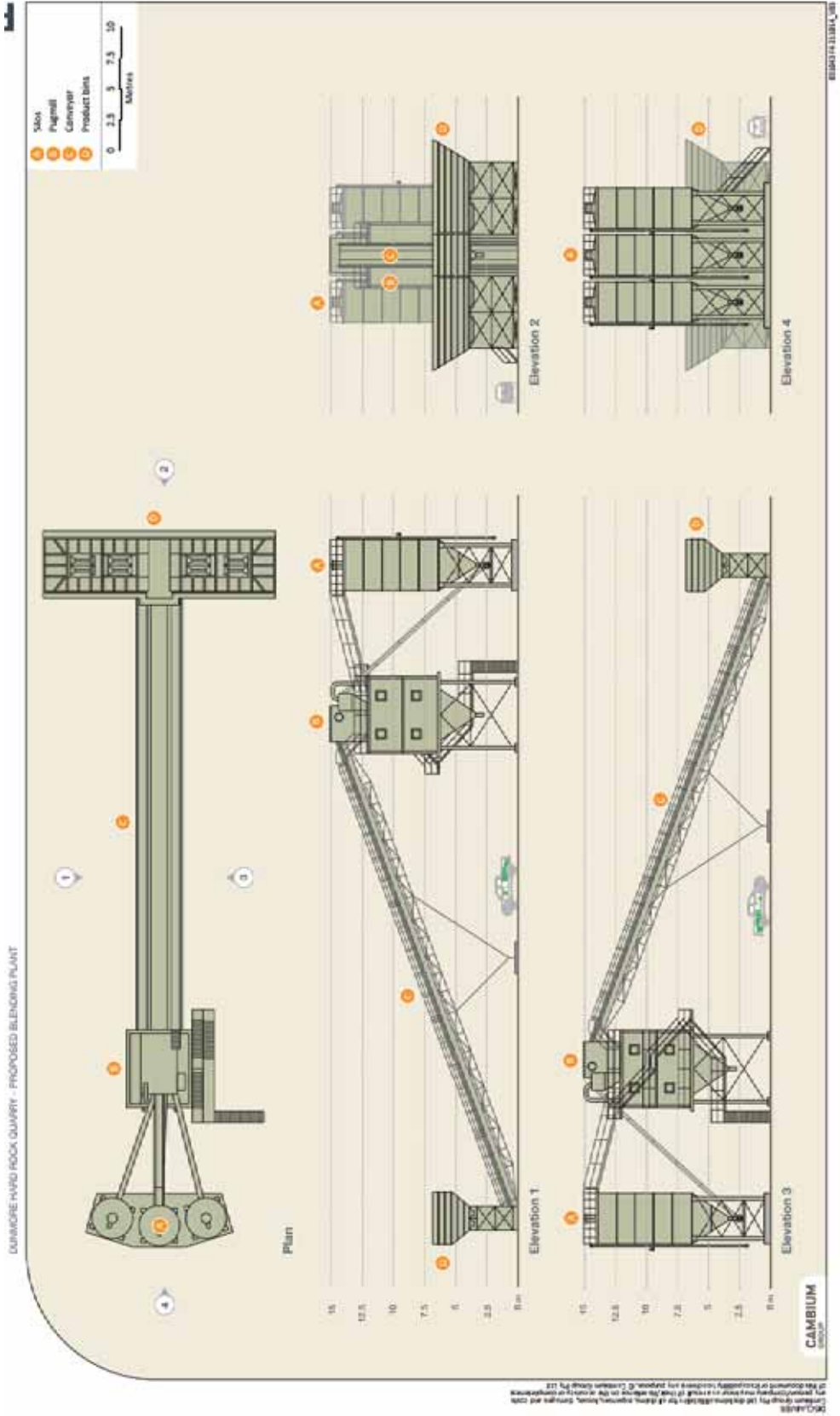


Figure 2-2 Blending Plant, plan and cross-section views



3 METHODOLOGY

3.1 Air Quality Assessment

The study area for the AQA encompasses the nearest and potentially most affected residential receivers to the Project site as presented in Figure 4-1.

This qualitative AQA involved:

- establishment of appropriate air quality criteria;
- analysis of Boral's site monitoring data (deposition and concentration);
- identification of a dust inventory for the blending plant;
- comparison of the inventory from the proposed blending plant with previous inventory data; and
- identification of potential dust impacts and dust management measures.

3.2 NSW Air Quality Criteria

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The following section identifies the applicable air quality criteria for the potential air emissions that would be generated by the Project.

Air quality goals relevant to this study relate to particulate matter and are sourced from the NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW DEC, 2005).

The air quality goals for the relevant particulate matter pollutants relate to the total pollutant burden in the air and not just the pollutant from the Project. As such, consideration of background pollutant levels is required when using these goals to assess potential impacts.

Table 3-1 shows the criteria for each of the relevant dust metrics considered in this assessment.

Table 3-1 NSW EPA Air Quality Impact Assessment Criteria

Pollutant	Averaging Period	Impact	Criterion
Total suspended particulates (TSP)	Annual	Total	90 µg/m ³
Particulate matter ≤ 10µm (PM ₁₀)	Annual	Total	30 µg/m ³
	24-hour	Incremental	50 µg/m ³
Deposited dust (DD)	Annual	Incremental	2 g/m ² /month
	Annual	Total	4 g/m ² /month

There are currently no air quality goals for particulate matter $\leq 2.5 \mu\text{m}$ (PM_{2.5}) for Projects within NSW. However, the National Environmental Protection Council (NEPC) has developed an advisory National Environmental Protection Measure (NEPM) for PM_{2.5}, as follows:

- A maximum 24 hour average concentration of $25 \mu\text{g}/\text{m}^3$; and,
- An annual average concentration of $8 \mu\text{g}/\text{m}^3$.

The above goals for PM_{2.5} concentrations are considered advisory only.

3.3 Existing Development Consent

The existing Development Consent for the site has the following conditions that deal with air quality:

AIR QUALITY

Impact Assessment Criteria

22. The Applicant shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not exceed the criteria in Tables 7, 8 and 9 at any residence on privately-owned land.

Pollutant	Averaging period	^d Criterion
Total suspended particulates (TSP)	Annual	^a 90 $\mu\text{g}/\text{m}^3$
Particulate matter < 10 μm (PM10)	Annual	^a 30 $\mu\text{g}/\text{m}^3$

Table 7: Long-Term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging period	^d Criterion
Particulate matter < 10 μm (PM10)	24 hour	^a 50 $\mu\text{g}/\text{m}^3$

Table 8: Short Term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
^c Deposited dust	Annual	^b 2 $\text{g}/\text{m}^2/\text{month}$	^a 4 $\text{g}/\text{m}^2/\text{month}$

Table 9: Long-Term Impact Assessment Criteria for Deposited Dust

Notes to Tables 7-9:

- ^a Total impact (ie incremental increase in concentrations due to the Project plus

background concentrations due to all other sources);

- ^b Incremental impact (ie incremental increase in concentrations due to the Project on its own);
- ^c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003:Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.
- ^d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with EPA.

Management

23. ⁹The Applicant shall minimise and/or prevent the emission of dust from the site.
24. Within 3 months of the date of this consent, the Applicant shall prepare, and subsequently implement, a Fines Management Plan to the satisfaction of the EPA. This plan must include the measures that would be implemented to stabilise the surface of stockpiles of fines to minimise wind-blown dust emissions and the erosion/product loss due to stormwater run-off.

Note: Fines are < 4mm in diameter.

Monitoring

25. ¹⁰The Applicant shall monitor (by sampling and obtaining results by analysis) the concentration of each pollutant in Table 10 to the satisfaction of the EPA and the Director-General, using the specified unit of measure, averaging period, frequency, sampling method and minimum number of locations.

Pollutant	Unit of Measure	Averaging Period	Frequency	Sampling Method	Locations
Dust deposition	g/m ² /month	Month, annual	Continuous	AM-15	4
PM10	µg/m ³	24 hour, annual	Continuous	AM-18(or equivalent) ¹	1

Table 10: Sampling of Air Pollutants

- ¹ The Applicant may use an equivalent sampling method to AM-18, with the approval of EPA.
26. Within 3 months of the date of this consent, the Applicant shall prepare, and subsequently implement, an Air Quality Monitoring Program for the development, in consultation with the EPA, and to the satisfaction of the Director-General.

4 EXISTING ENVIRONMENT

4.1 Surrounding Land Use and Nearby Receivers

The land use of the area immediately surrounding the Project site is rural residential, with the Princes Highway located to the east of the site.

The residential receivers considered in this assessment include:

- Receiver 1 McParland Residence (Location A in Project Approval);
- Receiver 2 Creagan Residence (Location J in Project Approval);
- Receiver 3 Stocker Residence (Location K in Project Approval);
- Receiver 4 Dunmore Lakes Estate (Location O in Project Approval);
- Receiver 5 Dunmore Road Residences; and
- Receiver 6 Renton Residence.

Previous air quality assessments identified these receivers as potentially most impacted by the quarry operations.

The six (6) identified receivers are presented in Figure 4-1.

4.2 Local Climate and Existing Noise Environment

This section describes the existing climate and air quality in the area surrounding the proposed modification.

4.2.1 Local Climate

Long-term climatic data from the Bureau of Meteorology weather station at Albion Park (Wollongong Airport) (Site No. 068241) were analysed to characterise the local climate in the proximity of the Project. The Albion Park (Wollongong Airport) is located approximately 8 km southeast of the Project.

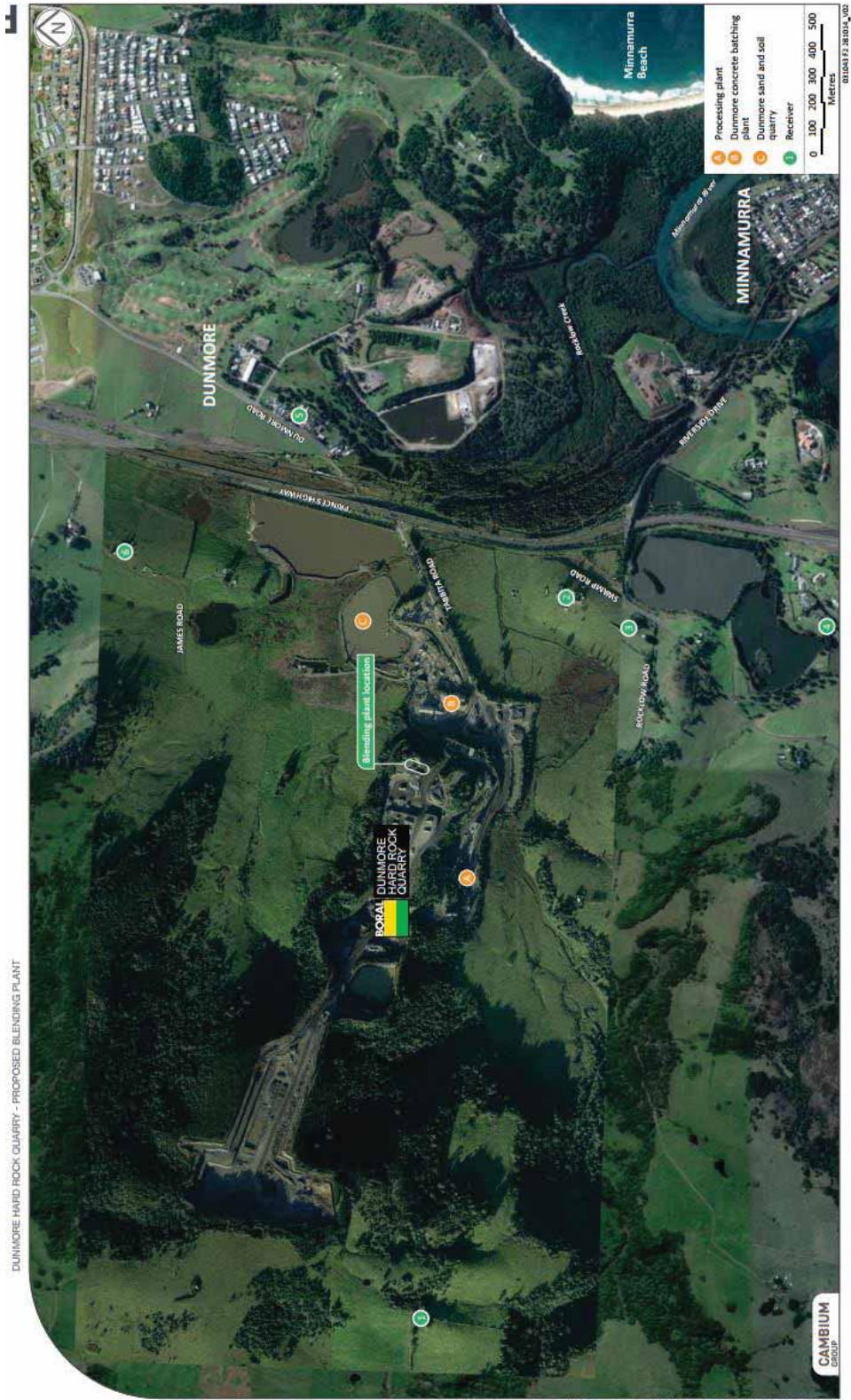
Table 4-1 and Figure 4-2 present a summary of data from the Albion Park (Wollongong Airport) weather station collected over an approximate 11-year period.

The data indicates that January is the hottest month with a mean maximum temperature of 26.8°C, July and August are the coldest months with mean minimum temperatures of 6.3 °C.

Humidity levels exhibit variability over the day and seasonal fluctuations. Mean 9.00am humidity levels range from 57 per cent in September to 76 per cent in March. Mean 3.00pm humidity levels vary from 49 per cent in August to 67 per cent in February.

Rainfall peaks during the summer months and declines during winter. The data shows February is the wettest month with an average rainfall of 151.0 mm over 9.0 days and August is the driest month with an average rainfall of 28.7 mm over 4.4 days.

Figure 4-1 Nearby Sensitive Receivers



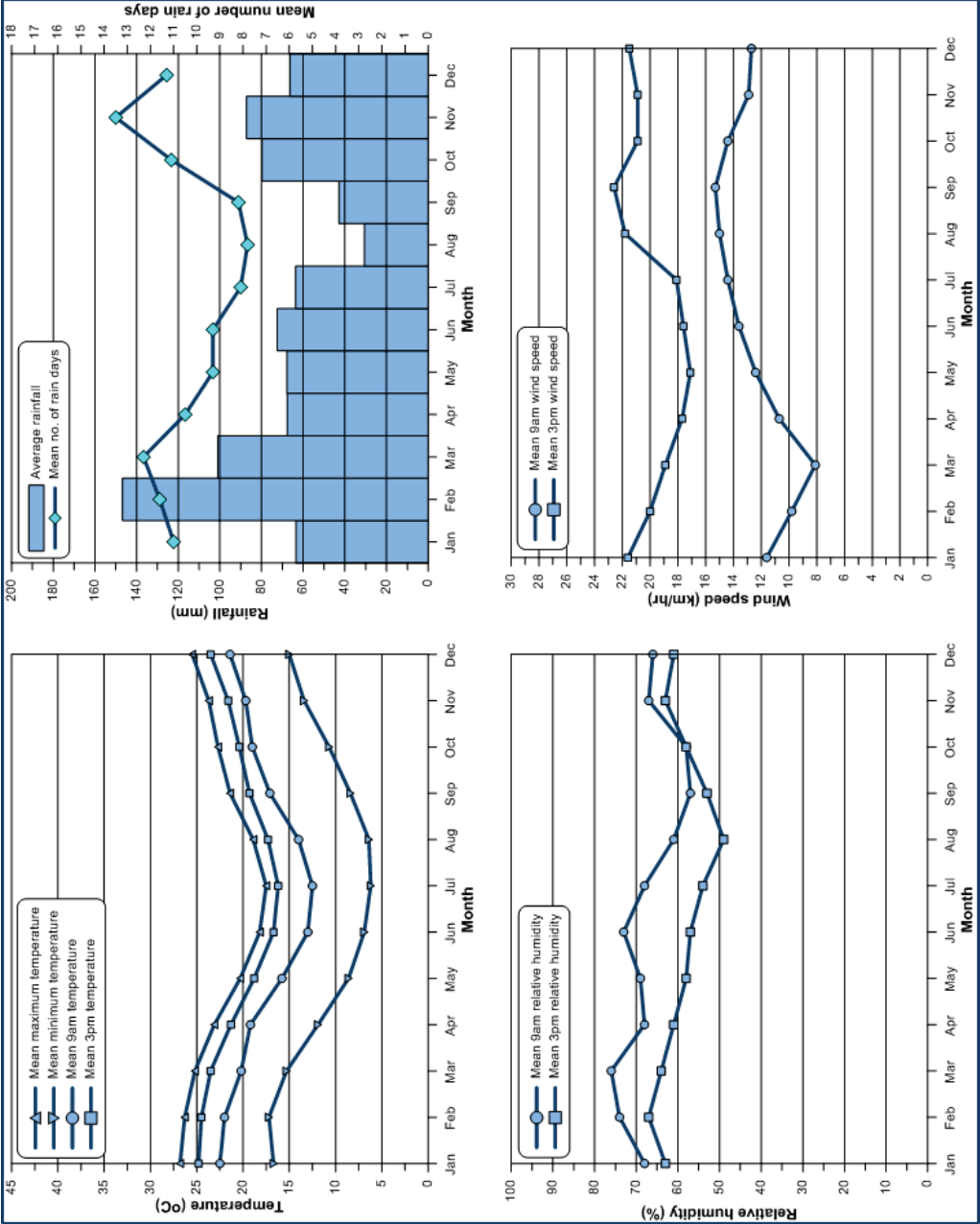
As expected, wind speeds during the warmer months have a greater spread between the 9.00am and 3.00pm conditions compared to the colder months. The mean 9.00am wind speeds range from 8.1 km/h in March to 15.3 km/h in September. The mean 3.00pm wind speeds vary from 17.1 km/h in May to 22.6 km/h in September.

Table 4-1 Monthly Climate Statistics Summary – Albion Park (Wollongong Airport)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature												
Mean max. temperature (°C)	26.8	26.3	25.2	23.1	20.3	18.2	17.5	18.9	21.4	22.7	23.7	25.5
Mean min. temperature (°C)	16.7	17.2	15.3	11.9	8.6	6.9	6.2	6.4	8.4	10.7	13.4	15.0
Rainfall												
Rainfall (mm)	63.5	146.7	101.0	67.7	67.8	72.4	63.6	30.5	42.9	79.8	87.2	66.4
Mean No. of rain days (≥1mm)	11.0	11.6	12.3	10.5	9.3	9.3	8.1	7.8	8.2	11.1	13.5	11.3
9.00am Conditions												
Mean temperature (°C)	22.5	22.0	20.2	19.2	15.8	13.0	12.5	14.0	17.1	19.0	19.7	21.4
Mean relative humidity (%)	68	74	76	68	69	73	68	61	57	58	67	66
Mean wind speed (km/h)	11.6	9.8	8.1	10.7	12.4	13.6	14.4	15.0	15.3	14.4	12.9	12.7
3.00pm Conditions												
Mean temperature (°C)	24.8	24.5	23.5	21.3	18.8	16.7	16.2	17.3	19.3	20.4	21.6	23.5
Mean relative humidity (%)	63	67	64	61	58	57	54	49	53	58	63	61
Mean wind speed (km/h)	21.6	20.0	18.9	17.7	17.1	17.6	18.1	21.8	22.6	20.9	20.9	21.5

Source: Bureau of Meteorology, 2013

Figure 4-2 Monthly Climate Statistics Summary – Albion Park (Wollongong Airport)



The site has a meteorological station. Windrose plots showing the distribution of wind direction and wind speed at Dunmore for 2013 are presented for each month in Appendix A.

The prevailing wind directions for Dunmore Quarry are presented in Table 4-2.

Table 4-2 Predominant Dunmore Quarry Season Wind Direction

Season	Predominant Wind Direction
Autumn	South-westerly
Winter	South-westerly
Spring	South-westerly
Summer	North-easterly

5 LOCAL AIR QUALITY & CURRENT AIR QUALITY IMPACTS

Surrounding land uses are primarily rural (agriculture and grazing) and rural residential. The closest residential receivers for the quarry are located approximately 350m to 1km south-east of the Dunmore site. Surrounding residential suburbs within 10km of the site are Shell Cove, Minnamurra and Kiama Downs. Sources of particulate matter in the area would include traffic on unsealed roads and the Princes Highway, quarry activities, local building and construction activities, animal grazing activities and cultivation.

The Development Consent conditions require that PM10 and dust deposition be monitored to manage dust from the site. One High Volume Air Sampler (HVAS) with a PM10 head and four dust deposition gauges have been installed around the site. The monitoring locations are shown in Figure 5-1.

Figure 5-1 Dust Deposition & High Volume Air Sampler Monitoring Locations



PM10 and dust deposition levels have been consistently measured around the site since 2005. The recorded PM10 and dust deposition levels have been used to establish the potential zone of impact for the existing quarry and these results are used qualitatively to assess the proposed modification including the blending plant. The PM10 and dust deposition levels measured around the quarry are summarised in **Error! Reference source not found.** and Table 5-2, respectively.

Table 5-1 PM10 Monitoring Results

Year	Measured PM10 Levels	
	24 hour maximum ($\mu\text{g}/\text{m}^3$)	Annual Average ($\mu\text{g}/\text{m}^3$)
2005-2006	30.8	12.7
2006-2007	68.9	18.9
2007-2008	36.1	12.6
2008-2009	49.4	12.95
2009-2010	33.6	8.2
2010-2011	46.4	16.4
2011-2012	35.7	11.3
2012-2013	30.3	11.0
2013-2014	42.3	13.9

The results of HVAS monitoring indicate that suspended particulates have generally remained below the air quality goals despite the monitor being located half way between the closest receiver and the boundary of the quarry. Three exceedances of the $50 \mu\text{g}/\text{m}^3$ 24 hour impact assessment criteria were recorded in 2006-2007 with the maximum recorded being at a time when the wind speeds and directions did not indicate that the quarry operations were the contributing factor to the elevated readings. In 2013 to 2014 the annual average was $13.9 \mu\text{g}/\text{m}^3$, which is well under the long term impact assessment criteria of $30 \mu\text{g}/\text{m}^3$, and the highest reading was $42.3 \mu\text{g}/\text{m}^3$, which is below the 24 hour impact assessment criteria of $50 \mu\text{g}/\text{m}^3$.

Table 5-2 Dust Deposition Monitoring ($\text{g}/\text{m}^2/\text{month}$) (Annual Average)

Annual Averages	D1	D2	D3	D4
2005-2006	3.3	3.7	4.1	3.9
2006-2007	3.5	2.5	2.8	4.3
2007-2008	3.3	2.4	3.9	3.8
2008-2009	3.7	3.0	3.1	2.7
2009-2010	3.8	3.5	5.0	2.6
2010-2011	3.4	3.3	3.4	2.5
2011-2012	3.7	3.3	5.0	2.8
2012-2013	3.7	2.6	5.8	3.3
2013-2014	5.2	3.6	4.6	3.2

The dust deposition levels monitored typically indicated compliance with the recommended dust deposition criterion of $4 \text{ g}/\text{m}^2/\text{month}$ (annual average). There have been a number of exceedances of the criterion at D3. This gauge, however is located very close to the quarry compared to the closest residence - Receiver 2. The gauge is located approximately 300m from the active part of the quarry compared to Receiver 2 which is 600m away. Therefore the dust deposition levels at Receiver 2 are likely to be well below the recommended dust deposition criterion of $4 \text{ g}/\text{m}^2/\text{month}$ (annual average). There are single exceedances of the annual average deposition criterion for gauges D1 and D4. The overall trend of these gauges, however is that they comply with annual average deposition criterion of $4 \text{ g}/\text{m}^2/\text{month}$.

6 STUDY FINDINGS

The presence of dust is influenced by a variety of factors, including prevailing wind direction, temperature, time of day, topography and operational activities.

The SEE (2008) notes that the main sources of dust associated with the current operation of the quarry are:

- Drilling and blasting of rock within the active extraction areas;
- Vehicles travelling on unpaved surfaces;
- Crushing and screening of rock within the processing plant;
- Loading and unloading of material to trucks, crushers, stockpiles and trains; and
- Wind erosion from stockpiles and unpaved exposed areas.

The 2008 SEE which accompanied the Modification 4 application states that the estimated annual dust emissions from the quarry would be 469,885kg of dust per annum for a production rate of 2.5Mtpa.

The proposed blending plant has the potential to increase dust from the site due to the following operations:

- Dumping of crushed rock in the product bins. This process has already been accounted for in the inventory from the previous assessments as it would be similar to loading a truck.
- Conveying the crushed rock to the blending plant. The conveyor of the blending plant is fully enclosed and The dumping of crushed rock in the product bin is similar to that has not bee ;
- Loading of the cement to the silos and the conveying to the blending plant;
- Blending of the product; and
- Loading of the blended product into trucks for dispatch to customers.

Dust generated from the blending plant is presented in Table 6-1.

Table 6-1 Estimated dust generation from blending plant.

Process	Emission estimate kg / tonnes	Quantity of Dust kg
Dumping of crushed rock in the product bins.	This process has been accounted for in the existing inventory from the previous assessment as it would be similar to loading a truck. No emissions.	-
Conveying the crushed rock to the blending plant	Conveyor is fully enclosed. No emissions.	-
Loading of the cement to the silos and	The cement would be transferred	-

Process	Emission estimate kg / tonnes	Quantity of Dust kg
the conveying to the blending plant	pneumatically. No emissions.	
Blending of the product	Blending occurs in an enclosed space. No emissions.	-
Loading of the blended product	0.0022 kg/t USEPA(1995) NPI (2012)	330
Total Dust (kg)	-	330

The proposed blending plant is estimated to increase annual dust emissions from the quarry by 330kg, which is less than 0.1 percent of the total dust emissions.

Therefore the proposed modification would result in a negligible increase to current dust emissions. As discussed in Chapter 5, dust emissions from the existing operations are generally compliant with ambient criteria and therefore it is highly unlikely that the proposed blending plant will cause exceedances of the ambient air quality criteria.

The following dust management measures are already in place at the quarry and will continue to be implemented during operation of the blending plant:

- regular wet down of unsealed surfaces using a water truck;
- wet down as required on blasted rock haul roads and stockpiles;
- collection or dampening down on drill rig cuttings to reduce the quantity of dust released to the atmosphere during a blast;
- where possible, confining traffic to identified haul road routes;
- removal and rehabilitation of unnecessary roads;
- exposed areas kept to a minimum;
- requiring all trucks exiting the site to use the operating wheel wash;
- cleaning of areas which could become sources of dust; and
- review of meteorological conditions prior to blasting to minimise dust emissions.

Provided the management measures described above are implemented, it is considered that exceedance of the air quality goals would not result from the proposed modification. Therefore, the proposed modification would not have a significant impact on air quality.

7 CONCLUSION

A qualitative air quality assessment has been conducted to identify and assess potential impacts associated with the construction and operation of the blending plant proposed to be established at the Dunmore Hard Rock Quarry site located at 38 Tabbita Road in the Shellharbour local government area.

The proposed modification would not increase the amount or rate of production and so would not increase dust generation from sources such as crushing and screening of rock within the processing plant and wind erosion from stockpiles. The levels of dust generated from the loading and unloading of material would remain constant. The frequency of blasts will not increase.

The proposed blending plant is estimated to increase annual dust emissions from the quarry by 330kg, which is less than 1 percent of the total dust emissions. The dust emissions from the existing operations are generally compliant with ambient criteria and as such it is considered that the proposed modification would result in a negligible increase to current dust emissions.

The following dust management measures are already in place at the quarry and will continue to be implemented during operation of the blending plant:

- regular wet down of unsealed surfaces using a water cart;
- wet down as required on blasted rock haul roads and stockpiles;
- collection or dampening down on drill rig cuttings to reduce the quantity of dust released to the atmosphere during a blast;
- where possible, confining traffic to identified haul road routes;
- removal and rehabilitation of unnecessary roads;
- exposed areas kept to a minimum;
- requiring all trucks exiting the site to use the wheel wash;
- cleaning of areas which could become sources of dust; and
- review of meteorological conditions prior to blasting to minimise dust emissions.

Provided the management measures described above are implemented, it is considered that exceedance of the air quality goals would not result from the proposed modification. Therefore, the proposed modification would not have a significant impact on air quality.

8 REFERENCES

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Climatic Averages Australia, Bureau of Meteorology website
[<http://www.bom.gov.au/climate/averages>]

SEE (2008)

"Statement of Environmental Effects for the proposed Dunmore Hard Rock Quarry Extension", Boral Resources, May 2008.

NPI (2012)

"Emission Estimation Technique Manual for Mining, Version 3.1", National Pollutant Inventory, January 2012. ISBN: 0 642 54700 9

NSW EPA (2005)

"Approved Methods for the Modelling and Assessment of Air Pollutants in NSW", August 2005

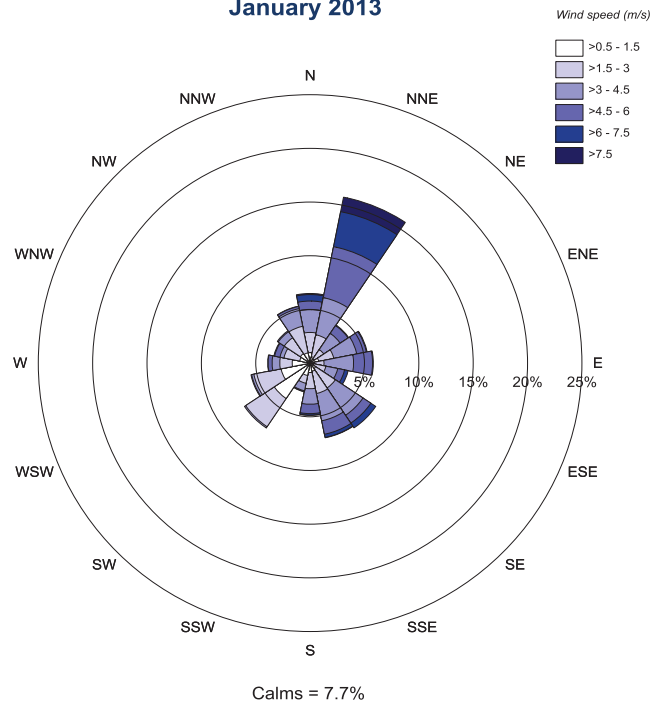
US EPA (1995)

"Compilation of Air Pollutant Emission Factors", AP-42, Fourth Edition United States Environmental Protection Agency, Office of Air and Radiation Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711. Note this reference is now a web-based document.

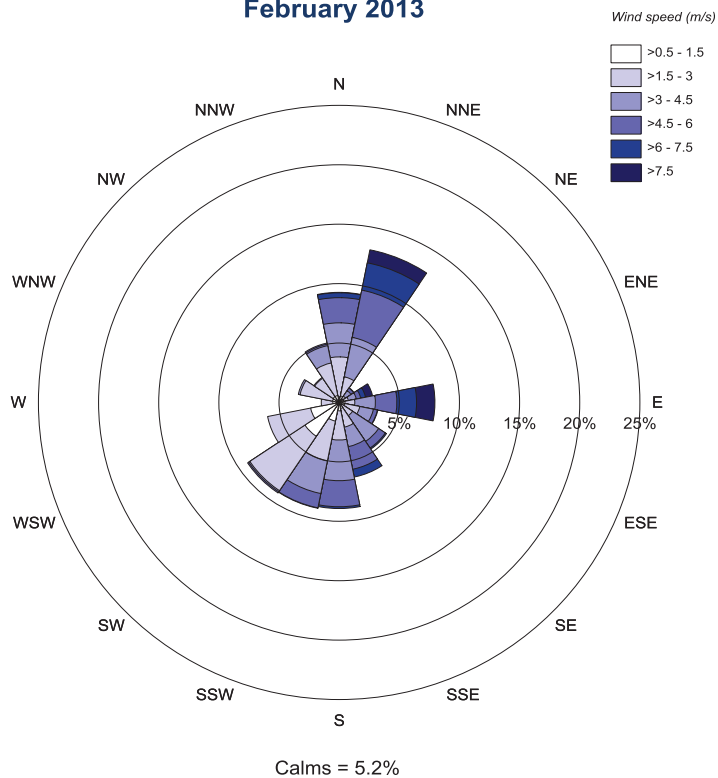
APPENDIX A

SITE WINDROSES

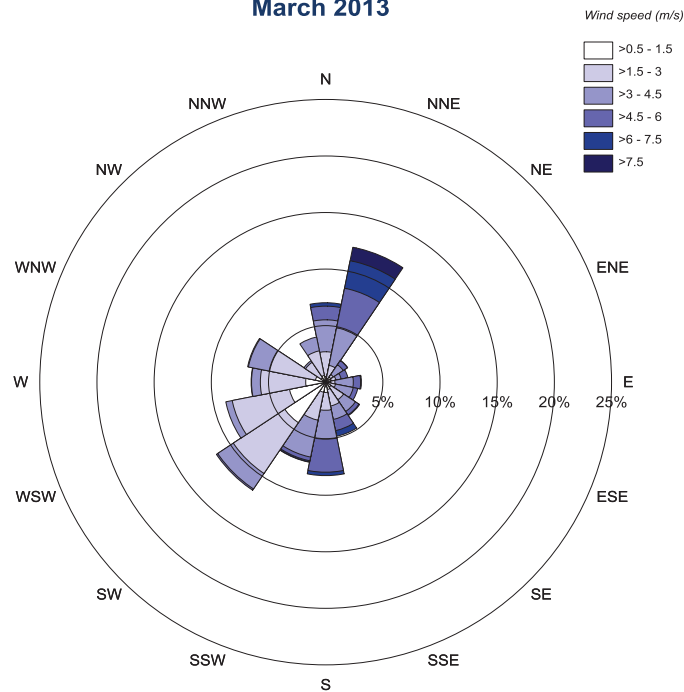
**Windrose for Dunmore Quarry
January 2013**



**Windrose for Dunmore Quarry
February 2013**

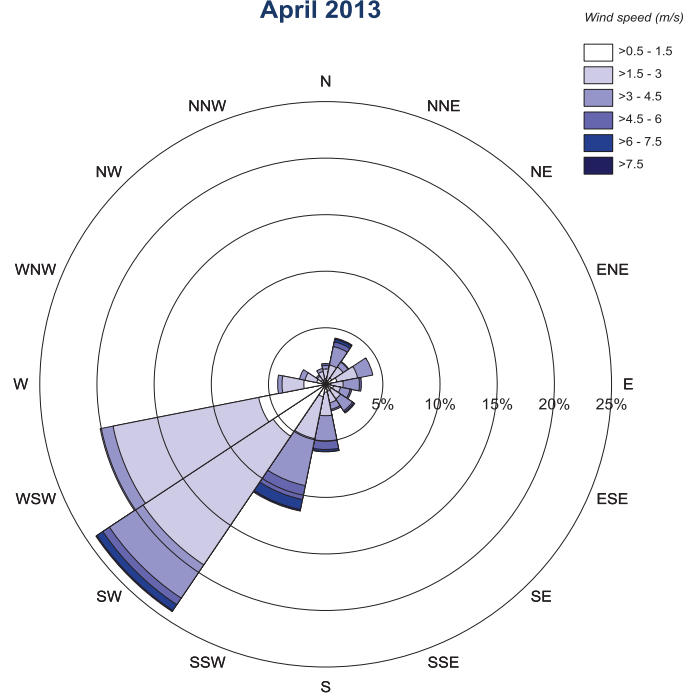


Windrose for Dunmore Quarry March 2013



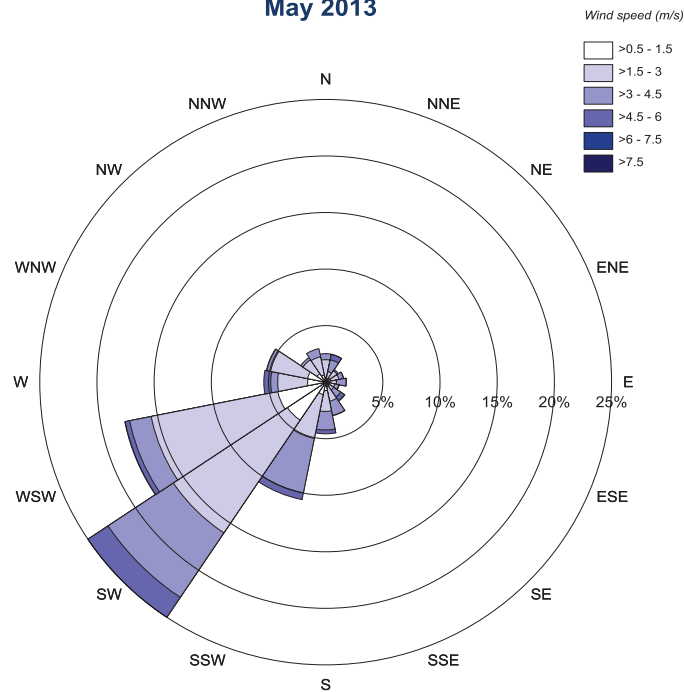
Calms = 6.4%

Windrose for Dunmore Quarry April 2013



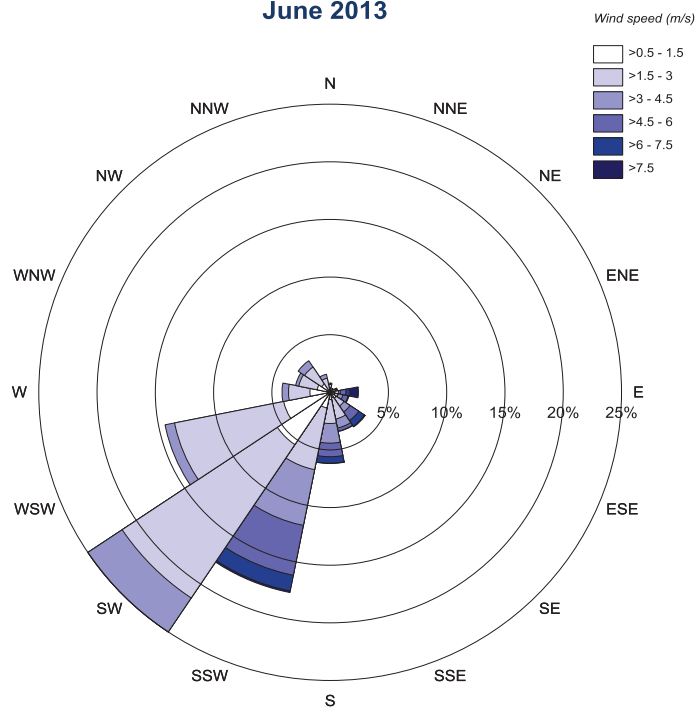
Calms = 8.9%

Windrose for Dunmore Quarry May 2013



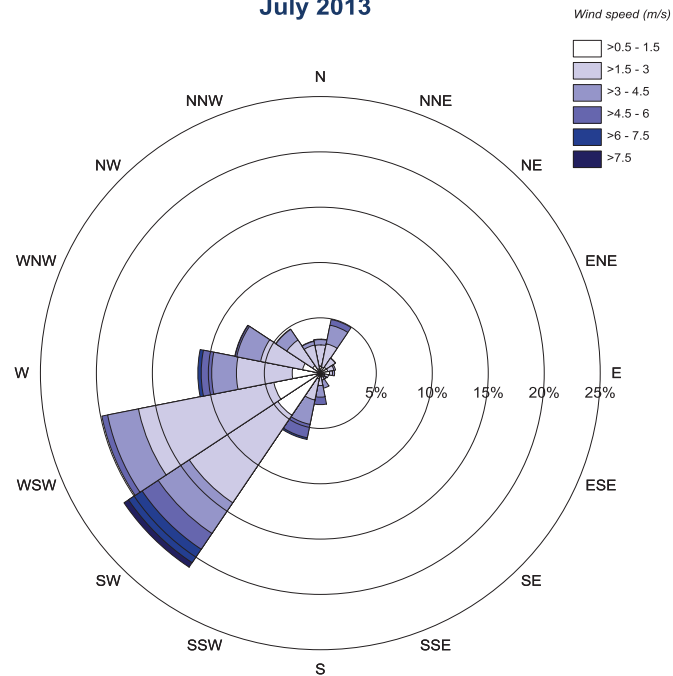
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Windrose for Dunmore Quarry June 2013



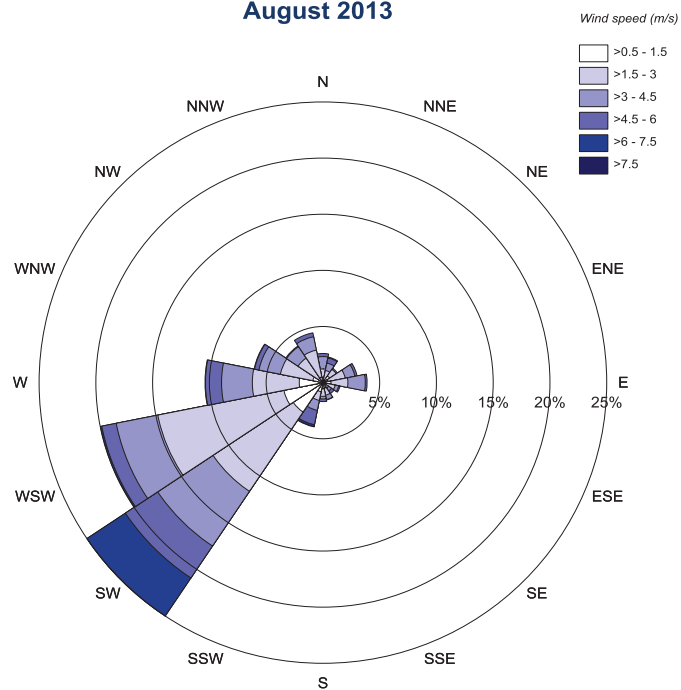
Calms = 8.8%

Windrose for Dunmore Quarry July 2013



Calms = 17.9%

Windrose for Dunmore Quarry August 2013



Calms = 18.0%

